

disk

USER

**BBC MICRO
MODEL B
MODEL B+
MASTER 128**

**ALL DFS
FILING
SYSTEMS**



On the Disk

**SHEDDING LIGHT ON 3D GRAPHICS
BLOCKADE — BLAST 'EM UP
MUSIC TUTOR
INTERACTIVE TUTORIALS
DISK OVERLAY TECHNIQUES
SCREEN COMPRESSION
CHARACTER EDIT
DISK REPAIR
REPTON 3 MAPS AND SCREENS
ANIMATIONS**

In the Magazine

**BEGINNERS GUIDE TO
DISKS
DISK SOFTWARE
REVIEWED
DISKS AND THE 512
CO-PRO**



FROM THE PUBLISHERS OF

**A&B
COMPUTING**

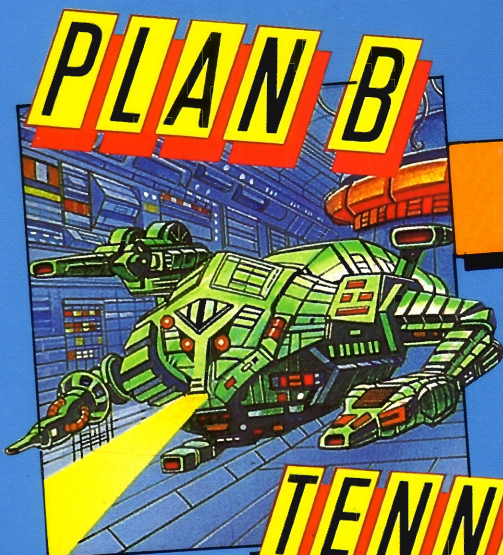
THE

BUG-BYTE

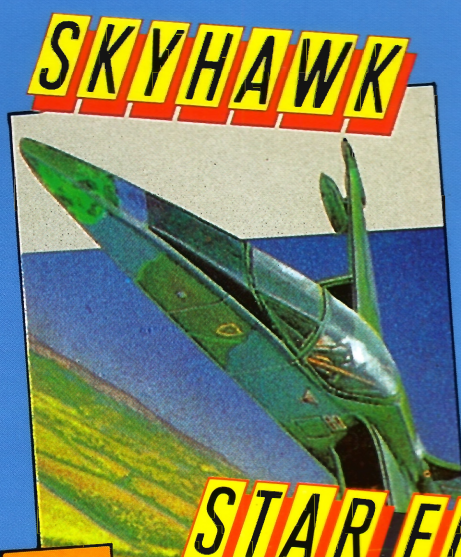


Compilation

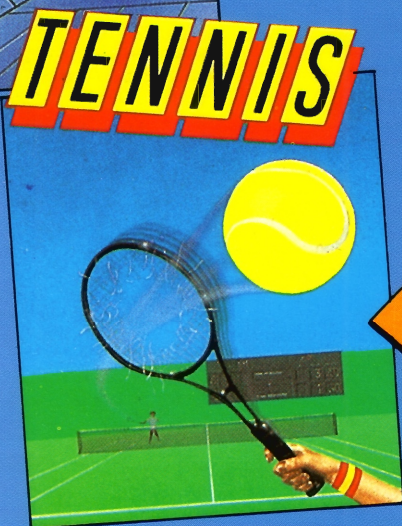
**Four Great Games For Your
BBC Machine on One DISK**



PLAN B

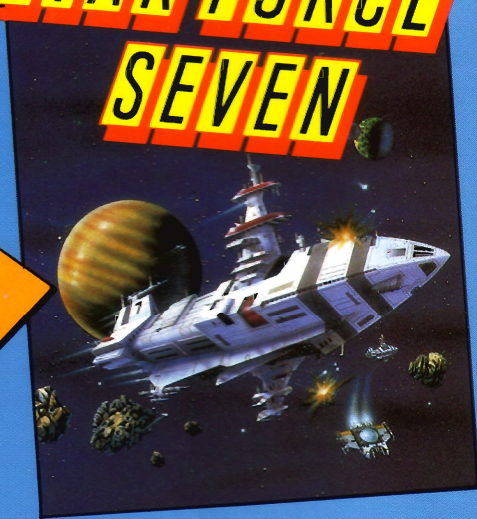


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Leicester Place
London WC2H 7NB

BUG-BYTE



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Bug Byte, Unit 1
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Watery Lane Darwen, Lancs.

disk USER

**Disk User Number Four
December/January
1987/88**

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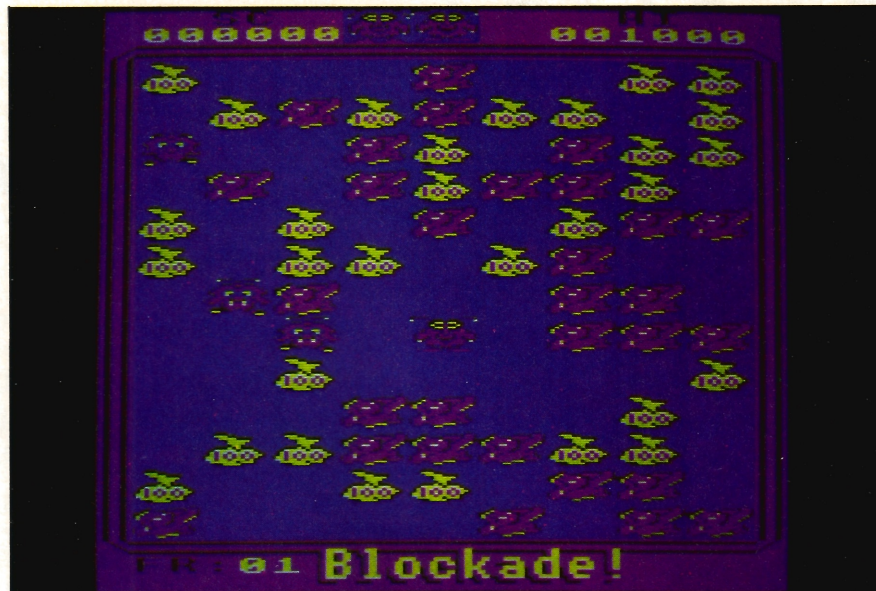
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Due to lack of space we've held onto



our Toolkit character editor for next month. Don't risk missing out, order your copy of Disk User 5 now. Another unique issue will include: Disk User's very own theme tune! animations disk utilities fast and furious games zooming in on graphics overlay techniques

Subscription enquiries on 0442 48432 Disk User is published bi-monthly on the third Friday of the month preceding cover date. Editorial and advertising enquiries to Disk User, Number One Golden Square, London W1R 3AB. Telephone: 01 437 0626. Distributed by SM Distribution Ltd., 16-18 Trinity Gardens, London SW9 8DX. Telephone: 01 274 8611. The contents of this publication including all articles, designs, plans, drawings and programs and all copyright and other intellectual property rights therein belong to Argus Specialist Publications Ltd. All rights conferred by the Law of Copyright and other intellectual property rights and by virtue of international copyright conventions are specifically reserved to Argus Specialist Publications Ltd. Any reproduction requires the prior written consent of Argus Specialist Publications Ltd.

Cover design and design by the ASP Design Studio 01 631 3888 Printed by Riverside Press, Barnstaple, Devon Disk duplication by Disk Copy Labs ISSN 0264-4584

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Disk User is supplied on a 40 track disk format and can be run without conversion on a 40 track drive.

If you have 40/80 switchable drives then make sure the drive is switched to the 40 option.

For 80 track only drive owners, a conversion program is provided – see Disk Instructions.

DISK INSTRUCTION

DISK INSTRUCTIONS

To get the best from your copy of *Disk User*, please carefully read the instructions below. We have made *Disk User* able to run on a very wide range of systems.

One point to note is that we **strongly recommend copying the disk on to a blank formatted disk before you use it.** You should use this copy as your working copy, and keep the original as the back-up. Many of the programs require to write to the disk, and doing this will diminish the usefulness of the original.

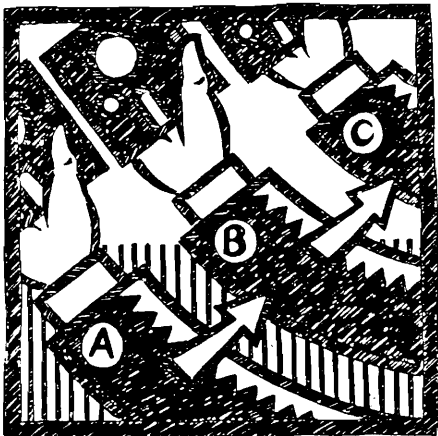
40 Track Drive Systems

Disk User is supplied on a 40 track disk so will work on any 40 track BBC micro system (at least, any that we know of!) straight away. Remember to make a working copy before use.

40/80 Switchable Drives

If you have this sort of drive, you can use *Disk User* straight away with the drive switched to the 40 track setting; don't forget to make a copy for normal use. However, you may wish to copy the disk on to 80 track format, in which case, with a single drive, you should follow the instructions for 80 track systems.

With two switchable drives, or one switchable drive set to 40 track and an 80 track drive (or even a 40 track drive and an 80 track drive), you can easily copy *Disk User* on to 80 tracks; put *Disk User* into drive 0 (40 tracks)



and a blank formatted 80 track disk into drive 1 (80 tracks) and type:

COPY 0 1 <RETURN>

Here <RETURN> means hitting the return key. You can set the boot option to drive one by typing:

***DRIVE 1** <RETURN>

***OPT 4 3** <RETURN>

80 Track Drives

Because *Disk User* is supplied as a 40 track disk, 80 track disk drives have to double-step through the disk. Probably the most convenient thing to do is to copy *Disk User* on to 80 track format. This can be done in two ways.

If your filing system allows double-stepping, we recommend using the system's own command. As a general rule, built-in 40-to-80 track converters should be used where available; the documentation for your filing system or utility ROM will give full instructions, and we give suggestions for some better-known systems further on).

Not all filing systems have facilities for double-stepping; Acorn's DFS is one such system. To overcome this, a program called CHANGE is supplied on the *Disk User* disk in a section which can be accessed by 80 track drives.

Using CHANGE

Insert *Disk User* into an 80-track drive (or 40/80 switched to 80-track) and type:

***CHANGE** <RETURN>

The program will prompt you to insert a pre-formatted blank 80 track disk when it is ready to write to it (you will have to swap back and forward between the two disks several times if you are using only one drive). Once this is completed, you can use the newly created 80-track version of *Disk User* and keep the original as the back-up.

Our suggestions on how to use *Disk User* on some popular DFSs now follow.

Master 128

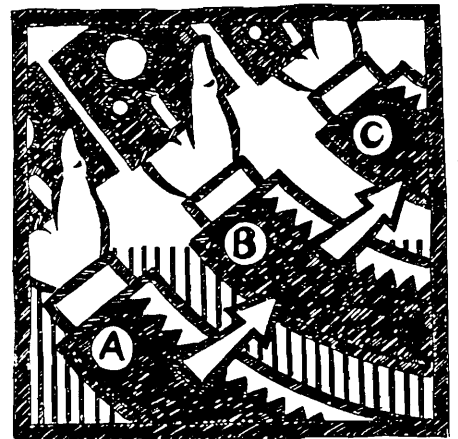
This Acorn DFS has a software double stepping mode for a 80 track drive. Set it with the command

***DRIVE 0 40** <RETURN> and then hit <BREAK>

Disk User will then work without any need for conversion. However this may not allow writing to the disk in 40 track mode; in any case, you should make a working copy, so copy to a 80 track disk.

DFS on Master Compact

The DFS is supplied as an image on some versions of the Master Compact Welcome disk (or is available from Acorn on disk) and this may be used in conjunction with a 5¼ inch 40 track disk drive to run *Disk User*. Please note that we **cannot** at present supply *Disk User* on a 3½ inch disk (if there is sufficient demand, we may be able to in the future).



Opus DDOS/Challenger 3

If you are using the Opus DDOS disk filing system or Challenger 1.0/DDOS then issue the command

***4080 AUTO** <RETURN>

or

***ENABLE 40/80** <RETURN>

and *Disk User* will work without any need for conversion.

Challenger 3

If you have the later ROM version Challenger 1.1 then issue the command

***OPT 8,1** <RETURN>

to achieve the same result. *Disk User* will work effectively from the RAM disk. Use

***COPY 0 4 ***

***CONFIG 4=0**

***OPT 4 3**

to run from RAM disk

Solidisk DFS

With the Solidisk DFS 2.1 and 2.0 you can set a software double stepping mode for a 80 track drive with the command

***ENABLE 80 <RETURN>**

Disk User will then work without any need for conversion.

Watford DFS

The Watford DFSs also have a software double stepping mode for an 80 track drive. Consult your manual for the appropriate FX call or command. Disk User will then work without any need for conversion.

Disk failure

If for any reason your copy of Disk User will not work on your system then please carefully re-read the instructions given above.

If you still experience problems then:

1. If you are a subscriber, return it to:
**Disk User, Infonet, Times House,
179 The Marlowes, Hemel
Hempstead;**

2. If you bought it from a newsagents, return it to **Disk User Replacements, Discopy Labs, 20 Osyth Close, Brack Mills, Northampton NN4 0DY** before 1st January 1988. You can make telephone enquiries about *Disk User* on 01 437 0626 (please ask for *Disk User* Editorial). Enquiries in writing will be dealt with as promptly as possible and replacement disks sent out immediately. Please use appropriate packaging, cardboard stiffener at least, when returning a disk. Do not send back your copy of the magazine. Only the disk please.

Disk Hints

You can speed up your disk access, speeds by issuing the software command: ***FX255,15 <RETURN>** The effect lasts until **<CTRL><BREAK>** is pressed. This extra speed is only possible with the latest disk drives - the half-height and slimline drive types.

Disk User files

All change - 40 track to 80 track
convertor

files:

CHANGE machine code file. *RUN

Disk User - Disk magazine title
page animation

author: Abbas files:

P.RUNDISC BASIC file A.DISC
machine code file

Menu - Easy selection of the
software.

author: Matthew Fifield files:

MENU BASIC file

Floating point 3D graphics -

Advanced mathematics made easy.

author: J. Walsh files:

GRMENU BASIC file PROG1 BASIC
file PROG2 BASIC file PROG3
BASIC file PROG4 BASIC file OBJ5
machine code file

Music Tutor - Making melodious
music has never been easier.

author: F. M. Botto files:

MUSIC BASIC file TUTOR BASIC
file

Blockade - Fast moving maze
chase!

author: C. Dunkley files:

BLOCK BASIC file

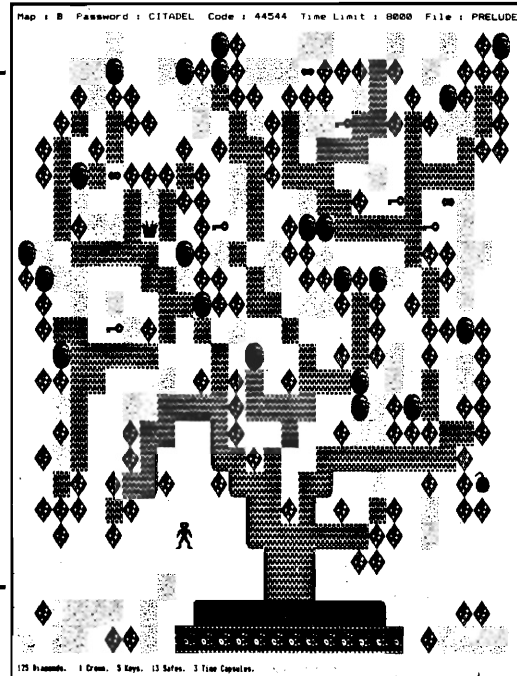
**NOTE:- Blockade fails to
work properly on the Master
Series!**

Screen Compacter - Squeeze
big screens into small spaces.

author: J. Kelk files:

B.COMP BASIC/Assembler source
file

Repton 3 screen printer - Find
your way with this map printer.



author: P. K. Bedford files:

Codegen BASIC file

Animation - Abbas animates the
letter E.

author: Abbas files:

E.Alpha data file P.RUNE BASIC file

Interactive Teach-in - All you
need to know about Random Access
Files.

author: Mostyn Hellard files:

Teachin BASIC file

Number Resequencer - Get
your BASIC programs in order!

author: John Kelk files:

B.RES BASIC/Assembler source file

New REPTON 3 screens -

Designed for your enjoyment.

author: C. Dunkley files:

EXTRA Data file

Disc Repairer - Nurse your discs
back to health with this utility.

author: Michael Spalter files:

REPAIR BASIC file

ADFS Users

After a straight conversion from DFS
to ADFS the following step will help
the programs run.

Delete line 140 in file MUSIC. The
disc repairer (file REPAIR) fails to
work on the ADFS.

Note:-

Disk User almost fills a 40 track disk.
Any software that may need extra
disk space to save information
should be copied onto a blank disk.
i.e. Screen Compacter, Number
Resequencer and Repton screen
mapper.

DISK NEWS

AMPLINEX

Users of the **Music 5000** synthesiser will no doubt be pleased to know that there is a new disk based magazine called AMPLINEX.

Interestingly it integrates with the AMPL/Studio 5000 system to create what is best described as an interactive listening experience, and via a series of menus, to access music, news, utilities, and new instrument definitions as well as act as a forum for news and information to all AMPL users everywhere.

The disk is bi-monthly and is available from AMPLINEX, 26 Arbor Lane, Winnersh, Berks, RG11 5JD – don't forget to enclose an SAE.

FJP's CV Computer Package sounds like a good idea. The software explains what a CV is, assists in the writing of the CV, provides editing and printing facilities. Price per school, college, or centre is £15.95 plus £1 postage and packing.

FJP Software, 11 Eastnor Grove, Leamington Spa, Warwickshire, CV31 1LD.

Cambridge Software House has four new releases, Can you find it?, Water Manager – in partnership with the Anglian Water Authority, The Princess and the Ring – adventure for 5+, and Pathfinder – a large scale simulation based around aviation.

Cambridgeshire Software House, The Town Hall, St. Ives, Huntingdon, Cambs, PE17 4AL.

Illustrations

Nidd Valley have released a software package for their Digimouse called "The Illustrator", a disk based program compatible with the BBC B and the B+.

The Illustrator produces high resolution printouts in a choice of four sizes and two densities in monochrome Modes.

The software includes an extensive library of designs, plus an icon editor, brush designer and a pixel

and zoom editor.

The price for "The Illustrator" disk is £49.90 and includes a Digimouse, although if you already own a mouse, you can purchase the software alone for £19.90.

For more information, contact Nidd Valley Micro Products Ltd, 4AA9 Thorp Arch Trading Estate, Wetherby, West Yorks, LS23 7BJ. Telephone (0937) 844661.

Graphics adventure

Robico have released their first adventure to feature graphics. The Hunt – Search for Shauna costs £12.95 on disk and is available for Model B and B+ initially with a special Master version in the pipeline.

The disk version has 20 or so location pictures stored on the disk so that they are very detailed and of a high resolution.

Robico Software, 3 Fairland Close, Llantrisant, Mid Glamorgan CF7 8QH. Tel: 0443 227354.



Genie Junior

Genie Junior is a cut-down version of the successful Genie hardware. All that needs to be done is to install the Genie Junior ROM in the Beeb, ensure that a disk is in the disk drive and you have a working system. You can jump out of any application and instantly have the benefits of an online date stamped

calendar, calculator, notebook and address book.

Genie Junior costs £25 and is available from Permanent Memory Systems, 38 Mount Cameron Drive North, St Leonards, E Kilbride, G74 2ES.

Educational Software on disk

There can be no doubt that some of the most original software is now coming from educational software houses. Many of the packages will prove useful at home as well as in the school. Here are the new releases on disk:

Progress is a student profiling package on 40 or 80 track disk. This specialised database style software is supported by Newcastle IT centre.

City of Newcastle Upon Tyne, Information Technology Unit, Pendower Hall, West Road, Newcastle Upon Tyne, NE15 6PP. Tel: 091 274 3820

Beat the Boss is the third in a series of real life simulations from RBRC software, in which students learn by doing. It's called *experiential learning*. In Beat the Boss a five year play through takes 2.5 hours, the objective to maximise profits and to earn larger cumulative profits than the boss!

Prof. Ronald Brech, The Guild House, 32 Worple Road, Wimbledon, SW19 4EF. Tel: 01 946 8641.

Maps and Landscapes No.2 is the follow up to Chalksoft's first successful geography title. Three large sections deal with Direction, Scale and Contour. Chalksoft say that their trials have shown that teachers of children of ages 8 to 14 found the approach very suitable. Price £17.25

Chalksoft, PO Box 49, Spalding, Lincs. PE11 1NZ. Tel: 0775 69518.

DISK NEWS

News Desk is the latest in Granada's The Micro at Work series. It's a publishing software package for stories and pictures. The adviser is Tony Quinn, editor of Acorn User. Nice to see he's branching out from listings!

Also new is Status, a statistics handling package aimed mainly at geography and biology departments. Status is unique in that it selects the appropriate tests for the data.

Contact Mercury Music Co. Ltd, PO Box 194, Sevenoaks, Kent, TN15 8TZ. Tel: 0732 883261.

Designer disks

These very fetching 3.5" disks are the latest in **TDK fashion add-ons** for earlobes and earlobe compatibles. From TDK's latest trade adverts for their new floppies.



Acorn Loss

The half year results recently published by Acorn show that the sales in the first six months of 1987 totalled £19.02m. A net loss of £1.38m was suffered.

Acorn's managing director, Brian Long, in announcing the results said that "The Master series continued to sell well, although effective early promotion for the Archimedes led to a slowing down in sales in the second quarter as customers evaluated the new line"

Solids Modeller

The **Silicon Visions** "professional" 3D CAD system has recently been expanded to handle hidden line removal operations so that the wire frame images displayed on the screen look - to all intents and purposes - solid.

The package is a big one, consisting of a 32K ROM and six floppy disks.

The software is compatible with the BBC B the B+ and the Master 128. A Master Compact version is available for DFS users only, and it does support a mouse.

Prices are £89.95 inc VAT for the package, and it is available from Silicon Visions themselves at 47 Dudley Gardens, Harrow, Middlesex, HA2 0DQ. Telephone (01) 422 2274.

Topologika Adventures

Newly formed **Topologika** are specialising in educational programs and adventures. Peter Killworth, author of Countdown to Doom and Philosopher's Quest has expanded the games into disk versions. The maps have been enlarged and new puzzles and twists added.

A team of programmers are working on a new range of adventures for release in the new year. These will include Quondam, Avon, a game with a Shakesperean setting and Murdac, by John Thackray, author of Acheton. Peter Killworth is working on the follow up to Countdown to Doom to be called, you guessed it, Return to Doom. Castle of Riddles is also being upgraded to disk. Prices are £17.50.

Details from Topologika, PO Box 39, Stilton, Peterborough, PE7 3RL. Tel: 0733 244682.

MicroCODIL is supported by two new databases, Family History Pack and History Project Pack. You'll need the MicroCODIL language. Available on DFS or ADFS, 40 or 80.

CODIL Language Systems, 33 Buckingham Road, Tring, Herts, HP23 4HG.

'**Datafile of Educational Software** and addresses of interest to computer users in education' is valuable data on disk compiled by Nick Evans, author and expert in the field of educational computing. The data is available for the following databases: FIND, Viewstore, Key and Supastore. All disks supplied are 80 track double sided. Price £15.00.

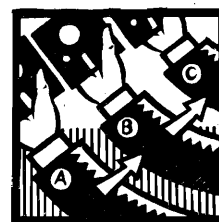
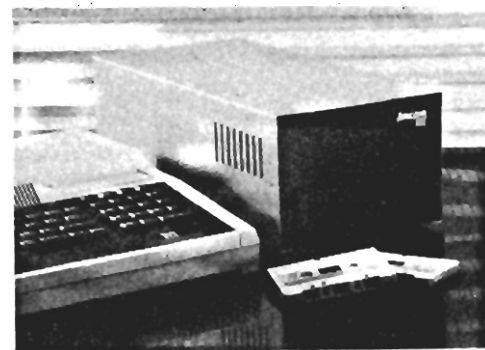
Nick Evans, PO Box 55, Grimsby, DN32 0QB.

Winchester way

Amcom have corrected the prices we gave in our first Disk User article on winchester hard disks. Their range of hard disks is now available from £399.

Amcom's comments extend to the use of tape streamers mentioned in the article as a means of backing up data. They point out that the tape streamer is capable of copying 10Mbytes in five minutes and, although more expensive than a second winchester, the tapes are removable media and therefore more secure. Their 20Mbyte tape streamers cost £950.

Amcom can be contacted at 35 Carters Lane, Kiln Farm, Milton Keynes, MK11 3HL. Tel: 0908 569212.



DISKS AND THE 512

The 512 coprocessor is now available to all BBC owners. As a disk based system what has it got to offer disk users?

The 512 coprocessor is a piece of hardware which provides 512K RAM, faster processing and bundled software for what is now a reasonable price of £199. Model B and B+ owners will require a Watford or Acorn interface, both costing under £100. It also opens up IBM compatible software, much of which is not available in native BBC form, for instance integrated business software and desktop publishing.

DOS+ is the disk operating system provided. Some commands are resident in memory, most are read from disk before execution. The 512 will also operate automatically with MSDOS. GEM, a graphics based front-end, can be loaded to provide an easy to use interface with the files on disk. This involves pointing at disk icons with a mouse (provided as part of the 512 package) and choosing from pull down menus and boxes which display directories and files. Different filetypes are distinguished by a three character postfix.

DOS Plus

DOS+ can only communicate in a rudimentary fashion with the BBC operating system eg copying data between different disc formats with GETFILE and PUTFILE commands. So, although this is useful for transferring text files, it's a case of choosing to be in one system or the other, not of switching between each.

The DOS+/GEM disk operating system is certainly an exciting new environment but be warned, if programming is your interest, the Acorn manual will not help. You will need to invest in manuals and a programming language.

The GEM applications supplied, Paint, and Write, have excellent features but it's only worth ditching your current software if it's of poor standard or if the graphics approach (wordprocessed text and graphics on the same screen and sheet of paper) is required. Also if you are lucky enough to own a laser printer, there are printer drivers supplied with

GEM.

The 512 is of interest to schools and colleges as the pressure increases on them to train their pupils with the software packages they may meet in their careers outside. It's a great educational computing debate whether this pressure is justified when perfectly good spreadsheets and wordprocessors are available on the standard BBC. The great thing about the 512 is that it is not just a token gesture to counter this criticism but a technical improvement over the standard IBM clones combined with a useful set of software.

DOS commands

Well, from the disk user's point of view let's take a look at the disk filing system which is at the heart of the 512. DOS+ has a number of commands, most of which are called up from disk, with the consequence that dual (two) disk drives are almost essential. Syntax is similar to the Acorn ADFS. DFS users will need a while to get used to the hierarchical structure and the use of directories. DIR gives a list of files in a directory, CHDIR moves to a specified directory, TREE displays the structure of your files/directories. PATH tells the system to look in a particular directory along a particular path through the tree. RMDIR removes directories, ERAQ removes files.

Here's a familiar command:

COPY B:temp.txt A:final.txt

where you can see that A and B are used to distinguish between the two drives. The postfix '.txt' is just one of a number of standard mnemonics which are attached to filenames. They are in fact more important than just memory joggers about the contents of the file, but are recognised by DOS and acted upon. GEM also makes use of these conventions.

The Master 512 supports a range of disk formats. A utility program can be called up from the DOS prompt (just type DISK) to format and copy disks in 640K format (DOS+), 800K format (Acorn DOS+ format), 400K

(CP/M) compatible with the Acorn Z80 format, 360K for IBM compatibles (such as Amstrad 1512/1640) and Olivetti and Tandy special formats, among others.

An important element of DOS+ is the ability to create 'batch' files in a text editor supplied with the system. Much more sophisticated actions are possible than with Acorn EXEC files. Batch files are used to create 'turn-key' systems which start up exactly as required by the batch file programmer, in the desired colour scheme, directory selected etc.

DOS can also set up a RAM disk, setting aside a specified amount of memory for a fast disk. It also supports two 'background' activities, ALARM and PRINT. PRINT is especially useful for printing documents while you continue with your work.

GEM

GEM loads from its own disk and boots up a full screen desktop with a mouse controlled pointer, icons, folders and utilities. The icons represent disk drives, directories (folders) and application programs such as GEM Write or GEM Paint, provided with the 512. Clicking on the icons moves around directories or activates programs. Drop down menus provide other options. If GEM needs information typed in, it prompts you. A number of submenus allow full configuration of the system, from linefeeds to plotter characteristics.

Back in DOS, BBC Micro operating system calls can be accessed and finally there is a command NOTUBE which takes you back to the BBC Micro environment.

If you do choose the 512 upgrade path then you will find a powerful system, some very good bundled software and the opportunity to run any number of IBM compatible packages. One word of warning: do check with your Acorn dealer about 512 compatibility with IBM software before buying.

COLLECTORS ITEMS



Our alphabetic animations reach the letter E

Some I could mention suggested *E for Editor* but computer artist Abbas thought along more traditional lines.

Abbas' further contribution to this issue is the *Random Access* artwork, produced on Prisma 3. Millipede Electronics are making Prisma 3 Archimedes compatible too, quite a combination for graphics of all kinds.

C.Dunkley

BLOCKADE

This is Blockade – it's difficult but we know that, when it comes to games, Disk Users don't despair that easily



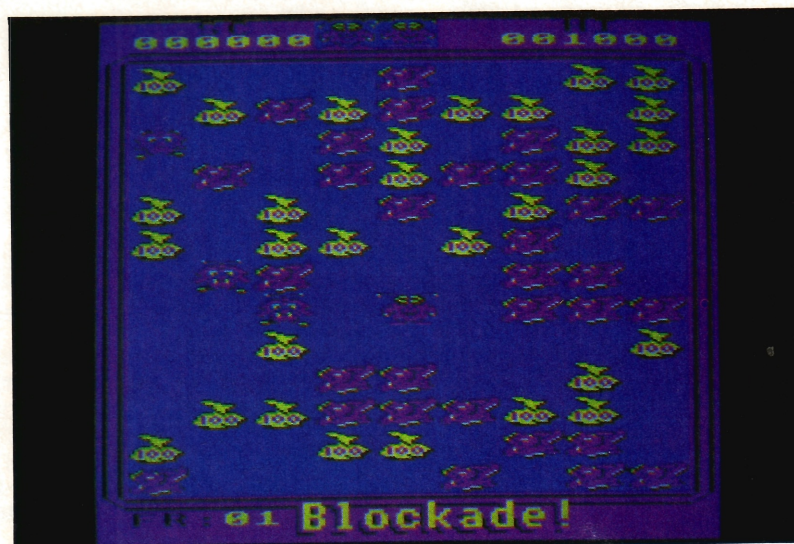
Blockade game keys:

A – up

Z – down

< – left

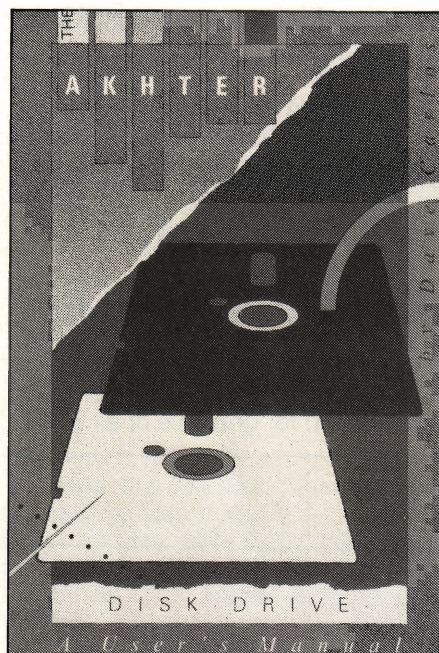
> – right



There are full on screen instructions for blockade. Best of luck.

BOOKS

A quick guide to some of the handy books aimed at disk drive owners

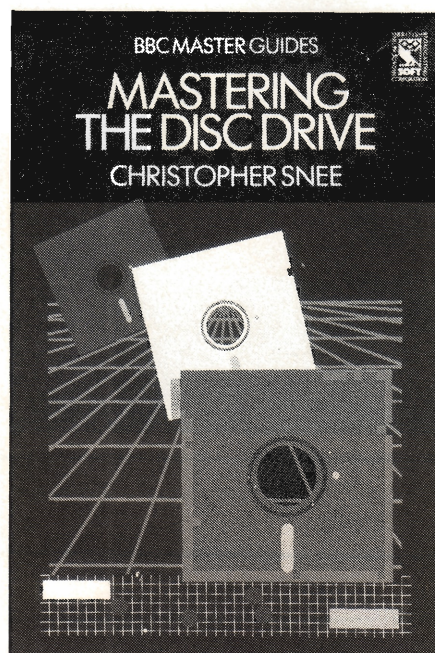


User's Manual

Akhter, a well known name in disk drive supply, have their own user's manual. Written by Dave Carlos, the spiral bound typeset 134 page book acts as both an introduction to disk use and a reference to the DFS (Disk Filing System) * commands. Each command is listed with full syntax, examples, a description of its effect, associated commands and notes on possible pitfalls, error messages you might encounter and an explanation of what might have gone wrong.

Other useful chapters include a look at the BBC Model B/B+ memory map and how information is held in RAM for the use of the DFS, advice on transferring programs from cassette to disk and accessing the DFS from assembler. There are also some notes on Akhter's disk utilities which come with their drives.

Clear layout, full index, various program examples and screen print-outs make this a very successful reference work, ideal for anyone who picked up a disk drive system but



very little documentation with it. £7.95.

Mastering the Disc Drive

Christopher Snee's book for BBC Soft is quick off the mark, briefly going through the system arrangements and DFS commands and quickly on to the operating system entry points and examples of how to access them from assembler. Chapters four to six detail the 8271 floppy disk controller, which was the first Acorn controller chip (succeeded by the 1770) and offer some quite large utilities to type in.

A description of random access to disk based data from BASIC leads to a full database example with a brief sidetrack into sorting. There are appendices on DFS 1.2 and memory workspace, a glossary and index. £7.95

Practical Disc File Techniques

Another book with a number of example programs by Peter



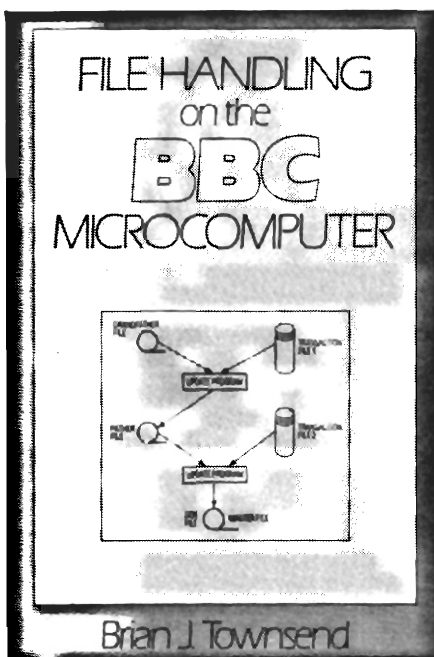
Beverley-Brown from Pentire Press. Random access filing is the theme which builds up to chapter 10 and a full database program. There is a general introduction, differences between BASIC 1 and 2 (important with random access where OPENUP appeared in BASIC 2) and new concepts in ADFS. A general look at opening and closing files leads to serial and random access routines.

Chapter six takes on index-sequential files where index files point to the position of entries in a data file. Editing, sorting and searching these files follows with hints and tips on other programming techniques such as validating input.

If you are interested in the subject of random access then it is well explained here and the examples are well-annotated. The ninety eight typeset pages cost £5.95.

File Handling on the BBC Microcomputer

A much larger book (over 200 pages) on similar subject matter is Brian J.



Townsend's for MacMillan. The price has been kept down to £6.95 partly by using a daisywheel printer to prepare the pages. There are some tables but little use of diagrams.

The text takes us right from a cassette based machine to random access on disk files and the book concentrates on manipulating data, sorting, searching, printing out and updating and there are large BASIC procedure-based listings to type in (although a tape/disk is available). The self-test questions reveal that this book is intended for educational use but, if you want to learn about programming for data manipulation then this is a good 'teach yourself'.

Disk Systems for the BBC Micro

This is an early £6.95 worth from Ian Sinclair, published by Granada and is well worth getting hold of if you are new to disk filing. The explanation of how the DFS does its work is excellent. Amcom and Watford filing systems are taken into account and

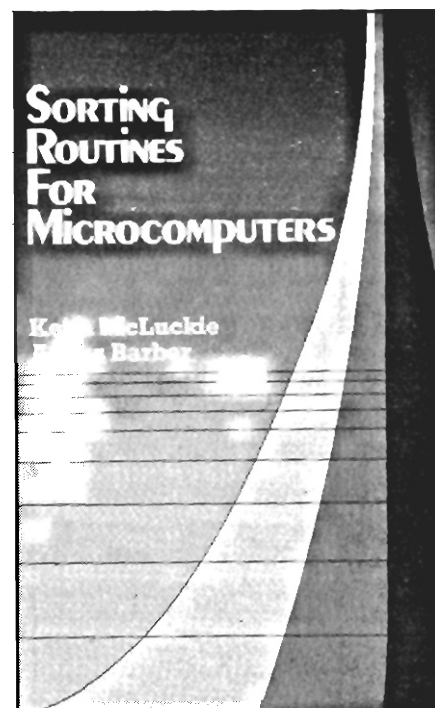
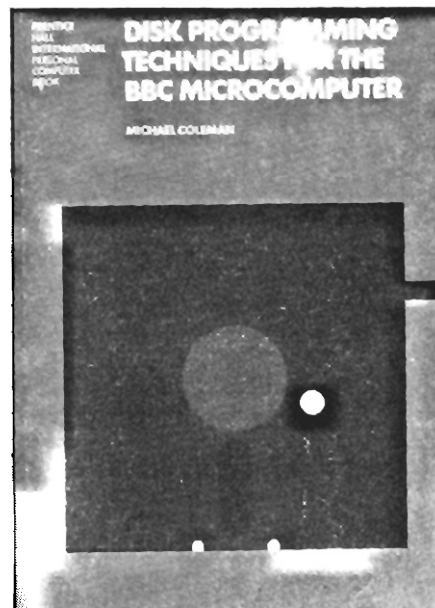


there is a good chapter on filing techniques from BASIC. There is technical detail about how data is held on disks and a tutorial on how to use disk utilities such as DUMP. Good if you can get it at £6.95.

Disk Programming Techniques

Michael Coleman's book for Prentice Hall is nearly 250 pages of daisy-wheeled text. Early chapters go into how data is stored and how DFS commands do their work and how best they can be used. Serial and random access files follow and there are a number of case studies – annotated programs to type in. The chapters on executive files, combining program files and diagnostic aids are also good reading. Amcom and Watford systems are taken into account.

Good use of diagrams and screendumps combines with well-presented procedural BASIC to make the book an attractive read. Nor are the listings too indigestible. Even so a disk is available for £11.95.



A good sort - the last word in reordering routines



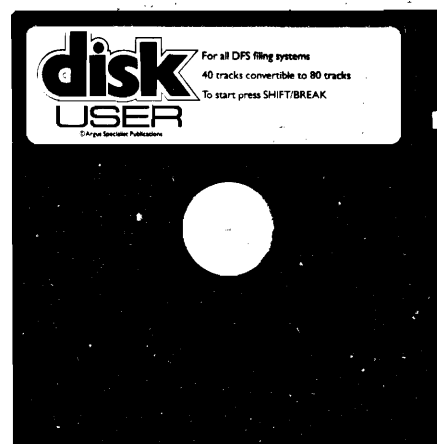
Abbas

RANDOM ACCESS

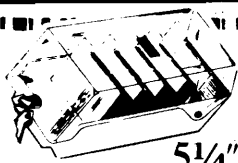
A full on-screen interactive tutorial on the subject of random access disk filing techniques

The *random access tutorial* on this month's disk will take you through the subject with short program examples on screen and exercises you can try.

This is a new idea in articles on Disk User and we'd love to know what you think of it. The *learning curve* with microcomputers is never a short one. There's so much in every machine. So we hope the disk based tutorial approach is useful.



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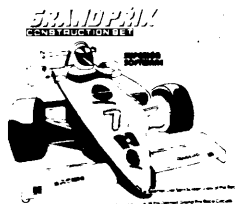
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THIRD DI

Fascinating 3D graphics and a disk based tutorial on how to produce them

First, the hard bit, a *Hitchhiker's Guide* to floating-point maths.

DON'T PANIC!

I hope you don't have the same fear of this subject that I used to. Fortunately for me (as it's turned out), I was thrown in at the deep end! One day I went into work, eagerly awaiting a new project to start, when they handed me a very heavy listing of the whole of the BBC's BASIC ROM, then told me to find out how the floating point routines worked (and to reproduce them). I nearly left! If they had only wanted add, subtract, multiply and divide it might not have been so bad, but they wanted the lot, SQR, LOG, EXP, SIN, COS and TAN! Some time later, to my amazement, I did it, and so it is now my pleasure to reveal the intricate workings of floating point maths.

I feel that I should just point out one very important thing about floating point maths before we start. 'floating point' is only really another method of representing (or storing) numbers, like BCD (binary coded decimal) is only a method of representing numbers. You could say that you use floating point *internally* until you have a result, then convert the floating point result into a form more suitable for its use. Eg if you were drawing a wire frame image, you might choose to use floating point values while calculating the 2D co-ordinates from the 3D co-ordinates and rotation, but once you have the results, you would have to convert them into their integer values for the line drawing routine.

In the beginning

In the beginning there were positive integers, then came the negative lot, then we got fractions and eventually, reals. Let's take a look at a number,

51853726376946255860874629 (I could go on) which is of course an integer, and a big one at that, but it's a little hard to handle. So one day, a long long time ago, someone invented (or discovered) standard form. Using standard form I can now re-write this number as $5.1853726376946255860874629 \times 10^{25}$. But this still doesn't help much. We don't really need all those digits and, if we stopped after only 3 decimal places, it would still be accurate to 1%, like so, 5.185×10^{25} .

It is the underlying principle that you need to understand here: that any number can be written as a value between 1 and 9 (with a decimal part) multiplied by some power of 10.

It is important also to notice that I have only said 'written'. Usually you do not use numbers in this format directly, you would need to convert them back into their actual values if you wanted to add two numbers together.

Of course I'm assuming that you are using base 10 here, but you could use any base you wanted to, so the general rule is:

any number can be written as a value in the range $1 \leq \text{value} < \text{'base'}$ and multiplied by some integer power of the base.



Now it's time to take a look at the first example program on the disk. Choose the 3D routines from the menu and option one from the submenu. You can work in any base you wish, but start with something you know (ie base 10). Make sure you understand base 2, because this

is what you are aiming for with floating point maths. What you should look for is the similarity between the bases, ie to multiply or divide by any power of the base only requires a shift in the position of the decimal point.

Theory to practice

By now you should understand how standard form can work in base 2 (binary from now on) which is floating point in principle. But there are a few slight modifications to make it more efficient in practice. First some definitions:

mantissa (man) – this is the binary pattern of the number
exponent (exp) – this is the power of 2 to be multiplied by (in binary)

The modifications are best shown by means of a worked example, so here it is: 100100 (36 to you and me) would be written (check using program 1)

1.001×2^{101}

mantissa exponent

which is not yet in its easiest form for the computer. First we shift the mantissa right one more place (ie divide by 2) so that we have $0.5 \leq \text{man} < 1$ (remember the general rule), and adjust the exponent accordingly, so we get this:

$.1001 \times 2^{110}$

Note that you should be able to see that the first bit of the mantissa after the decimal point will always be a '1', which follows from the definition. If you don't believe me, then go back to the first example program and try it. It's true for all values (except zero, but that comes later).

MENSION

Now think of the decimal point being between 2 bytes, eg aaaaaaaa.bbbbbbbb. This mantissa can be thought of as just the fractional part (ie 0.mantissa) and the decimal point can be left out (but it is still implied), so we get this:

10010000 *2¹¹⁰

Now the exponent can be put into a byte, and the *2¹¹⁰ can also be left out (but still implied), thus:

10010000, 00000110

So now we have 36 written in binary floating point. It's quite easy to convert back, just shift the decimal point (remember, it's only an implied one) right by 'exponent' bits. Thus 10010000, 00000110 becomes 100100.00, which you can all see is 36!

The exponent is a two's complement value, so it can take values between -127 to +127. For +ve values, the decimal point is shifted right, and for -ve values, it is shifted left!

On the negative side

Up to now I have only considered positive values, so what about negative ones? Well there are two ways of representing negative values

i) two's complement

ii) ABS value and a sign bit and although either of these could be used in floating point, a sign bit turns out to be much simpler (in my opinion anyway), ie you store the ABS value and have one bit that tells you if it's positive or negative. "But where are you going to put this sign bit?" I hear you ask. Well this is where binary comes into its own. Remember that the first bit of the

mantissa (after the decimal point) will always be a '1', because of the definition. So if this bit is always a '1', then we can re-use it for the sign bit, ie it is assumed to be a '1' for the mantissa, but it is, in fact, the sign bit.

So, 36 would be 00010000, 00000110, and -36 would be 10010000, 00000110 ^ sign bit

What about nothing?

There is a number that doesn't have any bits set in binary, zero! This causes a problem because we have just assumed the first bit of the mantissa to be a '1', which clearly for zero, it can't be. You try and represent zero and you'll find that you can't!

The problem can be overcome by a special 'flag' value for the exponent, 128 for example. So a special check has to be made for zero, but then if the value is zero, it's very easy to handle (in add, subtract, multiply or divide). So zero <=> 00000000, 10000000

In fact, the mantissa could have any value, it doesn't matter since only the exponent is significant, so the mantissa could be used as some kind of a flag as well. In some applications, you need to be able to work with 'unknown' values, so this could be flagged by a certain value in the mantissa, but that's another story.

The finishing touch

As I've already mentioned, floating point is only a method of representation, so you might well ask yourself, "how do you get values into and out of this representation?"

Well I use two routines called 'FIX' and 'FLOAT'.

FIX

This takes a floating point number and converts it into the integer equivalent value. Of course this will not always exist. If the exponent is too large or too small then the integer will simply be out of range. This also depends on the size of integer you decide to use, 8 bit, 16 bit, with or without a fraction byte, etc. If the value is too large, then you must be satisfied with the largest value possible for the integer, and if it's too small, well zero should do.

FLOAT

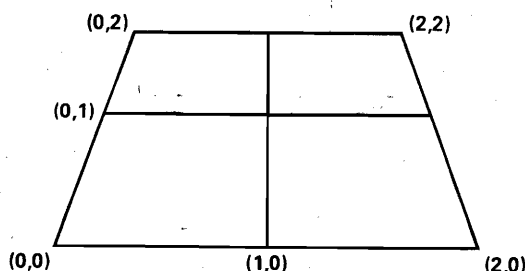
This is the opposite of 'FIX', taking an integer value and converting it into its floating point form.

In both of these you have to be careful to take note of the sign. The integer will be in two's complement form, and the floating point will be in 'ABS and a sign bit' form.



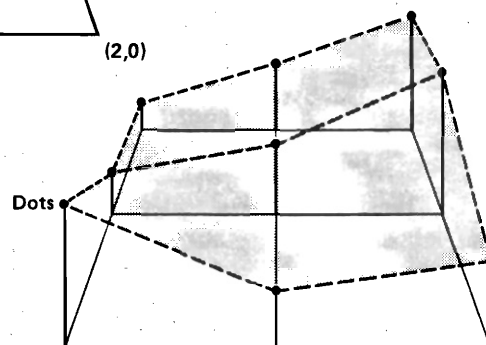
Time again to take a look at a program from the disc, program 2. This is the program I used to test the machine code routines and you can use it to see how accurate they are, and to convince yourself they work. My floating point routines use a two byte mantissa, and a one byte exponent, with an integer conversion (using FIX) of four bytes, made up of a two byte integer and a two byte fraction of 65536 (in two's complement form). The BBC's BASIC uses a five byte mantissa and a one byte exponent, so it's much more accurate but somewhat slower (the test program prints the BASIC result in brackets).

Exercise 1. Try and write add and subtract for this floating point representation. Send in your listings to us in time for the next Disk User, and I'll publish the best solution. If you can't get them to work, still send them in and I'll try to sort out your problems. Mark the envelopes '3D art' in the top left-hand corner.



Square matrix as a grid

Figure 1a.



Height gives the dots, join them up to give the 'surface'.

Figure 1b.

Third dimension

Well now it's time to put the floating point routines to a good use, ie some 3D graphics. This is quite a simple algorithm for drawing a wire frame ground, with hidden line removal. I was going to use it for a helicopter flight simulator (similar to 'Aviator' for the Spitfire) but I don't think it's quite fast enough. I would have liked around 10 frames per second, but this will only generate about 5 frames per second.

Join the dots genesis

The creation of the world (as far as the computer is concerned) starts off with a square matrix (or 2D matrix if you like) of values. The matrix can be thought of as a grid in the horizontal plane (ie flat) and the value at each point represents the vertical height to the surface above that point (see Figure 1 a and b). All you have to do to see the surface is play 'join the dots'.



You could take a quick look at program 3 on the disc, that will show you what a surface looks like without the hidden line removal.

Colour switching

I'd better just quickly explain about colour swapping. This is a method for drawing the next frame for animation on screen, without it being seen, and then swapping to that frame instantaneously. This makes the animation from frame to frame very smooth, and independent of how long it takes to draw each frame. The complete method involves two parts

i) what is actually drawn on the screen, which concerns logical colours

ii) what you actually see, which is concerned with physical colours.

i) Consider a pixel in a four colour Mode, which has two bits that make up each logical colour. If you draw a frame using only one of those bits, then you effectively have two screens that you can draw in, the colour 1 screen, and the colour 2 screen. Frames are drawn alternately in these colours, and the colour not being used is erased. This is done by AND'ing the whole screen with a mask that will only keep the colour bits being used.

ii) At the same time as the above is going on, the logical colours 1 and 2, are being turned ON and OFF in such a way that you can only see the completed frames. Turning the colours ON & OFF means:

ON => the foreground colour (usually white)
OFF => the background colour (usually black).



Take a look at program 3 on the disc which goes through the sequence of events slowly, first without colour swapping so that you can see what is going on. Remember, when it draws in a colour that is turned OFF you won't see anything, but it is still doing the same as when you could see it before.

Also look at the program itself because it draws the ground in a

very similar way to the machine code, so it should help you to follow the machine code if you have any trouble.

Hidden line algorithm

There is a very simple method of doing the hidden line removal in this case. If you draw from front to back, a pixel is only visible if it is above whatever has already been drawn. This is quite easily implemented in the following way:

"start of frame"

- 1) clear the 'pixel buffers', ie set all to zero
- 2) draw the wire frame from the front towards the back, using the special 'plot a point' routine
- 3) do the colour swapping.

The special 'plot a point' routine is this:

```
IF y <= buffer(x) THEN end
ELSE plot-point(x,y)
buffer(x)=y end
```

It's as simple as that, in theory.



Program 4 on the disc (or just BOOT it) is the full machine code version of the above. When I first wrote it, I tried using Mode 4 just to see how much flicker there was. Compare it to the Mode 5 colour swapping version yourself. There is quite a difference.

FOR BBC MICRO, BBC MASTER & ELECTRON



Listen Son, You may
but just remember
human y brain

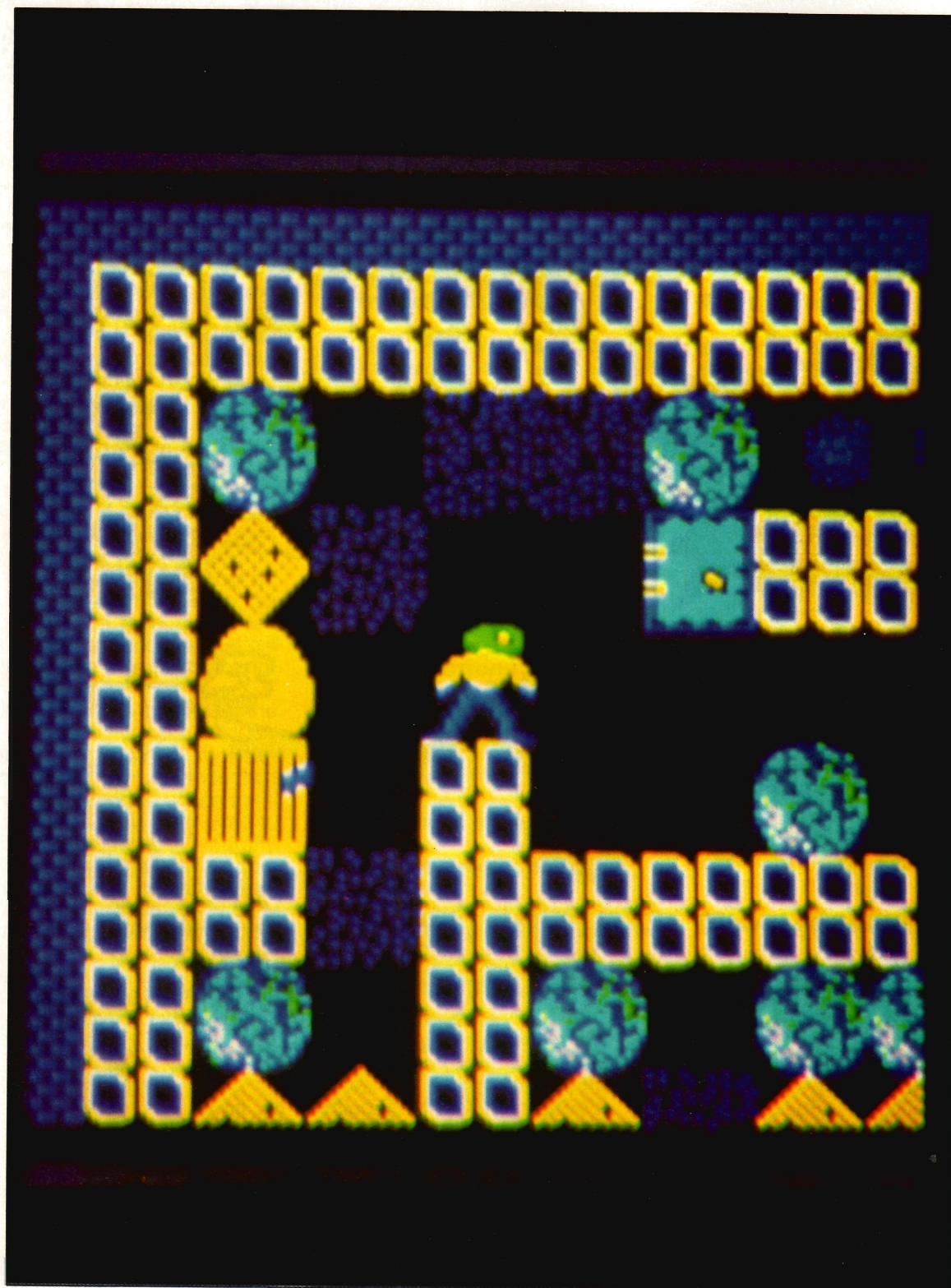
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FUN!

Treats for *Repton 3* and *Sentinel* fans

Repton 3

The main element of the column this month is an excellent map printer for *Repton 3* by Paul Bedford. I've had this for some months now, but at last time and *Disk User* have come together to present it.

The program is written in 100% machine code (using ADE+ on the Master) and has been tested on the BBC, Master and Master Turbo, though it should also work on the B+ and Compact.

As well as printing maps, it also prints passwords, edit codes, time limits and numbers of diamonds, eggs, safes, etc.

It works on Epson compatible printers only, using the following commands –

Condensed print: `CHR$(15);`
End condensed print: `CHR$(18);` **Set line feed to 7/72:** `CHR$(27)CHR$(49);`
Single density graphics: `CHR$(27)CHR$(75).`

Extra help

To save you digging through past mags I'm including here the passwords and edit codes for *Repton 3*.

Prelude:

A – Prelude – 56882
B – Citadel – 44544
C – Morning – 13330
D – Awkward – 33023
E – Fritter – 24656
F – Lawless – 8515
G – Ration – 3447
H – Tobacco – 2303

Toccata:

A – Toccata – 48042
B – Upstart – 6527
C – Octagon – 27942
D – Chaotic – 20312
E – Majesty – 1356
F – Revenue – 16713
G – Foresee – 50190
H – Reserve – 65280

Finale:

A – Finale – 27246
B – Enliven – 24937
C – Contest – 3200

D – Illegal – 19786
E – Appease – 3346
F – Student – 20055
G – Average – 16660
H – Phoenix – 51762

Even more help!

For 256 lives in the game, simply *LOAD D.REPTON1 from your *Repton 3* game disk, change CALL&2F00 to ?&1B5A=0: CALL&2F00 and resave it.

To edit any screens without the use of the codes, simple *LOAD E.REPTON3 from your *Repton 3*

Using the *Repton 3* map printer

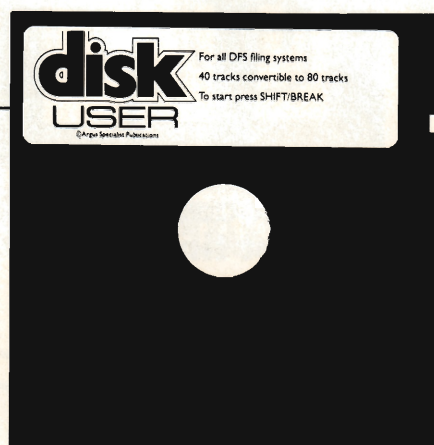
The program on Disk User is called REPMAP and is the source code for the printer program. You will need to copy this program to a new disk. You can then CHAIN "REPMAP". This will result in the assembly of REPMAP and the automatic saving of the program REPRT, a machine code file.

You may then activate REPRT with *RUN REPRT. The program will prompt you for a filename – TOCCATA for instance from *Repton 3*, or try some of our new screens from this issue – the file on your disk is called EXTRA and it's from Blockade programmer Carl Dunkley, thanks Carl.

Till next time

One of the nicest parts of my job as regular games columnist in *A&B* is the feedback from readers and the bumper postbag of hints, tips, questions, maps and so on.

Now, I cannot believe that readers of *Disk User* are any different; so, where are the letters?



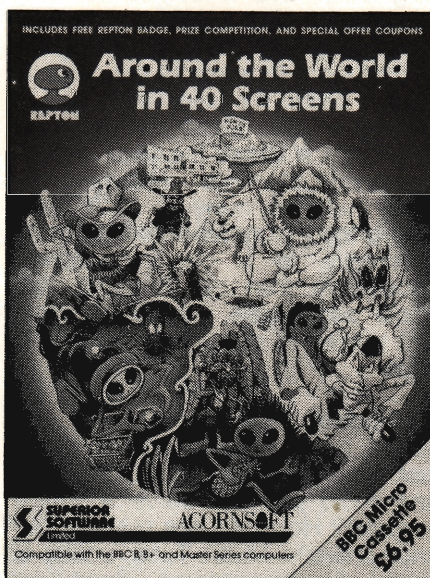
game disk, enter ?&257C=&60 and then *SAVE E.REPTON3 2400+400 400 400.



For a more extensive *Repton* Editor, read the next issue of *Disk User*

Please do let me know what you'd like to see in this column – at present we're making it up as we go along, not quite sure of the right blend that will appeal to disk games players.

I await your thoughts.



MUSIC TUTOR

A 'noteprocessor' which is so easy to use you've got time to learn about music

Early on in the BBC's ubiquitous career, the machine was duly recognised as being a good micro for music (and sound) orientated programs; a reputation inherited by the more contemporary Master Series. And ever since, many music orientated programs have appeared on the market. Perhaps the better known are the music synthesis packages which allow a music keyboard to be interfaced. And though numerous 'composer' type programs have come and gone, the value of such programs to people beginning to learn about music at school or leisure cannot be denied. As it almost goes without saying that such programs offer the learner far more than any book tutor. For, any reasonable educational program should be dynamic enough, and graphical, as to offer the user a feedback otherwise inaccessible; of course that's if there is no teacher or expert at hand.

However, down to business: the program I have written is not only educational, but also a tool for composing music. But, as I thought it offered more in terms of educational value, I called it Music Tutor. And to tell you a little about the program: BASICally, it allows the user to input sequences of music, containing not more than two hundred notes; any type of note may be entered from a semibreve to a demisemiquaver; accidentals may be included. And whole sequences may be entered and played in one of six selectable keys.

Inputted sequences may be edited, saved, loaded and so on. In fact, it's a little like a wordprocessor; and could perhaps serve a similar purpose? However one major difference prevails. Music Tutor, unlike all useful wordprocessors does not drive a printer. But such a routine could be easily added; but before you attempt that, first acquaint yourself with the following text.

Describing matters

To begin, Figure 1 shows a high level flow chart of program one (file MUSIC on the disk), which of course highlights the general order in which the program operates. As such reference to Figure 1 may assist the following description.

Program 1 is a loader program in which envelopes and all characters are appropriately defined. And being furnished with various REMs, it is left to the reader to examine program one, which is far from being a sophisticated piece of software. However, to continue: Listing two is the main program, and as such warrants further explanation. And to begin, a brief description of procedures and main global variables contained within the program:

PROCInstructions

simply produces the screen layout together with various 'prompting' text

PROCstave

draws the music stave

PROCinput-notes

permits the entry of various notes. This is perhaps one of the main procedures and will be discussed more fully later on

PROCmove-note

is nested into PROCinput-notes, and erases and draws notes as they are moved up or down the stave

PROCreplay

simply replays an entered or loaded sequence; with or without text

PROCload

allows a specified sequence to be

loaded, and also catalogues all files on disc

PROCsave

saves sequence of notes.

PROCOptions

allows one of the main options to be selected. Main options include: SAVE SEQ, LOAD SEQ and so on...

PROCacc

permits the introduction of an accidental, (# b or natural)

PROCedit

allows single notes to be amended as necessary.

PROCsearch

is nested into PROCedit, and allows a note to be located (using the cursor keys) and altered

PROCnew-line

redraws stave for new lines, and is of course, frequently executed

Global variables

A% array stores all notes

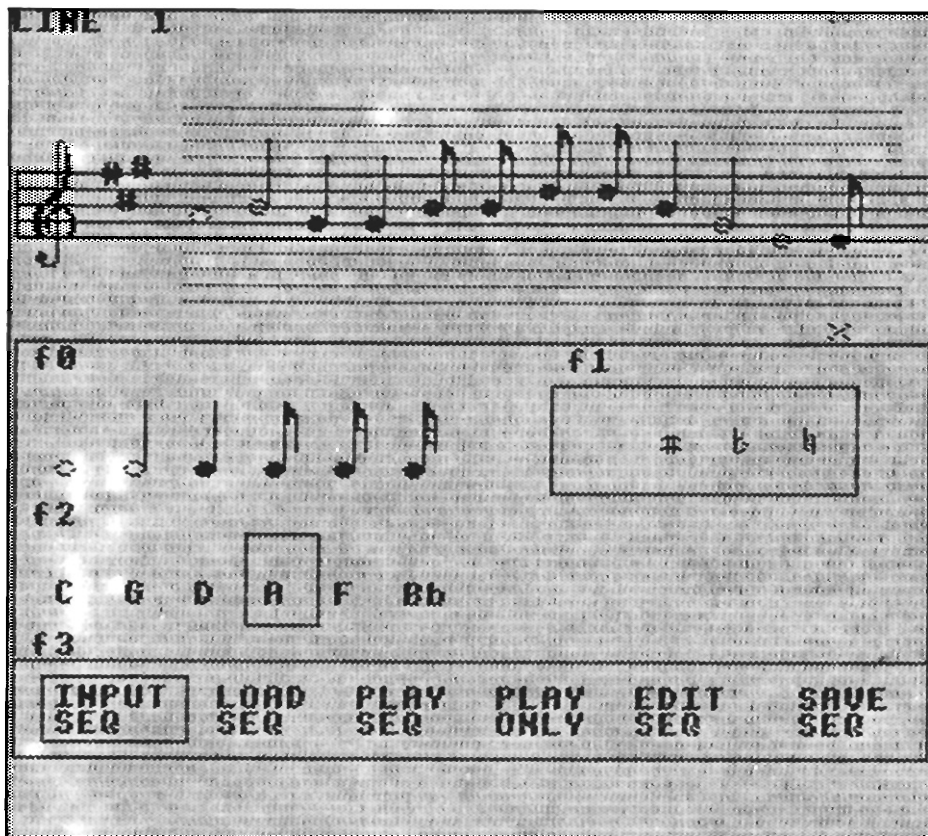
b% represents the height (or pitch) of a note upon the stave

c% represents the x dimension at which the first note of new line is plotted

q% represents the x dimension at which the selection rectangle is drawn

y% indicates the number of stored notes

yy% temporarily exchanged with



y% in PROCedit

J% indicates the line number

O% represents the x dimension of the 'rectangle' within PROCOptions

The idea is simple:

As can be seen from the listing, the main program *Music Tutor* is entirely written in BASIC, and apart from a few unavoidable GOTOs is reasonably structured with simple procedures. The most significant of which is PROCinput-notes, and basically loads the A% array with two pieces of information corresponding to each saved note, namely, the note duration and graphical height of the note upon the stave, from which the pitch will be later determined using simple arithmetic. Also realised from the graphical height of the note, is information

regarding accidentals; that is, of course, whether or not a note is sharpened, flattened or naturalised.

Operating the program

When the program is first run, an option may be selected by positioning the flashing rectangle (using the left and right cursor keys) over one of the following options:

INPUT SEQUENCE

LOAD SEQUENCE

PLAY SEQUENCE

PLAY sequence ONLY

EDIT SEQUENCE

SAVE SEQUENCE

The only options which warrant further explanation are: 'INPUT SEQ' and 'EDIT SEQ'. With reference to the former, this option will be undoubtedly utilised most frequently, and may be operated as follows: The up and down cursor keys allow notes to be moved up and down the stave as required, whilst pressing the space bar will save the note in line with the two flashing xs. By positioning the rectangle using the left and right cursor keys, any of the shown note durations may be selected. To sharpen, flatten or naturalise a note, press f1, which allows the rectangle to be manipulated as before, and press f0 to return to 'inputting notes'. In order to change key simply press f2, and select from any of the shown major keys, and once again press f0 to return to 'INPUT SEQ'. Note; a sequence can be arranged in one key only. Pressing f3 will permit the selection of another option.

Editing sequences of notes is quite straight forward: Firstly, all previous notes will be shown, as such when the desired section or line number is encountered press the space bar. Consequently, the two flashing stars may be directed using the left and right cursor keys. When a desired note is located press SHIFT; you are now free to change the note according to the facilities permitted in option 'INPUT SEQ'. When satisfied with your alteration, press the space bar as before, which will automatically cause the whole of the previous sequence (including editing) to be shown, after which, option 'INPUT SEQ' will be selected.

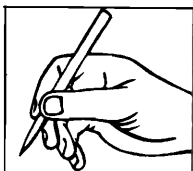
f0 to return to 'inputting notes'

f1 to sharpen, flatten or naturalise a note

f2 to change notes

f3 to permit the selection of another option

DISCUSSION



Dear Sir

While using Wordbox (Disc User No.2) I encountered a problem. This was that, when a wordbox was printed out the letters did not line up vertically to form a square (see enclosed example).

I originally thought that the printer required unidirectional printing to be selected to ensure that the letters lined up. That was a red herring. The problem lies in lines 1760 and 1830 which send the escape codes to the printer.

The program uses what Epson call Selectype Mode and Star call Master Print Mode. This feature enables different print styles to be combined with a single escape sequence. The sequence starts with 'escape "I" ' and the number following is the sum of the features required, each style having a unique number corresponding to a power of 2. Thus emphasised is 8 and expanded print is 32 so emphasised enlarged is 40. The program should have used code 32 at the end of lines 1760 and 1830 which corresponds to expanded print. In fact the value in the listing is 34. On the Epson this does not cause a problem since the extra '2' is not used and so it is ignored. Many printers now, including the Star NL10, feature a proportional Print option. This is turned on by adding 2 to the Master Print value. Thus by

```
AGFVGOFASCHOOLYGNNTI
BBCEGBJNWANYRATNHMOH
RURYJSJBXEDVSKWKUEGF
ADKAGMTRVKVWHEYJZQXN
CHURCHXSKRCRESCENTGS
APYMLASSEJSHLXHUHAYD
DDSUYIDWADFPYUCUJGNA
AAHZZJVAKWLTJRRMTMSH
BLVBIQDSBOCHRTCVAHAK
RAWGSIFEXRFYLMHHACKK
AZTARMACADAMIVAJBAFS
COAGRZSGHOGIGDPHADGV
GANGZTYVDHLCHURCHADD
TFGCEJNQMTSALBUNQMSF
IXERVFFSBLCLOGSGHRE
ZVNETOWRZKCLGLVRBCA
AHTPEXRAPRSYELLOWEDH
UEIJTXITESOPFVORHDEA
YKACJWEINMMMENTBEENAG
HOLOGARITHMICALLYHLF
```

```
L.1730,1860
1730 DEFPROChard
1740 PROCtt("Wide Double or Quad high ? W D Q"):G%-GETAND223
1742 IFW%>18 AND G%=-81 G%=-68
1743 IFG%=-81 Q%=-2 ELSE Q%=1
1744 K%=-78
1745 IFG%=-87PROCtt("Print any words found in bold? (Y/N)":PROCget
1750 PROCtt("Press 'P' to print. <RETURN> for menu."):G$=GET$
1760 IF G$<>"P":ENDPROC ELSE PROCmid
1764 IFG%=-87 VDU2,1,27,1,33,1,32 ELSE VDU2,1,27,1,104,1,Q%
1770 FORY%=-1TOD%
1780 VDU1,13,1,32,1,32
1790 FORX%=-1TOW%
1800 VDU31,X%,Y%:PROCosbyte
1810 N%=POINT(X%*32+8,956-Y%*32)
1820 IF K%<>89 OR N%=-3:VDU1,U%
1830 IF K%=-89 AND N%<>3:VDU1,27,1,33,1,56,1,U%,1,27,1,33,1,32
1840 NEXT:NEXT
1850 FOR N%=-1TO6:VDU1,13:NEXT:VDU1,27,1,64,3
1860 ENDPROC
```

DISCUSSION



sending 34 the printer is instructed to print expanded proportional which, of course, puts the vertical alignment out. Changing the '34' in lines 1760 and 1830 of the original program to '32' solves the problem.

I bought the issue in question principally for the Wordbox program since my wife is a teacher and uses wordboxes for worksheets. I have modified the printing procedure in the original program to allow the use of two further print modes on the Star NL10 – Double height, double width and quad height, quad width – which are especially useful for use in class.

I enclose a listing of the modified procedure which is pretty straightforward (sorry about the line numbering!). The line which is not obvious is 1743. This checks the

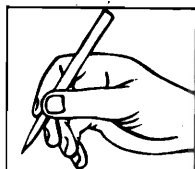
width of the wordbox if quad size is requested and, if it is wider than 18 and hence will not fit on 80-column paper, the program defaults to a double height, double width.

I have not previously bought Disc User but will certainly look out for it in future. Could you please tell me if issue number one is still available and, if so, whether the automatic disc cataloguer will work with the Opus Challenger.

Yours faithfully

S M Dryden
Surrey

Many thanks for the fix for the Star printer. This interesting letter wins its writer a copy of Superior's latest compilation, Play it Again Sam.



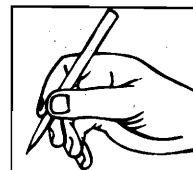
Dear Sirs

I have just purchased Disk User Two and am highly delighted. I was unable to obtain Disk user One due to holiday and business travel and am anxious to keep up with collecting the series. I am an advisory teacher for I.T. and cannot find anyone with a copy.

L. Baldwin
Bradford

We understand the problem caused by issue one selling out so quickly.

But don't despair. Disk User One is now available from our Software Service, see Services this issue.



Dear Sir

Users of Opus Challenger can get the Kwik Kopy (third issue – October/November '87) utility to work simply by changing the !BOOT file as follows:

```
*ACCESS !BOOT
*BUILD !BOOT
1 PAGE=&1900
2 *ENABLE CAT
3 CHAIN "P.RUNDISC"
4
(PRESS ESCAPE)
*ACCESS !BOOT L
```

Then SHIFT+BREAK to BOOT the file.

This works because Kwik Kopy reads direct from the catalogue table usually stored from &E00 on most standard DFS's, but not on the Challenger, which defaults to PAGE &E00.

The command *ENABLE CAT puts catalogue info at &E00 and sets PAGE to &1900 on the next BREAK.

Yours faithfully

M J Holmes (Mr)
Northumberland

```
ARCTICEZAARR
HBMOQIXECNLA
RWZMPBWTNTCL
OTMAJCGMLAAL
TFMTMYKXAYZS
VSYOLDQLRTNS
RXZUOUAZGNOT
VUIFBCVIWIRB
AMHTBKPZDAIM
ZVZCTSHAMEXR
PPNUPMGRYYIS
EITYKNJSBJQT
```


DISK DATA

Yes Prime Minister

A great new disk based game to play is *Yes Prime Minister* from Mosaic Publishing.

You take the role of Jim Hacker, and must raise his standing in the polls during five days of turmoil and crisis. You can gather information from Sir Humphrey and Bernard Wooley. Can you handle situating a nuclear power station next to the head of the CEEB? or should it go near your mother in law's home? Do you *really* want to appear on Blue Peter? Or how about resolving a Russian Spy Crisis.

The text is written by an Oxford economics don, prepared for micro

by Oxford Digital Enterprises and published by Mosaic Publishing. You play by moving around your office answering incoming calls, responding to new events, making visits and important decisions.

The text is amusing and although the scenarios begin to repeat themselves, there is plenty of mileage in this game before boredom sets in, especially if you are a fan of the television series. The disk version is much more enjoyable because data has to be regularly read into memory and there are no delays. Price £19.95 on disk.

file all you have to do is highlight it.

The only unfriendly bit about The Menu is the installation process. However the clear instructions supplied should overcome any problems.

The Menu is ideal for those who do not wish to go down to DFS level when dealing with disks but don't want the more comprehensive (but expensive) ROMs available. It is compatible with all BBC Micros but not second processors. Price £15.75.

Camelot also produce a program called the LIST, which can be used in DFS or ADFS. It allows you to add 39 character descriptions to files. Especially useful for DFS – with its cursor 7 character filenames – one would have thought.

Brian Clough's Football Fortunes

Fans of the game themselves, the lads at CDS have played hard and long to come up with this winning formula. Simple to learn and play, even for the non football fanatic, any complications and all the statistics are taken care of by the computer.

The board game is not unlike a football version of Monopoly. Managers build their teams from player cards and chance takes a hand as you move around the board according to the score on the computerised dice.

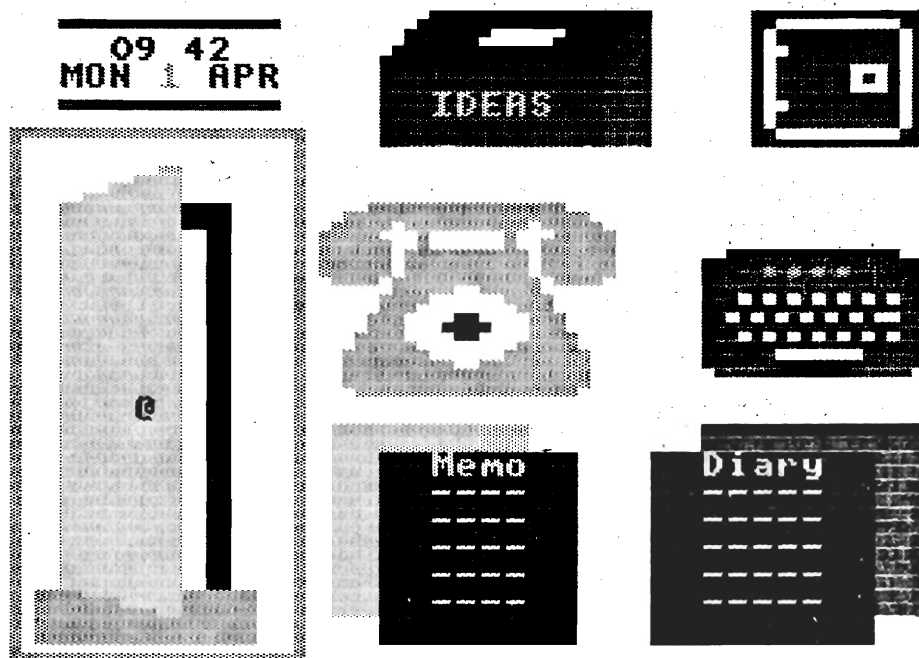
If you enjoy board games then you will find this well-designed, a clever combination of computer and more traditional elements. I know that football can make many as sick as a parrot but even those not interested in the reality might enjoy this game for its wealing and dealing and general entertainment value.

And if Doncaster (CDS' home turf) make it to the final, don't be surprised! Price: £17.95

Camelot Computer Services
14 South View
Woodley
Stockport
Cheshire
SK6 1PD
061 494 2253

Mosaic Publishing
0425 57077

CDS
Beckett Road
Doncaster
DN2 4AD
0302 21134



Lines of communication to Jim Hacker's office in *Yes Primeminister*

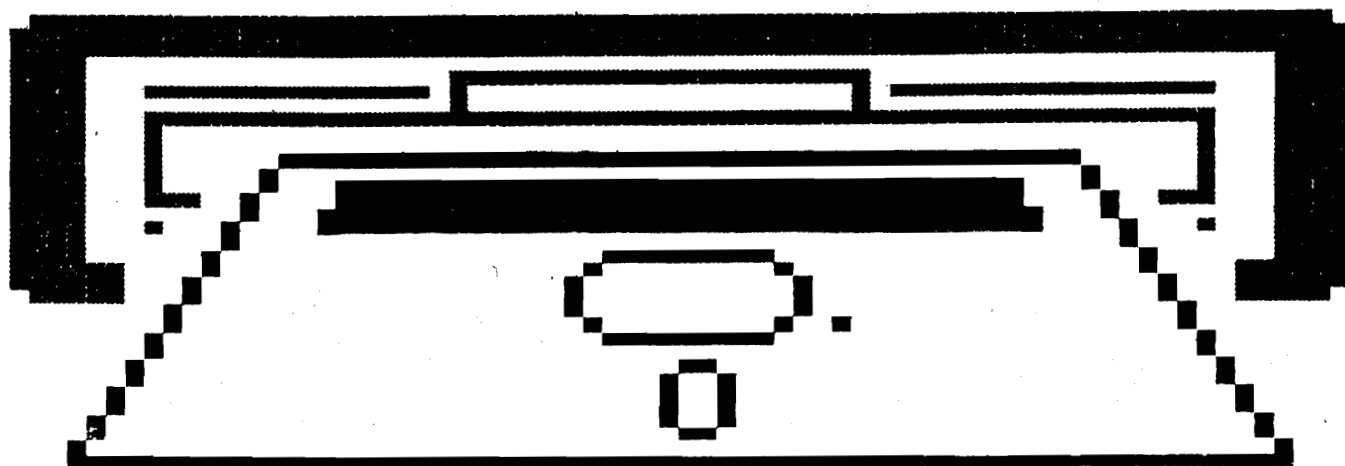
The Menu

A 100% machine code program, the Menu takes the form of a !BOOT file which is added to each of your disks. A Mode 7 'front end' is presented for disk files, ROMs and RAM, loading

RAM images from disk into a specified bank and saving chosen ROMs to disk. The Menu will work with single or double sided drives.

On Master 128 the menu displays date and time. Various instructions are also on screen. To select a

DISK USER



SHIFT-BREAK

Put the BOOT in on a Disk User for the BBC Micro Disk User for the BBC Micro — Just Press for Action

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BRIDGE

Is there any point in upgrading to the ADFS? We discuss the issues and the practicalities

For many, Acorn's original DFS is good enough. That is all there was during the great boom in micro-buying between 1982 and 1984. It offered fast, reliable loading and saving, as well as added features not possible with tape, such as random access filing. It was such an advance on the hassles of loading from tape that it seemed churlish to quibble about its deficiencies. But then the double density DFS (DDFS) from various third party manufacturers made its appearance. It offered more storage space and, in some cases, more files per disk surface. Then followed the advanced DFS (ADFS). To upgrade or not to upgrade then became the burning issue in the letters and features pages of many BBC Micro magazines.

But while there are still plenty of copies of Acorn's old original DFS quietly sitting in thousands of machines up and down the country, still giving sterling service, the world has moved on. The Master gave Acorn's stamp of approval to the ADFS and many have moved over to it. So what are the advantages and drawbacks?

The main disadvantage, first of all, is incompatibility, especially for early machines in which Acorn's DFS version 0.90 (the original) cannot co-habit with the ADFS because the two chips need different floppy disk controllers (FDCs).

The FDC converts instructions from the DFS or ADFS into the binary signals that directly command the disk drive. It issues the instructions to stop and to start rotating, when and to what position to move the head (the magnet that picks up and lays down the information on the disk's surface) and when to start or stop relaying that data to the computer's memory.

Acorn started off with the 8271 but its successor in the Acorn world, and the one driven by the ADFS, is Western Digital's WD1770 FDC. Used also by IBM PCs and compatibles, this chip has advantages over the 8271: it is faster, more common, cheaper and, most importantly, it can lay down both single and double density recording.

Double density recording is a way of cramming more information onto a particular area of the disk's surface. How exactly this is done need not concern us here, save to say that the method used is known as modified frequency modulation (MFM) while the Acorn DFS 0.90 employs frequency modulation (FM) alone.

If data is more tightly packed it is read faster by the disk drive: as it passes under the drive head, for each rotation of the disk it is picked up at a greater rate than on single density recorded disks.

So the price of upgrading for a standard BBC B is the need for a new FDC, from the 8271 to the WD1770. The ordinary DFS will need to stay as well: unless both it and the ADFS are present in the machine it will be impossible to move files from one system to the other. More on this later.

But the Acorn DFS was written for the 8271 and does not work with the WD1770. So, that will also mean an upgrade of DFS, either to a later Acorn (issue 2.2 or later) or an Acorn and WD1770-compatible version. And, as the two FDCs are not directly interchangeable, you will need to buy the WD1770 integrated with an upgrade board from the likes of Watford Electronics or Solidisk. There is an alternative which involves keeping both FDCs, which I

shall come onto later.

What are the benefits of ADFS?

The result of the ADFS' double density recording is more data per disk: 640k as opposed to 200k on a 40-track drive or 400k on an 80-track drive, assuming double-sided drives in all cases. And that is a pointer to one of the big changes between the DFS and ADFS. Only 31 files may be stored on a disk surface by the Acorn DFS, a ceiling very quickly reached with 80-track drives which can store 200k on each surface. The ADFS maximum, on the other hand, is somewhere in the thousands and is set by the maximum of 47 objects (files or sub-directories) permissible in each directory. To reach it, your root directory would need 47 sub-directories, each again with 47 sub-directories and so on ... you would be very hard pressed to hit the limit. And it treats the two physical surfaces of a disk as one logical unit so there is no need to keep worrying about whether your lost file is on drive 0 or drive 2. If it is on the disk, you will find it.

The process of finding it is easier too, thanks to the ADFS' hierarchical directory structure which has been likened to a tree. This is the key to the ADFS' power and the possibility of an almost unlimited number of files per disk.

When first accessing (or *MOUNTing) an ADFS disk, the root directory is displayed. It has an unalterable name, simply "\$" and is the jumping-off point to anywhere on the disk. It should ideally contain only a !BOOT file, if needed, along with a list of other sub-directories on the disk. These other directories will be further up the tree: this means they

THE GAP

can be part of another sub-directory, down to as many levels of nesting as you want. There is a practical limit of course to the length of a filename you will want to type in just to save or load it, so two or three levels of nesting are probably it.

For example, a disk with word-processing documents on it may display a root directory with just two sub-directories: letters and work. Each of these in turn may be subdivided. The directory "Letters" might contain two further sub-directories, such as "Domestic" (for those letters to the gas board or the rates department) and "Work" (for work!). So starting from the root directory, to look at a letter to the gas board you might enter the following command and path name:

***TYPE LETTERS.DOMESTIC.GASBOARD**

If a path gets much longer than this, it becomes too cumbersome; too much nesting could be a bad thing!

But here, almost by default, we have stumbled across another ADFS advantage. Filenames, including those of sub-directories, can be up to 10 characters long, rather than the limiting seven of the DFS. The maximum filename length of even the much-vaunted IBM PC is only eight characters.

You will also have noticed that directories can have proper names just like a file, as opposed to the DFS' single letter names. On typing ***CAT**, rather than presenting the user with a simple but unstructured list of files, the ADFS will give you only the current directory. This is sensible as, otherwise, you might be presented with a list of several hundred filenames. So, provided you have used the directory structure to

organise your files, finding and accessing them will be simpler because you will have fewer disks to search and directory and file names are more meaningful.

Then there is the question of upgrading even further. The price of Winchester, or hard disks, has been falling along with almost all other computer hardware. Before too long, everyone may well be able to afford one but they do require the ADFS. To try to find a file among 20 Mbytes of data without it would be soul-destroying.

And the drawbacks...

Apart from a new FDC board, another demand made on the hardware budget might be disk drives. Getting the most out of ADFS means taking advantage of its capacity and its logical manner of storage. Double-sided 80-track drives could mean you will be able to keep a whole year's output of business data or wordprocessed documents on one disk. It will be subdivided into directories, each of whose contents probably would previously have occupied one disk on its own. A bigger drive, though not mandatory, is a definite asset.

Once the hardware is installed, there is then, as with any new piece of software, a learning curve to be undergone. While most ADFS commands are identical or very similar to their DFS predecessors some, such as ***COPY**, have a different syntax to make use of the ADFS' extra features. And there are some new commands. For instance, ***FREE** reports on the amount of free space left on a disk while ***MAP** tells you if it is strewn throughout the disk or compacted into a single, continuous lump. This is to ascertain whether or

not a disk needs compaction; that dreary task is still with us, unfortunately.

The ADFS' hierarchical structure takes a bit of getting used to as well but I found it easy to pick up and, like everyone else I know who has made the leap, would not voluntarily return to the bad old DFS days. In other words, most think it is worth it in spite of other, more minor, drawbacks.

One drawback might be the extra memory claimed by the ADFS: in a BBC B, the new system demands an additional five pages or 1.25K. Another might be that disk accessing is slightly slower than DFS due to the more complex information which the ADFS has to retrieve from the disk about a file's position and length.

The biggest hassle, though, is often the task of transferring files from one filing system to another. And the fact that some files refuse point-blank to run under ADFS, which means your disk box will fill up with two types of disk, each incompatible with the other. As anyone who moved systems from DFS to DDFS and then to ADFS will tell you, this can be a pain.

Having decided the benefits outweigh the obstacles, there is no quicker way to find out how the new syntaxes and directory structures work than to start finding out which files will cross the great divide. As a general rule, most programs written since the advent of the Master at the start of 1986 will work with ADFS. This is particularly true of business-type applications, such as Computer Concepts' InterWord suite of word-processor, spreadsheet and database.

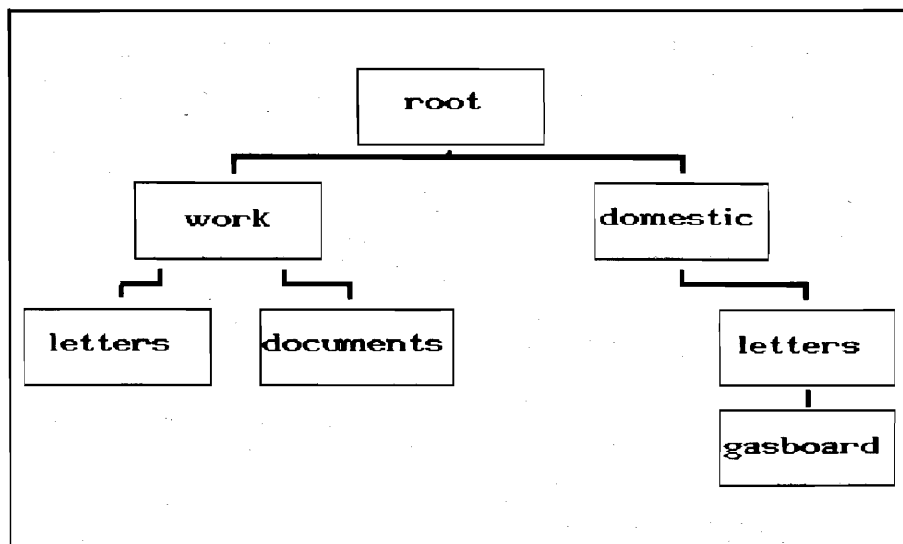
Games tend to do unpredictable things to unconventional crannies of

memory and many will demand the space claimed by the ADFS. Many of those that use Acorn's operating system calls to save and load will work. However, there are still some around which demand the presence of the 8271 FDC, in which case the solution is to get hold of a dual-FDC board, such as Solidisk's. The 8271 and WD1770 can then both be used) the former perhaps by a DFS loaded into sideways RAM when needed.

There are two basic methods of transferring files from DFS to ADFS. Either use the utility that comes with the Acorn chip, or buy ACP's Advanced Disk Toolkit and let the ***XFER** command take full control over the process. For Acorn ADFS users, who do not get formatting and transferral utilities built into the ROM chip, it is vital. For users of other manufacturers' products, which do usually possess them, it still gives you more power over the disk and the information on it. Other utility ROMs include Pineapple's ADFS utilities. On disk there is MB Software's Mastercopy – see SPECIAL OFFER below. A&B Computing's November issue also carried a DFS to ADFS backing up utility – available on the *Master Only* disk on offer through Disk User Services.

Weighing it up

So there are good points and bad. Most of the hassles come at the beginning of an ADFS user's life, particularly when transferring files en masse. Once done, the facilities and ease with which information can be accessed and controlled under ADFS outweigh the short time spent learning it. You will also wonder how you managed in the days when the 31-file maximum meant half of the disk was left empty, simply for the



lack of a few more pages of memory and disk space. And one manufacturer, Solidisk, markets an ADFS that self-frugalises and takes only one extra page of memory by reducing to one the number of files it is possible to open at once.

The only lasting disadvantage is having to remember which filing system files are stored under and the need to keep the two types of disk clearly marked. And that is a small price to pay for a 60% increase in storage capacity that is real and usable because the DFS limit on filenames no longer applies.

Finally, the system is open to the future. Who knows when hard disks will become cheap enough to be as plentiful as floppy disk drives are today? When they do, they will need the ADFS to drive them...

ADFS? To be highly recommended.

Conversion

Disk User doesn't want to lose any readers so don't throw away your DFS whatever you do! Seriously, we recognise the need to support ADFS as much as possible and will give instructions for transfer every issue.

SPECIAL OFFER

MB Software Master Copy

Master Copy is a disk based set of conversion utilities for DFS and ADFS in combination.

A friendly question and answer session establishes the transfer required and this is swiftly carried out.

Master Copy is on special offer – a saving of £3.00 – in this month's Disk User. Turn to Services to place an order.

INTERCEPTORS

Two exceptional utilities, one to help your BASIC programming, another to squeeze high resolution pictures onto your disks

The two machine code utilities presented here provide users of BBC micros with four new commands, *PSV, *PLD and *F&R which may be used in the same way as any other operating system commands.

In the first program a solution to the problem of large amounts of valuable disk space being eaten up by screen saves is given. Remember that a normal save of a Mode 0, 1 or 2 screen would require 20K!

Screen compression

COMP saves screens in a highly compressed format by use of the command *PSV <filename>, where filename may be any valid name – eg *PSV SCREEN1. The command *PLD <filename> is used to load a previously saved picture file back from the disk to the screen.

To use these commands the machine code must first be installed in the computer's memory. The program given in Disk User is a BBC BASIC assembler listing. This source code must be run to create the object code (machine code) which will be used by * commands. In the assembler form it is possible to make alterations fairly easily and the program structure is made clearer by use of long variable names.

As an example of a possible change, those with disk operating systems which leave PAGE at &E00 or who need space under &1900 in order to run a program might wish to alter the assembly address in lines 140 and 1805 to &B00 instead of &1700. Note that if this is done function key and character definitions, which overwrite pages B and C

respectively, may not be used.

When run, the assembler listing will automatically save the object code as a file called "COMP" (line 1805) and so it is vital that a disk, other than the copy of Disk User, is in your drive ready to receive this. Once the object code has been saved in this way the utility may be installed in the computer memory at any time by installing the utility disk in a drive and issuing the command *COMP or *RUN COMP, after which saves and loads may be carried out by use of the * commands given above.

The routines work in any non-shadow screen mode and the screen may even have scrolled before saving. As screen memory is read and written to directly the routines will not operate with shadow RAM. It is impossible to give an exact figure for the amount of storage saved as this depends on the complexity of the picture on screen. A saving of 60 to 75% is common.

How it Works

The new commands *PSV and *PLD are added by redirecting CLIV, the command line interpreter vector in &208, &209 (lines 160–410). The second utility does the same thing and the technique may be easily used to add your own commands to the machine. Note that after an operating system call the X and Y registers contain, respectively, the low and high bytes of the address of the character immediately after the * character on the command line.

To save a screen the first 4 bytes output to disk contain the information needed from PAGE 3 to restore the screen in the correct Mode and with scrolling accounted for (lines 520–550). The screen is then output by reading the screen memory from the bottom of screen memory (&3000 for Modes 0, 1 and 2) up to &8000 and by applying the following algorithm:

Read a byte of screen memory – if it is different to the previous byte examined then increment a counter (B%), store the byte in a PAGE 0 buffer and repeat until two consecutive bytes are identical.

When this occurs there is no need to store the byte again – simply increment a counter (S%) and repeat until a different byte is encountered. When this occurs output the value of B% and S% followed by all the entries in the buffer.

In this implementation the limit on the size of the buffer (16 bytes from &80 to &8F) means that B% may only take values from 0 to 15. Advantage is taken of this by restricting the range of S% to 16 also. This means that B% and S% may be conveniently combined into one byte when saving, B% making up the most significant nybble or 4 bits of the byte while S% fits the 4 least significant bytes.

The save routine is on lines 450–970.

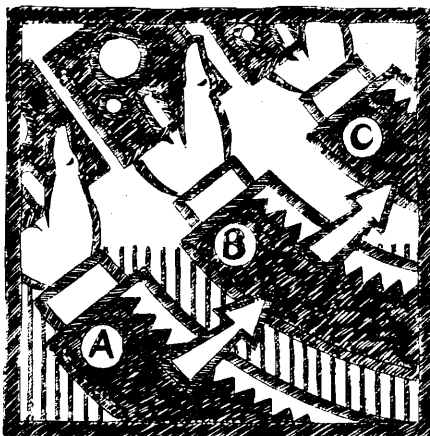
The load routine simply reverses this technique and may be found on lines 990–1540. Notice the use of SHEILA addresses &FE00 and &FE01 to reset the screen in its previous scrolled position in lines 1090–1250.

PAGE Zero use by the F&R program

- &70-&71 --- (a) workspace used in the conversion of decimal keyboard input into 2-byte hex.
(b) base address of each BASIC program line for use with indirect, indexed addressing.
- &72-&73 --- (a) temporary storage of the address of the first line to be searched, later moved to &70-&71.
(b) the number of bytes from the current search position to end of program.
- &74 ----- (a) flag to indicate whether start or end search parameter is being checked.
(b) flag to indicate whether we are inside quotes or not.
- &75 ----- takes three possible values, 1 or 0 or -1, representing respectively, replacement string longer than search string, replacement string equal to search string, replacement string shorter than search string.
- &76 ----- length of search string.
- &77 ----- length of replacement string.
- &78 ----- absolute value of the difference in length of the two strings.
- &79 ----- length of current line.
- &7A ----- number of bytes into line when search match begins.
- &7B ----- number of bytes into line when search match ends.
- &7C-&7D --- (a) address of position where search match finished if replacement string is shorter than search string.
(b) address of the new program end if replacement string is longer.
- &7E-&7F ----- address of the position where replacement string will terminate when inserted into line.
- &80-&81 --- (a) &81 is used as temporary storage for the hi-byte of the line number being compared with the search parameters.
(b) used to store lo,hi-bytes of line numbers to be printed out by the basiclineno subroutine.
- &82-&83 --- (a) used to store the lo,hi-bytes of the start search parameter.
(b) used as base for indirect, indexed addressing searches through the BASIC keyword table.
- &84-&85 --- (a) used to store the lo,hi-bytes of the end search parameter.
(b) workspace used in decoding tokenised line numbers. eg after GOTOS or RESTORES.
- &8A-&8B --- storage for the contents of the X and Y registers on entry to the OSCLI interception routine. ie on entry X, Y registers contain the lo,hi-bytes of the address of the start of the text of the * command.
- &8C-&8D --- contents of the original OSCLI vector.
- &8F ----- temporary storage of the original contents of the hi-byte line number in the line after the last search line.
This is replaced by &FF to ensure that the search terminates, after which the original contents are restored.

INTERCEPTORS

See DU FEB/MAR 88
p.27



Find and Replace

The second program, *B.F&R*, is a find and replace utility. Any piece of text in a BASIC target program may be located and displayed or replaced by this routine. As it makes use of two areas of the BASIC ROM (the table of keywords and the tokenisation of text routine) this utility will only run on the version of BASIC on which it is created. "B.F&R" automatically sets up the code for your BASIC (1, 2 or 4) and saves it to your own utility disk as "F&R". If you wish at some later date to use the utility on a machine with one of the other versions of BASIC the Disk User source code will have to be run again on a machine with the alternative BASIC installed. Once again remember to replace Disk User with your own disk before running the source program so that the machine code generated may be saved.

Since F&R is likely to be used more than once in a program debugging session function key 0 is set up with the command *F&R to save time and typing.

The search may be global, *F&R, or selective eg *F&R 100/200. If line numbers are given as parameters both syntax and range checks are carried out: *F&R 2000/25 would be rejected and an error message given. Default parameters may be used: eg *F&R /250 would carry out a find/replace from the program start to line 250, while *F&R 2500/ would do so from line 2500 to the end of the program.

After giving the *F&R command

with any parameters and pressing RETURN you are prompted for text to be searched for. This text may be of any length up to the maximum allowed in a line of BASIC and may contain keywords.

You are then prompted for a replacement string. Pressing RETURN immediately will simply carry out a search for all occurrences of the first string and display these lines. Otherwise any text entered will replace the first text wherever it is found and the altered lines will be displayed. To increase readability any multi-statement lines are displayed one statement to a line on screen.

How it works

Lines 130-300 set up CLIV in a similar fashion to the previous utility but from 310-660 the necessary further checks on parameter values are carried out.

The search and replace routines need to know the values of PAGE and TOP (lines 670-710).

After any string is typed in it is tokenised by the same routine used by BASIC so that keywords may be included in search and replacement operations (lines 1080 and 1250).

The remainder of the source code consists of a number of routines, some of which you may find useful in utilities of your own. For example linetoken (1830-1920) decodes the three byte tokenised line number found after GOTO and RESTORE and places the resulting normal two byte number in zero page;

basiclineno (2970-3260) is a routine which prints a two byte hex number, stored in &80, &81, as a decimal number on the screen; printoken (3280-3480) takes a BASIC keyword token stored in the accumulator and, by using the keyword lookup table in the BASIC ROM, prints out the full keyword; convert (3500-3670) takes input of a string of decimal digits one character at a time through the accumulator and converts this to a two byte hex number stored in &70, &71; finally message (3700-3770) will print any string, stored in a known address by EQU\$, providing the address is passed to the routine in a similar way to lines 990-1010 and the message ends with a carriage return, character 13.

To leave the maximum space for the BASIC target program the machine code and string buffers are assembled as far up the memory of the computer as possible (at &7500). A Mode change from Mode 7 would corrupt this code unless shadow RAM is being used. While using the routine to help debug a program this is normally no problem. If, however, this occurs make sure to reset the OSCI vector to its normal value by pressing BREAK before installing the routine from disk once more.

In the source code provided no long variable names have been assigned to PAGE 0 addresses because several of these have multiple uses. To explain the function of each of these the following Table One is provided.

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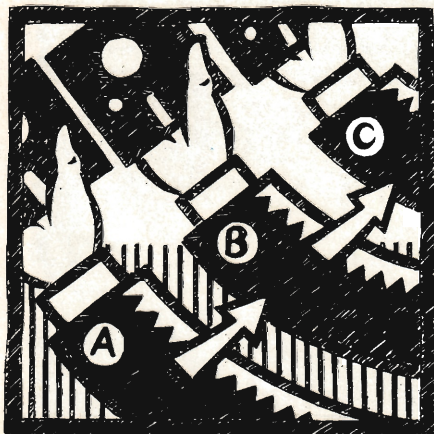
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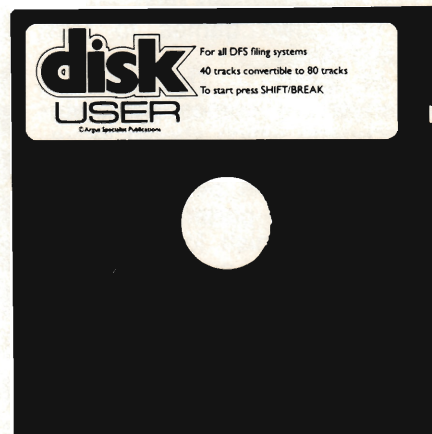
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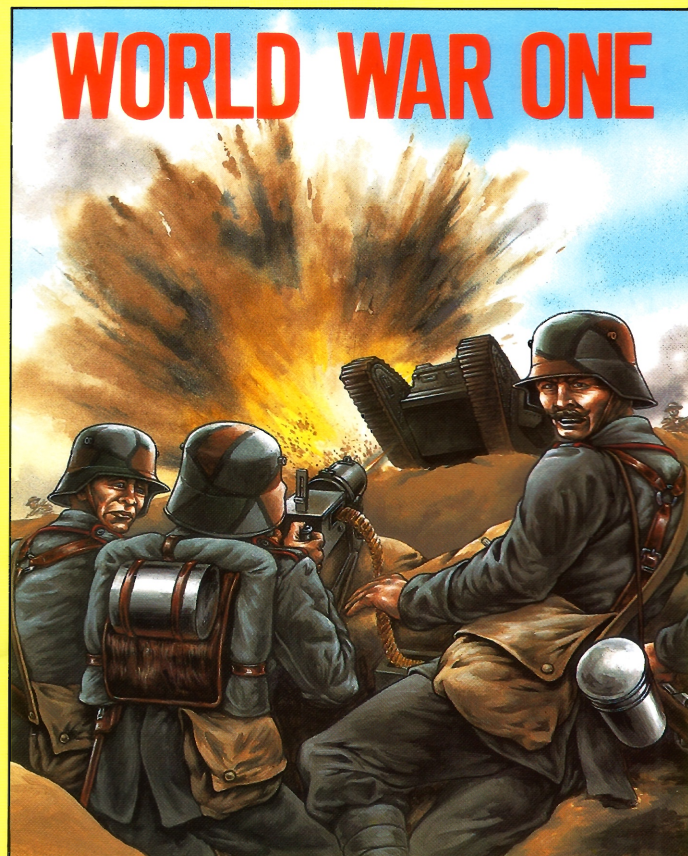
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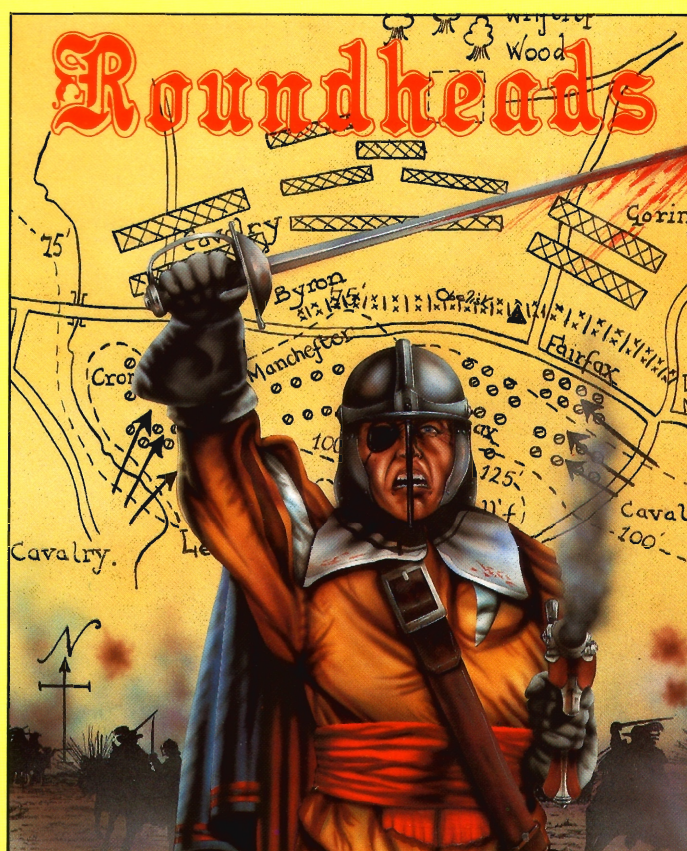
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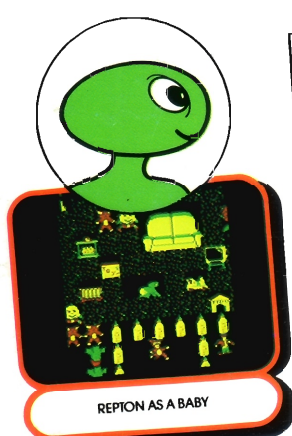
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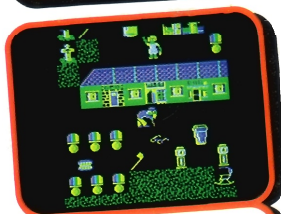
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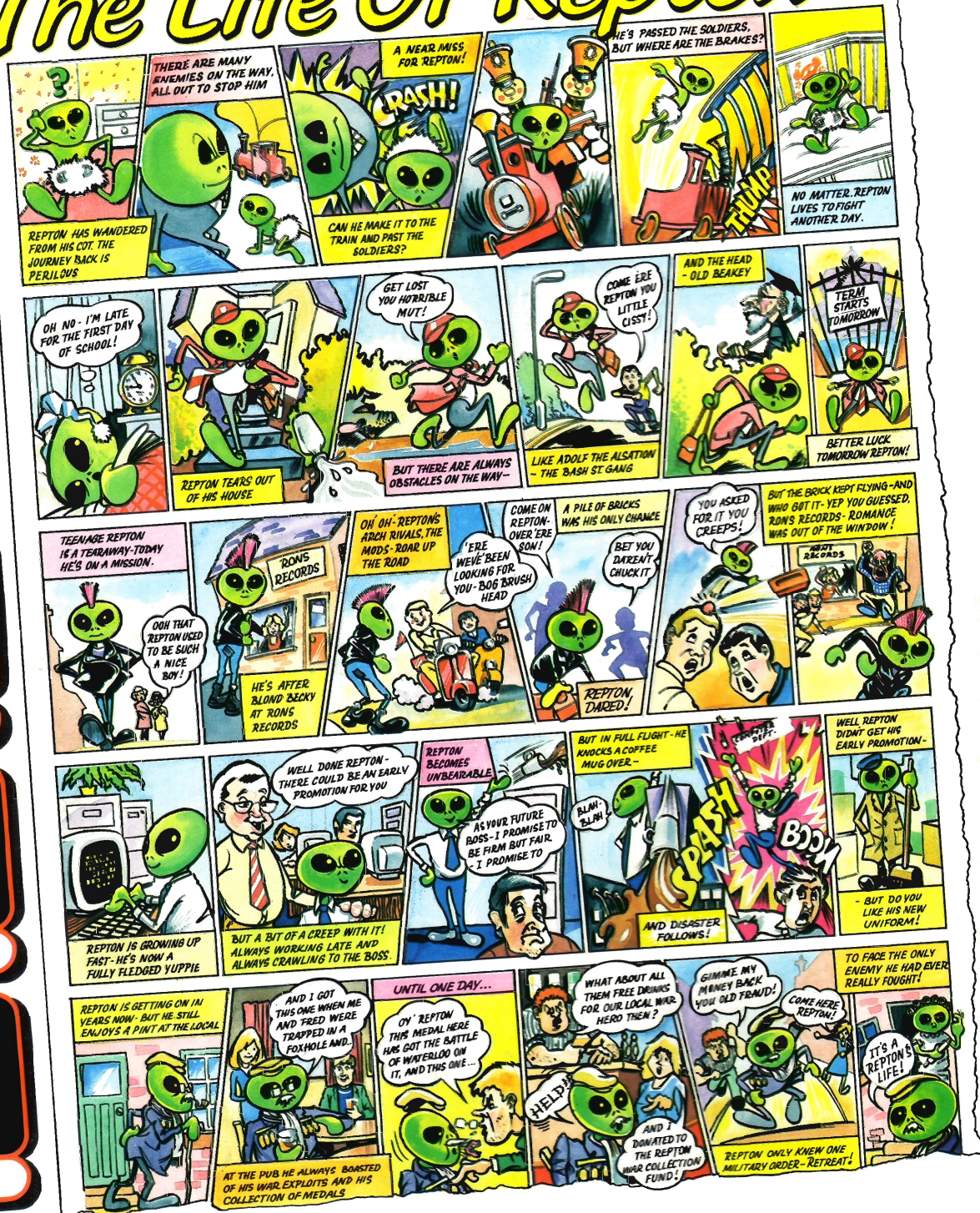
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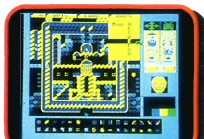


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