

1090
AN ARGUS SPECIALIST PUBLICATION

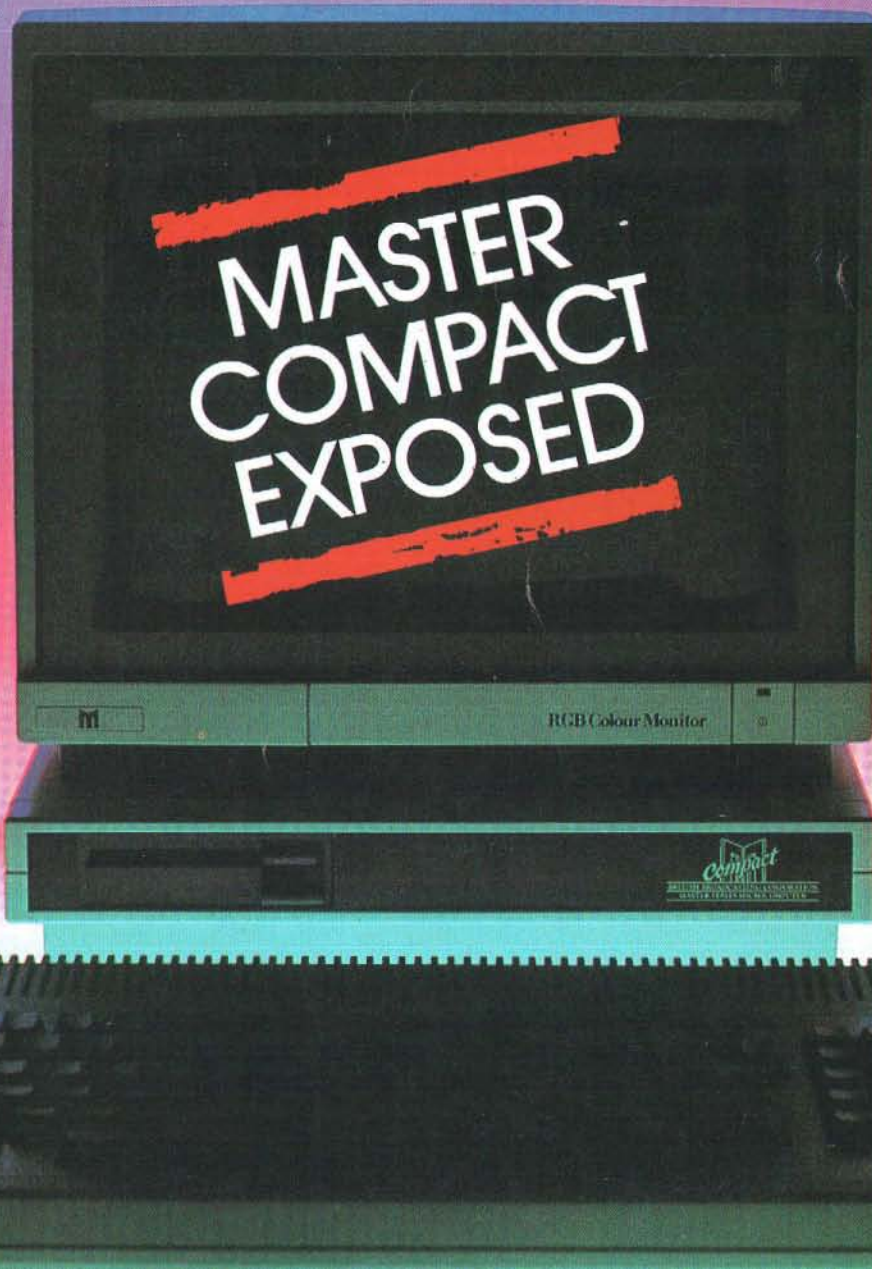
A&B

OCTOBER 1986
£1.50

COMPUTING

FOR BBC MICRO, ELECTRON AND TORCH USERS

FRIENDLY ADFS
DISC MENU
ELECTRON TELETEXT
SAVE £50
WITH OUR 4
FOR THE PRICE OF 1
HOME EDUCATION
SOFTWARE OFFER



ACORN'S NEW MICRO INSIDE ►►►

**Without music, graphics
and sound the Board
Game has become the
most popular in the
world.
Now it has them.**



"Over 3,000 questions of no vital importance."

Available now on
Spectrum 48/128K Commodore 64/128K
BBC 'B' Amstrad CPC
Cassette and Disk



John Menzies

and all local stockists



HORN ABBOT
INTERNATIONAL
© 1988 HORN ABBOT INTERNATIONAL

TRIVIAL PURSUIT is a Trade Mark owned and licensed by Horn Abbot International Ltd.
Published by Domark Limited, 204 Worple Road, London SW20 8PN. Tel: 01-947 5624.
Trivial Pursuit was programmed by Oxford Digital Enterprises.

DOMARK

The Master Compact is a cut down BBC Master 128, 3½" disc drive and monitor with a sub £500 price tag. Our in depth review prides out the details on performance and puts the package into perspective



The first major review of the Master Compact follows...

A&B COMPUTING

Volume Three Number Ten October 1986

Editor: Mark Webb
Deputy Editor: Fiona J. Eldridge
Advertisement Manager:
 Jonathan McGarry
Group Editor: Dave Bradshaw
Group Managing Editor:
 Wendy J. Palmer
Editorial Director: Ray Lewis
Managing Director: Peter
 Welham

A&B Computing is constantly on the lookout for original and well written articles and programs for publication. Feel free to submit your work to us for consideration for publication.

All submitted material must be in machine readable form. This applies both to programs (in any language) and to documentation, which should be prepared with a BBC or Electron wordprocessor. 5 1/4 inch disc (40/80) or cassette equally acceptable. Please also include hardcopy and any suitable illustration, photographs and/or screen dumps.

If you are considering submitting material to A&B then please send a SAE for a comprehensive style sheet. It's also sensible to give us a ring before going ahead with any major work.

All submissions will be acknowledged and material returned if not required. On acceptance the copyright in such works which will pass to Argus Specialist Publications Limited will be paid for at competitive rates. All work for consideration should be sent to the Editor at the above address.

A&B Computing is published monthly on the first Friday of the month preceding cover date. Editorial and advertising enquiries to A&B Computing, 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.

Typeset by Dimension 01-729 3147
 Cover design and design by Argus Design Ltd 01 631 3888
 Printed by Alabaster Passmore & Sons Ltd, Tovil, Maidstone, Kent

ISSN 0264-4584



© Copyright Argus Specialist Publications Ltd 1986

Features

Special Offer: Four for the Price of One Educational Software..... 10

Don't miss this money saving offer

Making Tracks..... 36

Studio 8 from Beebugsoft brings a mixing studio in software

Trivial Pursuit..... 64

Win a solid gold set of Trivial Pursuit

Feeling the Squeeze 68

How to make memory go further

Pic and Mix 78

The making of educational software: Picture Craft

ADFS Menu 92

Essential Software for Master128/ Compact, Electron +3 and all ADFS users

Easyfont 102

Beautiful printouts

Business

Down to Business..... 50

Jon Vogler with tales of Torch and their Telecom Manager

Master Series

Master Compact..... 12

In depth review

Reviews

Solidisk Masterpieces ... 54

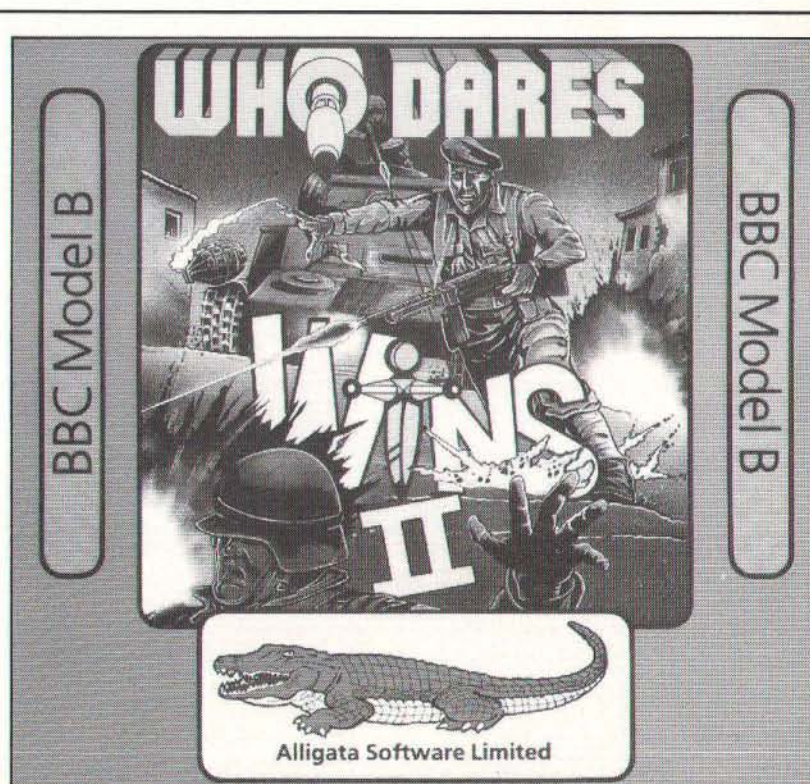
Gordon Taylor on the Real Time Clock and 256K sideways RAM card. Solidisks for serious users

Cross Compiling 86

The BBC as programming workstation with Crossware

...And a Micro in a Pear Tree 108

PC keyboard, professional housing for the BBC



Smooth Operator 110

Linemaster — comms software for hackers

Software**Colour IKON 28**

A colour drawing package for Model B disc systems

Tea, Mr Shifter? 72

Fancy a go at interior design? Plan your own environment before breaking your back. BBC/Electron/Master 128/Compact

ADFS Menu 92

BBC/Master/Electron

Easyfont 102

Fancy fonts for Model B/B+/Master 128/Compact

Electron Computing**Games/letters/news 76**

The quick brown fox jumps over the lazy dog

The quick brown fox jumps over the lazy dog

THE QUICK BROWN FOX JUMPS OVE

The quick brown fox jumps over the lazy

The quick brown fox jumps over the laz

The quick brown fox jumps over the lazy dog

The quick brown fox jumps over the lazy do

The quick brown fox jumps over the lazy

Fancy Fonts — design your own page 102

Channel 7 90 Dynamic Duo 106

Mode 7 for Electron

Plus 4 and ROM box Plus

Regulars**News 6**

Acorn RISC, M19, £1,000 competition with Micronet, ROM releases and adventuring at the Acorn User show

The Arcade 19

Joust, Who Dares Wins II, Commonwealth Games, Mikie, Airwolf, Castle Quest help, hints and tips

Feedback 60**Next Month 80****Soft Sale 81****Making the Most of Assembler 100**

Dynamic add-ons for the Electron page 106

NEWS



Oak's own housing for Master Series

Oak Professional

Oak Universal are back with a range of micros based on the Master Series but packaged in Oak's own keyboard/processor housing. The range includes scientific, turbo and communicator options. Prices range from £495.00 to £2,735.000 for the versions with disc drives, Winchester or modems included.

Oak have put together some thoughtful combinations of hardware for the specialist user and are willing to build systems to users' exact requirements and to add clients' own printed circuit boards. Details from D. Atkins or S. Robinson on 0532 502615.

Myrem Competition

Robico are running a competition to mark the end of the Rick Hanson series with their new adventure Myrem. The adventure casts the player in the role of Rick Hanson, hardened assassin and super-spy in a mind-bending plot, the climax of which will surprise (and possibly shock!) many Hanson fans.

Prices will be £9.95 for the cassette and £12.95 disc. Each game will be sold with a special form which must be completed and returned to enter the competition when the player has solved Myrem. The first out of the hat will win £100. Details on 0443 227354.

Micronet Freebie Confusion

Apologies for our news item last month which stated incorrectly that the Miracle WS2000 modem was being given away with Micronet subscriptions. It is of course the Prism Modem 2000 which is bundled as part of a 12 month subscription to Micronet. Details from them on 01 278 3143.

Spell Spec

Computer Concepts have released a preliminary specification for their SPELL ROM. It is going to be a 128K product, occupying a single Model B 16K socket, using a special system to switch between 8 different 16K images. SPELL will hold its entire system dictionary (about 50,000 words) in ROM.

The prototype is checking at up to 4,000 words a minute and will work with all CC wordprocessors and is intended to eventually be compatible with View. User dictionaries will be possible on disc and once a useful dictionary has been compiled it can be blown into EPROM. BROWSE, FUZZY, PROOFREAD, CROSSWORD, ANAGRAM, SPELL and IMMEDIATE are intended * commands. CC are hoping for a price of £69 inclusive and release date should be towards the end of '86.

Autoalarm is a new home and commercial security system to keep your computer safe. Raceamble have invented Autoalarm, which can be installed with only the use of screwdriver. Autoalarm incorporates a powerful internal siren and a key switch with over 2000 different keys. It can be used with pressure sensitive devices. The controller can be wired into an integral 13 amp plug and will warn if the computer has been unplugged. Price £45 for the controller with typical infra red systems around £200. Details on 0271 62801.

Raceamble's micro protection



Dinosaur Music Link

A new software house from Cambridge have come up with a unique music package for two BBC Micros. It creates 8 channel music (with edit and playback).

The musician can now write music with as many as 8 separate voices and then hear them play back. The software is designed to complement the musicpen chip just released. The two micros are linked via the RS423 port. The software costs £9 with £3.50 for the cable. Musicpen is available at £28.75.

Risk Taking

One year ago we were writing headlines like "Back from the Brink", now it is possible to report excellent sales of the Master 128, the launch of a Master 512 coprocessor which runs a PC AT and Apricot Xen close on performance and an entirely new chip, the Acorn RISC Machine, which is now available to developers in the form of an evaluation kit. Acorn have been marketing their Acorn Cambridge Workstation into science and industry with advertisements in magazines such as *New Scientist* and *The Engineer* and the RISC evaluation kit should follow a similar path for the time being.

There is another potential market however. The development of the RISC chip at this crucial time, as Europe decides whether it should have a standard educational computer or computer standard, means that Acorn are in the running to supply just such a system. The evaluation kit will persuade developers whether the chip set is worth using beyond the doors of Acorn and Olivetti, in whose products it is bound to appear. The unique blend of educational experience and reputation for research and development may come together to launch Acorn into part of a very lucrative and prestigious project.

In the meantime Acorn have badged the Olivetti M19 as their own with a launch at the Acorn User show. The hardware is identical but Acorn will be providing Acorn style documentation and technical backup following purchase. Olivetti will shortly respond in kind by selling Acorn Master Compact computers in Italy. Thirty thousand have been ordered for the initial sale through retail outlets. There have also been orders from Poland and Acorn have already held meetings with third party companies about releasing product for these markets. The same show saw the official launch of the Master 512 (reviewed A&B July). The range of software running on this coprocessor gets more interesting week by week.

How about these required criteria listed in a recent Acorn staff advert as an indication of what Acorn are up to: knowledge of productivity tools, operating systems, in particular experience with MS-DOS and UNIX, distributed computer schemes, on-line help systems, window management, graphics and I/O systems, editors, document manipulation, formatting and printing, compilers etc etc.

The Master is still selling very well and Acorn believe



Master 512 running GEMpaint

that many customers have been attracted into computer dealers by other products but have ended up walking out of the door with a Master in tow. And if you look at the full specification of the rival packages (software and hardware combined), it's not surprising. Those who buy Acorn computers do so with a purpose in mind. They need to get something done and the Master 128 is more capable than most. The flash and show of the Atari and Amiga reveal great potential but for all practical purposes and for the moment, they remain inferior to the Master 128 in terms of I/O expandability, firmware and bundled software, apart from the lack of third party products. Funny how the Commodore Amiga turns out to be a machine which is designed to use coprocessors to good effect (such as the IBM emulating Sidecar).

With the range of second processor options available for the Master 128, the Master also has great potential for development and the RISC option greatest of all.

ROM Now Resident

Event One have realised that they have a winner in *Ice Box* and have relaunched the product. The sideways RAM software can interrupt any program and is ideal for saving screens, moving from tape to disc and getting help with your most difficult games. Details from Event One on 06845 65671.

Software Services have released a Master version of their

Floppy Wise utility ROM for disc users. The commands have been extended to deal with Master facilities and are Tube compatible. Details on 051 427 7894.

Penfriend is a new wordprocessing utility for Wordwise Plus users, from the specialist magazine *Wordprocessing*. Details from Word Processing, PO Box 67, Wolverhampton, W.Midlands, WV10 9HG.

Music 5000 Launch

Watch the zeros. It's the five thousand this time. Hybrid Technology have launched their successor to the Music 500. Continuing development has created an integrated music production package capable of MIDI compatibility and of further software and hardware upgrades.

Music 500 owners are far from forgotten. A software and documentation 500 to 5000 upgrade pack has been created for them. Those who want to hear what the 5000 is capable of can get a demonstration cassette from Hybrid. Details on 0223 316910.

C O N T I N U E S ►

BITS

Advanced RAM software have released more sideways RAM routines in **Advanced RAM Plus**, a 16K version of the popular ROM style programs. Details on 0389 57881.

Index Utility is not now being marketed, says author J.M.Durant. Rights have been withdrawn because of a dispute with ATPL. His Jaysoft company is selling a product called **Auto Beebaid** for £34.00 inclusive. Details on 01 462 8453 (evenings).

Hantarex have a new range of high res monitors. The new HX12 looks impressive for just £72.50 inc VAT. It's green phosphor, 12" with RGB/composite and audio input. In the colour market their offering is the 14" CT 9000/1 MR at £199.50.



Hantarex monitor range

McHugh's magazine bibliography has been updated with machine code searches which make looking up BBC magazine articles a doddle. Each part contains an average of 1200 references from A&B, Acorn User, Micro User, Beebug and Educational Computing. Watch out for an A&B offer soon. Meanwhile catch up with McHugh's dedicated database at 43 Hookstone Oval, Harrogate, North Yorkshire, HG2 8QE.

Computer Review is Gemini Marketing's new publishing enterprise. Produced on computer and printed via a dot matrix (not all of them!), **Computer Review** is a vehicle for Gemini products. However, editor Simon Williams has done a good job in

making it a decent read for anyone interested in small business computing.

J.L.Dore has expanded its video interests by acquiring the stock, goodwill and rights of **Bevan Technology**, whose Companion interactive video system for the BBC Micro and video-cassette/disc player, is well known.

John L.Dore Limited recently announced its entry on the interactive3 video scene with the **Exercise 2000** sports and fitness training system which it developed in close collaboration with the BBC (Open University) and with the active encouragement of the National Coaching Foundation. Details on 037284 4144/5/6.

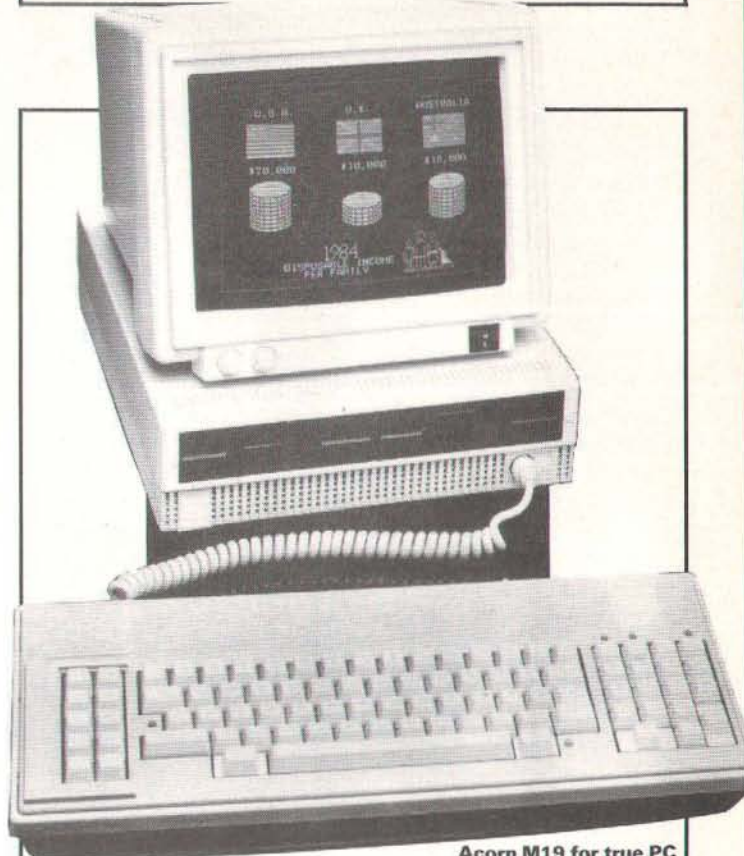
Computing often belongs to business or bureaucracy and the



chance to keep up with trends in information technology becomes the preserve of people who are working. **Sheffield City Council** are doing their best to break down barriers to computing facilities for the unemployed. Three new schemes have secured backing for this year and there is even a home loan scheme.

Risky Business

At the risk of sounding too optimistic, Acorn seem to have to have shaken off the traumatic events of a year ago, the takeover, the refinancing and management restructuring, redundancies and rationalisation. With a thoughtfully designed Master Series selling better than anyone predicted and a powerful range of second processors emerging, Acorn are competing again.



Acorn M19 for true PC compatibility, at a price

Acorn Compatibles

Acorn's two PC compatible micros, the 512 and the badged M19 are now well and truly launched. Acorn are presenting the machines as complimentary products. The M19 is the true PC compatible and will run software such as Lotus 123, dBASE III and MSWord. Priced at £1,499 it features as standard a graphics card, serial and parallel ports, high resolution monitor, twin 360K disc drives, tutorial/demonstration discs (an impressive introduction) and three months' telephone helpline support. It remains to be seen whether the badged M19 product can ever get off the ground in the light of Amstrad's launch of an IBM compatible system.

The Master 512 on the other hand is the performance machine with a 10MHz 80186 and includes mouse and GEM software. At £345.26 it offers considerable MSDOS compatibility. Packages tested by Acorn and useable are dBase II, SuperCalc3, Twin, Turbo Pascal, Wordstar, Logistix, VP-Planner, Volkswriter 3, Flight Simulator (2.12), Executive Writer, Executive Filer. A full applications compatibility booklet is available from Acorn dealers handling the 512.

Date: 24th July 1986. Place: Barbican Centre, London. Mission: Visit the Acorn User show, collect as many treasures as you can find and escape with your sanity intact.

Well, you wouldn't expect a seasoned adventurer to resist a challenge like that, would you? Actually, living a long way from London, I don't normally go to the shows, but I felt the time had come to meet some of the people whose products I write about. The Barbican Centre Exhibition Hall turned out to be a windowless black hole bursting with people trying to force their way down all too narrow corridors between exhibitors' stands. Well, at least there still seems to be an enthusiastic community of users of Acorn products — for all the chiding of the independent computer press about overpriced, outdated 8 bit technology.

A quick flip through the programme reveals that all the major companies supporting Acorn products are there. A&B Computing are exhibiting and Acorn User of course — but no Micro User. Well, they do have their own show and their writers seem to have standing instructions to pretend that AU doesn't exist. You know, rather like the BBC and ITV. Actually, it turns out that Micro User are there under cover, neatly disguised as Database Publications who are quietly selling their software in the corner.

Now, I must have a chat with Computer Concepts about the latest Plus Talk that I am writing. The only snag is that it takes about half an hour to get anywhere near their stall. CC are busy demonstrating their brilliant new wordprocessor, Inter-Word and apparently selling them by the hundred at a special discount. But what's this sitting on the side of their display? An Atari ST if I am not much mistaken. I know that CC are keen to get into the Atari, to take advantage of the much larger memory that 16 bit technology provides. They have evidently infiltrated this Quisling micro in an attempt to take Acorn users with them. In which case, they shouldn't have provided us with such superb software! From what I have seen of the Inter series, its combination with the Master 128 series is going to keep 8 bit computing a serious proposition for quite some years to come.

Abandoning hope of reaching CC for a while, I notice

what the show has to offer in the way of games. It soon becomes clear that there is no new blockbuster, nothing special, no Elite (will we ever see its like again?). Superior Software, master programmers of BBC games, have a stall with three BBC Master's in a neat row providing free demos of some of their best. They seem to be selling their games well at standard prices, but the curious thing is that there are several independent software dealers around the place selling the same games at a substantial discount. There are also some remarkably cheap offers of admittedly old software (including Acornsoft) to be found, eg £1 each or 5 for £4. These prove impossible to resist, especially since I had made the mistake of bringing my daughter with me, but you must understand that for a software reviewer to buy any program with real money is a cause of acute physical pain.

In the middle of the hall, Acorn Computers themselves are exhibiting. So far as I can tell, they are the only company in the hall providing staff who are either over the age of 30 or wearing suits. I have a brief conversation with a genial Acorn manager. 'Will my Master 128 really burst into flames?' 'Most unlikely.' 'What do you think of Inter-Word, isn't it great?' 'I haven't seen it myself, but yes I've heard of it.' 'Why are BBC computers so expensive?' 'If you want a Rolls Royce you have to pay Rolls Royce prices.'

Wow. After that I really must get something to eat. The catering is upstairs and consists of a huge queue for a choice of pizza, quiche or salad which is then consumed sitting on the floor as the dozen tables provided prove hopelessly inadequate. There is a bar, but I resist the consoling influence of alcohol as I have a long drive to make this afternoon. By this time, three or four hours of claustrophobic surroundings is beginning to take its toll. Perhaps we should leave while we can still afford to buy the car out of the Barbican carpark. My daughter, who has already bought every game in the place, is claiming cunningly that the charge doubles every hour.

But surely, we must have missed something? Yes, we've seen lots of goodies and talked to all the main companies, but why is there this feeling of disappointment? In truth, there is nothing really new, no exciting developments to take your breath away. Good solid product developments, predictable or already known about are there in plenty. Perhaps that is all we have a right to expect. Microcomputing is past its first flush of youth, and those heady early days are probably gone for good.

Comms Corner

Aldoda International, whose first release for the BBC was their Teletel ROM (which enables BBC users to log onto the free French equivalent of Prestel), are introducing Fred, a viewdata frame editor with full wordprocessing facilities and mouse or Graphpad driven graphics editing with cut and paste, banners and headlines. Fred is priced from £43.00.

A further release is "D", an intelligent communications package with a command language for making batch tasks, electronic mailing etc easy for the user. Two different versions work for 40 and 80 column terminals. Details on 01 794 0991.

Codenamed BB

The new Master Compact, codenamed Model BB, takes Acorn back into the high street stores with an undiscounted machine for the first time since the Electron was launched. The bundled software, the graphics interface, the quality of monitor, the disk storage and the price, will make it a most attractive buy this Christmas. Indeed why wait until Christmas. More two-computer families are predicted and a lot of upgrading to a machine that wordprocesses (for kids and adults), teaches Logo, does mailshots — all without typing in awkward commands. Nice an Acorn.

A&B READER OFFER

Four educational software packs from Acornsoft have been chosen by us to feature in this exclusive offer to readers of A&B Computing.

The four home educational packs are part of the same series of specially commissioned educational software and each has received fulsome praise in the computing and educational press. Indeed ABC uniquely captured the British Microcomputing awards for both 'Home educational software of the year' and 'Best software in schools'. A better combination, we believe, would be difficult to find.

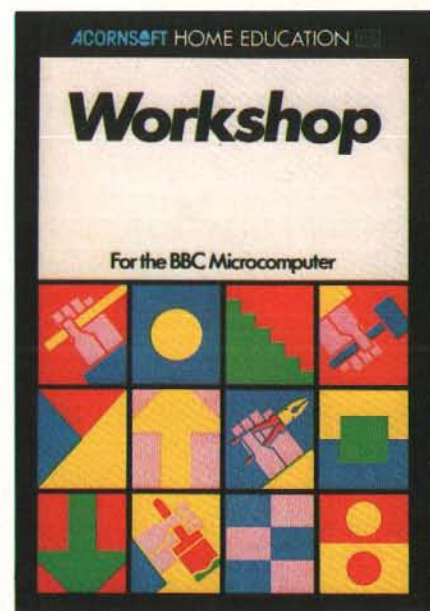
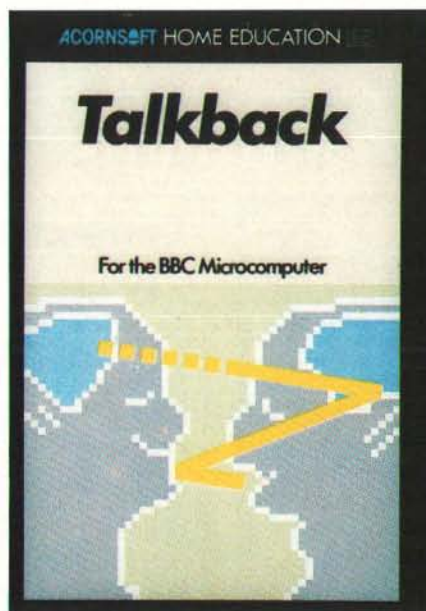
Des Thomas, in a review in A&B Computing November 1985, had these points to make:

The Acornsoft Home Education range is aimed at a new group of users: parents and children. By carefully selecting areas of interest and making these as accessible as possible, this provides adults and children with opportunities to work and enjoy themselves in shared activities where the computer acts as a focus for discussion and creativity.

On ABC:

I must admit, I've never enjoyed writing: essays were always purgatory, reports a necessity but usually put off until the last minute, and as for those long, newsy letters which some people seem able to churn out! Perhaps I'd be exaggerating if I said that the word processing chip in my micro has revolutionised my life and attitude to writing, but certainly I'd be lost without it.

So, if I were asked to recommend just one program for the home computer it would have to be a word processor — or one with a word processing facility. Chandler's chapter on word processing, "Words which Dance in Light" — what an expressive title — shows how profound an effect the word processor can have on the attitude of young children to the printed word: "When one considers the host of difficulties that young writers have to cope with, it is no surprise that some children never learn to write and many more never really exploit the potential of writing....Often, children working with pen and paper in schools start to write, change their minds, and because they don't like to be reminded of what they see as mistakes, cross them out and try again....A word processor allows users to produce text which is always legible and attractive. Children know in advance that other people will be able to read it. For many, one of the most liberating discoveries is the Delete key (the Tippex button!). Words, sentences and paragraphs can be shuffled around, inserted or deleted...."





Four Educational Software Packs for the Price of One

The fourth Spooky Manor is an original approach to the Adventure format, with up to four people playing at the same time, meeting up with each other and with a few surprises as they explore the rooms.

The individual items of software are proven. There's excellent documentation to accompany the programs. What we've done, with Acornsoft's help, is to package the four titles together in one disc or cassette pack. The prices and mail order details are below. We think we've negotiated a good offer on your behalf. Have fun.

On Workshop:

Author Daniel Chandler: "All of us, not just children, learn more effectively when we are at our most "playful": when we are actively participating in an enjoyable experience, or when we engage with ideas in a way which involves the exercise of our own creativity. For the young child far more learning occurs during play than in any deliberate and structured manner. It is through the experience and language of play that young children naturally make sense of the world. They are not conscious of their activity as 'learning'... and so it is with Workshop, which provides a microworld in which to discover what each of the program's amazing "machines" can do with simple shapes. Children, aged apparently from three years upwards, are given the opportunity to plan, experiment, explore and develop strategies to solve problems which they have posed themselves. Large or small colourful shapes can be created, painted, drilled with holes, squashed, stretched, cut, rotated and have other shapes glued to them to develop more complex shapes.

On Talkback:

In Talkback, Chandler has cleverly developed the Eliza idea so that the "conversation" can be between two computer characters with the users joining in the conversation, or between either of the computer characters and the user. The users create their "characters" by building and developing sequences of Keywords, Responses and Starters, and in so doing, manipulate language, have the chance to develop their understanding of language and discover what micros can, and cannot, do with words.

So, turn that television off — you weren't watching it anyway — and get cracking with one of these new packages from Acornsoft. I'd recommend the first two for the whole family while, for once, I agree with the accompanying blurb, Talkback is for those who enjoy an "intellectual challenge".

To order your Four in One educational packs fill in the form below and send it to:

Vector Services Ltd.,
Unit 21
The Ideal Complex
Victoria Road
Wellingborough
Northants

Please send me

☐ copies of the home education disc pack at £14.95 each

☐ copies of the home education cassette pack at £11.50 each

I enclose cheque made payable to Acorn Computers Ltd. for

Prices include VAT and postage and packing.

Name

Address

.....

.....

.....

Postcode

Telephone

Signature

Date

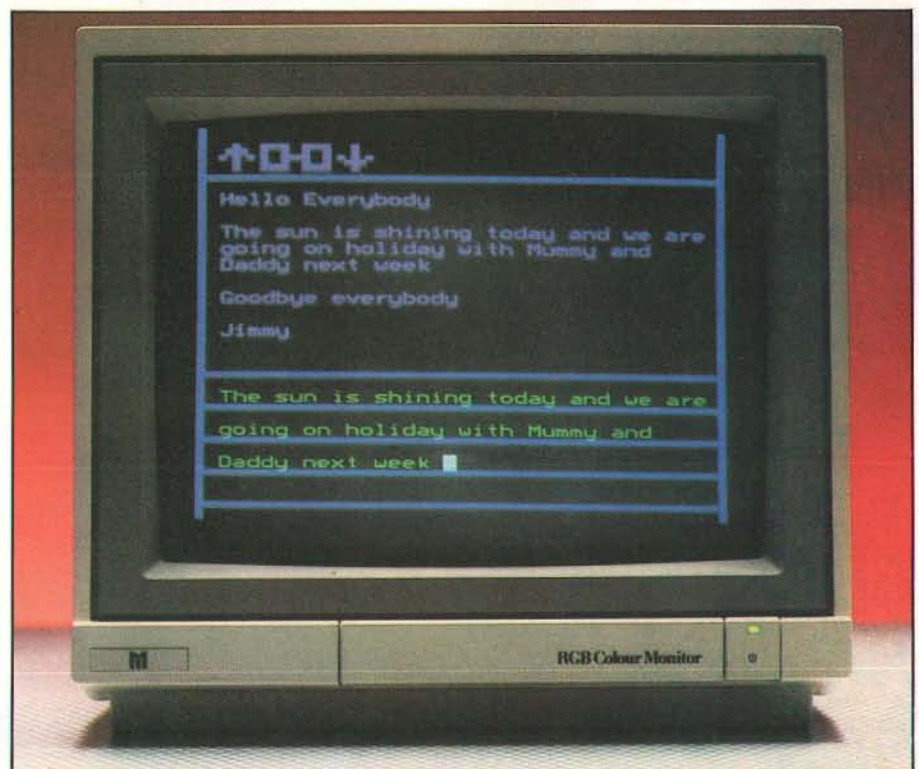
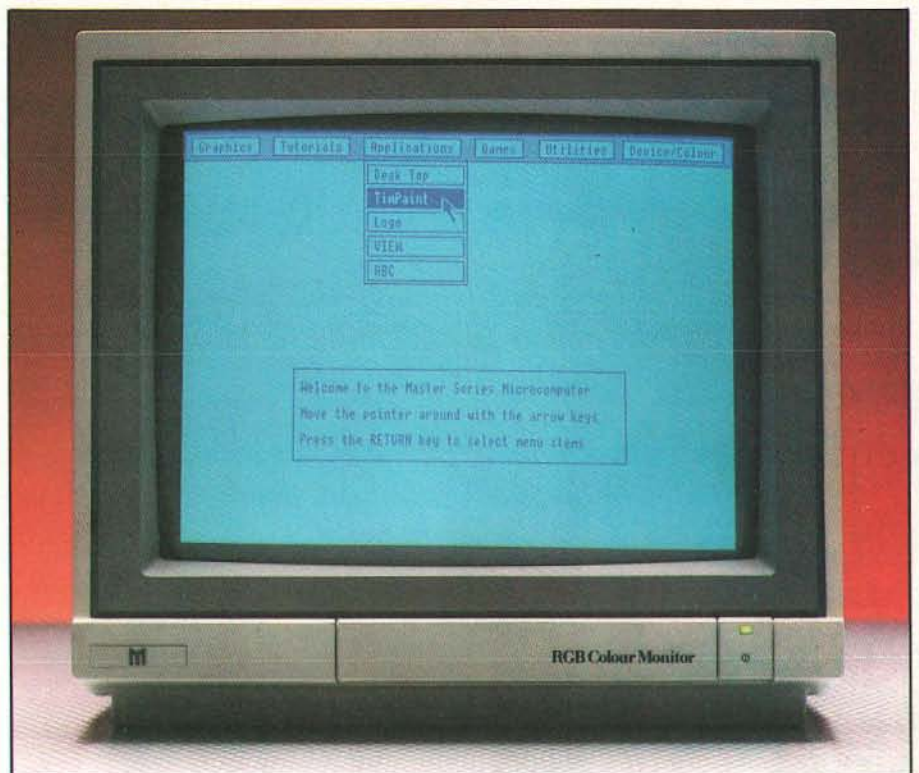
A C O R N ' S N E W M A C H I N E

**A complete
Acorn system
for under £500?
That is new!
Gordon Taylor
with the first,
in-depth
review of the
Master
Compact**

The design of Acorn's new Master Compact was based partly on ideas gleaned from formal market research, and partly from informal talks with a great many people. As a result, Acorn have a clear idea of what people want, and who they expect to buy it. In concept, the Compact is a lower-priced version of the Master 128 — designed to do all that many users will ever ask of it. It is also intended to be a complete system — including software — usable "straight out of the box", even by the first-time user. Moreover, it will eventually be available with many different national keyboards, and even the UK version has a new prefix or "code" key to obtain characters from an extended set.

In overall size, the Master Compact is similar to the original Acorn Atom (1979) and the Electron (1983), though slightly wider due to the addition of a numeric pad. Like the Atom and the Electron, the keyboard unit of the Compact is small and light because it does not contain the power supply. This is in a separate unit, which contains one $3\frac{1}{2}$ inch drive as standard (with room for a second), and is designed to support the display. High quality monochrome and colour monitors are also offered as part of the system.

While incorporating many components from the Far East, the computer itself is manufactured in the UK. Initially, this is by Rank Xerox, of Welwyn Garden City, using very modern equipment, including automatic insertion of components into the printed circuit boards. AB Electronics, who are making Master 128s at an increasing rate in Abercynon, will eventually manufacture the Compact as well. Acorn expect to produce



MASTER COMPACT

T H E M A S T E R C O M P A C T

and sell several tens of thousands of Compacts by the end of the year, and at a rising rate thereafter. Even before the launch major interest has been expressed by Australia and Canada.

The Marketing Story

The Compact is the direct successor to the Electron, but just as the Master has learnt from the original Model B, so the Compact has learnt many harsh lessons from the Electron. Notable amongst these is that software compatibility must not be compromised — at least as far as the code itself is concerned, as opposed to the file format and disc size. This becomes ever more important as the software base continues to grow, and with the marketplace becoming increasingly competitive. Software compatibility is directly related to hardware. Whereas the cost of the Electron was lowered (compared with the Model-B) by reducing the number of keys, and compromising the screen display modes, these were found to be impediments to acceptance by both software houses and users.

Responding to these lessons, Acorn are offering the Compact as a complete high-quality system, with hardware and software especially suited to the school and the home. As a full member of the Master Series, endorsed again by the BBC, it should give continuing satisfaction to its users, both in the UK, and — increasingly — overseas.

The Keyboard Unit

The casing is based on that of the Acorn Communicator — a smart desktop computer-plus-telephone being developed by Chris Curry — one of Acorn's founders. However, the Master Compact differs completely in both its keyboard and contents.

The layout of the 93 keys is the same as that developed for their "top" series product — the Acorn Cambridge Workstation, and adopted for the Master 128. Moreover, the key area of the Compact is the same full size — there has been no subtle narrowing or crowding of keys to shave the cost. It features ten red function keys in a single horizontal row at the top — where they have always been on a BBC Micro. Unlike vertical columns or rectangular groups, horizontal rows can be labelled clearly — with keycards or on-screen — with multiple legends for shifted functions if necessary. There is a full numeric keypad to the right, with the cursor keys in a separate cruciform group between. Interestingly, IBM have just changed to a new keyboard for all their personal computers — with the function keys in a horizontal row, and cursor keys separate from the numeric pad!

The keyboard uses a different technology from that of the Master 128. Instead of metal springs and contacts, special rubber is formed into bubbles, which yet gives "full-travel", both light and positive, with some overcentre action. Since the contacts are between carbon-impregnated rubber and gold, they are highly resistant to corrosion — and should be very reliable.

The keyboard also differs in shape in side elevation. Rather than being in raked rows, as

on the Master 128, all the keys are in a single (though sloping) plane. However, they themselves are angled — each row differently — by an amount increasing with distance from the middle QWERTY row. Moreover, the keytops are of conventional hard plastic (which gives some click), with sculptured tops and flared sides, and clear, permanent markings. The keys themselves feel much like those of the Model B in action, and somewhat different from those of the Master 128. I found the keyboard very acceptable, and understand that touch typists like its light action.

As on the Master 128, the Break key may be locked against use, by turning a recessed screw alongside. The keycard simply rests in the usual place above the function keys.

The Character Set

The markings on the keys are identical to the Master 128, save that the @ character is now on <SHIFT-0>. The former @ key — now marked with two small squares — is known as the "Code" key. It is used to prefix other keys, to send ASCII characters 128 to 255 direct from the keyboard — and thus access an extended character set. (The Master 128 — and indeed the Model B — can already send them, but only by typing CHR\$(n) or VDU(n). This is to enable the computer to be multi-lingual (not to say multi-national), with letters and marks additional to those usual on the English keyboard. Conceptually, this "Code" key is the same as the prefix! used to add 128 to the code of a character in GSREAD encoding.

The action of the "Code" key may seem odd at present — since it requires the <CTRL-SHIFT-Code> combination to prefix each single character sent. However, future versions of the machine operating system (MOS) — in a one- rather than a half-Megabit ROM — will allow the "Code" key alone to toggle between two alternative character sets. Moreover, these will not be simply 0 to 127 and 128 to 255, but a complex mapping, differing for each national keyboard. (Presumably the keytops themselves will be double marked.)

In the jargon, ASCII characters 128 to 255 "have the top bit set", since the normal characters 0 to 127 are defined with only seven bits. For such extended characters to be useful though, as well as being sent from the keyboard and displayed on the screen, they must be accepted by applications such as word processors and acted on by peripherals such as printers. Not all applications and peripherals can be upgraded, and this will take time. In any case, it concerns mainly non-English-speaking countries, but it does show how Acorn and Olivetti are planning an international future for their products. Meanwhile, you can use the Master Compact version of *View* for editing text containing even double-height Teletext characters — though you will need to use a screen dump to print them!

Data Ports

On the Model B and Master 128 machines, the relatively expensive Analogue Port is used

most often for connecting "proportional" joysticks. However, many games expect the less expensive (and much more widely used) switch-type joysticks, which requires an adaptor. Similarly, the digital User Port is most often used for connecting an (AMX-type) mouse or (Marconi-type) trackerball which are also "proportional". Hence for the Compact, Acorn has elected to support the switch-type joystick, along with the mouse and trackerball. This is done by providing an "industry-standard" joystick/mouse port, with a 9-pin D socket — as used by Atari and Commodore, amongst others. The operating system software allows the new port to accept either "switched" (joystick) or "proportional" (mouse) inputs. Furthermore, the cursor keys can be set to simulate a switch-type joystick, so that software which requires it can be run even without additional hardware.

I tried the popular "Quickshot" switch-type joystick (which costs £6.95) with the "Icon" pointer-controlled software on the Welcome disc. It should be anchored securely — which means that the suction pads need a metal, glass or plastic laminate surface. Even then, it gave a rather imprecise response — but perhaps I was expecting too much of such a device. As proportional digital devices, the mouse or trackerball should be much better suited to controlling a pointer. They operate using interrupts, generated from two shaft-encoders, whereas the joystick has to operate by regular polling of the four directional switches. Both proportional devices worked well with the GEM "Icon" software of the Master 512, but I lacked an adaptor to enable their User Port connectors to fit the new joystick/mouse port on the Compact.

The Compact has a full 8-bit parallel printer port as standard. (The Electron did not even have a printer port until you added a Plus 1 interface, costing £60). However, the connector is now a 24-way Delta socket, rather than the 26-way IDC plug used by the Model B and Master 128. The reason is that some countries have severe Radio Frequency Interference (RFI) requirements, and the new connectors can be shielded much better if necessary. This would be done by using metal-sheathed versions of the connectors, and screened ribbon cable. These are expensive measures, for marginal technical gain, but are the price of penetrating international markets such as the USA — as Acorn knows to its cost with the Model B. The main benefit to the user is that this provides the volumes which justify the investment in a high-quality product.

The disc drive data connector on the back of the keyboard unit is also different. The 34-way IDC plug of the Model B and Master 128 has been changed to a 25-way "D" socket, again because it can be shielded better against emitting Radio Frequency Interference.

Inside the Case

On opening the case, the preparations for other RFI measures are apparent, with plastic "teeth" which bridge the two halves of the

C O N T I N U E S ►

case, to ensure electrical continuity when the interior is metallised.

The motherboard looks economical. Almost all the components are soldered in place, including the processor. The only exceptions are the sockets for ROMs and the EEPROM, and for the fitting of the RS232 and Econet hardware.

The processor is the 65C12 — exactly the same as the Master 128. There are also two 6522 chips — one of which controls the audio circuitry and reading the keyboard (as on the Master 128), while the other serves the printer and joystick ports.

The Master 128 has eight semi-custom chips, including two carried over from the Model B. The Master Compact uses five from the Master 128, and the RS232 upgrade uses one from the Model B. Where the 40-column Teletext Mode 7 display was only simulated on the Electron, the Compact has the same Mullard 5050 chip as the Model B and Master 128 — for total compatibility. Likewise, where the Electron had reduced sound capability, the Compact has the full (three "voices" plus noise) capability of the Model B and Master 128.

The floppy disc controller is a WD 1772, which is very similar to the 1770 used in the Master 128, but offers the choice of track-to-track times of 12, 6, 3 and 2ms, rather than 30 and 6ms.

Of the five physical sockets on the right, the MOS occupies the one nearest the front, and the sideways ROM/RAM system the remainder. Three of these are of 16K capacity, and one will accept 16 or 32K ROMs. This is a wise provision, as the cost of the larger ROMs is already low, and they allow room for even more capable applications and languages, several of which are already of 32K (eg Pascal), now and in the future. The 16/32K ROM socket is "mapped" onto the same ROM banks as the expansion connector, with selection being by an internal link (PL 11).

Since the Compact does not have the cartridge slots of the Master 128, none of the internal ROM sockets are "mapped" onto the four x 16K of sideways RAM. However, Acorn have ensured that sideways RAM occupies banks 4 to 7 in both machines for compatibility, even though they recommend using the "machine-independent" bank "letters" W, X, Y, and Z, which are also supported by the operating system.

In their search for cost-effectiveness, Acorn have provided a powerful non-volatile "configuration" capability at less cost, by using an EEPROM, rather than battery-powered CMOS RAM as the Master 128. It stores many settings of this flexible machine while it is switched off — in accordance with the user's preferences. Although each "bit" is guaranteed to retain its data for a year, even after at least 10,000 write operations, Acorn have socketed the EEPROM chip for ease of eventual replacement. However, the capacity — of 128 bytes — is more than the 50 bytes of the CMOS RAM, and will be used for future developments.

While the Compact does not have a real-time calendar and clock as in the Master 128,

the operating system returns a fixed date and time (the end of the century!), to reduce the risk of programs stopping with an error, unable to find any date and time at all.

Two small sockets in the centre, and two larger ones to the left, are for the RS232 upgrade, while two special in-line sockets to the right of centre, near the back, are for the Econet upgrade board.

The power supply (from the disc drive unit) uses a standard connector — the same as for the Electron. However the Compact requires only 5 volts DC (not the 18 volts AC of the Electron), and the socket is accordingly clearly marked. It may be tempting for some young users, familiar with the Sinclair Spectrum, to switch off by pulling out this connector. However, unlike the Spectrum, the Compact has a proper switch at the back of the disc drive unit, which should be used — to avoid excessive wear of the connector.

One of the consequences of the "value engineering" is that, unlike the Model B and Master 128, all the connectors now fit on the back face of the keyboard unit.

Disc Drive Unit

The disc drive unit can support even a heavy monitor at just the right height, and yet manages to look elegant. Those who have a crowded desktop will need to leave space on the right to reach the power switch — just as for an IBM-PC. However, the Compact takes up far less room. Also, if you route the monitor lead over from the left — with the power, disc, and printer leads — the keyboard unit can be moved out of the way when required, without needing to disconnect anything.

The unit contains the power supply and a single 3.5 inch disc drive, with a formatted capacity of 640K. A second identical disc drive is available as a dealer-fitted option, giving a total capacity of 1280K — all accessible at once. The number of drives is limited by the hardware to two, even though the ADFS appears to allow four.

Cassette tape filing is not supported, and no socket or interface is fitted, or even available as an option. The price of a bare disc drive is now less than £100, compared with £30 or £50 for a much less capable cassette recorder. Now that a disc drive is included as standard, the cassette port has been deleted as a cost saving.

Of course, the Electron disc system also used 3½ inch disc drives. However, since then they have received the "ultimate accolade" of being adopted by IBM for their latest machine — the new Portable. Acorn will be supplying only 3½ inch disc drives for the Compact — though third parties may well offer add-on 5¼ inch drives. However, Acorn hope that software houses will accept that most users will have only the ADFS and 3½ inch drives, and will distribute in this format and on this media. Certainly they have been given plenty of notice.

Acorn see this as primarily a disc-based — rather than a ROM-based — machine. There is less need for external cartridges and internal ROMs if a fast, high-capacity disc filing sys-

tem is standard — especially if the machine has sideways RAM. This is the first high-volume Acorn machine of which this could be said (the Master 128 having been in transition, not having a disc drive included as standard). Certainly, disc-based software is less expensive in hardware terms. RAM comes in packages of ever-larger capacity, and can be soldered in, whereas ROM must be in modules of 16 or 32K, and must be socketed.

While 3½ inch discs are more expensive than 5¼ inch discs (by a factor of perhaps two), their capacity is between 1.4 and 6.4 times as great. Also, the ADFS allows much better use to be made of the disc capacity, thanks to the hierarchical directory structure that may be used, which increases the number of files (from 31 per side under the DFS), essentially without limit.

The 3½ inch disc has other functional advantages. It is easier to handle, and the magnetic medium is far better protected (by the plastic shell and sliding shutter), which should lead to higher reliability in practice. To write-protect a 3½ inch disc, you slide a captive plastic tab so that you can see through the notch. While this logic is opposite to a 5¼ inch disc, it is the same as an 8 inch — the original floppy disc.

Another benefit is that the 3½ inch drives are both less expensive and yet (in general) higher in performance. For example, as more recent products, they are designed to work with track-to-track times of as little as 3ms, as compared with from 6 to 30ms for the older 5¼ inch drives. (The later and better 5¼ inch drives — typically half-height — however, can also be run with a time of 3ms. My Teacs worked perfectly with it.) Hence a suitable Floppy Disc Controller (the 1772) can be chosen in place of the 1770 of the Master 128 (and Model B upgrade). The skew factor of 4 in the disc format has also been optimised to the new drives. This all adds up to a disc system of even higher performance than in previous models.

The disc drive unit also has a power-out socket for the monitor, so that both computer and monitor can be powered via a single mains lead. This socket is not subject to the computer power switch.

Displays

The systems are offered with the choice of a monochrome or colour monitor — both of high quality. It will also be possible to buy a system without a display — in the event that the purchaser already has a suitable monitor, or proposes to use a television. Although this is not recommended for more than brief periods or 40-column screen modes, a lead with an in-line modulator will be available — since there is none inside the casing.

The monochrome monitor has a green screen and is made by Philips. This would probably be preferred for business use. To reduce cost, the composite video connector (normally used for monochrome monitors) has been changed from the BNC connector used on the Model B and Master 128, to one like the UHF socket on these machines. However, no damage should result from plugging

T H E M A S T E R C O M P A C T

in a television directly — it simply would not work.

The colour monitor supplied by Acorn is a Philips with a dot pitch of 0.42 mm — the same as the medium resolution Microvitec 653. The display tube has a black shadow mask, for higher contrast, but lacks an anti-glare finish — which was judged too expensive. Even so, this gives very legible 80-column text and fine colour graphics — far better than a colour television tube. The RGB connection for the colour monitors is identical to that used on the Model B and Master 128, as are the signals provided by the computer. However, the monitor has a SCART connector, which ensures maximum flexibility for future applications, such as displaying more than 16 colours, and overlaying video pictures.

Other Peripherals and Expansion

Acorn do not intend to include printers in these systems, since they believe that the purchaser should be free to choose — depending on their requirements. Dealers will also offer advice. The Compact (like the Model B and Master 128) provides an industry-standard parallel interface, and the option of an industry-standard serial interface, which makes the choice of printer almost unlimited.

In addition to the second disc drive, Acorn offers two upgrades for the computer itself — an RS232 kit, and an Econet kit — the sockets for which are already in place. They may both be fitted by dealers. The RS232 is essentially equivalent to the RS423 fitted on the Model B and Master 128, but is significantly less expensive to implement. It is by far the most widely used standard for serial interfaces, and enables the Compact to be connected to modems, serial printers, and as a terminal, direct to larger, mainframe computers. Econet is of course Acorn's own Local Area Network, of which there are now more than 6000 installations. The Econet board is the one which may also be fitted in the Master 128 — another useful rationalisation.

The new machine has no "Tube" hardware or connector, for second or co-processors, since these are provided for in the Master 128. Although this may seem a significant loss, Acorn (and others) have done much to reduce the "need" — at least for 6502-type second processors. This has been done by the provision of shadow RAM (since the B+), private RAM — enabling PAGE to remain at &0E00 with any filing system — (since the Master 128), and progressively faster versions of BASIC. The latest version of BASIC 4 running in the Compact is faster than BASIC 2 running in the original 6502 Second Processor.

There is however an expansion connector on the right-hand side, fitted with a push-on plastic protector. There is also provision for mechanical mounting — with holes for attachment screws either side of the connector. It has all the 24 address lines available, so doubtless various devices will be offered to use

it. One obvious candidate is an adaptor/ socket for Electron and Master ROM cartridges. None is yet available, but they are likely to be offered soon by Acorn and/or third parties. The latter may well also offer a second processor ("The Compact Turbo?") with more RAM and a higher processing speed — as PMS have done for the Electron, which likewise has no Tube.

A 1 MHz bus is not provided as such, but again the signals are available on the 50-way expansion connector. So, eg, a Winchester hard disc drive could be connected quite easily. However, the version of ADFS used in the Compact lacks the special code needed to control a Winchester — though it could be

respect of graphics, compared with the Model B (though the Model B can enjoy the same facilities by plugging in the GXR ROM). Moreover, thanks to the provision of private RAM in the Master Series, using the GXR routines does not raise PAGE, and so reduce the space available for user programs.

To increase compatibility with the Master 128, even where certain hardware (such as the cassette interface) is not fitted, the operating system continues to recognise eg TAPE and MOTOR, so as to minimise the risk of an error. Even GOIO is recognised, which could be good news for anyone fitting a second processor.

*HELP ADFS returns the commands seen in the Master 128 version, with the addition of DRIVE (as well as DIR :n), FORMAT, VERIFY and BACKUP. This on-board formatter is a significant improvement on a disc-based utility, since it is all too easy to find that you have a masterpiece in memory, but no formatted disc to take it.

Bundled Software

Much of the bundled software comes on a Welcome disc, which may simply be "booted up", by pressing (SHIFT-BREAK). You are presented with an icon-based graphic environment, in which a pointer is used to select from menus. This follows the fashionable idiom pioneered by Xerox, and popularised by the Apple Macintosh and Digital Research GEM. The pointer can be controlled by a switched joystick, a handheld "mouse", or a trackerball, connected to a socket at the back, or by the cursor keys — since none of these devices is supplied as standard. After positioning the pointer, you press the "Fire" or "Execute" button, or the (RETURN) key, as appropriate.

The contents and structure of the menus and sub-menus is shown in Figure 1. For example, to use the Calculator, you select "Applications", then "Desk Top", then "Calculator". These Desk Top applications are both entertaining and useful, and yet, like all this "Icon" software, they have been written in BBC BASIC! This makes them accessible to users, who are encouraged to make use of them in their own programs. However, the "Icon" software minimises the demands on a modest, 8-bit processor, since only a patch of the screen has to be redrawn for every pixel of movement by the pointer. It thus represents a "tour de force" in BASIC programming, and a credit to both writers and machine.

The Welcome disc demonstrates how the Compact may be regarded as much as a disc-and-RAM machine as a ROM machine. Thus, after booting it up, sideways RAM Bank 4 contains the Sprite ROM which complements the Graphics Extension ROM (GXR) routines built into the Master Series Operating System, and Bank 5 contains the Pointer and Mouse Filing System (PMFS), which handles pointer and other data for the icon software. Furthermore, on selecting

Fig. 1	WELCOME	DISC
Graphics	Castle Clown Cloud Patterns Shapes	
Tutorials	ADFS Keyboard Screens Text	
Applications	Desk Top	Card Index Calculator Note Pad Catalogue Clock
	TimPaint Logo View ABC	
Games	Adventure Arcade	
Utilities	Characters Envelope Control Panel Pattern Editor Disc Utilities	CatAll EXAll DirCopy CopyFiles
Device/Colour	Text Colour Background Mouse Joystick/Keys	

provided separately. Instead, the code space so released has been used to provide FORMAT, VERIFY and BACKUP, while staying within a limit of 16K.

System Software

The machine comes with a revised Machine Operating System (MOS), a modified ADFS, and an improved version of BASIC 4 — all in 64K of ROM. *H. may be used to call up a full report on the ROMs (and ROM images) installed, complete with all the on-screen help that they provide. However, very sensibly, it is automatically presented in "paged" mode — to avoid it scrolling rapidly out of sight! *HELP by itself returns MOS 5.00, UTILS 1.00, Advanced DFS 2.00 — the system software. *HELP MOS returns a full list of commands — a short form of on-screen help. Among these, *SRLOAD has been enhanced. The syntax is now *SRLOAD filename 8000 W Q I — where W denotes the RAM bank or slot letter, Q is for quick, and I is for initialise — both optional. This last avoids the need for (CTRL-BREAK).

It is worth recalling that the Master Series has been enhanced very appreciably in

C O N T I N U E S ►

ACORN'S NEW MACHINE

(among Applications), either Logo or View, the corresponding ROM image will be loaded into Bank 7. View (version B3.02) is the "senior" word processor from Acornsoft, enhanced to handle extended 8-bit characters. Logo is the best-selling version of the programming language from Acorn/Logotron. It takes full advantage of both GXR and Sprite graphics.

Many other demonstration, application and utility programs are supplied on disc for running in main RAM memory. There are tutorials for the keyboard, screen modes, text options, and ADFS, while the graphics demos use GXR routines, and may be listed for inspiration. The applications comprise the "junior" word processor "ABC", Card Index, and TimPaint. The disc utilities are CatAll, ExAll, CopyFiles, and DirCopy. The first two allow you to examine all the files on a high-capacity 640K disc, and the last two can help you to reorganise them.

Everyone expects a computer to come with BASIC — and the Compact is no exception. However, both it and the 128 come with two versions — BASIC 4 for running shorter programs very fast (the fastest in the class), and BAS128 for running longer programs (the longest in the class) somewhat slower — but still much faster than most rivals. At the same time, it allows well-structured programming, and full access to the excellent graphics and sound facilities.

Other Applications

The machine carries the BBC name — as part of the Computer Literacy Project — and is one of the Master Series. This means that it has a very high degree of compatibility for all Model B and Master 128 software.

ROM software that does not require a utility disc (such as View, ViewSheet, Inter-Word, Inter-Sheet and Inter-Chart, and doubtless many others among the 140-odd which are available) will be immediately usable in their present form. I can confirm that, in addition to the ROM versions of View and ViewSheet, Wordwise Plus, Inter-Word and Inter-Sheet all work — as does the new Master- and ADFS-compatible version of Merteck DataScribe.

Along with View, which is bundled with the machine on disc, the rest of the View family can all be expected to be available very early, and to work perfectly. I received ViewSheet and ViewIndex in time for this review, and the remainder — ViewStore, ViewPlot, ViewSpell and the View Printer Driver Generator — were in the final stages of testing. As well as using ROM images on 3½ inch discs in place of ROMs, they are being enhanced to handle the extended 8-bit character set.

While the Compact has immediate access to a large number of applications both from Acorn and third parties, it is largely thanks to Acornsoft that it also has a very wide range of powerful programming languages available. As well as BBC BASIC (now even faster and more accurate — see below), and Logo, these include Cornal, Pascal, Lisp and Prolog. These undoubtedly contribute to the attractions of the BBC Microcomputers abroad as well as in the UK.

Fig. 2	BYTE	WORD	PROCESSOR	BENCHMARKS	
	Times	for	4000-word	document	seconds
Computer+WP	MC+View	MC+Inter-Word	MC+Scribe	PCW+Locoscript	IBM-PC+WS
Load	3.4	3.7	3.8	11	10
Save	3.5	3.5	4.0	143	25
Search	3.3	3.0	11.4	292	11
Scroll	44.6	13.2	(53.3)	65	41
Times for PCW+Locoscript and IBM-PC+WS taken from Byte 86/3					

Of course Electrons with disc systems used 3½ inch discs and the ADFS. Although they never achieved a high market share, owners of such systems will gain from the fact that they are media- and file-format-compatible with the Compact. Compatibility of applications, user programs and data in both directions remains to be seen, but (even if not complete) should still be good news for both parties.

Acorn have sought to ensure that over 100 titles will be available for the Compact at launch — using the 3½ inch discs. A list of the compatible titles will be included with each machine. Beyond this, Acorn have produced four (of seven planned) catalogues, which list BBC Micro software in the General Interest, Educational, Scientific and Industrial, and Medical fields. Much of this vast resource of over 1700 titles should run on the Master Compact — especially if you or your dealer can transfer it to 3½ inch discs.

Transferring between Filing Systems

If you want to use software or data on cassettes, it will have to be transferred first to a 5¼ inch disc using a Model B (or preferably a Master 128, for which PAGE = &0E00), and then to 3½ inch disc using a Model B, Master 128 or Compact — suitably equipped with 1770 or 1772 disc interfaces, ADFS, and appropriate data cables.

Small numbers of files smaller than the available memory may be transferred between 5¼ and 3½ inch discs simply by loading them from the one, swapping the leads, and saving to the other. However, any significant volume of files, and any long ones — such as database files — requires that one 3½ and one 5¼ inch drive be connected to the same system. (Use could also be made of two machines, connected via their serial ports — if the RS232 upgrade has been fitted in the Master Compact).

It is possible to connect 5¼ inch disc drives directly to the Compact — preferably 80-track, and double-sided. This of course gives media-compatibility with the Model B and Master 128. Furthermore, in addition to reading from and writing to such media under the ADFS (which is standard on the Compact), it is possible to install and use a version of Acorn's original DFS with 5¼ inch discs. Only those versions which run in a Master 128 are suitable, since the workspace for file channels is in a different place in the memory map. However, as the Master 128 DFS is "em-

bedded" in the Megabit ROM, it is necessary to load an "image" of it from disc into a side-ways RAM bank of the Compact. These will be available from dealers. After initialisation with <CTRL-BREAK>, it works just as well as one in ROM (although it is of course lost at switch-off). With these provisos however, a complete path for data transfer is available.

Indeed, one of the features of the DFS 2.2 used in the Master 128, is that *DRIVE n (40) may be issued, which causes the disc drive to double-step, and so enable reading from (and, if necessary, writing to), 40-track discs.

Apparently the best way of switching between filing systems in this case is not "permanently", with eg *DISC, *DIR :3, LOAD <filename> then *DIR :0, *ADFS, SAVE <filename>, but "temporarily", from the ADFS, with eg LOAD -DISC:-3.<filename>, then SAVE :0.<filename>. Alternatively, both short and long files may be transferred using the *XFER command in the excellent *Advanced Disc Toolkit* from Advanced Computer Products.

Performance

Some useful measures of performance in business tasks are the word processor benchmarks established by the US magazine *Byte*. They use a standard document of 4000 words. Figure 2 shows the results for the Master Compact, using the word processor supplied with it (View), and two major alternatives (Inter-Word and Scribe). They are compared with the Amstrad PCW with Locoscript, and the IBM-PC with WordStar 3.3. This shows that, even on this modest document, the Compact with any of the three word processors is far quicker than the Amstrad with Locoscript. (Scribe is a page-based word processor, in which continuous scrolling is not possible, but the time shown is based on 320 lines being scrolled at a rate of six per second). The Compact with View or Scribe is even faster than the IBM-PC with WordStar at loading and saving, and otherwise comparable, while the Compact with Inter-Word is far faster at all four tasks. This shows that the Acorn is a powerful business machine, with a choice of effective software.

For many computing tasks, the accepted measure is the average time for the PCW/BASIC benchmarks, see Figure 3. For the Master Compact, this is 8.3 seconds — some 13% faster than even the Master 128. Apart from a slightly reduced MOS overhead (reflecting the lack of support for Tube or 1 MHz bus),

T H E M A S T E R C O M P A C T

this is due to further improvements in BBC BASIC — making what Acorn call version 4½. This has new algorithms for the so-called “transcendental functions” (logarithmic and trigonometric) — as revealed by the 30% greater speed for Benchmark 8. They are also more accurate. It thus runs user programs faster, without over-speeding games written in machine code — as would eg an increase in processor frequency.

This benchmark time makes the Compact with BASIC 4½ some 70% faster than BASIC 1 and 2 on the Model B, and faster even than on the original 6502 Second Processor. It also makes the Compact almost twice as fast at running BASIC than any 8-bit Amstrad or the 16-bit IBM-PC. Hence, although the Compact was planned specifically to offer greater cost-effectiveness, enhancements have clearly been implemented, where they have not compromised the main intent.

With their powerful operating systems, the Acorn machines have less room for BASIC programs than some others when running BASIC 2 and 4. However, when running BAS128, the Compact and 128 can handle programs and data of up to 64K. Moreover, the speed is little slower than the IBM-PC and many compatibles — for which BASIC programs are usually limited to only some 59K, however much RAM memory the machines may have.

Documentation

The manual is typeset, with both contents and an index, and is wire-bound to lay flat when open. It devotes some 19 pages to the Icon software, 67 to BASIC, 23 to *View*, 14 to

ABC, and 23 to Filing Systems. Notes on Getting Started, Expanding the System, and 11 valuable Appendices complete an introduction to the hardware and — especially — the software. The latter is very extensive (over 400K), but fortunately the games, tutorials, and utilities have on-screen help, and the graphics demos need none at all. A separate manual on Logo programming is included, while the excellent full manual for *View* costs only £10 for those who want to use the more advanced facilities. Doubtless additional manuals for advanced users of the machine will emerge in due course — as they have for the Master 128.

Discussion

It is very well understood that you pay more for quality in the fields of eg cars or hi-fi. The difference in the field of computers is that the measures of quality are less widely appreciated. However, they are increasingly seen to include processing speed and capacity, filing system speed and capacity, freedom of choice of peripherals, expandability, and — above all — the quality of the software. These things are directly linked however, since quality machines will give rise to quality software — written by people who take the time to understand and exploit the machine fully, quite often surprising the designers in the process!

Examples of these potentials being realised include Computer Concepts' *Inter-Word*. In addition to the ROM-link system for in-memory data transfer, this offers very high performance (see Figure 2) and other features in proportion, in a 32K ROM which “looks like” only 16K to the machine — thanks to

“internal paging” (see *A&B*, August 86, p56). Another example is the forthcoming *Inter-Spell* spelling checker, which — though a separate product — can be called from within *Inter-Word*. This too will use internal paging — of no less than 128K of ROM — to contain a dictionary of over 50,000 words. At the same time, it will be fast enough to check words as you enter them — so you can correct as you go. Yet because they are designed to work in any BBC Micro, including the Compact, such quality software can be sold at prices which reflect the prospective high sales.

The Compact is very important to Acorn as part of their plan to remain a volume producer of micro-computers and systems. While the machine itself has only limited scope for upgrade, these are well-chosen — a second disc drive, Econet for local area networks and RS232 for modems and “wide area networks”. However, both users and software are also able to migrate to the compatible and very versatile Master 128 — with its greater capabilities for measurement and control, and potential for adding Winchester disc drives and co-processors. The latter include the 8-bit “6502-type” and Z80, the 16-bit 80186 and 32016, and the 32-bit Acorn Risc Machine. This gives remarkable scope for growth, while retaining much of your investment in hardware, peripherals and software.

Conclusions

The Master Compact may be compared with two Amstrad machines — the CPC 6128 and the PCW 8256 — as the only rivals with 80-column capability and reasonable speed for BASIC. As seen above, the Compact running *View* is much faster than the PCW 8256 running *Locoscript*. Moreover, it has ample disc capacity, and a standard printer interface. At the same time, it has better colour and graphics than the CPC 6128 — both for games and more serious purposes, such as simulations and business graphs. Hence the one Acorn machine beats their two more limited offerings. This is compounded by the quality of the hardware, and Acorn's excellent reputation for reliability — which is being further enhanced by the Master 128.

Furthermore, the Compact can be expanded, not just with a RS232 serial port for a modem etc, but with an Econet Local Area Network, to share powerful resources — such as Winchester disc file servers, and printer servers, which could even be laser or other “page” printers.

Finally, some of the best 8-bit business software, and most of the best educational software — at primary, secondary, and college and university level — is available on this BBC Micro — thanks to a base of over 600,000 compatible machines. This review was written (to a very tight schedule) using the Master Compact and *Inter-Word* — an impressive test of its compatibility and power. Certainly “Compact”, it is still a “Master” in terms of performance and value.

Acorn Computers Ltd, Cambridge Technopark, 645 Newmarket Road, Cambridge CB5 8PD Tel 0223 214411

Fig. 3	BASIC	SIZE AND	SPEED
Computer	Basic	Size for Basic - K Average Time - s	
Master Turbo	BBC Basic 4	44 with disc	4.6
Master 128	BBC Basic 4 BAS128 v 1.1	28.5 with disc 64 with disc	9.4 18.1
Master Compact	BBC Basic 4 1/2 BAS128 v 1.1	28.5 with disc 64 with disc	8.3 18.2
Model B + 6502	BBC Basic 2	44 with disc	9.8
Model B	BBC Basic 2	25.7 with disc 28.5 with tape	14.3
Electron	BBC Basic 2	20.5 with disc 21.5 with tape	20.4
Amstrad PCW 8256	Mallard		14.9
Amstrad CPC 6128	Mallard	41.3 with disc	
Amstrad CPC 464	Mallard	45.5 with tape	14.6
Atari 130 XE	Atari	40 with tape	75.5
Commodore C128	Basic 7	37.5 with tape	40.1
Commodore C64	Commodore	37.5 with tape	34.0
Sinclair Spectrum	Sinclair	40 with tape	58.5
Sony (& other) MSX	MSX	26 with disc 32 with tape	44.3
IBM-PC	Basica	59 with disc	16.8
(Some results taken from Personal Computer World and Practical Computing)			

NEW BBC PRODUCTS FROM CLARES

FONTWISE PLUS £20.00

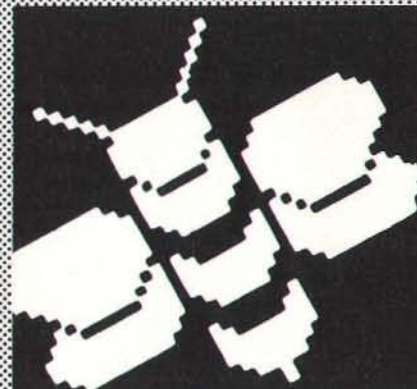


FONTWISE PLUS is now compatible with VIEW, MINI OFFICE II, EDWORD 2 and INTERWORD as well as WORDWISE and WORDWISE+!

Now you can have PROPORTIONAL and JUSTIFIED text in 12 different fonts, all within the same document if required. In addition to the standard facilities like line and page length, pagination, left margin etc. we have now added

- Enlarged, standard & condensed fonts
- Tabs
- Temporary indent
- User definable line feed
- User definable character spacing
- Non proportional fonts
- Now with 12 fonts
- Plus many more features

If you are not convinced ask us to send you a sample printout and you will be amazed at the quality - requires an EPSON compatible printer capable of single, double and quad density graphics but you do not require any RAM in your printer to use FONTWISE PLUS.



MACROM £40 £35 DISC



MACROM is a fast full featured MACRO ASSEMBLER ROM that allows the use of macros, which are loaded from a macro library stored on disc. Assembly can be from disc to memory, disc to disc, memory to memory or memory to disc, thus allowing the use of very long source code up to the length of your disc. MACROM source code is tokenized and thus takes up far less room in memory or on disc than most assemblers.

- Operate in any mode
- Tokenized source code
- Assembles 6502 & 65C02 codes
- Automatically loads macros from library on disc
- Automatically loads subroutines from disc
- Macro library supplied plus demo files
- Chain program sections into main code
- Many different assembly options
- Converts BBC assembler code into MACROM source code
- Very fast & very flexible

In a comparison with ADE, MACROM was able to assemble a program to disc in 1 min 24 secs compared to 5 minutes with ADE and the source code took up 30% less room on the disc.

Ask for a data sheet today

Enhanced

BETA-BASE £25



SPECIFICATION

- | | |
|------------------|------------------------------------------|
| 1) Random Access | - disc based, single or dual drives |
| 2) File Size | - max 65,000 records |
| 3) Record Size | - up to 2048 characters and 200 fields |
| 4) Field Size | - up to 254 characters |
| 5) Holds | - approx 1200 ADDRESS records per 100k |
| 6) Search | - 5 search fields using powerful options |
| 7) Sort | - 500 records on 3 fields in 60 seconds. |

SYSTEM FEATURES

- *CALCULATE - using any valid expression
- *PRINTOUT - Powerful options
- *REDEFINE - Titles, fields etc.
- *TRANSFER - From one file to another
- *GLOBAL ENTRY - of repetitive data
- *SEARCH LISTS - Allow creation of sub Databases within main Database
- *SPOOLER - enables you to create spooled files that are compatible with Wordwise, View etc.
- *INPUT - is a routine included on the disc which will allow you to write your own utilities for accessing your data. Many of the programs on the utilities disc were written using this procedure

BETA-BASE

UTILITIES £12.00



Extend the power of Beta-Base with the extra facilities provided on this disc.

- *MAIL MERGE
- *LABEL PRINTER
- *DISC SORT
- *EXTENDED SEARCH
- *FREE FORMAT TRANSFER
- *FAST PACK
- *STATUS

The MAIL MERGE alone is worth £12 so you get a real bargain with this disc. The features are so numerous that we cannot mention them all here.

Ask for our UTILITIES DATA SHEET if you want more information.



DISC

40 _____ 40 TRACK

80 _____ 80 TRACK

3 _____ 3" DISC - ADD £3



EPROM

Send for detailed newsletter.

All prices inclusive of VAT & Carriage - NO EXTRAS! Please state 40 or 80 track disc and state D.F.S. you use.

RAMROD £40 ROM



£35 DISC



RAMROD is the ultimate in toolkit ROMs and is fully compatible with the whole BBC range from Model B through to the MASTER 128 and including both 6502 and TURBO co-processors. RAMROD adds 54 new commands to your computer. Areas covered are DISC (DFS & ADFS), GENERAL (memory commands etc.), ROM (including sideways RAM) and TUBE.

RAMROD provides commands to dump memory or a disassembly of memory to a printer. Editors can display the screen in 40 or 80 column mode.

DISC

Edit discs and search for ASCII or HEX sequences.

GENERAL

Edit, search, disassemble, compare, dump to printer and relocate ANY area of memory including the SHADOW screen. List vectors in use, load and save function keys even on MASTER etc.

In addition to the above you can move between ROM/RAM banks using (CTRL) Cursor Keys when in either memory or disassembly mode PLUS you can switch between memory editor and disassembler by pressing (CTRL)(TAB).

ROM

Includes commands for listing, loading, saving, wiping, swapping, ROM images. PLUS formatting and titling RAM banks for the ROM filing system and saving programs in RFS format.

TUBE

Provides the same memory commands as GENERAL plus SHIFT and COMPARE memory across the TUBE both ways.

We cannot do justice to RAMROD in the space here so please ask us to send you a fuller data sheet - RING NOW!

NEW PRODUCTS

Watch out for a fabulous new product which will be released during SEPTEMBER for the MASTER and its compatibles.

This is a high quality art package called ARTROOM but it offers many features not provided elsewhere. It is a full screen package and is written by the authors of FLEET STREET EDITOR so you know that it will be good.

Ask for a data sheet NOW!

clares
MICRO SUPPLIES

98 Middlewich Rd.,
Northwich, Cheshire CW9 7DA.
Tel: 0606 48511
Open 9-5pm Monday-Friday
LUNCH 12.30-1.30

A R C A D E

THE ARCADE

Another bumper month for arcade aces! Isn't this supposed to be the quiet time of year?

Airwolf

Elite
Model B
Tape/Disc £9.95/£14.95

Graphics 9
Sound 7
Playability 7
Life Span 7
Overall 8

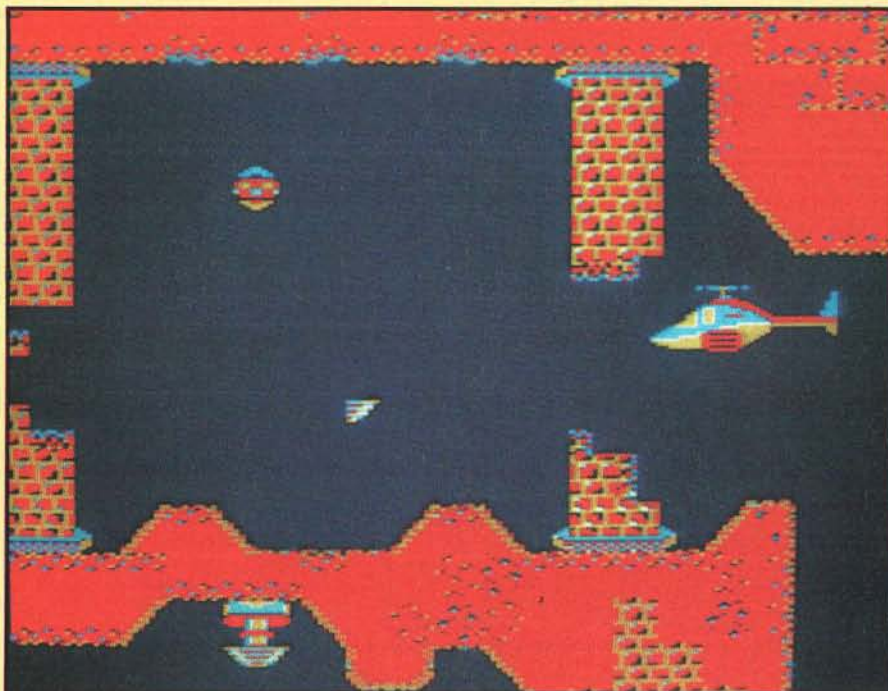
An elusive title that seems to have slipped past the gathered ranks of reviewers which is a great pity as this is a very good game, well-programmed by Andy Williams, which deserves a better fate than being sold at discount (which is where I found it!).

Based on the Universal TV series about Stringfellow Hawke and his futuristic helicopter, the game is a drastic and compulsive

update of those old *Space Caverns* sort of games except that instead of taking your spaceship through twisting tunnel under a planet's surface you must direct your helicopter through the defense systems of an underground terrorist base.

The graphics are superb, especially the detailed helicopter which handles responsively and smoothly. Amongst the many underground rooms and passages are puzzles and buttons which must be fired on until new areas of the game open up. As such it is an intriguing mixture of arcade game and graphic adventure with the added excitement of helicopter simulation.

I liked this game a great deal and will return to it often until I solve it. There's a slight coldness about it that may not appeal to some of you (futuristic helicopters are not easy to relate to) but it is well worth seeking out and adding to your collection.



Airwolf — smooth graphics, subtle flying skills to master and puzzles to solve

Bang! Bang! You're dead...

Who Dare's Wins II
Alligata
Model B
Disc £9.95

Graphics 7
Sound 5
Playability 8
Life Span 7
Overall 7

Hot on the heels of Elite's *Commando* and beating Imagine's *Green Beret* to the shops comes *Who Dares Wins II*; a scrolling soldier-against-the-world scenario, popular across a whole range of computers. In fact, this game was originally released for the Amstrad, but the conversion seems fairly accurate.

The title is not a ploy to get you hunting for Part I in the shops but a consequence of the original Commodore 64 release of *Who Dares Wins*, whose alleged connection with the arcade *Commando* caused a 'II' to be added when converted for the 64.

WDW II shares many features with *Commando* — notably the upwards scrolling screen (with no retreat), the single soldier armed with rifle and grenades (with extra grenades to collect) and the necessity of completing levels by destroying the enemy before advancing to the next stage.

But whereas *Commando* offered satisfyingly chunky graphics (albeit with the most horrendous attribute problems) and a welcome joystick option, Toby Butler's *Who Dares Wins II* makes do with the kind of small scratchy figures fans of *Manic Miner* will feel at home with.

The game's involvement of the player depends on the keyboard basher relating to the soldier and his instant necessary reflexes — tiny flickering graphics tend to work against that. However, WDW II does have the advantage of speed (especially when not firing) and the largely observable patterns of fire and movement can be memorised. I also

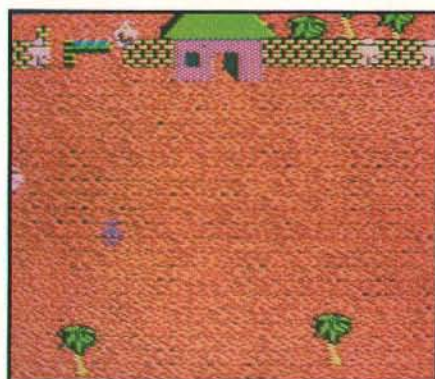
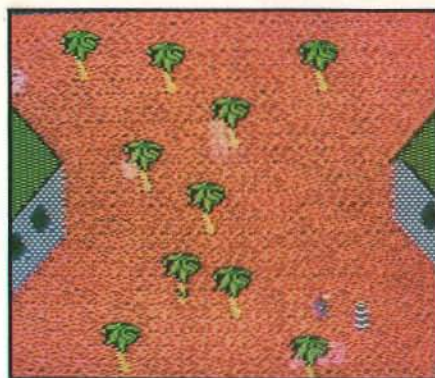
C O N T I N U E S ►

liked the convincing detail in the landscape of buildings, trees, walls, railway lines, etc and the firing is a lot more accurate than *Commando*, where there isn't even a continuous fire option.

The plot is a simple — you have to invade an enemy stronghold and a nice touch after getting to the heart of the game is another mission — fight your way out!

The pseudo-3D graphics do give a convincing impression of the mission and the speed and movement of the enemy soldiers (much faster than *Commando*) allows for some intricate footwork around trees, obstacles, etc. It is easier too to plot a route and use cover as if this was a real mission.

The essence of game play here is to only advance up the screen when you have killed the small number of enemy soldiers you can



see (remember: no retreat). Go too far too soon and you'll end up with too many to handle at once. Still, my taste runs back to *Commando*. I miss the larger figures, the extra detail and the constant feeling of achievement when death does not take you right back to the beginning. But fans of death and destruction will certainly enjoy *WDW II* and despite my preference, it is a welcome addition to my software library.

This disc is a pre-production copy and it is to be hoped that the released game will have some music and extra sound effects and not have dumb spelling mistakes in the window scrolling introduction (I liked that), or copy the bizarre behaviour of this disc which switched into my Beebugsoft's *Exmon II* toolkit ROM after the third life was lost!



Commonwealth Games swimming — tough going but the record can be broken for a points bonanza

Commonwealth Games

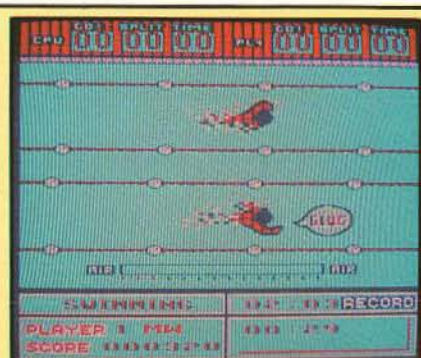
Tynesoft
Model B/Electron
Tape/Disc £7.95/£8.95

Graphics 9
Sound 7
Playability 5
Life Span 7
Overall 8

I'm not a great fan of these sporting compilations, partly because there is rarely a joystick option and I'm worried about what the constant pounding is doing to my keyboard connections. Sadly, Tynesoft has not given this much thought and after three heats of eight events (ALL using the Z/X keys!) you may find your keyboard smoking.

However, that said, this is an excellent package. Well up to the standard of their best-selling *Winter Olympics* in terms of graphics and representation of the games involved. All it's missing to make it really accurate is a boycott mode!

The games covered are Hammer Throw-



ing (speed plus angle of throw important), Swimming, Cycling and Running (basically speed events but with the need to breathe in the Swimming and the need to stay on the track in the Cycling), Long Jump, Steeplechase, Rowing and Wrestling. Perhaps the hardest event is Rowing which involves co-ordinating two rowers by hitting Z,X,C in the right order.

If you've seen *Winter Olympics*, then you'll know what to expect graphically. Apart from a stunning photo-like title screen, the figures are well-drawn, pleasantly large and chunky with some very nice little touches here and there (especially the water splashes in the swimming).

Apart from my keyboard reservation, I'm sorry there isn't either an option to practice as there was in *Winter Olympics* or an option to skip certain events.

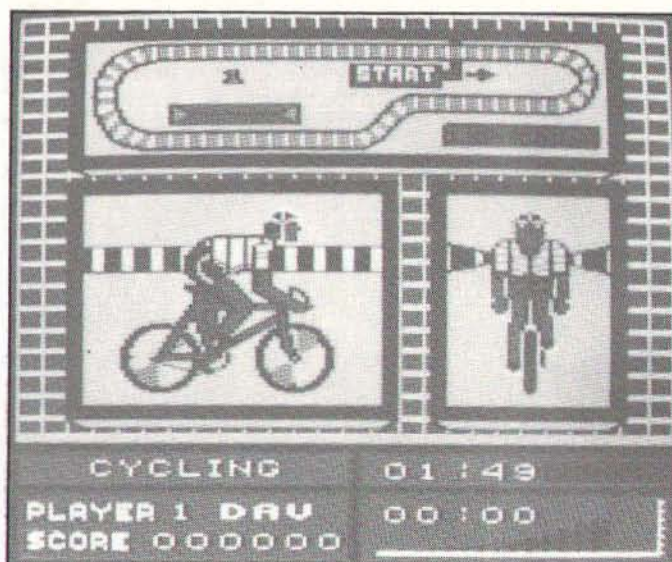
This is certainly better than either *Hyper Sports* or *Olympic Decathlon* and you shouldn't let the Commonwealth Games tie-in suggest that this is a hastily produced product. There are many thousands of satisfied *Winter Olympics* owners; I suspect there will be very satisfied *Commonwealth Games* owners as well.



Commonwealth Games hammer — stoke up the power and judge the angle



Commonwealth Games rowing — skilful sculling wins out everytime



Commonwealth Games cycling — multiwindow displays are a feature of the software

Game of the Month! Joust

Aardvark Software
Model B
Tape £9

Graphics 8
Sound 5
Playability 7
Life Span 8
Overall 8

Some people just don't have any luck! Take the case of Delos D Harriman, for instance. Back in 1984 he produced a stunning version of the arcade classic *Joust* for copyright holders Atari — exit Atarisoft after producing a small handful of arcade conversions. Enter (in 1985) Aardvark Software, well-known showcase for the brilliant if unprolific talent of one Orlando (*Frak!*, *Zalaga*, etc), a bit of conversion and tidying up and the game was ready for an unsuspecting world.

Then, disaster! Aardvark seemed to disappear and this masterpiece was left to languish once more, unknown but to a few games freaks. Finally, a despairing Harriman resorted to trying to sell the game through a small ad on Micronet (MBX M.Fox on 919999020 for full details). Enter A&B and the game gets its true reward: **Game of the Month!**

As well as being an accurate conversion for the arcade hit (as far as I can remember), the game scores well by incorporating all sorts of clever and welcome extras like the windows on the title screen with a count-down of loading time and nicely scrolling instructions. Accuracy is stunning: a pixel-for-pixel copy of the original written with the help of the original programmer, Williams.

The idea of the game is simple — you control a flying bird and must joust in the air with either another player or the computer, the loser turning into a harmless bird laying an egg that can gain extra points. Yet, with all such simple ideas, the game play is complex

and subsequent screens gain infuriatingly in complexity, speed and difficulty. Those who played the original arcade game will recall the Boulders, Hunters, Shadow Lords, Larva Troll, hatching eggs and Team, Gladiator and Egg Waves — well, they're all here!

What raises the game well above the usual level is the option for two player games — not just competitively as in many games but in co-operation against the computer. An added delight is the computer's random announcement of a 3000 point bonus for the first player to kill the other! In games like this you need to know who your friends are!

With joystick, redefinable keyboard or joystick and keyboard options, this is a model of how a game can be made a real pleasure to play. As a single player game it is a well-designed and compulsive challenge; as a dual game, especially in a group of friends, it takes on a whole new depth where your baser natures can take over.

Great game, great programming; now let's just hope it gets the success that is more than a little overdue.

Vindaloo

Tynesoft
Model B/Electron
Tape/Disc £7.95/£8.95

Graphics 8
Sound 7
Playability 6
Life Span 6
Overall 7

Great fun! A virtual clone of *Bug Eyes* by the same author, this platform-type game involves guiding Raj, the Indian takeaway owner, deep through the cellars under his restaurant to find the toilet (*Vindaloo* — Find a loo — geddit?). Despite the awful pot-

ential of racist jokes, this is a straight game that uses humour well and is inoffensive as far as I can see.

Like *Bug Eyes*, you only use Z/X for left/right and the multiple screens are full of the familiar lifts, descending monsters and flying objects to be avoided. The characters are satisfyingly large and the time element imposes a sense of urgency. Not the best game of the month, but of a quality to make me eager to see the next batch of Tynesoft releases.

In the post

It's not very often we're asked to review a mail order catalogue and the sheer nerve of Speedysoft (Tel 01-846 9353) rather appealed to me.

Although not offering discounted software, Speedysoft has been around for nearly four years and their catalogue is well thought out. Wherever possible games receive full details (ie joystick compatibility, hardware compatibility, loading time), screen shots and quotes from published reviews as well as short descriptions.

I can't speak for their service (although their publicity material is always plastered with testimonials) but I like their catalogue. A&B readers who send a £1 for a brochure (37 Church Road, London SW13 9HQ) will receive a £1 voucher to spend. But be warned that it is not exclusively BBC games and probably only of real interest if you have no software shop close to you.

C O N T I N U E S ►

Mouse Trap

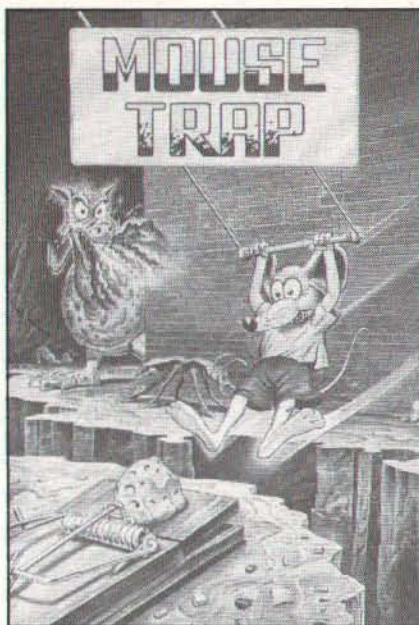
Tynesoft
Model B/Electron
Tape/Disc £5.95/£6.95

Graphics 7
Sound 5
Playability 6
Life Span 5
Overall 6

Anybody here remember *Contraction*? A rather wacky but well-designed and very playable platform game, whose most engaging feature was the bizarre graphics.

Obviously a lesson well-learned by Chris Robson, whose *Mouse Trap* is a fairly standard platform game raised from the general level of such games by such wacky nasties as grasping hands, fried eggs and flying loo rolls!

The plot involves Marvin the mouse clearing 22 screens of food on his way to a golden chunk of cheese. The game is not too difficult: as usual with such games once you've mastered the art of jumping, worked out the route around screens and plotted the patterns of the nasties then it is just patience and a steady hand.



The graphics are excellent and the game plays well enough to deserve a place in most gamer's libraries. Its deceptively low score here is due to its lack of appeal to non-platform players only.

Tapper

US Gold
Tape £9.95

Graphics 7
Sound 7
Playability 7
Life Span 7
Overall 7

Yet another arcade classic makes it to the Beeb, this time the Bally Midway game about a barkeeper desperately trying to keep the customers supplied with drinks.

Converted last year by P R Morgan and Micro Power (remember Micro Power?), this is a graphically excellent version of the compulsive game. It starts slowly with four bars, a customer on each, glasses to fill, empties to catch as they slide along the bar and tips to collect for bonuses. The first sequence is quite easy but subsequently the game speeds up, with extra customers, bonus screens (with a find the ball game) and different bars.

Brimming with 'one more game' appeal, this is a lot of fun. Though beware the very long loading time, though — why no disc version for this one, US Gold?

*LOADING soon

News and up and coming releases that we'll review just as soon as we see them.

- Gearing up for an Autumn smash with *Trivial Pursuits* is Domark, whose stand at the PCW Show in September (traditionally a major event for game releases) will just feature the game, ignoring other 1986 releases. Claimed to be the best board game conversion, it is also the basis for a great competition — see elsewhere in this issue for details.

- Melbourne House have produced *Fist II* (sequel, of course, to *Way of the Exploding Fist*) for the Commodore 64 and Spectrum with other versions to follow. Can Beeb owners wait?

- New from Ariolasoft is a new strategy game *Think!*

- US Gold are expanding yet again with more staff recruited. Hopefully they will continue to satisfy Beeb owners with more conversions.

- ASL are working on a conversion of their *Graham Gooch Test Cricket* game, plan to continue supporting the Beeb and will release a new arcade game *The Free at PCW*.

- Also planned for release at that show is Firebird's new mystery game, launched on the BBC first for a change.

- Surprise, surprise, Superior Software have signed a deal with Acorn to produce a

range of "quality-produced software games" under a joint Acornsoft/Superior label. Superior will have the publication and distribution rights and the first releases are due out in the autumn. Apart from that, Acornsoft are being cagey. More news next month.

- Michael Jakobsen (Danish author of *Citadel*) is currently working on a new game with an ancient Greece theme. Should be released in the Autumn.

- Advanced Memory Systems (mouse makers) have produced the first two mouse compatible games: *Zap Zone* and *Mind Games*. The first is an arcade game; the second a selection of five intelligence games.

- Tynesoft are to support the BBC heavily for the next year or so, with up to 20 releases planned (with Electron and Master compatibility as a matter of policy). However, apart from *Jet Set Willy II*, they are being cagey about titles. Their best-seller so far is *Winter Olympics* with about 1000 sales a week and overall, sales are about double what they expected. Again, we're looking forward to major releases at the PCW Show.

- A new multi-user adventure game is starting on Micronet about now (end of August) called *Shades*. Promising no registration fee and playing charges of 99p an hour, it sounds like a welcome addition to *Starnet* and the troubled *MUD*. We'll be taking a look at this as soon as we get our free credits.

- Deleted from my last column was all mention of a new Martech release. Let's just say it is a card game featuring the physical assets of ex-Page 3 girl and minor pop star, S« F«. Versions for other micros already exist and apparently it plays a mean game of poker. Rumours that it has to occupy a double cassette pack are unfounded and jokes about disc versions on floppies are to be treated with contempt.

- There is no truth to the rumour either about a new Imagine/Konami conversion about the romantic office life of a magazine editor called *Markie*.

- Being rather elusive at the moment is Imagine's *Green Beret*, despite advertising claims. Must be those camouflage techniques they learn...

Talking point

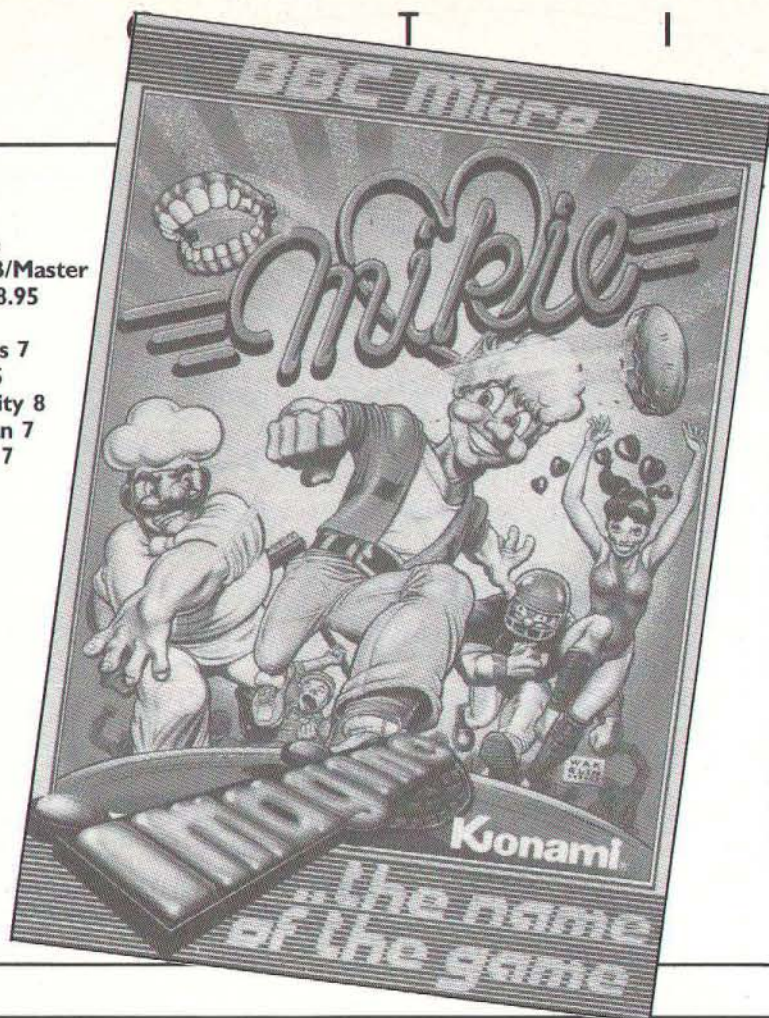
Owners of micros other than the BBC frequently sneer at us, as I'm sure you've noticed — overpriced, fine for education, but for games...?

What must be confounding the sceptics is the stream of high-quality software now being produced for the Beeb and the commitment of software houses (including several recent entries into the market) to continue releasing games. Admittedly, the flow of software for the Spectrum and Commodore 64 still leaves Beeb owners a little envious but, as the months and years go by since the Model B's release, the games get

Mikie

Imagine
Model B/Master
Tape £8.95

Graphics 7
Sound 5
Playability 8
Life Span 7
Overall 7



Yet another arcade conversion! Some of us must have been doing something good in a previous life! This time it's Konami's Mikie, set in an American High School and converted by Peter Johnson. Can you help Mikie collect parts of a letter to his girlfriend and then deliver it whilst avoiding the teacher, the manic janitor, the chef and the delights of kissing the dancing girls?

The letter is assembled by collecting hearts found around the school in classrooms, the locker room, canteen, gymnasium and yard. Mikie has various bizarre collectin methods such as the Hip-Zap which shifts fellow students from their seats. The graphics are adequate although there is a dreadful attribute problem which displays the figures as wire models and not solid characters.

Certainly a lot of fun and compulsively easy to play. In a quiet games month, this could have scored a lot higher and had a much longer review. In recompense, there's a prize for the first arcade reader to send in the (correct) message which Mikie delivers to his girlfriend.

better. Quantity seems on the increase as well.

The question is: why? Partly, of course, because of the machine's obvious capabilities as a games machine (nobody who has played *Elite*, *Revs*, *Psycastria* etc can doubt that) but perhaps more importantly because of the loyalty of Beeb owners. Second-hand Model Bs traded in for Masters are being snapped up faster than dealers can get hold of them, new add-ons are produced almost daily and an insistence by Beeb owners on quality means that there is a continuing reliable base for software houses to plan for.

Great news for us, of course. Even if we are loyal to a dead machine that was overpriced, lacking in arcade-needed memory and without sprites...

Enter The Hall

Don't forget to send your nominations for the best and worst games for our Hall of Game Fame and Dodgy Dungeon announced last issue.

You might also like to include entries for a third category — Unsung Masterpieces. This is for secret favourites of yours that, for some reason, never became talking-points amongst your friends, never appeared in the software charts and which you never see mentioned in hints columns. My own nominations might well include Clive Webster's *Birds of Prey* from Romik and Simon Birrell's *Microbe* from Virgin.

Again, nominations as soon as you can think of them and we'll dig into the A&B software sack to reward the most interesting reasons why games should be included.

Game Play

In this section each month I'll be taking a look at a variety of add-ons and hardware goodies that will help your game play. Not all will be designed solely with that aim in mind, but nevertheless this series guarantees added arcade action and enjoyment for you.

Before I take a look at more obvious game enhancements (such as joysticks, to be comprehensively reviewed later in the year), I thought I'd start with a cheap and cheerful add-on that I recently fitted to my trusty old Beeb.

To tell the truth, it was a boring week and I was in the mood to spend some money — but what on? The games file was full, I hadn't enough money to upgrade to dual discs, so what could it be? My eyes fell on a small ad for a *Sound Control Volume and Headphone Socket Kit*; hardly earth-shattering, I know, but potentially useful.

Imagine my surprise when I fitted the small unit and played my first game (last month's *Game of the Month Psycastria*) complete with headphones. Instant ecstasy! The sense of total involvement is amazing and even the most ordinary games, provided they have sound, take on a new lease of life.

The dual unit fits quite easily at the rear of the machine — a backing plate fits over two nuts holding a potentiometer through the Econet socket and a headphone socket through the nearby ventilation hole. Then it's just a simple matter of hooking up the unit to the white speaker plug that lurks under the keyboard. No soldering, no messing — five minutes at the very outside.

As well as the headphone socket, the sound control allows the machine to sound normally or be silent (easier than *FX210, I all the time!). Just the thing, in fact, for late night forays into the depths of some megazapper.

I'm very impressed with this small unit. It's well constructed, surprisingly cheap and adds a whole new dimension to your games play. With a slight mental questionmark about potential overheating problems with the ventilation hole blocked, I would recommend this to any games player.

Sound Volume Control and Headphone Socket Unit

Cantocks Enterprises Ltd

Tithe Cottage, Policemans Lane, Pensford, Avon BS18 4AS

Price £5.75

Another volume control which I haven't seen is available from SL Peripherals (Tel: 01-466 1087), price £5.99 but there's no mention in there literature of it being a headphone socket too.

C O N T I N U E S ►

The Complete BBC

**Audiogenic
Model B
Tape £19.95**

**Graphics 8
Sound 6
Playability 7
Life Span 7
Overall 8**

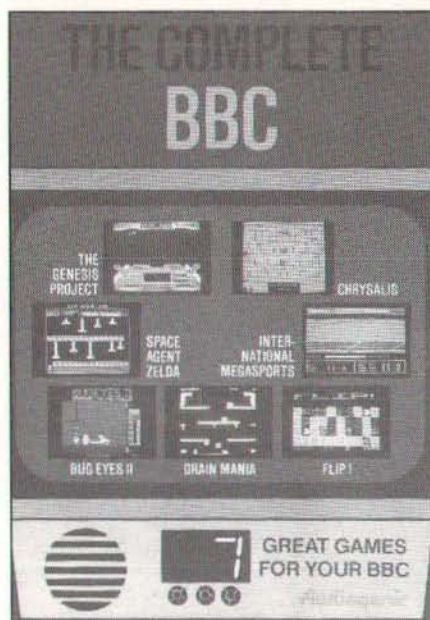
Note: Scores based on the package — some games score higher, others lower.

The title is, of course, a misnomer. What we have here is a good collection of recent releases (mainly of Icon software) which could still sell at full price. Seven games (rather more if you count *International Megasports* as more than one) is a bargain, even if the price seems like a lot to shell out at once.

The games come on two cassettes and, confusingly, Audiogenic have also just released a twin pack of *International Megasports/The Genesis Project* for £8.95.

The Genesis Project

Yet another *Star Trek* game but above the average quality. A detailed control panel and nicely scrolling stars soon make you forget



the search for Trilithium crystals and concentrate on shooting aliens, etc. Yet more evidence of The Art Crew's talent and a game that repays extended play.

Flip!

Remember a card memory game called Pairs, where you have to pick up two cards at a time and try to recall where the pairs are?

This is a computer version with stunningly competent little cartoons instead of cards and a range of well-programmed theme songs as well.

Play against the computer or an opponent, but however you choose to do it, this is one of the very few games that will entrance non-computer lovers. Great for parties. This deserves a much wider exposure than it received as an Icon release and a big tip of the hat to programmers Adrian Stephens and John Dale for taking a simple idea and turning it into an understated display of very fine talent.

Chrysalis

Dave Mann of *Contraption* fame again displays his wacky humour, excellent use of music and large flicker-free objects in an oblique variant of *Pacman*. Outwit the mutant worms in a garden maze with swinging gates. A lot of fun — you'll play this one again and again.

Drain Mania

A fairly standard platform game that plays well enough but doesn't inspire me, I'm afraid.

Space Agent Zelda Meets the Bug Eyes/ Bug Eyes 2 — Starman to the Rescue

The original *Bug Eyes* was compulsively playable with simple left/right controls as you

Loony Loco

Anybody interested in a collector's item? Announced at the recent *Acorn User Show* was a new game, *Loony Loco*, from Kansas City Systems. But rather surprisingly, there were no review copies available as they had decided to withdraw the game after very poor sales on the first day. What about your development costs, I asked. Doesn't matter. Don't you think a review might stimulate interest in the game, I asked. Doesn't matter. Don't you think this is all a little bizarre, I asked. Doesn't matter.

So, those of you at the show who managed to pick up a copy have what is either an unreleased gem or a justly-junked oddity. Either way we'd like to see it, if any of you would care to help us out with a loan...

Attention programmers!

An on-going project here in *The Arcade* is a database of Beeb games and programmers' gameographies for a future feature.

We'd like also to include profiles of particular programmers and companies but first we do need some hard info.

If you're a Beeb programmer with credits or can help us track down reluctant pro-

grammer friends then do please get in touch.

Programmers deserve rather more attention than they've received so far in the Beeb world but we need you to come out from behind your keyboards and help us with our mission.

Hints 'n' Tips

This month's *Hints 'n' Tips* contains a variety of playing treats - a *Castle Quest* solution, some passwords and a coupla pokes. I know you were expecting *Wizadore* but the arrival in the office of a couple of *Castle Quest* tips changed our priority plans.

But we don't know all the answers, so write in with your games hints and tips. Include your name and address, the game involved (obvious, I know but...), whether it's a complete solution, whether the pokes are tape or disc based plus any other information needed. You may think it obvious how to create a false header; many readers won't know.

Repton

Still a tremendously popular game and likely to gain a renewed rush of interest when *Repton III* recreates lizard fever again this autumn. Each screen, on completion, reveals a password taking you onto the next; here we reveal all the passwords so you can practice any screen. Use of these passwords will

enable you to enjoy the whole game and not just the sections you can complete on your own. Enter these passwords via the **P** option on the menu screen.

B: noelemahC
C: niparreT
D: redniwediS
E: okceG
F: nohtyP
G: rednamalaS
H: anauql
I: hsifelttuC
J: supotcO
K: malC tnaiG
L: nekarK ehT

These are obviously all spelt backwards, so you will have to make a conscious effort to cheat! Incidentally, anybody out there with a *Repton 2* map yet?

Citadel

Following our *Citadel* solution and map feature last month, we're now able to give you an extra energy poke revealed in *Micro User* by the game's author Michael Jakobsen.

LOAD the BASIC header ('Citadel') and then type

8250!&85=&17192329

Then RUN. This will make all energy flasks give you 65 energy units instead of 30 (from

A C T I

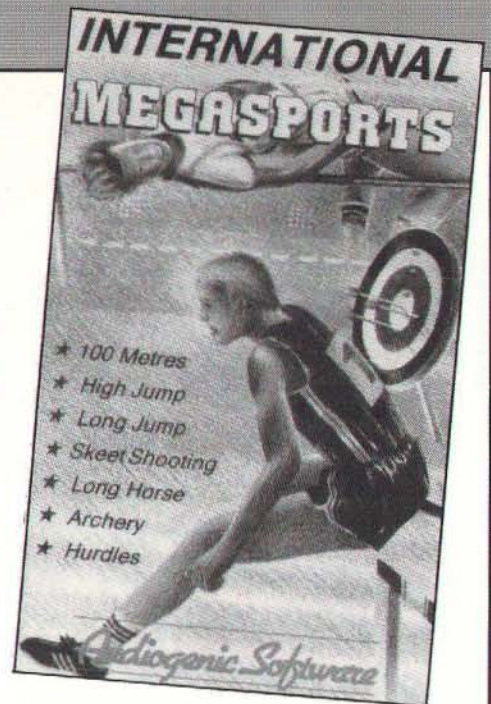
directed a little spaceman through caverns of descending pistons, flying monsters, etc. *Zelda* is virtually identical (see also this issue's review of *Vindaloo*, another very similar game by programmers Kevin Blake and Jason Sobell) but *Bug Eyes 2* is an instant classic.

Much the same plot and gameplay but with extra puzzles and keys to collect.

Mapping is essential here. Shingo reviewed *Bug Eyes 2* in A&B in July and liked it. I agree.

International Megasports

Yet another collection of sporting events, this time with Running, Skeet Shooting, Long Horse, Archery, Hurdles, High and Long Jump as the events.



Nicely programmed but rather a poor relation of Tynesoft's *Commonwealth Games*. Still, there are some nice touches of humour here and the game is quite playable.

So, in total, we have four outstanding games here with two reasonable and one disappointing. Not bad with change from £20 but, as always with compilations, its value to you will depend on what you already have in your collection.

Certainly worth getting if you haven't any of the *Bug Eyes* series and fancy *Flip!* and *Chrysalis* as well. A nice package.

the ten green flasks) or 50 (from the six red flasks) — an extra 440 energy units.

Apparently the assumed bug that allows you to jump into the title screen (see last issue's column for details) was intentional.

And I'm still waiting to hear about the apparent secret tunnel left from the bottom of the well...

Castle Quest

Tony Southcott's excellent arcade adventure from *Micro Power* was overtaken last year by interest in the delights of *Citadel* and *Dr Who*, but it's still a game to return to with pleasure.

Before the solution, here's an extra life poke. *LOAD the main machine program and then enter ?&433E=&x where x is the number of lives you want. This must be in Hex, up to a limit of FF. Then CALL the execution address and if you don't know how to find that, then you shouldn't be poking about.

Onto the solution. Space doesn't permit a lot of detail but it should be clear if you're used to playing the game.

From start go up, left and up to green guards, collect torch and then trap monkeys in dead end top left of screen below. Collect torch on this screen and drop it to bottom by ladder they always descend. Back up to monkeys, pick up torch and block top of the

ladder by other torch once they've passed. They should go left to spider screen. Follow, collect torch, chase them back and then go up to green guards. Kill them and take ruby.

Store both sword and ruby. Get captured by next guard and, in prison, jump and throw stool at torch. Get torch, jump up on stool to above door and throw torch onto bed. As soon as the guard comes in, jump down, collect the stool and jump up next ladder along passage. Once the guard has passed, you can go left to collect any items taken from you. Back up the ladder, right, down, left by stairs, jump to bridge and then jump right.

Kill the ogres and then go up for the aqualung, killing the red guards and then leave the sword. Fall off edge into water, left, up and jump across to next ladder. Go right, jump and get the bucket as you fall. Go up the ladder from the water, drop aqualung and then go down ladder to fill bucket with water.

Up two ladders getting the gold brick and then jump left to the troll. He will take gold down one ladder, go down the other, get the gold and go left. Dodge the troll, go left to start position again.

Do the monkey trick again and go left past both spiders and down steps, jumping left as you hear the witch. Throw the bucket of water at her and go left to wand. Stand on stool to get out then left and up, collecting gold coins. Re-enter the water with the aqualung and go up ladder again, getting the sword and ruby. Up, left and down short lad-

der, jump left into passage and again to ladder on left. Down again and kill yellow guards.

Move to right and throw the wand at the wall facing the ladder. The treasure should now be revealed!!

Micronet

Any of you comms freaks out there unable to put pen to paper or lick stamps can MBX me on Prestel/Micronet 919999020. I can hardly wait...

And finally...

Next month we should be presenting: Superior Software's *Gala Force*; the clash of Rambos with *Who Dares Wins II*, *Green Beret* and a comparison with *Commando* and Tynesoft's *US Drag Racing*.

Meanwhile, this column and last month's seem to be justifying our faith that there is enough games material out there to take seriously. All we need now is your input; so remember to send your comments, tips, maps, reviews, nominations and questions to:

Dave Reeder
The Arcade
A&B Computing
ASP Ltd
1 Golden Square
London W1R 3AB

Good old Teddy will always have great sentimental value.

The BBC Master Compact, on the other hand, will be valued for more practical reasons. No doubt your child is already familiar with BBC micros from the classroom.

With a BBC Master Compact at home, they will soon feel completely comfortable using computers.

From then on, learning becomes that much easier.

Parents will quickly spot the value of this new BBC micro for themselves.

Once your child is safely tucked up with Ted, you might use the Master Compact to do the dreaded VAT returns.

Accountancy Age has already acclaimed our micro's spreadsheet package* as 'the most sophisticated yet produced for a small micro'.

The BBC Master Compact comes as a complete, easy to use package. This includes colour monitor, processor, disc drive and enough software to keep you and your children occupied indefinitely.

It is now available from main computer dealers.

Like a Teddy Bear, it can be justified as an essential purchase.

Two things your f

AVAILABLE FROM SELECTED BRANCHES OF CURRYS, OXONS, JOHN LEWIS, LADY'S, WH. SMITH AND YOUR ACORN DEALER.
THE MASTER COMPACT 128K RAM, 3.5" DISC DRIVE, PRINTER AND JOYSTICK INTERFACE. SOFTWARE INCLUDES VIEW WORD-PROCESSOR, ABC, CARD INDEX,
LOGOTRON LOGO, WINDOW-DRIVEN DESK-TOP SYSTEM, ADVANCED DISC FILE SYSTEM, 14 PROGRAM WELCOME PACK AND 4 TUTORIALS. *SPREADSHEET EXTRA
AT £52. BASIC PRICE £399 WITH MONOCHROME MONITOR £469. WITH HIGH RESOLUTION (D42 PITCH) COLOUR MONITOR (AS ABOVE) £599. ALL PRICES PLUS VAT.
FULL DETAILS FROM ROB COATES, DEPT J, ACORN COMPUTERS LTD., CAMBRIDGE TECHNOLOGY PARK, 645 NEWMARKET ROAD, CAMBRIDGE CB5 8PD.

Compact
BRITISH BROADCASTING CORPORATION
MASTER SERIES MICROCOMPUTER

The BBC Master Compact

ve year old will still value at twenty-one.



Equips your child for life.

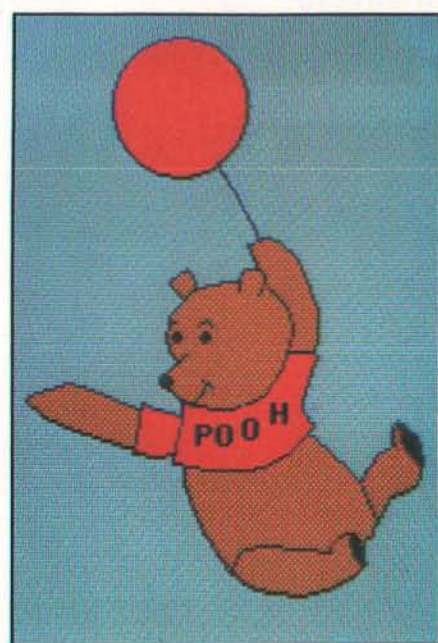
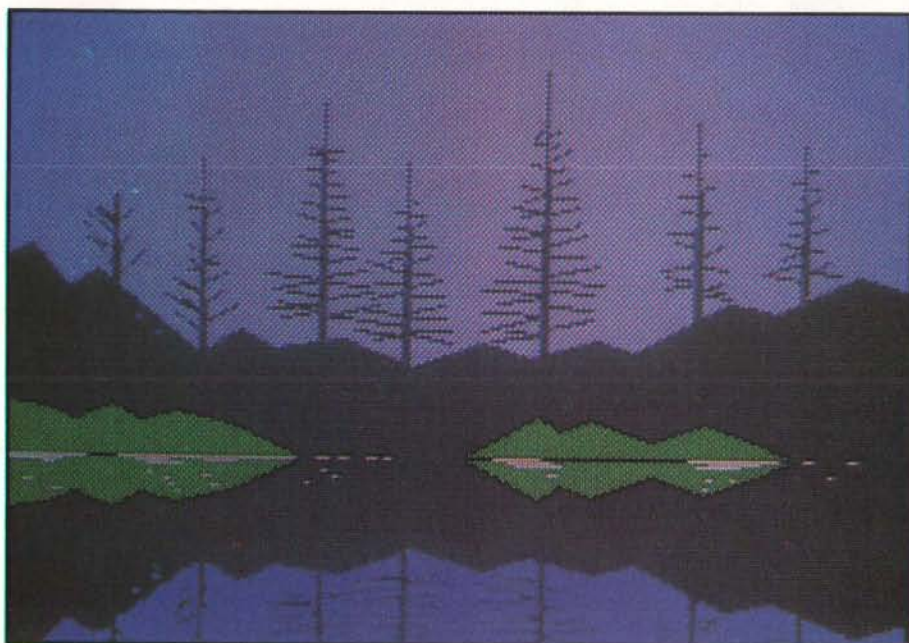
Acorn 
The choice of experience.

M O D E L B / B+ / D F S

**A sophisticated
colour drawing
utility achieved
with program
overlay techniques**



COLOUR IKON



This month, I will describe the more esoteric features of Colour Ikon.

Type in all the listings and save them under filenames ARC, DBRUSH, DPAINT and TOOLS. Type them in exactly as shown and do not renumber. All the overlay files must start with line 5000. Once all the new overlay files have been checked with the aid of the checksums, run Colour Ikon by typing **CHAIN"COLOUR"**.

Arc Drawing

In the third article of this feature, ellipse drawing facilities were implemented. They can be used to draw outlines of ellipses and circles of any size but in many cases, rotated ellipses are needed. In other cases, it is only necessary to have part of an ellipse, ie an arc. This facility allows you to do just that.

The option is selected by placing the cross hair over the arc icon (the eleventh one from the left) and pressing return. If you move the cross hair around the drawing area and press the TAB key, a circle should be drawn with its centre as the cross hair. This is the basis of the arc drawing process.

The size of this target ellipse may be altered as before with the cursor keys but you will not be able to see it change in real time so you must press TAB at frequent intervals to check the size of the ellipse. This ellipse may be rotated left or right by pressing keys A and S respectively. Again, you will not be able to see the ellipse change in real time so press TAB to check your progress regularly. Once you are satisfied with the size and the orientation of the ellipse, you should press the return key. The ellipse will then be fixed in the current drawing colour.

The arc drawing option is invoked by pressing the space bar instead of the return key. When the space bar is pressed, the ellipse will be redrawn in dotted outline and a small cross should appear. This can be moved about the circumference of the ellipse with the left and right control keys.

Press return when you have placed the cross at the starting point of the arc. Then another cross should appear. Move this cross to the end point of the arc as before and press return. The arc should then be drawn in the current drawing colour. When choosing the start and end points of the arc, remember that it is drawn anti-clockwise.

Due to memory limitations, this facility is very difficult to use. However, it is very useful and is worth your while to practice at

using it. The important thing is to press TAB at regular intervals to get the shape of the ellipse correct.

Defining your own Brush

The air brush facility was also introduced in the second article and you will remember that there is selection of brushes to choose from. As well as drawing outlines in various thicknesses, some of the brushes such as the circles are very convenient for adding small

details to the picture rather than having to fiddle with the rubber banding facility. You can now design your own brushes.

This option is selected by placing the cross hair over the fifteenth icon from the left and pressing return. The teletext mode should then be selected and the currently selected brush pattern should appear enlarged on a grid. You should see a flashing cursor at the top left hand corner of this grid. This may be moved about the grid with the control keys. If you press

A

R

C

```
136IFZX>3 ZX=1:PROCshowcol (F89B)
5010VZ=0:KZ=0:QZ=360:WZ=50:IZ=50:GZ=FAL
SE (2767)
5030REPEATPROCcross (4C27)
5040IFINKEY-74 ANDCZ<960 ANDCZ<>IZ GOSU
B5140 (880A)
5050IFINKEY-97 ANDCZ<970 GOSUB5190 (33B
E)
5060IFINKEY-99 ANDCZ<970 GOSUB5230 (DA9
1)
5070IZ=IZ+(INKEY(-42)-INKEY(-58))*SZ (F
08A)
5080WZ=WZ+(INKEY(-26)-INKEY(-122))*SZ (
7EA4)
5090VZ=VZ+(INKEY(-82)-INKEY(-66))*SZ (7
E09)
5100UNTILINKEY-74 ANDCZ>29 ANDDZ<19 (47
0E)
5110IFGZ GOSUB5410 (44A6)
5130RETURN (DC7C)
5140PROCcross (A9C6)
5150IFGZ GOSUB5410:GZ=FALSE (5A04)
5160GCOLZ,ZZ:VDU24,0;0;1276;956;:GOSUB5
400 (9235)
5170VDU26:GCOL3,3:PROCcross (CF54)
5180RETURN (D050)
5190PROCcross:IFGZ GOSUB5410 (C434)
5200LZ=BZ:RZ=CZ:NZ=WZ:AZ=IZ:TZ=VZ:GZ=TR
UE (4F5C)
5210GOSUB5410:PROCcross (B00F)
```

```
5220RETURN (4863)
5230PROCcross:IFGZ GOSUB5410 (439B)
5240GOSUB5400 (1129)
5250GOSUB5300:HZ=GZ:VDU7:GOSUB5300:JZ=G
Z:GOSUB5370:GZ=HZ:GOSUB5370 (9455)
5260GOSUB5400:GCOLZ,ZZ (7A73)
5270PROCellipse (BZ,CZ,WZ,IZ,PI*VZ/180,P
I*HZ/180,PI*JZ/180) (9A76)
5280GZ=FALSE:GCOL3,3:PROCcross (2391)
5290RETURN (444F)
5300GZ=0:c=COS(PI*VZ/180):s=SIN(PI*VZ/1
80) (8814)
5310GOSUB5370 (EF0A)
5320REPEATGOSUB5370 (F70D)
5330GZ=GZ+(INKEY(-67)-INKEY(-98))*10:IF
GZ>360 GZ=GZ-360 ELSEIFGZ<0 GZ=360+GZ (0
CD3)
5340GOSUB5370 (18E0)
5350UNTILINKEY-74 (0600)
5360RETURN (725F)
5370a=WZ*COS(PI*GZ/180):b=IZ*SIN(PI*GZ/
180):PROCc (3D4E)
5380MOVEBZ+x-B,CZ+y:DRAWBZ+x+B,CZ+y:MOV
EBZ+x,CZ+y+B:DRAWBZ+x,CZ+y-B (947A)
5390RETURN (05E8)
5400PROCellipse (BZ,CZ,WZ,IZ,PI*VZ/180,0
,2*PI):RETURN (A5A6)
5410PROCellipse (LZ,RZ,NZ,AZ,PI*TZ/180,0
,2*PI):RETURN (591F)
```

D

B

R

U

S

H

```
5000VDU22,7:*FX20,2 (5BAC)
5010PRINT"Editing brush ";FX-199 (6A09)
5020PRINTTAB(20,3)"R - Restore"TAB(20,4
)"C - Clear Grid" (972E)
5030?&7B=FX:XZ=&7B:YZ=0:AZ=&A:CALL&FFF1
(25CE)
5040FORYZ=0T07:GOSUB5210:NEXT (59AA)
5050XZ=0:YZ=0:*FX15 (DFBC)
5060REPEAT (CB26)
5070PRINTTAB(XZ+1,YZ+2); (7397)
5080GZ=GET (2E3A)
5090XZ=XZ-(GZ=88)+(GZ=90):YZ=YZ+(GZ=58)
-(GZ=47) (DACE)
5100IFXZ<0 XZ=*FX15 (4559)
5110IFYZ<0 YZ=*FX15 (56AE)
5120IFGZ=32 YZ?&79=((YZ?&79)OR(2^(7-XZ)
)):GOSUB5210 (4167)
5130IFGZ=9 YZ?&79=((YZ?&79)AND(255-(2^(
7-XZ)))):GOSUB5210 (4BEC)
5140IFGZ=82 XZ=&7B:YZ=0:CALL&FFF1:FORYZ
```

```
=0T07:GOSUB5210:NEXT:XZ=0:YZ=0 (4A97)
5150IFGZ=67 GOSUB5260 (EB16)
5160UNTILGZ=13 (90D0)
5170VDU23,FZ (B324)
5180FORIZ=0T07:VDUIZ?&79:NEXT (3D74)
5190DZ=UZ:PROCg:GCOL3,3:PROCcross:VD
U4:PROCicons (2A85)
5200RETURN (E58F)
5210RZ=YZ?&79:PRINTTAB(1,2+YZ); (46A1)
5220FORLZ=7T00 STEP-1 (3AAE)
5230IF(RZ AND(2^LZ))=0 VDU46 ELSEVDU255
(8176)
5240NEXT (99C1)
5250RETURN (CB2E)
5260IF((YZ?&79)AND(2^(7-XZ)))>0 HZ=255
ELSEHZ=0 (A845)
5270WZ=YZ:FORYZ=0T07:YZ?&79=HZ:GOSUB521
0:NEXT:YZ=WZ (DB56)
5280PRINTTAB(XZ+1,YZ+2); (9F40)
5290RETURN (444F)
```

CONTINUES ►

the space bar, the pixel indicated by the flashing cursor should be filled in. On the other hand, if you press TAB, the pixel should be erased. In this way, a new brush pattern may be created easily just as in a character generator. When you are satisfied with the new brush pattern, press the return key to get back to edit mode.

It is also possible to clear the whole grid by pressing C. If the pixel indicated by the flashing cursor is filled in when this option is invoked, the grid will be filled in completely. If on the other hand, the currently indicated pixel is empty, the grid will be cleared completely.

If you should decide that you do not want to alter the brush pattern, you can press R to restore the original brush pattern.

Do remember that when this facility is invoked, the brush pattern currently in use is selected to be edited.

Defining your own Fill Shade

As well as the facility to define your own brush patterns, I have implemented a facility for defining your own fill patterns. This facility is selected by placing the cross

hair over the box which indicates the current drawing colour (or the fill shade) and pressing return. As before, the teletext mode will be selected and the fill pattern currently in use will be enlarged on a four by four grid. The pixel to be filled in is indicated by a flashing cursor and as before, this may be move about with the control keys.

You will also notice that to the right of the grid, there are the four primary colours with a dash under one of the boxes. This indicates the colour with which you wish to fill the pixel in and may be changed with the left and right cursor keys. The currently selected pixel is filled in by pressing the space bar.

Various Tools

The toolkit option is selected by placing the cross hair over the seventeenth icon and pressing return. Teletext mode will be selected and a series of options should appear. As with the file handling facility, the appropriate option is selected with the use of up and down keys and pressing return when the right option is highlighted.

Having redefined some or all of the brush patterns and fill patterns, you may wish to use it again at some later date. As with picture saving and loading, the brush and fill patterns may be saved to or loaded from disc. Their operation should be self explanatory.

As with the filing option, if this option is selected by mistake, you can go back to edit mode by selecting the *Edit picture* option.

Finale

At last, *Colour Ikon* is complete and I hope you will find it as enjoyable to use as I have. As I mentioned in the first article, it was written to run on a standard Model B and does not attempt to make use of the extra memory of the new B+ machines. Because of the miniscule memory capacity of the Model B, the size of the individual overlay files was chronically limited and some facilities such as a zoom option had to be left out all together. So if you do have the B+, Master or Model BB, you may like to modify the program. The program uses some ROM routines which may have since moved. In any case, if you do create any brilliant pictures with *Colour Ikon*, please send them to me at the address below. I will try to get them published. If you send your masterpiece in on disc, we will return the disc with my examples on it and any other screen pictures submitted. In this way you should be able to build up a library of example pictures.

A&B Gallery
A&B Computing
No.1 Golden Square
London W1R 3AB

D P A I N T

```
5000RX=0:VDU22,7:PRINT"Editing shade ";
ZX+1':*FX15 (98BB)
5010PRINTTAB(20,5); (4BF7)
5020FORIX=0TO3 (1BCA)
5030IX=XZ?&74 (43CD)
5040IFIX=0 VDU32,156,ASC". " ELSEVDU128+
IX,157,32 (1E85)
5050NEXT:VDU32,156 (E725)
5060PRINTTAB(22,6) "-" (FFA7)
5070FORIX=0TO3:GOSUB5210:NEXT (D1DC)
5080XZ=0:YZ=0 (5F15)
5090REPEATPRINTTAB(XZ*3+2,YZ+2); (A7E5)
5100AX=BET:PRINTTAB(22+RX*3,6) " " (90E2)
)
5110XZ=XZ-(AX=88 ANDXZ<3)+(AX=90 ANDXZ>
0) (4476)
5120YZ=YZ-(AX=47 ANDYZ<3)+(AX=58 ANDYZ>
0) (D10B)
5130RX=RX+(AX=136)-(AX=137) (A122)
5140IFRX<0 RX=3 ELSEIFRX>3 RX=0 (3E5A)
5150PRINTTAB(22+RX*3,6) "-" (CD69)
5160IFAX=32 GOSUB5270 (3A93)
```

```
5170UNTILAX=13 (DB65)
5180FORIX=0TO3:?(AX00+ZX*4+IX)=IX?&70:N
EXT (8604)
5190PROCgfx:VDUS:GCOL3,3:PROCdcross:PRO
Cshowcol:PROCdcross:DZ=UX (14BF)
5200RETURN (E5BF)
5210HX=YX?&70:MX=136:PRINTTAB(0,YX+2);
(623C)
5220FORIX=3TO0STEP-1 (DB24)
5230QX=(HXANDMX)DIV(2^IX):QZ=?(&74+(QXA
ND1)+(QXDIVB)):MX=MXDIV2 (B4DE)
5240IF QZ=0 VDU32,156,ASC". " ELSEVDU128
+QX,157,32 (5BFF)
5250NEXT:VDU32,156 (59BF)
5260RETURN (33F8)
5270HX=(RXAND1)+(RXAND2)*8*(2^(3-XZ))
(5B10)
5280YZ?&70=(YX?&70)AND(255-2^(3-XZ))-(2
^(3-XZ))*16)+HX (FA20)
5290GOSUB5210 (975E)
5300RETURN (A42B)
```

T O O L S

```
5000PROCdcross:VDU22,7:*FX20,2 (F7F4)
5010VDU12,23;8202;0;0;0;28,1,23,39,0 (9
C8B)
5020PRINTCHR#129"Save fill pattern"CHR
#129"Load fill pattern" (B45B)
5030PRINTCHR#129"Load brush pattern"CHR
R#129"Save brush pattern" (B6D7)
5040PRINTCHR#129"Star command"CHR#129"
Edit picture" (0219)
5050PRINT"Select option then RETURN" (
3537)
5060VDU26:KX=0:PRINTTAB(0,0)CHR#157:*FX
15 (0ADB)
5070REPEAT:IX=GET:PRINTTAB(0,KX) " :KX=
KX+(IX=58)-(IX=47) (4FDF)
5080IFKX<0 KX=5 ELSEIFKX>5 KX=0 (5A92)
5090PRINTTAB(0,KX)CHR#157 (03A9)
5100UNTILIX=13 (4807)
5110IFKX=4 GOSUB5330:GOTO5010 ELSEIFKX=
5 GOTO5180 (9740)
5120INPUTTAB(0,9)"Filename "A$ (B944)
5130IFA$="" GOTO5010 (7E97)
5140IFKX=0 PROCoscli("SAVE "+A$+" A00+F
F") (EF97)
5150IFKX=1 PROCoscli("LOAD "+A$+" A00")
(7C76)
```

```
5160IFKX=2 GOSUB5200 ELSEIFKX=3 GOSUB52
60 (309B)
5170IFKX<5 PROCwait (B9B1)
5180PROCgfx:GCOL3,3:PROCicons:DZ=UX (66
89)
5190RETURN (86A6)
5200RX=OPENUPA$ (FD83)
5210FORIX=200TO219 (7AAB)
5220VDU23,IX:FORLX=0TO7:VDUBSETLX:NEXT
(F4B5)
5230NEXT (6061)
5240CLOSELX (060E)
5250RETURN (C8E2)
5260RX=OPENOUTA$ (56BA)
5270FORIX=200TO219 (5422)
5280?&74=IX:XZ=?&74:YZ=0:AZ=?&A:CALL&FFF1
(24FD)
5290FORLX=0TO7:BPULX,LX?&75:NEXT (8FA
3)
5300NEXT (C662)
5310CLOSELX (F593)
5320RETURN (09C4)
5330CLB:INPUT"*"A$ (7FED)
5340PROCoscli(A$:PROCwait (3A7C)
5350RETURN (B945)
```


C O M I N G S O O N

NEXT MONTH

Supplement your knowledge of Acorn add-ons

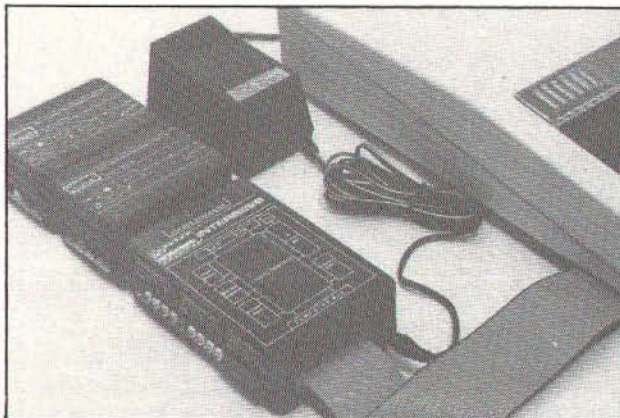
Reserve your copy of next month's A&B immediately or you may miss our Buyer's Guide, covering hardware and software for Model B, B+, Electron, Master 128 and Master Compact.

The A&B editorial team are packing a whole range of essential information into a buyer's guide.

Anyone looking for the latest in hardware or software purchases for their Acorn computer will find straightforward advice on best buys, technical terms and compatibility of products.

Above all, the buyers guide will be a clear and practical reference guide for the ordinary microcomputer owner.

We'll be nominating products in a variety of categories and awarding rosettes to the winning software or hardware. We'll also be asking you what add-ons, games and serious software you think are best buys for Acorn machines.



Don't Miss Out

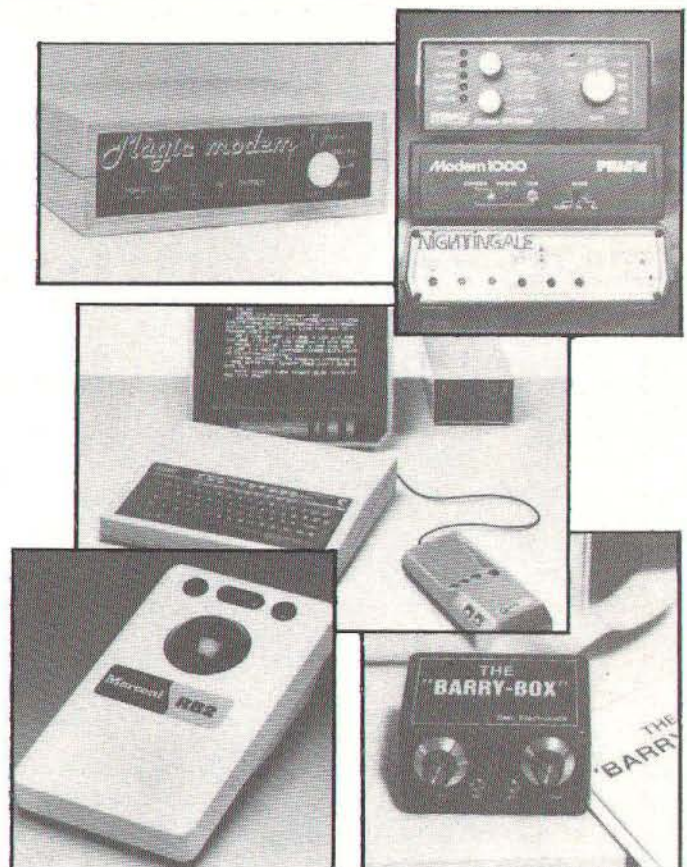
Don't miss the free buyer's guide supplement and don't miss the second part of our articles on wordprocessing, print and creating your own newspaper — desktop publishing in education.

Also we ask "Is the Master Compact the ideal primary school computer?"

Check out the Acorn power processor — the 32016/ Master Scientific.

Plus the best in games action, more news, more great listings and reviews.

FREE BUYER'S GUIDE WITH YOUR NOVEMBER ISSUE OF A&B



A&B ORDER FORM

Give this to your newsagent to reserve your monthly copy of A&B Computing.

Dear newsagent

Please reserve me a copy of A&B Computing every month.

Name

Address

.....

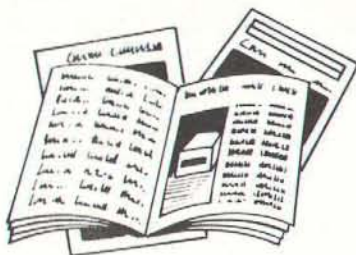
.....

Postcode

.....

Signed

Your key to communications!



PRESTEL

PRESTEL is a trademark of British Telecommunications

FREE Electronic Mail . . . International
Telex . . . 10 National Chatlines (Interactive
Bulletin Boards) . . . 70,000 users across the
UK . . . Teleshopping . . . Multi-User
Interactive Strategy Games

Instant computer news . . . Hardware and
software reviews . . . Technical features . . .
Hints and tips . . . On-line business advice
and features

FREE and discounted quality software to
download direct to your micro—**24 hours a
day**

300,000 pages of information on the huge
Prestel database

for just 20p a day

*Micronet 800—
The ultimate
peripheral*

Micronet 800
8 Herbal Hill, London EC1R 5EJ
Telephone: 01-278 3143

To: Micronet 800, 8 Herbal Hill, London EC1
Please send me a brochure on Micronet 800

Name

Address

Telephone No

Age Micro

AB10

EDWORD 2

for Word Processing and
Language Development
on the BBC Micro

- ★ Easy to use
- ★ Comprehensive range of features
- ★ Accents for Modern Languages
- ★ W.Y.S.I.W.Y.G. (what you see is what you get)
- ★ Used in 21 Countries Worldwide
- ★ An excellent word processor for Secretarial and Business Studies
- ★ An invaluable tool for Language Development in Primary and Special Schools

PRICE £39.95 plus VAT

NOW AVAILABLE

Edword 2 Applications Pack
including:
Jumbo print
multi-copy facility
Newsprint
Mailmerge
Electronic Mail

NEW
LEA/School
Licences and
Quantity
Discounts Now
Available.

Export Enquiries Welcome

Please contact us for more details



CLWYD TECHNICS LIMITED DEPT A.B.C. 10
ANTELOPE INDUSTRIAL ESTATE, RHYDYMWYN,
MOLD, CLWYD TELEPHONE: (035283) 751



QUESTION:- What is the difference between a BBC with
System Delta and an IBM with dBase II?

ANSWER:- Over £2000 !

Look more closely and you will find further differences. System Delta has 150 commands which are written as an extension to the 128 BBC BASIC commands. Programs are written using BASIC - a language that most programmers already know, thus reducing the learning curve. System Delta is compatible with all BBC systems and doesn't need the additional purchase of a second processor.

Demonstrations of Graph and Reports programs at the recent Acorn User Show confirmed the speed and power of System Delta and BBC BASIC. Several dBASE programmers quoted at least 1/2 day and 5-6K of program for the graph which was achieved in just TEN minutes and 13 lines of BASIC. This power and flexibility of System Delta is available to you at ONLY £64.95 so why spend more?

FREE CARD INDEX

Many people buy System Delta purely for the powerful, versatile, Card Index which has received many excellent reviews and been quoted as "exceptionally simple", "ranks with the best databases", "fast and versatile", "a great innovation with its flexibility", "unreservedly recommended" -- -- what's more, it's ABSOLUTELY FREE!

PRINTERS ANGEL

NLQ Font Designer

Define your own character fonts for the popular NLQ printers. Fast machine code screen handling routines for fast, simple character definition. Banner mode for designing multiple character definitions. Slant/unslant for easy italics. Create part fonts for merging character sets. Definable figure of eight grid for character design and size consistency. 5 popular type fonts provided. Needs 6264 RAM chip (£6 Extra).



£27.95

APPLICATIONS

- for use with System Delta ROM

FLEXIBILITY, EFFICIENCY and SIMPLICITY are the key features :	
MAILSHOT - mailmerge and labels	£19.95
VIDEO RENTAL - for efficient shop management	£54.95
SCHOOL ADMINISTRATOR - the most flexible system available	£69.95
HOTELIER - 80 room comprehensive management, bills, mailist	£59.95
NEWSAGENT - Time saving and informative.	£54.95
ORDER PROCESSING/INVOICING - unbeatable on flexibility	£45.95
SALES LEDGER - merge with invoicing or use on its own	£45.95

SYSTEM DELTA REFERENCE GUIDE

Programmers can write their own programs quickly and efficiently with the aid of the 160 page Reference Guide which contains full technical details, example usage and even a fully explained relational tutorial program. £19.95

CUSTOMISATION

Any application may be customised or you may have your own system written for you. Contact us if you have an application in mind - it may well be under development at the current time.

- PLEASE SEND BY RETURN ☐
PLEASE SEND FURTHER DETAILS ☐
System Delta with FREE Card Index ☐
Reference Guide ☐ Video Rental ☐
School Admin ☐ Mailshot ☐
Order Entry/Invoice ☐ Hotelier ☐
Sales Ledger ☐ Printers Angel ☐

Cheque/Access No.

Name.....

Address.....

.....

.....

.....Ref AB10.6b



MINERVA SYSTEMS, 69 SIDWELL STREET,
EXETER, DEVON, EX4 6PH. Tel: 0392 37756

Watford Electronics

Jessa House, 250 Lower High Street, Watford, England

Tel: Watford (0923) 37774/40588 Telex: 8956095 WATFRD

Credit Card Orders (ACCESS & VISA) Tel: (0923) 33383 or 50234 (24 Hours)

BBC MASTER 128K Micro	£395
BBC MASTER TURBO 4MHz	£510
512K Add on Board	£335
TURBO Add-on Module	£99
BBC MASTER ET (Econet Terminal)	£320
Econet Module for the Master	£43
ROM Cartridges for Master	£13
Reference Manual I (No VAT)	£15
Reference Manual II (No VAT)	£15
Advance Ref. Manual (No VAT)	£19
64K Upgrade Kit for B+	£32
Acorn 1770 DFS Upgrade Kit	£42
ECONET Upgrade Kit for BBC	£42
ECONET UPGRADES Available.	

SPECIAL OFFER

Gemini's popular OFFICE MATE & OFFICE MASTER Software Packages on Disc consisting of: Database, Spreadsheet, Beebplot Graphics, Wordprocessor, Accounts.

Packs: (Cashbook, Final Accounts, Mailist, Easiledger, Invoice & Statements, Stock Control on.

FREE

with every BBC MASTER purchased from us.

6502 Acorn 2nd Processor package	£160
Z80 Acorn 2nd Processor package	£319
ARIES IEEE Interface	£238
Acorn IEEE Interface Complete	£280
Acorn Teletext Adaptor	£125
Acorn Prestel Receiver	£115
Acorn Bitstick I	£299
Robocom Bitstick II	£759
Upgrade from B1 to B2	£450
Bitstick Multiplotter Driver	£65
(Securicor carriage £7)	

BROTHER HR-15XL

The new improved Brother HR 15XL is a very high-quality and very fast daisy-wheel printer for serious use. Notable features of this printer include a 3K buffer, 20cps, bi-directional proportional spacing, Centronics interface standard, (RS232 optional), optional Sheet Feeder and Keyboard.

ONLY £285 (carr. £7)

Ribbon Cartridges:
Fabric £3; Carbon £3; Multistrike £5

VARIOUS PRINTERS

• EPSON FX85 Printer	£315
• EPSON FX105 Printer	£435
• EPSON LQ 1500 Printer	£869
• EPSON JX-80 Colour Printer	£435
• EPSON Hi-80 Printer Plotter	£319
• KAGA/Taxan KP810	£215
• KAGA/Taxan KP910	£339
• EPSON LX80 Printer	£189
• LX80 Tractor Feed	£20
• LX80 Sheet Feeder	£50
• Centronics Printer Cable to interface all the above Printers to BBC	£6
(Securicor carriage charge on printers £7)	

RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232	£27	RS232 + 2K Buffer	£55
IEEE 488	£65	RS232 + 8K Buffer	£75

CENTRONICS GLP &

Brother M1009

(NLQ) Printers

Special Offer £95 (carr £5)
Tractor Feed Attachment £5

Centronics GLP Mk 2

(Brother M1109)

NLQ Printer

100 CPS, (25 in NLQ mode), Bi-directional, logic seeking. Friction feed, tractor feed optional extra, 2K Buffer. Has both Centronics parallel and RS232 both as standard.

Launch Price: £139 (carr. £5)
Tractor Feed Attachment £5

Acorn/Olivetti

Spark Jet Printers

Special Clearance Offer Only: £65

Pack of 4 Refills £9

PRINTER SHARERS

(Ideal for School environment)

Connect 3 BBC Micros to 1 Printer	£60
Connect 6 BBC Micros to 1 Printer	£129
Connects 3 Printers to 1 Micro	£65
(Cables extra)	

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust covers
BBC Micro	—	£3.50
BBC Master	—	£4.00
FX100	£7.00	£5.25
FX80/MX80	£4.50	£4.95
RX80	£4.50	£4.50
LX80	£4.00	£4.50
GP80/GP100	£4.50	£4.00
GP250	£5.95	£3.95
Centronics GLP	£4.00	£3.95
KAGA KP810	£5.25	£4.75
CANON PW1080	£5.25	£4.75
Microvitec Metal Monitor	—	£5.50

Listing Paper (Perforated)

1,000 Sheets 9 1/2" x 11" Fanfold Paper	£7
2,000 Sheets 9 1/2" x 11" Fanfold Paper	£12
1,000 Sheets 15" x 11" Fanfold Paper	£9
Teleprinter Roll (Econo Paper)	£4

Carriage on 1,000 Sheets £1.50

Panasonic KX-P1080

From the prodigious Japanese Stable of Panasonic comes this fabulous new NLQ Dot Matrix Printer

Introductory Price: £165 (carr. £7)
(Price includes 1,000 sheets of fanfold paper and a 4" Printer lead)

PRINTER LEAD

Centronics lead to connect BBC micro to

Standard length (4 feet long)	£6
Extra long (6 feet long)	£8

CREDIT CARD

Orders (ACCESS or VISA)
(0923) 33383/50234

MONITORS

We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible. You ask for a demonstration at our shop. All Monitors are supplied complete with connecting lead.

MICROVITEC 14"

- 1431 - Medium resolution as used on the BBC television computer programme... £172
- 1451 - High resolution, suitable for word processing in mode O... £225
- 1441 - High res, exceeds the capabilities of the BBC micro... £365
- 1431 AP RGB + PAL and AUDIO... £199
- 1451 AP RGB + PAL and AUDIO... £259
- TOUCHTEC Touch Screen Pack... £250
- Dust Cover for Microvitecs... £5.50

KAGA/TAXAN 12"

- KAGA KX1201G Hi-res Green Monitor... £90
- KAGA KX1202G Long persistence Hi-Res Green Monitor... £105
- KAGA KX1203A Ultra-Hi-Res Amber Monitor... £105

FIDELITY COLOUR MONITOR

- Medium Resolution, attractively finished, 14" RGB and Composite VIDEO/AUDIO Input. Has a detachable anti-glare screen.

£169

ZENITH

- 12" high resolution monochrome monitors
- Green (New Design) Hi-res... £69
- Amber (New Design) Hi-res... £79

N.B. Carriage on Monitors £7 (securicor)

DFS & DFS KITS FOR

BBC MICRO

- Watford Disc Interface Kit... £54
- Acorn 0.9 DFS Kit... £54
- DFS Manual (comprehensive)... £7
- ADFS ROM only... £25
- DNFS ROM only... £17
- Watford's DDFS Kit... £46

Mitsubishi Disc Drives

(All Drives are Double sided)

- Disc Drives complete with cables
- CLS200 Single 200K, 40 track... £99
- CLS400S Single 400K, 40/80 track... £103
- CLD400 Twin 400K, 40 track... £180
- CLD800S Twin 800K 40/80 track... £189

- Disc Drives with Cables & PSU
- CS200 Single 200K, 40 track... £112
- CS400S Single 400K, 40/80 track... £119
- CD400 Twin 400K, 40 track... £190
- CD800S Twin 800K, 40/80 track... £215
- Acorn's 10Mb Winchester plus Level III File Server... £1050
- Acorn's 30Mb Winchester plus Level III File Server... £1549
- Securicor Carriage on Disc Drives... £6

ASSORTED ROMS

MUROM	£21	View 2.1	£37
Printmaster	£24	View 3.0	£56
ROMIT	£29	Hi-View	£36
Serial ULA	£13	Viewsheet	£37
SLEUTH Rom	£24	Viewstore	£37
TERMI	£27	Viewspell	£50
Terminator	£25	Viewplot Disc	£25
TOOLKit Plus	£31	Wordwise +	£38
Video ULA	£15		

3M-DISKETTES

- 10 x 5 1/4" S/S D/D 40 Track Diskettes £10
- 10 x 5 1/4" D/S D/D 40 Track Diskettes £12
- 10 x 5 1/4" S/S D/D 80 Track Diskettes £17
- 10 x 5 1/4" D/S D/D 80 Track Diskettes £17
- Hi-Density 1.6M D/S D/D for IBM £32
- 10 x 3 1/2" S/S D/D 40/80 track Discs £25
- 10 x 3 1/2" D/D D/D 40/80 track Discs £35

TOP QUALITY 5 1/4" DISKETTES

- 10 x M4 S-S D/D 40 Track Discs £9
- 10 x M5 D/S D/D 40 Track Discs £11
- 10 x M7 D/S D/D 80 Track Discs £15
- 3" Double Sided Discs £4 each

SIDEWAYS ZIF SOCKET £15

16K Sideways RAM Modules

Only: £29 (carr £2)

Optional extras

- READ and WRITE protect Switches £2 each
- Battery for Battery Backup £3

16K DISC RAM New Low Price: £30 (carr £2)

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

SOLID STATE 16K SIDEWAYS RAM

Only £28 (carr 2)

Supplied complete with comprehensive software on Disc. Operating and fitting instructions.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD

Price: Only £32
Battery backup fitted £36
(carriage £2)

Watford ROM/RAM CARD

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM £45
- ROM/RAM Card with 64k dynamic RAM £65
- ROM/RAM Card with a massive 128k dynamic RAM £99
(carriage on ROM/RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit £6
- Battery back-up £3
- Read and Write protect switches £2 each
- Complete ROM/RAM board (all options installed) £115

Please write in for our Microcomputer product's catalogue.

32K SHADOW RAM- Printer Buffer Expansion Board

Only: £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

The Aries B-32 Shadow RAM Card

Price: B-32 £80 (carr. £2)

Aries B-12 Sideways ROM Board

Price:
Aries B-12 £40. Aries B-12C £5

THE ARIES B-488 IEEE-488 INTERFACE UNIT

Aries B-488 Unit: £238 (Carr £3)

Le Modem

£89 (Carr £3)

(Price includes: Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£115

(carr £3)

(Price includes: Nightingale Modem, Commstar ROM pack, Cables & Comprehensive manual)

ACORN MUSIC 500

Only £72 (carr £3)

The AMX Mouse

- Complete with Superart £65
- AMX DESK Package £20.00
- AMX UTILITY Package £12.00
- AMX SUPERART Package £43
- AMX PAGE-MAKER Pack £43
- AMX 3D ZICON Disc £21
- AMX Database Disc £21
- AMX XAM Educational £21
- Beeb Speech Synthesiser Unit £32
- Acorn Speech Kit

WATFORD ROMs

- BEEBMON £24
- Disassembler ROM £16
- Dump Out 3 ROM £25
- Epson NLQ ROM £25
- NLQ Designer ROM £25
- ROMAS £45
- Rom Manager £18
- RomSpell £25
- Spark Jet Dump £15
- Transfer ROM £25
- World-Aid £24

DISC Software

- Gemini DDD
- D base £15
- D Calc £15
- D Plot £15
- All 3 DDD £36
- Diagnostics Disc £20
- Investigator £20
- MiniOffice II £14.50
- Office Mate £10
- Office Master £21
- Money Management £11
- Replica 3 £13
- Studio 8 Disc £18
- VIEW PRINTER DRIVERS
- for Epson £10
- for Juki & HR15 £10
- for NLQ Rom £7
- for Silver Reed £10

CHIP SHOP

- 2764-250 £2
- 27128 £2.50
- 27512 £18
- 4013 £0.60
- 4020 £0.90
- 4416 £3.55
- 4816 £1.75
- 6264 LP £3.00
- 6502A CPU £5.00
- 65C02 £10
- 65C112 £9.00
- 6512A £10
- 6522 £3.40
- 6522A £5.00
- 6845SP £6.00
- 7438 £0.40
- 74LS00 £0.25
- 74LS04 £0.25
- 74LS10 £0.25
- 74LS123 £0.80
- 74LS163 £0.70
- 74LS244 £0.80
- 74LS245 £1.00
- 74LS373 £1.00
- 74LS393 £1.00
- 75453 £0.70
- 8271 £36
- DS3691 £3.50
- DS88LS120 £3.00
- LM324 £0.45
- SN76489 £5.50
- SAA5050 £8.75
- UPD7002 £4.40

ASSORTED ROMS

- Acorn Basic 2 £19
- Acorn ADFS £25
- Acorn DNFS £17
- Acorn OS 1.2 £6
- Acorn OS B+ £25
- Acorn BCPL £42
- Accelerator £48
- Alnoor Rom £85
- BCPL Calc Pack £15
- BCPL Stand Alone £36
- Genrator £25
- BROM £28
- Buffer & Backup £20
- Beebfont £25
- Beebmon £22
- Caretaker £27
- Communicator £49
- COMAL Acorn £36
- Disc Doctor £24
- Disassembler £16
- FORTH Acorn £32
- Graphics Xtension Rom
- GXR - B £21
- GXR - B+ £22
- Help II £27
- Inter-Chart £26
- Inter-Sheet £40
- Inter-Word £48
- ISO Pascal £42
- ISO-Pascal Stand
- Alone Genrator £30
- ICON Master £28
- L.B.O. Rom £17
- LISP Acorn £35
- LOGO Acorn £42
- Logotron Logo £52
- Microprolog £62
- Microtext Rom £48

Prices subject to change without notice and available on request.

MAIL ORDER AND RETAIL SHOP. TRADE AND EXPORT INQUIRIES WELCOME.

GOVERNMENT AND EDUCATIONAL ESTABLISHMENTS OFFICIAL ORDERS ACCEPTED.

CARRIAGE: Minimum £1 on all cash orders. On bulky items, Securicor charge applies.

VAT: UK customers please add 15% VAT to cost incl. Carriage.

SHOP HOURS: 9.00am to 6.00pm Monday to Saturday. (Ample Free Car Parking Spaces)

WATFORD ELECTRONICS

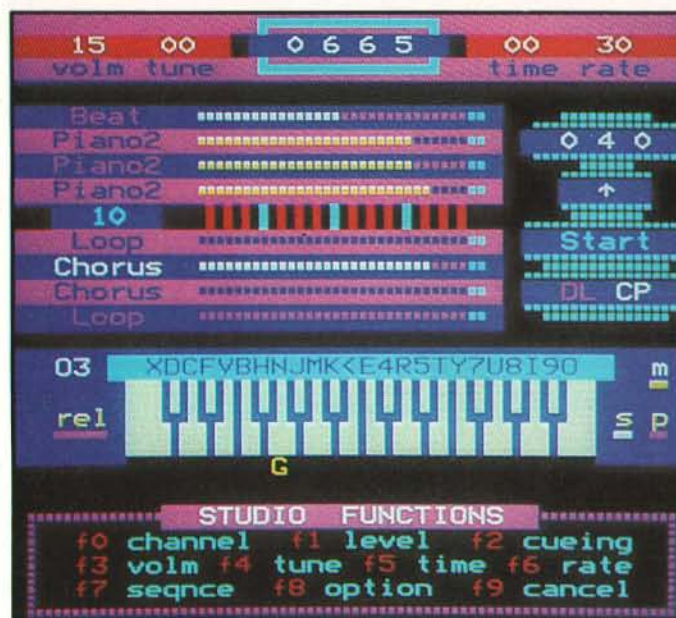
JESSA HOUSE, 250 Lower High Street, WATFORD, ENGLAND

Credit Card Orders ACCESS or VISA Telephone: (0923) 50234/33383

Telephone: (0923) 37774; Telex: 8956095 WATFORD

B B C M U S I C

MAKING TRACKS



Studio functions on function keys



Effect controls



Keyboard settings —
from here you choose
the range of octaves
you wish to work on

How to perform, produce, record, dub and edit your own compositions without spending six figures on a recording studio or growing more arms

Studio Eight is an advanced, disc-based product which turns the Beeb keyboard into a double manual instrument with single-note or polyphonic capabilities, using up to 32 instruments. There is an amazing range of options, available through six different control panels, all instantly accessible by using the function keys with **CTRL**. The package is cleverly designed so that it can be used to play something immediately with only minimal instruction from an appendix in the manual — or you can play some pre-recorded pieces. On the other hand, the more prepared you are to delve into the manual, the more complex and rewarding are the possibilities. As Beebug rightly point out, the addition of an external loudspeaker (and amplifier, if needed) makes an enormous improvement to the sound quality. The package works on the BBC, B+ and Master, but not with a second processor.

In its cassette version the whole package can be in memory at once, but the disc version involves overlays. The program occupies just about all the memory available, and makes use of interrupts, so the machine must be turned off to escape from the program. The various control panels and their functions may be summarised briefly as follows.

STUDIO PAGE

This is the main control page (or "front panel") which appears when the disc is

booted. It gives a great deal of status information, allows you to play notes from the keyboard in real time, recording, playback, fast winding and cueing and numerous other facilities. It is possible to record notes on up to eight "tracks", of which four use the familiar Beeb noise and tone channels, and the remainder are used for note sequences and loops in which the noise and tone channels are combined to give special effects. Musical "repeats" can make use of sequences, thus saving memory. The speed of play may be altered, so that entries can be made in slow tempo and speeded up later. Of the 32 different instruments, 16 are already defined (but may be altered). Even the tuning can be varied in quarter-semitones up to an octave in either direction, in case you were thinking of giving a recital with the London Symphony Orchestra.

MUSIC EDITOR

The entry and editing of all music data, including individual notes and their characteristics, loudness, time signatures, instrument used and other relevant operations are carried out from this page.

ENVELOPE EDITOR

This provides for the alteration of the amplitude and pitch envelopes, which are defined separately and used in combination to produce the required instruments.

INSTRUMENT DEFINER

Enables each instrument to be defined and named. The 16 already defined are named, and the remainder are listed numerically, but any can be renamed by the user.

KEYBOARD SETTINGS

Allows various characteristics of the keyboard to be changed, and provides for external keyboards, where available. Two types may be used — the excellent ATPL Symphony keyboard, or a DIY version made from parts obtainable from Maplin. At the time of writing the former is available from Beebug on special offer for £125 including VAT, plus £7 for 24 hour Securicor delivery. The DIY parts amount to roughly £60.00, which does not include a case. Some assembly skill is also called for.

FILING SCREEN

This is concerned with the loading and filing of music and envelope/instrument definitions. It will also pass "star" commands to the operating system.

Enter the Studio

On entry the Studio Page is presented, and most of the real-time functions are accessed through it. To the middle and left of the page is the mixing console, which lists the selected instruments for each of four channels, and shows the amplitude of each note as it is played by horizontal simulated-led displays in the corresponding channel. Under these are the four "sequence" channels, in which either a sequence of notes or an automatic chord replaces the single notes available in the upper four channels. Sequences can cover all six octaves, and will repeat until stopped.

The middle right-hand side of the screen gives the "tape recorder" control status, with an elapsed-time counter, indicators for recording, playback, fast forward/rewind, a cue marker display, and various editing functions. Along the very top of the screen are indicators to show the relative sound volume, the tuning off-set, the number of notes which will fit into the remaining memory, the metronome speed and the recording speed or "drive-rate". When any option is set or is being altered either an underline or the function name itself is highlighted by colour changes.

Near the bottom of the screen is a two-octave representation of the keyboard, headed by the QWERTY keys corresponding to each of the notes. When any note is played, its musical name appears below the key, and fades through darkening colours as the sound dies away. If several notes are played, only the last is left on screen. All the "black" notes are notated as sharps — flats are not used in this package. On the upper left of the keyboard is a number, which indicates which pair of octaves are selected for the QWERTY keyboard. The number can vary from 1 to 6, and is changed by the Tab key. Below this number are the letters *rel* (short for "release"), which causes a jump to the release phase of the note being played if the Space bar is pressed. On the right of the keyboard are three separate letters. *m* indicates manual sustain, and is underlined on pressing Shift/Return. In this mode, the release phase for a note starts immediately on the release of the key, but the note cannot be sustained for longer than is set for the instrument in use. *p* (short for "polyphonic") is set by Shift/Copy, allowing up to three notes to sound simultaneously. *s* stands for "split keyboards", engaged by Shift/Delete.

C O N T I N U E S ►

This is a complicated option, but briefly it can be regarded as a means of making different instruments available simultaneously in different octaves. The exact effect depends on whether the QWERTY or an add-on keyboard is in use.

Finally, at the bottom of the screen is a list of "Studio Functions" which shows which function key should be used (in conjunction with the cursor keys) to alter variables from their default values. These include channel selection, metronome rate, "tape speed", volume, tuning, erasure of notes, cueing markers and a choice of "options". The latter are used when recording, and provide for synchronising notes with the metronome, called "time-rounding", cancelling unavoidable delays at the start of a note sequence, and converting a sequence of notes to play continuously as a loop. Some of these functions require further choices, which replace the function key list in this bottom window. On pressing CTRL the window changes to show the function keys which are used with CTRL to access the other pages.

Page turning

The **Music Editor** page has a top banner which displays the name of the music sequence being edited and its time signature, plus the number of free notes remaining. Most of the page is taken up by a list of the notes and their parameters, in columns, under six headings. The first is the **key** meaning, perhaps a little misleadingly, the note itself, described by three characters — the octave (1 to 7), the note and a sharp sign if applicable. A change in level, which can be made at any time, is indicated by the letter L. The second column specifies the channel to be used. The next two headings are **Bar** and **Beat**, which together set the time for the note, counting from the start of the bar. They are related to the time signature, and will alter if this is changed. Fine adjustments are possible. **Dur** sets the note duration, again in terms of the beat. If auto-sustain is in use, the letter **A** is displayed. By juggling with these parameters a certain degree of expression becomes possible, such as the use of rubato or notes inegales. The sixth heading is **Ins**, which specifies the instrument to be used. On the extreme right of the screen are the recording counter readings appropriate to each note, and the start and finish of the section is shown on the extreme left. A long section can be scrolled, and this facility can be used either

for editing existing music (possibly as entered directly from the keyboard), or for copying directly from a score. Pressing TAB will play the current note. Music cannot be entered from the keyboard while in Edit mode, but can be added by first going back to the Studio Page. The Editor can also produce a hard copy of its contents on a printer — very handy if you want to score a masterpiece that you have just improvised!

Addresses and Envelopes

Studio Eight accesses the Beeb's sound generator chip directly, and enables the **Envelope Editor** to deal quite separately with sound and pitch envelopes. Any combination of these envelopes can therefore be used for any instrument. Conversely, any changes made in a particular envelope will affect all the instruments that make use of that envelope, so it is safest to make new sounds by modifying an envelope not used by any other instrument in the same recording. Sixteen envelopes of each type can be defined and utilised in any combination. The keyboard may be played while using the editor, and is displayed as on the Studio page. The various envelope parameters occupy most of the middle of the screen, with envelope numbers and lengths at the top, and the relevant function key uses are displayed in the bottom window, as usual. If any note is played, arrows indicate each phase of both envelopes as they are reached — this helps in deciding which phase should be altered to attain a desired sound.

The envelopes required for any particular instrument are combined in the **Instrument Definer**. The result can be tested by playing the keyboard, which again appears on screen above the function key prompt window. Selection is simply by choosing the serial number and step length of the amplitude and pitch envelopes to be used, also the volume level and sustain time required — the latter can be up to 10 seconds. The instrument can be an existing or a new one, and its name can be specified or changed. Its serial number is also shown. The editor is entered at the instrument currently in use, but can be moved to any other by the cursor keys. Return confirms the selection, and the appropriate parameters are displayed.

The **Keyboard Settings** page selects the type of add-on keyboard to be used, and sets the four contiguous octaves to be covered out of the six available. It also allows the keyboard to be split into octave sections, in such

a way that both the pitch and the instrument used can depend on the octave played. Thus up to six instruments are available at the same time, in different octaves. The QWERTY keyboard can have only two octaves at a time, but different instruments can be selected for these by using the Tab key to change the octaves selected. The QWERTY keyboard can be played in this page, but is not displayed. In its place appears a **Polyphonic Channels** selection window. This is used if only two note chords are required, when it can reserve one channel for another music line, which will not be "invaded" if three keys are pressed while in the polyphonic mode.

The simplest control panel is the **File Control Screen**, which, obviously enough, deals with loading and saving Studio Eight files. The current filing system data appears at the top, with a text area below for general communication. "*" commands can be issued directly, but only a limited number are safe, such as filing system or TV commands. On disc, the default directory is "M", and all music data will be saved together with envelope and instrument details. If the directory "I" is used, only the envelope and instrument data will be saved, and a fresh set can then be loaded while retaining the current music. Any directory can replace "M", but "I" is specific. In the unlikely event of a computer hang-up all is not necessarily lost — using Escape/Break will attempt to carry out an automatic save under the filename **M.BREAK**.

Closing bars

This program is quite remarkable for the sheer number of possibilities it offers, all of which work without any problems. As a synthesiser/"tape recorder" it has every feature one could wish for, and it is limited only by the user's imagination and the restrictions of the Beeb's sound chip. It is perhaps worth noting that Studio Eight must also be used for playback, so you cannot use it to write interrupt-driven incidental music for your own programs! The 54-page manual is both helpful and contains a wealth of information. This clever package stretches the Beeb's sound capabilities to their limits, and is excellent value.

Studio Eight costs £22 on disc, £17 on cassette. Further details from Beebugsoft, Dolphin Place, Holywell Hill, St Albans, Herts Tel (0727) 40303

DOUBLE PHANTOM?

YES! This IS the program demonstrated on BBC TV's "Micro Live". The Worlds first micro multi-user combat flight simulation is now available direct from DOCTOR SOFT via our 'HOT LINE' FIRST CLASS MAIL ORDER service.

DOUBLE PHANTOM is basically a TWO computer version of the highly acclaimed PHANTOM COMBAT simulation. At least one BBC must have a disc system. A hardware link (included) then links the machines which become separate aircraft sharing the same airspace, each VISIBLE and VULNERABLE to the other!

DOUBLE PHANTOM has all the usual PHANTOM features including the fastest and smoothest 3D colour graphics around (15fps). RAF Phantom pilot Paul Courtnage's verdict: "Marvellous... quite the best micro flight simulation I've ever seen... Totally captivating!"

Phone: Mail Order Hot line 0903 776000 with VISA/ACCESS. Mail: PO BOX 66, East Preston, West Sussex BN16 2TX. Most orders despatched SAME DAY, FIRST CLASS, POST FREE.

DOUBLE PHANTOM (inc link)	BBC ★	disc	19.95
LINK separately	BBC	cable	9.95
PHANTOM COMBAT	BBC ★	disc	12.95
PHANTOM COMBAT	Electron & BBC	cass	9.95
747	BBC B only	disc	9.95
747	BBC B only	cass	8.95
747	Electron	cass	7.95
747	Commodore 64	cass	12.95
747	Commodore 64	disc	14.95
747	Commodore 64(USA format)	disc	14.95

(Overseas orders, equiv currency, add air mail at cost)

JOYSTICKS optional with all programs

BBC means all machines from 32k up

★ SPECIFY DFS when ordering discs

£2 discount on multiple order

DOCTOR SOFT - THE FLIGHT SIMULATION SPECIALIST



ROCKFORT for quality, Services & Prices



DISK STORAGE

M.F.50 Floppy Disk Box

— Holds 50 - 5 1/4" Disks.....	£ 9.50
M.F.10 Box — Holds 10 - 5 1/4" Disks.....	1.85
MD.12/30 Box — Holds 12 - 3" or 30 - 3 1/2" Disks.....	7.85

ROCKFORT 5 1/4" DISKETTES

10 — SS/DD 48tpi in M.F.10 Box.....	10.95
10 — DS/DD 48tpi in M.F.10 Box.....	12.95
25 — SS/DD 48tpi in M.F.50 Box.....	22.95
25 — DS/DD 48tpi in M.F.50 Box.....	26.95

Disks supplied in sleeves with write project notch, hub rings, labels and carry a lifetime guarantee.

BBC MASTER SERIES

Master 128k.....	460.00
Master ET.....	389.95
Econet Module.....	49.95

DISK DRIVES

Single 100KB 40tk w/o PSU.....	89.95
Single 400KB 40/80 Switchable w/o PSU.....	119.95
Dual 800KB 40/80 Switchable w/o PSU.....	229.95

CENTRONICS Dot-Matrix Printers

Centronics GLP II 100 cps, 25NLQ, Ser, Par	159.85
Horizon HPC-80 (Canon) 180cps, 34NLQ, Par	268.95

All Prices INCLUSIVE of VAT and Carriage.

NO HIDDEN EXTRAS

ROCKFORT PRODUCTS Tel: 01-203 0191

81 Church Road, Hendon, London NW4 4DP



BINDERS

FOR YOUR VALUABLE COLLECTION OF A & B COMPUTING MAGAZINES
 *SMART *EASY TO USE
 *TOP QUALITY

£5.20
inc
P&P

To ASP Readers Service, PO Box 35, Wolsey House, Wolsey Road, Hemel Hempstead, Herts HP2 4SS (0442-41221)

Please supply..... A & B Binders £5.20 Inc. P&P
 Total £.....(Please make cheques payable to ASP Ltd.)
 Years Required - 198.., 198.., 198.., 198..

Name.....

Address.....
 Please allow 21 days for delivery

If an advertisement is wrong we're here to put it right.

If you see an advertisement in the press, in print, on posters or in the cinema which you find unacceptable, write to us at the address below.

The Advertising Standards Authority.

ASA Ltd, Dept 3 Brook House, Torrington Place, London WC1E 7HN

CUT-PRICE DISKS - LOWEST YET!



5.25" 'Universal'
 suits all drives -
 SSDD, SSDD, DSDD, DSQD-96.
£49.99 - 100 disks
£26.99 - 50 disks
£14.99 - 25 disks
 *Life-time No Quibble Warranty!
 *Hub-rings, full spec.
 *No Extras - vat & delivery included

Lowest **3M**
 & branded prices - Try us!
 Official orders very welcome.

FREE! Buy 200 disks and get a tub of screen/computer wipes.

3.5" Hi-grade
 Single or Double sided
 SSDD or DSDD All ex-stock
£139.99 or £159.99 - 100 disks
£ 75.99 or £ 85.99 - 50 disks
£ 39.99 or £ 49.99 - 25 disks
 Same day despatch -

Cheques or orders to:-
Dept AB
Direct Disk Supplies Ltd
FREEPOST
29 Dagmar Road
Kingston, Surrey, KT2 6BR.



DIAL-A-DISK
 01-541 1144
 Answering service for out of hours orders

PEARTREE

AUTHORISED ACORN DEALER

HARDWARE

AMB15 BBC MASTER 128 £395.00

- * 128K
- * Complete with View, Viewsheet, A Basic editor, Termulator, ADFS, 1770 DFS and Basic
- * Battery backed up RAM
- * Two ROM cartridge sockets
- * Numeric keypad

ANB55 BBC B+ 128K £325.00

- * 64K BBC Basic
- * Sideways RAM
- * 1770 DFS

ANB03 BBC B INC DFS £299.00

- * 32K computer
- * Includes Acorn DFS

ADC06 TURBO UPGRADE FOR MASTER £102.00

- * 65C102 second processor
- * 4MHz
- * 64K RAM
- * Hi-Basic
- * Hi-Editor
- * Printer buffer software

PTC5000 MUSIC 5000 £140.00

- * Compatible with BBC B, B+ and Master
- * Complete with Ample on ROM
- * Multi user-friendly input modes for ease of use
- * 16 channels
- * Includes a step-by-step beginners guide

ADF14 ROM CARTRIDGE £13.00

- * Takes existing ROM software in cartridge form
- * Cuts down opening of machine to insert ROMs

ANB28 1770 DFS UPGRADE FOR BBC B £39.00

- * Allows BBC to access disc drives
- * Will take ADFS for double density

ANB29 ADFS ROM FOR 1770 OR BBC B+ £23.00

- * For use with BBC B+
- * For BBC B with 1770 DFS kit
- * Double density
- * Hierarchal filing structure

ANB27 64K UPGRADE KIT FOR B+ £35.00

- * Upgrades B+ to 128K
- * Sideways RAM

ANC06 32016 CO-PROCESSOR £999.00

- * 32 bit processor
- * Complete with Fortran, Iso-Pascal, Cambridge Lisp, Panos, C, BBC Basic & 32016 Assembler
- * 1 megabyte RAM

ANC01 6502 2nd PROCESSOR £159.00

- * Complete with 64K Hi-Basic
- * Compatible with B, B+ and Master

ANC04 Z80 2nd PROCESSOR £329.00

- * 64K CPM
- * Complete with vast range of business software

ECONET

AMB12 BBC MASTER ET 128K £320.00

- * No DFS
- * Econet station
- * 128K memory

ADF10 ECONET MODULE FOR MASTER 128 £49.00

- * Upgrades Master 128 for networking
- * Easy to install plug-in module

PTC11 ECONET KIT £55.00

- * Upgrades BBC B or BBC B+
- (please specify when ordering)
- * Must be professionally fitted

AEH18 10 STATION LEAD SET £25.00

AEH19 ECONET STARTER KIT £79.00

AEH21 ECONET SOCKET KIT £29.00

AES22 PRINT SERVER EPROM £40.00

- * Allows a BBC to be a printer server when Econetted

AND61 10 MEG WINCHESTER WITH FILE SERVER £999.00

- * Plus into 1meg bus
- * Complete with ADFS and file server manuals
- * Built in fan and power supply

DRIVES

PTC01 DUAL 40/80TK DRIVES (MITSUBISHI) £199.00

PTC02 DUAL 40/80TK DRIVES inc PSU (MITSUBISHI) £210.00

PTC03 SINGLE DISC DRIVE (MITSUBISHI) £109.00

PTC04 DUAL DISC DRIVES (MITSUBISHI) £249.00

- * In monitor bridge (Master size)
- * Built in fan and power supply

PCT10 400K DISC DRIVE AND 20 MEGABYTE WINCHESTER £799.00

- * In monitor bridge (Master size)
- * Built in fan and power supply
- * Other size Winchester available

CSX40S SINGLE 40/80TK DISC DRIVE (CUMANA) £134.00

CSX80S DUAL 40/80TK DRIVES (CUMANA) £260.00

CS800S DUAL 40/80TK DISC DRIVE inc PSU (CUMANA) £295.00

PRINTERS

EPSON RX100+ £179.00

- * 100 CPS wide carrier printer
- * IBM compatible
- * Extremely robust
- * Complete with tractor feed

EPSON LX80 £225.00

- * 100 CPS
- * NLQ mode
- * Centronics interface

EPSON LX80 TRACTOR FEED £18.00

EPSON LX80 SHEET FEEDER £49.00

EPSON FX85 £399.00

- * 160 CPS
- * Downloadable character set
- * Centronics interface

EPSON FX105 £499.00

- * As above with wide carriage

EPSON FX85 TRACTOR FEED £37.00

EPSON LQ800 £595.00

- * 24 pin head
- * 180 CPS
- * Excellent near letter quality

EPSON LQ1000 £795.00

- * Wide carriage version of above

KAGA TAXAN KP810 £229.00

- * Low cost NLQ printer
- * Built in tractor feed
- * 160 CPS

KAGA TAXAN KP910 £389.00

- * Wide carriage version of above

BROTHER HR15 £299.00

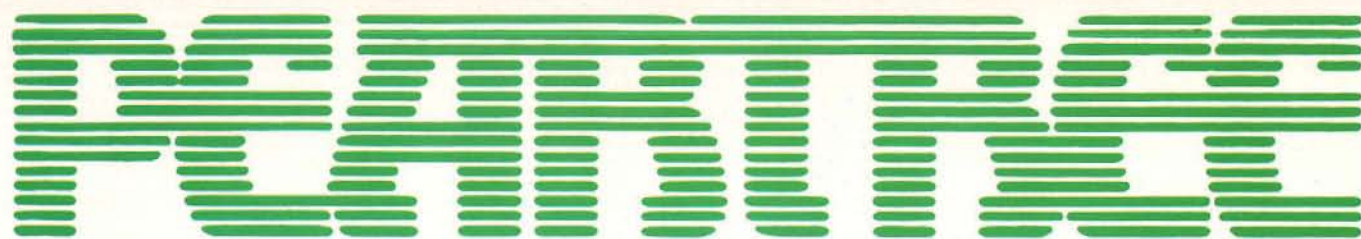
- * Daisy wheel printer
- * Optional keyboard available
- * 15 CPS

QUEN DATA DWP1120 £169.00

- * Daisy wheel printer
- * Robust construction
- * 20 CPS
- * Qume compatible

BROTHER M1509 £399.00

- * 180 CPS
- * Built in tractor feed
- * RS232 and Centronics interface
- * IBM compatible
- * Full international character set
- * Epson compatible



APPROVED ACORN SERVICE CENTRE

MONITORS

COLOUR

HANTAREX COLOUR MONITOR £159.00

- * Medium resolution
- * RGB interface
- * Composite video and sound input
- * Anti-glare filter

MICROVITEC 1451 COLOUR £235.00

- * Medium res monitor
- * Metal or plastic case
- * RGB interface
- * Complete with cable for BBC

MICROVITEC 1451 A/P £275.00

- * As above with audio and composite video input

MICROVITEC 1441 COLOUR £450.00

- * High resolution monitor
- * 895 pixels
- * RGB interface

TAXAN SUPER VISION 3 £349.00

- * Compact 12" super high resolution RGB colour display
- * Text switch gives green display
- * Super high contrast tube
- * 640 x 252 line resolution
- * 0.37 dot pitch

MONOCHROME

HANTAREX BOXER £69.00

- * High res green monitor
- * As preferred by educational establishments

KX1201 KAGA GREEN (P31) £89.50

KX1202 KGA GREEN (P39) £95.50

KX12003 KAGA AMBER (PUL) £95.50

- * P31 standard persistence
- * P39 long persistence
- * PUL long persistence
- * Greater than 20MHz bandwidth
- * Flat 635R tube
- * 1000 line resolution at centre

SOFTWARE

With every 3 ROMs purchased we will supply a MR3000 ROM board at no extra cost

COMPUTER CONCEPTS

WORDWISE £32.00

- * Mode 7 editing
- * Preview in mode 0 (80 cols)
- * Can produce ASCII text for modems

WORDWISE PLUS £45.000

- * As above with multi document editing
- * Built in programming language for data handling

INTER-SHEET £45.00

- * 40 80 and 105 column mode
- * Multiple spreadsheets in memory
- * 64 by 255 sheet size
- * ROM link

INTER-CHART £30.00

- * Built in Epson screen dump
- * Supports pie, line and bar charts
- * Line and bar graphs can be displayed on the same axis
- * Automatic scaling
- * ROM link

INTER-WORD £45.00

- * 80 or 105 column word processor
- * Continuous documents limited to disc size
- * Editing operations similar to Wordwise
- * ROM link

INTER-BASE £55.00

- * Compatible with all filing systems
- * Contains powerful Basic-like programming language
- * Card index mode
- * Powerful customising mode
- * Max 250 fields per record
- * Max 32K per field
- * Variable field lengths and records
- * ROM link

ACCELERATOR £51.00

- * Basic compiler
- * Can produce ROM/RAM format code from Basic programs
- * Comprehensive manual

CARETAKER £26.00

TERMI 2 £28.00

- * VT52 terminal emulation
- * Complete with file transfer software
- * Easy to use menu options
- * Custom configurations can be stored on disc

COMMUNICATOR £55.00

- * As above with VT100 emulation

SPEECH ROM £25.00

- * Must be used with Acorn speech processor
- * Liven up your programs

ACORNSOFT

VIEW 3.0 £58.00

- * Industry standard word processor
- * Complete with printer configuring utility
- * Can be used in any mode
- * BBC B, BBC B+, 6502, Shadow RAM, DFS and ADFS compatible
- * Complete with comprehensive manual

VIEW SHEET £42.00

- * Compatible with complete View range
- * Can be used in any mode
- * Windows can be selected for printing

VIEW STORE £38.00

- * Complete with report generator
- * File size limited only by disc storage size
- * Data can be imported from other View products

VIEW SPELL £33.00

- * Spelling checker for View
- * Complete with 70000 word dictionary
- * Dictionary can be extended to include technical terms

VIEW PLOT £25.00

- * Enables you to draw line, bar or pie graphs
- * Compatible with Viewsheet

VIEWINDEX £15.00

- * For View
- * Automatically creates index
- * Notes page numbers
- * Sorts alphabetically

VIEW PRINTER DRIVER GENERATOR £9.00

- * Used to personalise View documents to include special printer features

GXR GRAPHICS £23.00

- * Extends plot ANV VDU commands to provide: circle plotting, ellipses, parallelograms, dotted and dot dash patterns, shading patterns, colour fill, shade fill and sprites
- * Built in sprite designer
- * Please specify BBC B or BBC B+

ISO PASCAL £52.00

- * Full implementation of the ISO standard
- * Can use BBC's sound and graphics
- * Compiles to a compact intermediate code
- * Complete with demonstration disc

LOGO £52.00

- * Good introduction to computing for children
- * Turtle graphics supported

TERMULATOR £27.00

- * Terminal emulator ANSI (VT100), VT52, Tektronix 4010, dumb terminal, hardcopy terminal and a special BBC terminal
- * Enables the host computer to be sent directly to the BBC's output driver

COMAL £39.00

- * Programming language standard in many European countries
- * Encourages structured programming

BASIC EDITOR £25.00

- * Powerful full screen editor
- * Many word processor functions included

MICRO PROLOG £60.00

- * Designed to emphasise human logic rather than machine procedure
- * Step closer to artificial intelligence
- * 6502 compatible

PEARTREE

BBC B+ 128K IN STOCK NOW £325.00

SOFTWARE

BCPL	£50.00
BCPL CALCULATION	£35.00
BCPL STAND ALONE GENERATOR	£35.00
CREATIVE SOUND	£19.00

BEEBUGSOFT

TOOLKIT PLUS (ROM)	£35.00
SLEUTH (ROM)	£28.00
ROMIT (ROM)	£30.00
EXMON 2 (ROM)	£28.00
HELP 2 (ROM)	£27.00
SPELLCHECK 3 (ROM & DISC)	£32.00
DUMPMASER 2 (ROM)	£27.00
DUMPMASER (DISC)	£13.00
PROGRAM BUILDER (DISC)	£19.00
DISCMASER (DISC)	£19.00
TELETEXT (DISC)	£13.00
SPRITES (DISC)	£13.00
STUDIO EIGHT (DISC)	£19.00
ICON MASTER (ROM)	£30.00
WORDEASE (ROM)	£26.00
WORDEASE (DISC)	£19.00
MUROM (ROM)	£28.00
QUICKCALC (DISC)	£16.00
HERSHEY FONT (DISC)	£19.00
BILLBOARD (DIS)	£21.00
DESIGN (DISC)	£21.00
PAINTMASTER (DISC)	£15.00

LEADS

PTC50 BBC TO TV	£1.25
PTC51 BBC TO GREEN MONITOR	£2.95
PTC52 BBC TO SONY/KAGA COLOUR MONITOR	£5.95
PTC53 BBC TO MICROVITEC	£2.20
PTC54 PHONO TO PHONO	£1.25
PTC55 BNC TO BNC	£2.95

PTC56 BBC TO CASSETTE	£2.25
PTC57 BBC TO ACORN CASSETTE	£2.25
PTC58 BBC TO CENTRONICS PRINTER	£9.95
PTC59 BBC TO SERIAL PRINTER	£8.95

PTC60 4 WAY MAINS TRAILING SOCKET	£9.50
-----------------------------------	-------

- * Including two metre extension cable plus plug

MODEMS

PAGE NIGHTINGALE	£109.00
<ul style="list-style-type: none"> * 1200/75 75/1200 300/300 baud rates * British Telecom approved * Complete with cable for BBC computer * Socket for through connection of telephone 	

PAGE NIGHTINGALE COMBO	£129.00
* As above with Commstar software	

PAGE ACCESSORY BOARD	£42.00
<ul style="list-style-type: none"> * Autodialler * Auto baud rate selection via software * Autoanswer for your own bulletin boards * Built in loudspeaker for monitoring 	

PAGE AUTODIAL DISC	£9.00
<ul style="list-style-type: none"> * Sets up Commstar for autodial * Stores favourite numbers 	

PAGE OBBS COLOUR BULLETIN BOARD SOFTWARE	£20.00
<ul style="list-style-type: none"> * To be used with the accessory board * Create your own bulletin board * Create your own office answering service 	

MINOR MIRACLES WS2000	£125.00
<ul style="list-style-type: none"> * Full range of baud rates * British Telecom approved * 25 way RS232 input 	

CABLE FOR MODEM	£5.00
WS2000 AUTODIAL CARD	£30.00
CABLE FOR AUTODIAL	£4.00
SK1 KIT	£10.00
WS2000 AUTOANSWER KIT	£30.00

WS3000 V21/23 MODEM	£285.00
<ul style="list-style-type: none"> * Hayes compatible * Intelligent speed buffering * Line noise filtering * Internal battery backup allows 63 names and numbers to be stored * Printer port for direct connection to a printer * Includes cable 	

DEMON MODEM	£76.00
-------------	--------

- * Auto dial, auto redial
- * Auto answer
- * Full and half duplex
- * CCIT and bell
- * Complete with mains supply, manual and ROM

DIAL DISC	£4.50
-----------	-------

SUPPLIES

RIBBONS FOR DOT MATRIX PRINTERS	£4.50
---------------------------------	-------

- * FX/MX80/LX80 printer
- * Juki 5510 printer
- * MP165 printer

RIBBON FOR KAGA KP810/ CANON PW1080	£5.00
-------------------------------------	-------

RIBBONS FOR 132 COL PRINTERS	£7.00
* FX100/RX100 printers	

BOOKS

THE EPSON PRINTER COMMANDS REVEALED	£5.95
-------------------------------------	-------

- * A must for all printer users
- * Commands for all Epson compatible printers
- * Easy to understand commands
- * Detailed explanations

MASTER REFERENCE PART ONE	£14.95
---------------------------	--------

MASTER REFERENCE PART TWO	£14.95
---------------------------	--------

VIEW MANUAL	£10.00
-------------	--------

VIEWSHEET MANUAL	£10.00
------------------	--------

DFS OPERATING SYSTEM MANUAL	£6.95
-----------------------------	-------

ADVANCED USER GUIDE FOR BBC	£14.95
-----------------------------	--------

ADVANCED SIDEWAYS RAM USER GUIDE	£9.95
----------------------------------	-------

MAIN EDUCATIONAL SUPPLIER
We accept Government and Educational orders. If there are any products not listed above that you require, please enquire.

SOUNDS SPECTACULAR



Take it home — Plug it in to your computer and hi-fi system and start to make spectacular sounds using up to 16 sounds at once selected from the many preset instruments, waveforms and envelopes provided.

The new AMPLE Rome easy to use, powerful and versatile menu driven music

language. Includes 'Island Logic' music system style of Staff Editor. The Music 5000 synthesiser is now compatible with BBC B, BBC B+ and Master 128 (Music 500 is not compatible with BBC B+ and Master 128)

Dealer enquiries welcomed. We accept Education and Government orders

PEARTREE

PEAR TREE

The black and white case for colour

Pear Tree are now offering the most powerful art package yet devised for the BBC Micro – Artist.

Artist is a new 16k language ROM compatible with the BBC Micro, BBC+ and the new Master Series, allowing full manipulation of a mode-2 screen. With Artist and Megamouse, colour graphics take on a completely new dimension, which has to be seen to be believed.

Copying specific screen areas to exclude certain colours. Drawing and painting underneath any colour combination. Making your brush cycle through a defined colour sequence. Colour pattern editing. Sprites of any size. Animation. Just a hint of how Artist is the most highly advanced software package yet designed, with features never before seen on the BBC Micro. The only limitation of Artist is your imagination.

With the ultimate in art packages comes the ultimate mouse – Megamouse. Built to professional standards and comfortably shaped, it provides sensitive, accurate movement, that is unbeatable.

This exclusive Pear Tree offer includes the Artist ROM, the systems disc, a users manual and an excellent grey shade Epson printer dump.

You have the option of buying the Megamouse separately, or saving £10 by buying the complete package.

Artist is already ahead of its time. Don't be left behind – order now before it's too late.



The Artist is compatible with the AMX Mouse and the Megamouse is compatible with the AMX Software.

Artist Software
Megamouse
Artist and Megamouse

£45.00
£49.00
£85.00

PEARTREE

BBC IN SERIOUS CLOTHING

NEW LOW PRICE NOW ONLY £173.00 + VAT



KBL 128 PC £599.00

- ★ BBC B+ board with 128K
- ★ 86 key IBM style keyboard
- ★ Dual 40/80 track disc drives
- ★ All sockets at rear for easy access
- ★ Infra red keyboard option supplied as standard
- ★ Easy access to BBC B+ board for changing ROMS etc

KBL 0 PC

KEYBOARD, CASE, CABLES, FAN £173.00

PLUS OPTIONS

INFRA RED REMOTE CONTROL £24.00

BBC B BOARD £299.00

BBC B+ BOARD 64K £325.00

BBC B+ BOARD 128K £385.00

DUAL DISC DRIVES 80 TRACK £199.00

6502 2ND PROCESSOR £159.00

Z80 2ND PROCESSOR £329.00

TORCH Z80 2ND PROCESSOR £199.00

FITTING

DRIVES SINGLE £5.00
DUAL £9.50

COMPUTER £17.00

CARRIAGE £12.00

MEGAMOUSE



MEGAMOUSE £55.00

- ★ High quality UK manufactured
- ★ Highly accurate
- ★ Slip free rubber coated ball

- ★ Fully AMX compatible
- ★ Because of all of this it is a popular AMX replacement

MEGAMOUSE AND SUPERART £95.00

MEGAMOUSE AND PAGE MAKER £95.00

AMX MOUSE WITH NEW SUPERART ROM AND DISC £65.00

AMX DESK £19.00

AMX UTILITY £11.50

AMX SUPERART £43.00

AMX PAGE MAKER £43.00

AMX 3D ZICON £21.00

AMX DATABASE £21.00

AMX XAM £21.00

WATFORD ELECTRONICS BEEB VIDEO DIGITISER £99.00

- ★ Input from any 1V video source
- ★ Can be used with Artist package
- ★ 1.6 seconds scan time
- ★ Slow scan television; sending images via a modem or radio
- ★ Security
- ★ Full resolution in modes 0, 1 and 2
- ★ Up to 8 grey levels
- ★ Manual or auto level control
- ★ Connects to user port
- ★ ROM software supplied

MAGAZINE MAKER £125.00

- ★ Watford video digitiser and AMX Pagemaker
- ★ Pictures produced by digitiser can be doctored to make up pages complete with text
- ★ Complete package at a bargain price

PEARTREE

Means Business

Pear Tree Computers Ltd. 12:00 01-10-85

PEAR TREE SOFTWARE
MAIN SYSTEM MENU

- 1 Stock Control
- 2 Customer Data Base
- 3 Purchase Ledger
- 4 Sales Ledger
- 5 Nominal Ledger
- 6 Invoicing and Credit Notes
- 7 Proforma Quotation
- 8 Petty Cash Control
- 9 Bank A/C Control
- C Create Data Disks
- E Exit from Main System

PLEASE CHOOSE ANY SYSTEM TO RUN

PROFIT
A complete business
system for only
£69

The first complete, integrated business package for the BBC Micro

Running a business isn't easy, but Pear Tree can help make it simpler with the most cost effective business software package on the market today – Profit.

Profit is compatible with all disk filing and advance disk filing systems for the BBC B, BBC B+ and MASTER 128.

Developed for Pear Tree's own compatible KBL 128 PC, Profit is as easy to use as ABC. Everything you require in running a business is there – accounts, stock control, customer data base and even the immediate status of your bank account.

With Profit, all the time consuming problems, the reams of paperwork and valuable hours taken in administration can all be condensed down far more efficiently. The

net result is that you have far more time to concentrate on making your company grow.

Profit is simply a way to help you control your business more profitably. Complete the coupon today and start to profit from the software designed for your business.

PEAR TREE PROFIT

'Profit' is now held in high esteem in both the business and computer worlds: "This represents good quality Business Software compared to others on the market and I can recommend it."

(ACORN USER magazine review, April 1986)

PEARTREE



Special Offers from PEARTREE[®]

<p>PEAR 1</p> <p>MASTER 128K EPSON RX100+ + SECURICOR DELIVERY</p> <p>Saving £148.00 of recommended retail price</p> <p>PEARTREE COMPUTERS</p>	<p>PEAR 2</p> <p>MASTER 128K EPSON PRINTER RX100+ AKHTER D/DRIVES AS ABOVE + SECURICOR DELIVERY</p> <p>Saving £192.00 of recommended retail price</p> <p>PEARTREE COMPUTERS</p>
<p>PEAR 3</p> <p>MASTER 128 EPSON PRINTER RX100+ AKHTER D/DRIVES AS ABOVE GREEN HI RES MONITOR + SECURICOR DELIVERY</p> <p>Saving £163.00 of recommended retail price</p> <p>PEARTREE COMPUTERS</p>	<p>PEAR 4</p> <p>MASTER 128K EPSON PRINTER RX100+ AKHTER D/DRIVES AS ABOVE MITSUBISHI MED RES COL MONITOR</p> <p>Saving £168.00 of recommended retail price</p> <p>PEARTREE COMPUTERS</p>



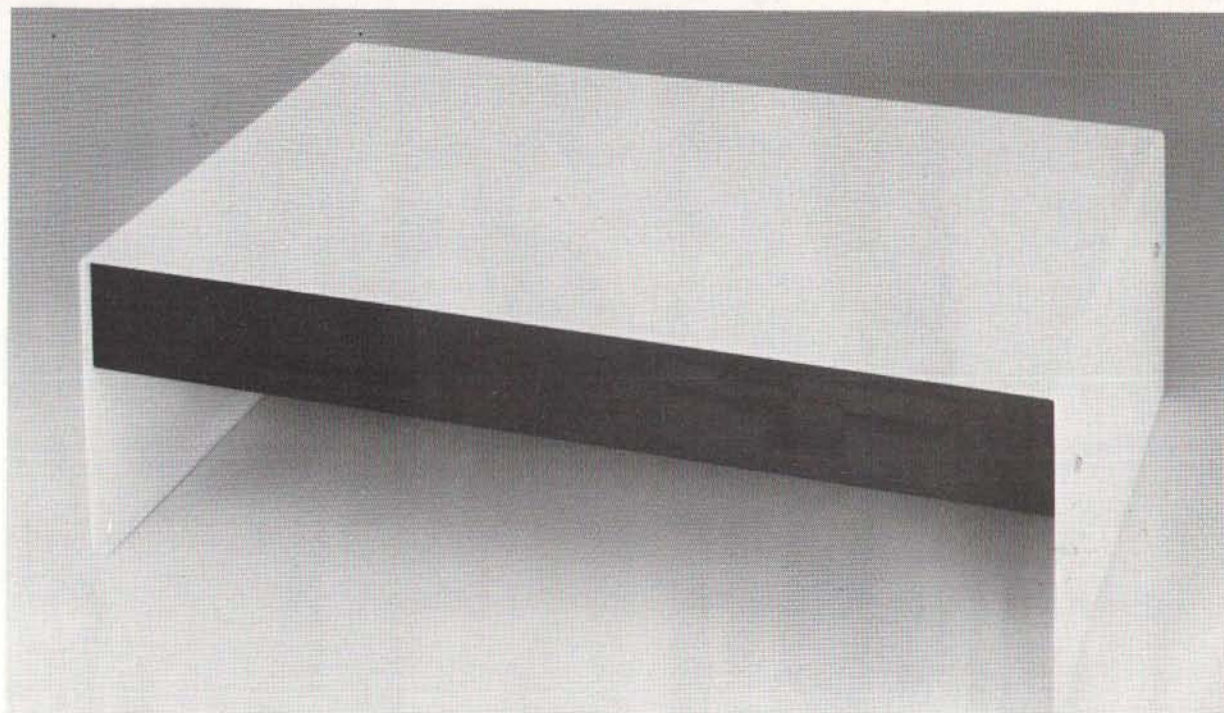
THE FANTASTIC EPSON RX100+
NOW ONLY

£179.00

- * 100 C.P.S.
- * Built-in tractor feed
- * 2K buffer
- * Wide carriage
- * Epson reliability
- * International character sets

PEAR1

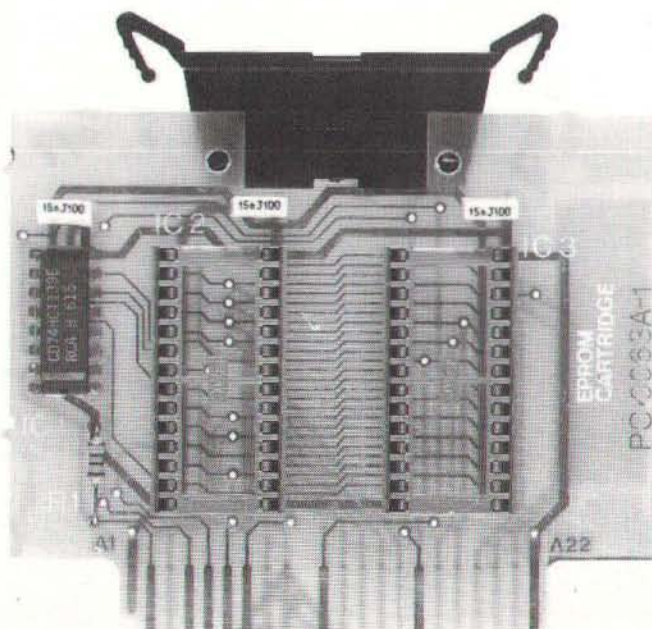
The All in One System £799.00



20 Megabyte Acorn Compatible Hard Disc with 5 1/4" DISC DRIVE BUILT IN

- ★ In Master Bridge
- ★ Built in Fan
- ★ Through Power Connector for Monitor
- ★ Can be supplied with Level 3 File Server

The above system is compatible with BBC B, BBC B+ and Master. For machines other than the Master please order an ADFS Rom.

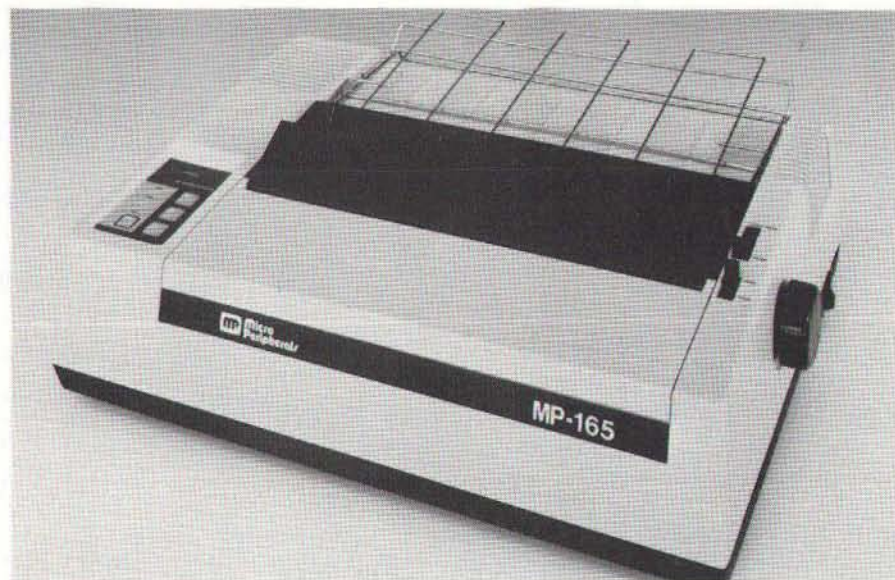


IN STOCK NOW

**Pear1 Master
Cartridge
only £5.95**

PEARTREE

MP165 at a new low price of £199

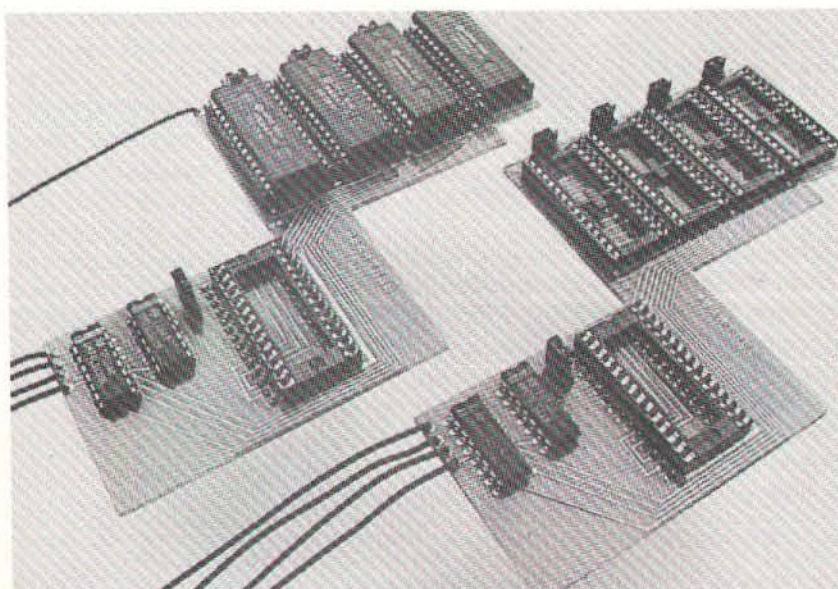


The latest generation of low cost near letter quality Epson compatible dot matrix printers giving you a super fast standard quality print at 165 CPS and a superb 40 CPS in NLQ. This printer will do all your work, print your important correspondence, print your listings, print your graphs or even dump graphics straight from your computer.

Features

- ★ Draft Speed of 165 C.P.S.
- ★ Near Letter Quality Speed of 38 C.P.S.
- ★ 2K Buffer
- ★ Maximum of 95 Downloadable Characters
- ★ Centronics Interface
- ★ Very Reliable
- ★ Excellent Graphics Quality
- ★ Built In Tractor Feed
- ★ Fully Epson Compatible

NEW Improved MR3000 & MR4200



MR3000 Mini-Rom Board:
Gives 4 extra Rom sockets on BBC 'B'.
Only £9.95. Full instructions enclosed.

MR4200 Mini 32K Ram Board:
Inclusive of the Hitachi 6264LP-15 Ram.
Full Software inclusive. Only £24.00
Add £1.00 for no solder version of either board.

PEARTREE COMPUTERS

HOW TO ORDER

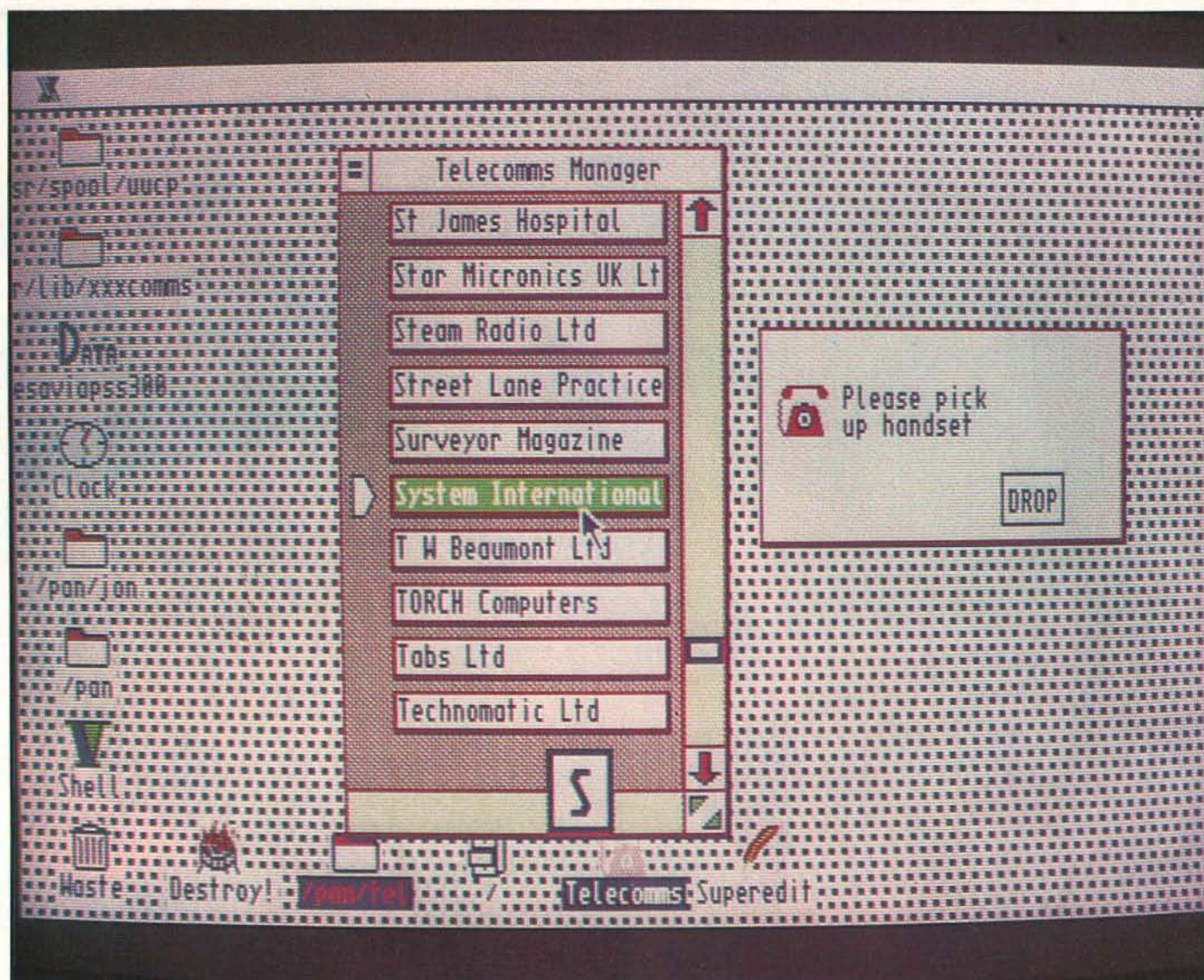
Bulk order discounts are available on some items. Government and Educational orders are welcome. Orders will whenever possible, be despatched on the same day.

All prices quoted exclude VAT and P & P. Postage will be charged as follows:

Items below £10.00	add £1.50
Items below £50.00	add £2.50
Items below £100.00	add £3.50
Items over £100.00	add £8.00

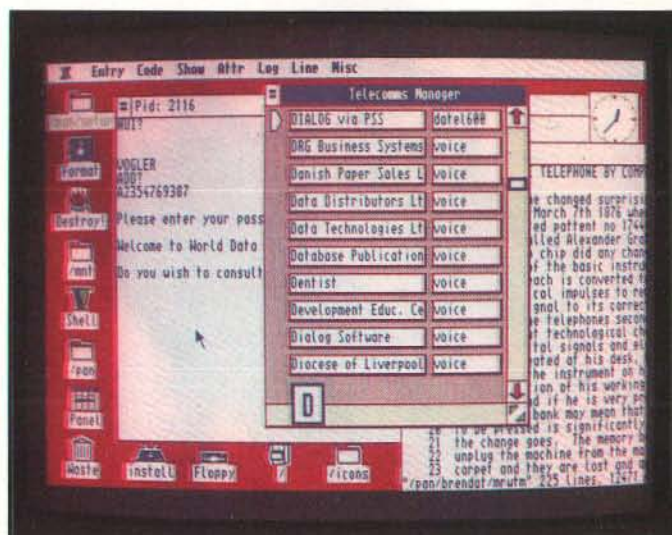
We accept





Down to Business

Dialling: the number changes colour, a window appears on the screen which shows the number as it is being dialled and is shortly afterwards replaced with a polite invitation to lift the receiver

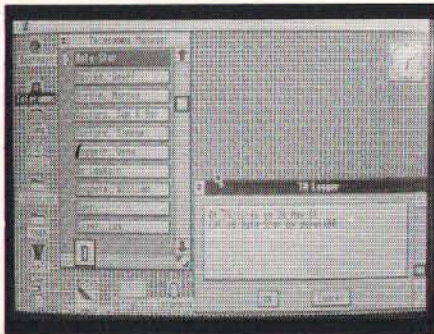


2. Formerly, logging into a data base was rather tedious with lengthy code and password procedures. Telecomms Manager automates them, giving fast, simple access

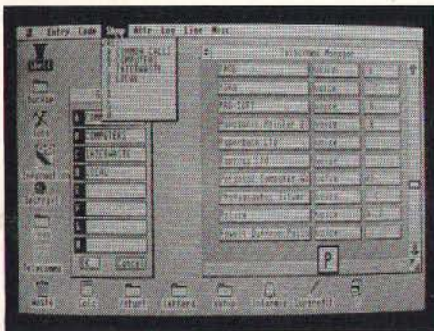
T O R C H ' S T E L E C O M M A N A G E R

One of the first pieces of software to be written specifically to exploit the friendliness and power of *Open Top*, is *Torch's Telecomms Manager*.

Any user who has attempted to use an external modem, either for voice or data communications, and particularly anyone who has progressed to software dialling, will know what a crazy confusion of buttons, dials, files, and incomprehensible codes this entails. Very few computers manage to make this process user friendly, but *Telecomms Manager* makes it positively relaxed.



3. There is a log which records what call was made, to what number, at what time and this can be used for jotting notes

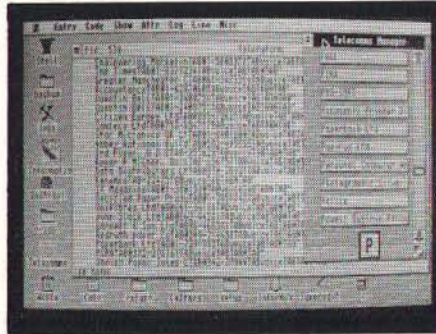


4. Numbers can be grouped. Each person or organisation in the directory can be given any combination of eight letter codes: A to H, (but you can rename them in any way you like). By clicking the "show" item on the top menu, you can "select" the category and only these will appear on the dialler menu

First of all you no longer need to know what number you are dialling: that information can be hidden in the computer. All you see is a neat directory of names on the screen in front of you, alphabetically arranged. To make a call you use the "mouse" to point at one of the numbers and click the mouse button. The number changes colour, a window appears on the screen which shows the number as it is being dialled and is shortly afterwards replaced with a polite invitation to lift the receiver. If you wish you can turn on the computer's loudspeaker and hear the dialling noise and the person at the other end answering so that you can keep your eyes on other work until the last minute.

On the screen in front of me as I write this is a directory containing some 400 business numbers although only 10 are visible at any moment. "Scroll boxes" at the side and bottom of the window permit me to move smoothly through, again using the mouse, although touching a given letter on the keyboard will reveal the first ten entries beginning with that letter.

This is one of two different directories: the other, which I use at evenings and weekends, contains friends and members of the family: you can change from one directory to another



5. It took me a couple of evenings to convert a database of six or seven hundred names, addresses and telephone numbers on my previous CP/M machine onto a file that could be read by the Informix database on the Triple X. I then selected from this the information needed for *Telecomms Manager*, so that I began using it, the day it was installed, with four or five hundred names and numbers on the dialler directory

with a couple of clicks of the mouse button. A menu of seven items at the top of the screen offers the opportunity to manually dial any number not on the directory (a number pad appears on the screen and you point to each key in turn and click the mouse button, just like on a telephone hand set), to redial a given number, to add or duplicate or change a number in the directory and various other functions. As soon as you add a number to the directory, it takes its place in the correct alphabetical order; as soon as you delete it the numbers on the other side close ranks with the precision of soldiers on parade.

One of the nicest features is that numbers can be grouped. Suppose you regularly phone 20 of your main customers to discuss their needs for the coming month or regularly chase up the same batch of defaulting debtors. Each person or organisation in the directory can be given any combination of eight letter codes: A to H, but you can rename them in any way you like. You might have a group called steel suppliers. By clicking the code item on the top menu, you can "tick" the category of steel suppliers and only these will appear on the screen directory. It is then simplicity itself to work down the directory, dialling each in turn. A pointer in the left hand margin indicates which one you dialled last so there is no confusion if you are diverted by an incoming call or an urgent message that the

fork-lift truck has collided with the mobile crane. If you and your head office a hundred miles away want to use the same "database" of numbers, the programme even enables you to strip off STD codes and replace them with local dialling codes or with a 9 to call up your internal switch board. Best of all for the many businesses where funny things happen after the boss goes home at night, there is a log which records what call was made, to what number, at what time and, if you are very efficient, this can be used for jotting notes about who you spoke to and what was said. If the

**Torch have
always made
communications
a priority.
The Triple X
now boasts
highly
intelligent
comms
software, ideal
for the
business user**

logging disturbs you, it can be made silent; you never know it is happening. Alternatively it can be turned off altogether.

Hands-Off Telephones

British Telecom insist that you use a telephone hand set with a number dialling device in case you have to dial 999 in a hurry; apart from this there is no reason to have a phone on your desk at all.

Telecomms Manager combines logically with a "hands off" loud speaking telephone that leaves your hands free for the computer's mouse and key board and your desk free of yet one more item and those cables that always seem to get twisted round a half empty coffee cup with disastrous results.

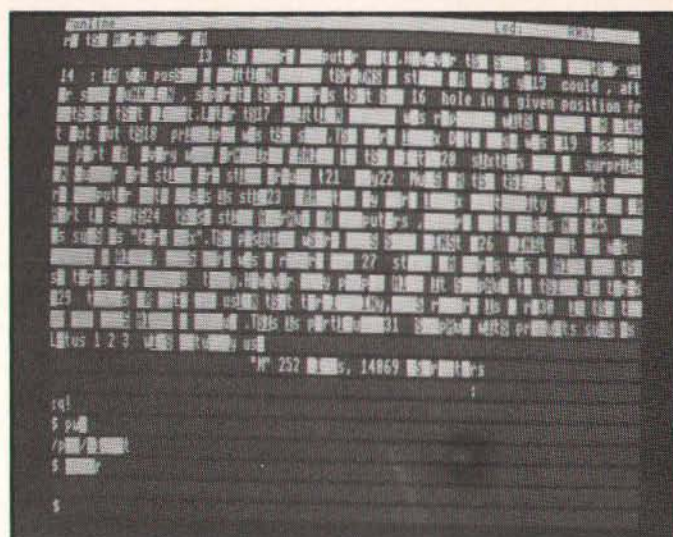
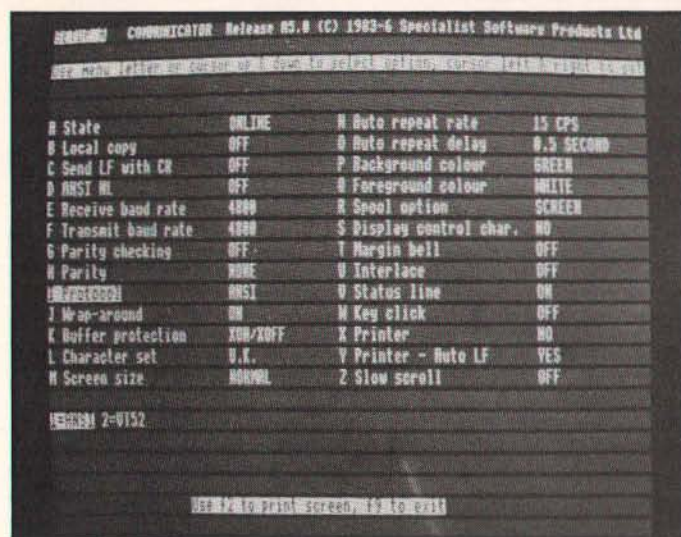
I tried two such 'phones, generously lent by two different departments of BT. The first, called *Easikom*, was not very satisfactory, because the amplifier will not turn up quite high enough, so I frequently had difficulty hearing the person at the other end. Strange this because *Easikom*, which costs just under £100, comes with its own transformer, so you would expect it to have ample power available. Also the button that you press to turn it on (equivalent to lifting the handset of a nor-

C O N T I N U E S ►

mal 'phone) often seemed to misfire and had to be pressed two or three times. The second, named *Kirk*, was more satisfactory. Although it does not need a transformer (one less wire on my cluttered worktop), voice amplitude is quite adequate. My only criticism was that the dial buttons need rather too much pressure; but if you use the auto-dialler, this does not matter. Both 'phones worked well with Telecomms Manager and I found that the whole process of 'phoning became slicker and more relaxed and reckon to save half a minute per 'phone call, on average, because of not

nect the call, unless you are prompt when the window appears. If you set it to long, you have to manually (with the mouse) drop the line before the 'phone "loudspeaks". Still, you cannot win. My final reservation is that I do not want to relinquish my *Ace-Telcom* auto-dialler 'phone (now under £50 from *Dixons*) because, although it has no microphone and the loudspeaker cuts out after a few seconds, its press-button dialling of my ten most common stored numbers is extremely fast. Telecomms Manager would be as fast if I could keep the dialler window permanently

that for logging into a remote database or sending a telex, or transmitting your accounts to your head office has undergone equally dramatic change. First the modem is invisible: hidden in the depths of the computer and you simply forget about it. However, at present Torch are offering the old modem from their *Professional* range of computers, which does not offer 1200 duplex, let alone 2400, so those doing a great deal of long distance file-transfer may prefer to use a higher performance external modem such as one of the *Miracle WS3000* range.



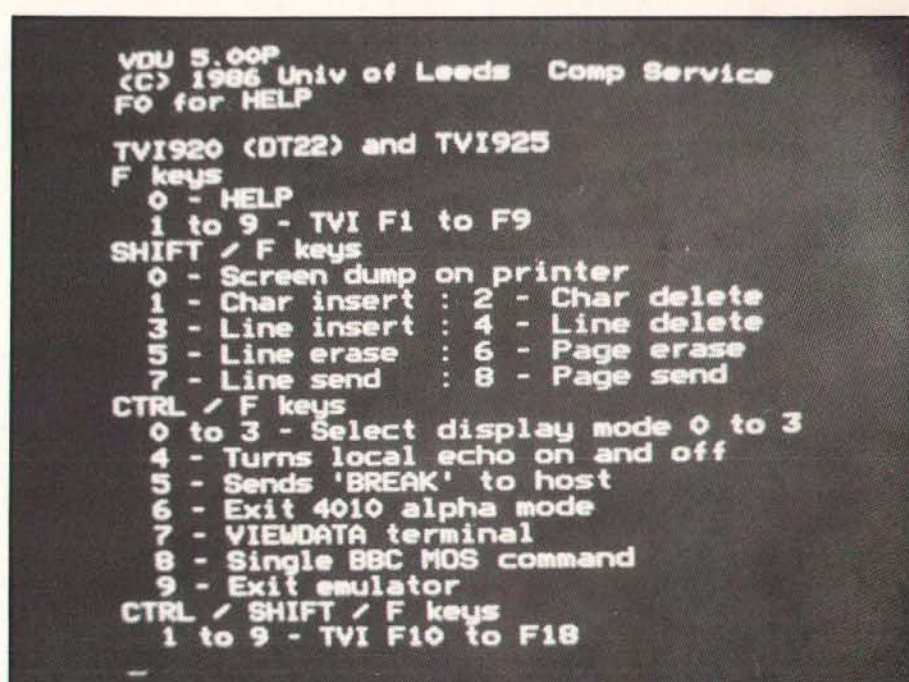
consulting a directory. I found it delightful not to have to hold the handset and of course the more one keeps information on the computer, the more essential it is to have both hands free for the keyboard. With this combination I find I can respond to questions like *Are you free on ...?*

Can you give me the address of ...?
in about a third of the time it took in pre Triple
X days.

On one point, however, I was disappointed. I had hoped to be able to initiate a call with the mouse, then get on with something else, while just "keeping half an ear cocked", until the person answering at the other end recalled me to the instrument. Sadly this is not to be; or not yet. If you switch the loudspeaker 'phone on before the autodialler has completed dialling then you corrupt the dialling sequence. I found the second best arrangement was to have the autodialler in "audible mode" (incidentally the otherwise excellent handbook omits to tell you how but a revision is promised: check you have it if you buy one), so I could hear when dialling had finished and glance up to see the little window that says, politely:

Please lift handset

Then I would cut in the speaker's phone, and resume other work until someone answered. Here again there was a minor conflict: you can choose a long or short pause before the Telecomms Manager drops the line. If you choose short, it may drop it before you con-



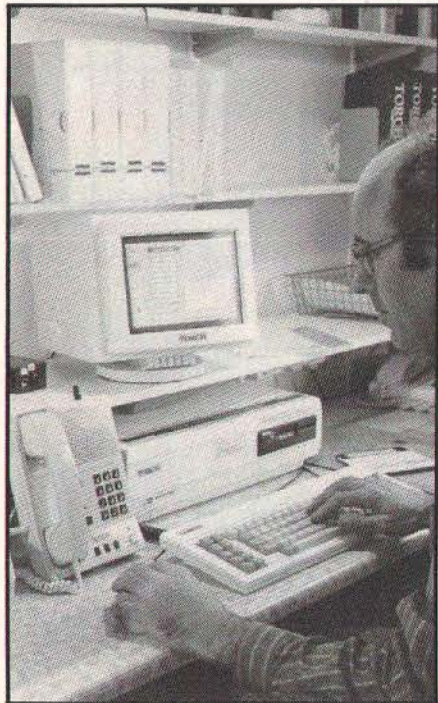
on screen but it uses too much memory for that. I believe BT offer a loudspeaker 'phone that also has memory dialling: I shall try that.

If the process of dialling to make a voice telephone conversation has been streamlined,

Operation is very smooth. The software does everything necessary and there are no buttons to press or dials to set. For every number that you put in the telephone directory, you specify whether it is a voice or a digital connection and, if the latter, which of half a dozen different types. Secondly, the system handles those tedious logging in and pas-

TORCH'S TELECOM MANAGER

sword procedures. Today, for example, I used the *DIALOG* data base in California to find out what information is available about some packaging technology. Formerly, connecting to a data base was rather complicated. First of all I had to dial my local "PAD" (the entry point to *British Telecom's Packet Stream Switching System*, without which the cost of the call would be excessive). Then I had to give the PAD my pass-word, without which they will not let me in (because they could not send me a bill for the call) and then the code for the *Dialog* database I want to call. Once my call has



6. Telecomms Manager combines logically with a "hands off" loud speaking telephone that leaves your hands free for the computer's mouse

reached *Dialog*, I had to tell their computer my pass-word for the same reason and then transmit the necessary codes to get access to the particular database file I wished to interrogate. All this involves perhaps fifty different numbers or letters and, if done by hand is nightmareish — it takes too much time over expensive long distance lines and it is too easy to make mistakes and my brain refuses to do it in the middle of a working day. *Telecomms Manager* has changed that. Sure I have to put in all the various numbers and codes but I simply write them in a simple computer file, using a wordprocessor and *Telecomms Manager* will send them whizzing down the line at about a hundred times the rate that I could and without errors. If I want to wait for a few seconds for the computer or exchange at the other end to respond, I can programme the delay in. There is nothing complicated about writing these files: you simply put the number and letter codes in and terminate each with a "carriage return" which is a bar followed by letter M. To insert a 3 second delay it is simply a bar followed by a 3.

What happens once you have logged in to your database and found the information you want? One of the top-of-the-screen menu options allows you to log into a file everything that comes through; your queries as well as the answers from the other end. This process can take place as rapidly as the data is received. You can still print if you want to, afterwards, off-line at zero cost.

The same is true if you are transmitting accounting or other files between different factories. All the transfers can be from a hard disc unit in one factory to that in another which keeps communication costs extremely low and also mean the data is available to be analysed in different ways, printed in a different format, or passed on to another department. This "total logging" is invaluable because it enables you to study your "conversation" afterwards and discover if you missed a vital keyword or spelt one wrongly to explain a disappointing "yield" from the database. It also enables one to "sharpen up" one's interrogation technique: a valuable exercise when costs of between \$50 and \$200 per hour connected may be at stake.

Multi-Communications: X-25

So far we have discussed operations that use the normal telephone lines. For those companies that decide to invest in their own digital telephone line, such as *British Telecom's KiloStream* or *MegaStream*, the Triple X computer offers particular advantages. The great strength of these communications systems is, as well as the low cost of sending data in digital packets, the possibility that several "digital conversations" can take place simultaneously. With only a single line, a head office can be receiving the accounts from ten different satellite factories all at the same time! This, however, is of limited use if a separate computer in the head office is required to receive each one; it would probably work out cheaper to stagger the calls by fifteen minutes each and get by with a single telephone and modem and a single computer.

This however is where Triple X's multi-tasking capability scores. It can behave like several computers and receive information over several separate digital channels all simultaneously. You can even have all the incoming data appearing on separate windows in the screen, and with a single click of the mouse button select which one you want to be "at the top of the pile" at a given time. While such heroic performance may not be essential for most firms, if you are playing the commodity market and want to compare the price of silver in New York, Tokyo, London and half a dozen other centres during the height of some dramatic price fluctuation, then such sophistication could give you a fantastic advantage over all your competitors.

You could even go further and programme the computer so as to bring to the front of the screen the window that was displaying the highest price at any given moment. In fact from there it is only a modest step to letting the computer do your commodity trading

entirely on its own, in accordance to carefully prepared formulae but I am not sure that confidence in electronic marvels has quite reached that stage. Bear it in mind however; if you do not get on top of this computer business soon, your competitors probably will!

Handling more than four or five operations simultaneously, particularly if they are demanding continuous activity from the processor and disc drive, tends to slow down the computer quite a lot (although intermittent activities, such as word processing or doing the books will have almost no effect because the computer is only working about a quarter of the time; for the other three quarters, it is waiting for the user to touch the keyboard). However, the Triple X has an answer to this problem too. For something over £1,000, you can add a further two megabytes of memory to increase the total to three mega bytes (the absolute maximum is an enormous seven mega bytes).

One of the biggest deterrents from introducing any new computer system is that files, often built up with loving care over many years, have to be converted and transferred to the new machine. At best this usually involves assistance from a specialist software house: at worse they have to be printed out by the old machine and keyed in afresh on the new. Here lies another of *UNIX's* unseen virtues. Using the *awk* pattern matching programme and the *sed* stream editor, it took me a couple of evenings to convert a database of six or seven hundred names addresses and telephone numbers on my previous *CP/M* machine onto a file that could be read by the *Informix* database on the Triple X. This time would have been even shorter had I not taken the opportunity to slightly improve the database structure. Once this had been achieved it took only a couple of hours to select from the *Informix* database the information needed for *Telecomms Manager*, so that I began using it with the same six or seven hundred entries.

Finally, *Telecomms Manager* tackles, far more practically than other software I have seen, the matter of error messages. First of all these do not simply appear on the screen and then vanish into thin air before you have had time to read them; they appear in a scrollable report window so you can go back and check on an error message that appeared yesterday (provided you have not switched the computer off in the meantime). Secondly, the error messages themselves can be tailored to individual need. Thus if you regularly swop accounts files with your French subsidiary company, you might wish to add a French translation to the error message that complains that data received was corrupt. Within the office it might make sense to replace *45 Serious Communications Error (OX9B)* with

Phone Oguyn the Maintenance and tell him the computer telephone's gone bananas.

Next month, in horrible but uncensored detail, Jon Vogler recounts his experiences of linking the BBC Micro with other computers, all in a day at Down to Business.

SOLIDISK MASTERPIECES

The latest ROM/RAM expansions for the Model B, and a new Real Time Clock

At the Acorn User Show (24th July), Solidisk launched new versions of their ROM/RAM expansions of 32 and 256K, two with (switchable) FourMeg processors, and a brand new product for the Model B. This is a Real Time Clock and Calendar, and like that in the Master Series, it can also hold a large number of settings which determine the configuration of the machine at switch-on. A rechargeable battery powers both the clock and the 50 bytes of CMOS RAM while the machine is switched off. Both products include ROMs which provide many useful features.

This article is a review of the 256 board, mentioning where the 32K boards differ, and of the Real Time Clock board. Together, they bring the Model B up to (and in some cases beyond) the capabilities of the Master 128 — with more RAM, more extensive control of configuration, and the speed of a Turbo. They form part of a coherent range of Solidisk products, which also includes floppy disc controllers, DFS and ADFS ROMs, and floppy disc and Winchester drives.

Installation

As usual, Solidisk offer free fitting at their premises (by appointment), or by one of their widespread band of "local experts". However, installation should be well within the capabilities of many users.

The Solidisk 256 board harks back to their very first designs for the Model B, in that it is mounted on the processor socket, and leaves the motherboard ROM sockets free. Indeed, four ROM sockets, each capable of holding

ROMs from 8 to 32K, are included on the board — though one is occupied by a 32K Manager ROM, containing control and utility software. The major part of the installation therefore consists simply of removing the existing 6502A processor from its socket, and putting the 256 board — with the 65C02 P4 "FourMeg" processor already fitted — in its place.

The board has five leads which need to be connected to the motherboard. Three of them go to existing pins (or "links"), the fourth to a resistor (R106) for a timing (or "clock") signal, and the fifth fitted to one leg of a chip. (Fewer leads are needed for the 32K boards). The three may be made by push-on connectors, the fourth by the spring clip provided, and the fifth by a hook-clip, thus avoiding the need for soldering. However, soldering is an alternative, and should give higher reliability.

Installation of the Real Time Clock (RTC) board is even easier, as it simply plugs into one of the ROM sockets on the motherboard. Since it extends to the left, any other ROMs should first be fitted into the sockets which it will overhang. These motherboard sockets are of 16K capacity, and will not benefit from the "FourMeg" feature. They are thus best used for DFS and ADFS ROMs, since the Floppy Disc Controller runs at 1 MHz in any case. The RTC may be mounted in either the rightmost socket or the one next to it. The latter is perhaps preferable, since it leaves the rightmost accessible without the need to remove the RTC. This can then hold a ROM such as *Inter-Word*, which is taller than usual because of its special carrier.

The benefits of the RAM/ROM boards may be described under shadow RAM, sideways RAM, RAM disc, and FourMeg features.

Shadow RAM

This, of course, is standard on the Model B Plus and Master 128, as well as being a popular upgrade for the Model B. It allows documents and user programs etc to occupy all the standard RAM memory, in any screen mode which enables unrestricted use, eg, of the 20K screen modes for graphics, and the 16K Mode 3 for text. Such unrestricted use depends upon the software being written to

appropriate "rules", but this is increasingly the case. For example, the Solidisk shadow RAM works with the Acorn View family, Computer Concepts' Wordwise, and their latest product, *Inter-Word*, as well as BBC BASIC and other languages.

As on the B+ and Master 128, the shadow RAM is controlled by typing *SHADOW 0 or 1. This may be done before or after entering the application or language. It may even be done at switch-on, by storing a suitable instruction (MODE 128 + n) in the CMOS RAM of the RTC, with *CONFIGURE (see below).

Shadow RAM enables word processors such as *View* and *Inter-Word* to hold 16 or 20K more text (say 2300 or 2800 more words) at once. While *View* with Continuous Processing, and *Inter-Word* in Multi-File Mode allow very large documents to be handled even in a standard 32K Model B, shadow RAM allows the memory-limited passages to be much longer, which makes editing much easier.

With the STL DFS, and shadow RAM enabled, *View* has 26,110 bytes free. With the STL ADFS, and only one file channel open (the default), it has the same, since PAGE remains at &1900.

Inter-Word is particularly ingenious, in that it senses when shadow RAM is available (ie in a Model B, fitted with an Aries, Solidisk or Watford board, or in a Model B+, or a Master 128), and turns it on automatically. Under the STL DFS and ADFS, *Inter-Word* has 25,278 bytes free.

As well as not benefitting from shadow Mode, *Scribe* actually will not display any text, as it writes only to the non-shadow screen. Shadow Mode must therefore be turned off.

Shadow RAM also enables *ViewStore* to hold many more records in memory at once, and spreadsheets such as *ViewSheet* to hold 16 or 20K more data (see *A&B*, January 85, p16). The benefit with programs in BASIC and other languages comes mainly when using the 16 or 20K screen modes — whether for text or graphics.

Sideways RAM

This feature has proved itself to be of great value on the BBC Model B, and has been the foundation of Solidisk's success (see *A&B*,

Fig. 1 END TO END TIMES for 16,177 word document

		- in seconds					
Word Processor	Action	DFS floppy Acorn	DFS floppy STL	DFS RAM STL	ADFS floppy Acorn	ADFS floppy STL	ADFS Hard Acorn
View C.P.	scroll dn	183	253	168	253	336	152
I-Word M.F.	jump dn	38.5	52.8	23	58.6	48	22.2
	jump up	8.2	11.2	4.3	13.3	9.8	4.3
Scribe	jump dn	9.0	9.3	6.5			
	jump up	3.0	3.5	0.5			

May/June 84, p88 and November 84, p64). It provides one or more 16K banks of RAM alongside the existing sideways ROM sockets (ie with addresses from &8000 to &BFFF) — up to the maximum total of 16 supported by the Machine Operating System (MOS). Images of your sideways ROMs may be loaded into this RAM from disc (or even from tape), thus allowing convenient access to far more "firmware" than could possibly be fitted into the machine, even with a large ROM-expansion board. The images may be of either "service" ROMs (such as DFS and ADFS), or "language" ROMs (which include both application programs like word processors etc, and programming languages).

As you would expect from Solidisk, the operation of sideways RAM is now particularly convenient, with *MENU calling a routine in the Manager ROM. This displays the contents of the sideways system — whether ROMs or loaded RAM banks — and below that a menu of all directories (for the DFS) or the current directory (for the ADFS) of the disc in the current drive. While there are RAM banks free, files which are suitable (ie ROM images) may be loaded simply by pressing the selection letter, shown alongside. After loading in this way, you must press <BREAK> to cause the MOS to recognise the "ROM".

One of the differences between the 256 and 32K boards is of course the number of RAM banks available. A 32K board may be set up as 20K of shadow RAM and one 8K sideways RAM bank, or as two 16K sideways RAM banks. However, a 256 board allows one bank of shadow RAM (or more for special purposes), and up to seven sideways RAM banks.

RAM Disc

With either size of board, some or all of the RAM may be set up as a RAM disc. In the

case of the 256 board, this may be of up to 200K, and still allows one bank of shadow RAM and one of sideways RAM as well. This requires that the Solidisk DFS and/or ADFS be present, since they provide the necessary "hooks" for the RAM disc to operate (see *A&B* October 85, p34). They are however available on request at nominal cost to purchasers of the 32 and 256 boards — either as disc images for loading into sideways RAM banks, or in ROM. The STL DFS 2.0 will work with the Acorn 8271 disc interface, while the STL DFS and ADFS 2.1 will work with both the Solidisk Issue 2 and Acorn 1770 disc interfaces. The ADFS is supported by few if any other RAM discs. It has the advantage that drive numbers 2 and 3 can be used, which are additional to the floppy (or Winchester) drives 0 and 1, and hence cannot be confused with them.

A RAM disc is easy to set up, with *RAM-DISK <drive>, where <drive> is within the range permitted for the disc filing system (0 to 3 for both the DFS and ADFS, or 0 to 7 with a Winchester). The drive number can also be changed with *RAMDRIVE <drive>. This makes it easy to set up a RAM disc for drive 0, which is where some programs (eg Scribe) expect to find utilities, with *RAMDISK 1, *COPY 0 1 *, and *RAMDRIVE 0.

RAM discs can be very useful with word processors, especially when editing long documents. Thus with *View* "Continuous Processing" (CP), one or both files (infile and outfile) can be held on a RAM disc. Accommodating both files means that each must be limited to less than 100K. However, much of the benefit comes from putting the "outfile" on the RAM disc, which means that it can be of up to 200K. Though appreciable, the benefit is still limited by the slow code (GETBYTE, PUTBYTE) used by *View* CP. Scrolling through the document FILER of 16,177 words in *View* CP, under the STL DFS, from an input file on a floppy to an output file

on a floppy takes 4 minutes 13 seconds, while from floppy to RAM disc takes 2m 48s — a 34% reduction. Scrolling the same document under the STL ADFS, from a floppy to a floppy took 5m 36s but from a floppy to a RAM disc took only 2m 32s — a 55% reduction. The STL ADFS from floppy to floppy is slower than the Acorn ADFS, because it does read-after-write — for increased reliability. However, the STL ADFS from floppy to RAM disc is some 60% faster than the Acorn ADFS from floppy to floppy — though the Acorn ADFS from Winchester to Winchester is quicker still.

All the words in a long document may be counted in *View* CP by first entering *KEY0 COUNT:M MORE:M, and pressing <f0> from Command Mode. To make it work several times, you simply hold <f0> down a while to fill up the keyboard buffer. In practice, the result is up on the screen quite long enough to note it down, while MORE is done. Under the STL DFS, from floppy to RAM disc takes 2m 56s, a 33% reduction on floppy to floppy.

A RAM disc can be very attractive with *Inter-Word* in Multi-file mode. This gives automatic saving and loading of the constituent files of a document, which can thus be much larger than the RAM memory. *Inter-Word* allows the document to have up to 255 pages, which could correspond to 1 Mb or more of text (or over 150,000 words). However the Solidisk RAM disc limits single documents to 200K — which may be as much as is prudent. The file handling performance is particularly impressive, since *Inter-Word* uses *SAVE and *LOAD. It is quite fascinating, when jumping down a multi-file document, to see the highlight moving down the multi-file list in perfect silence.

The document FILER of 16,177 words was held as five files in the *Inter-Word* Multi-file mode. Using a STL DFS floppy disc, scrolling from the start to the end (by holding down Shift-Down) — which includes formatting the whole document — took 57s. Jumping from the first file to the last (using the multi-file selector), then scrolling down the last file, took 52.8s — just shorter. Scrolling from the end to the start took 64.7s, but jumping from the last file to the first took only 11.2s. This is because, it does not have to format when going backwards. With the STL DFS RAM disc, jumping from the first file to the last, then scrolling down the last file, took 23s, and jumping up took 4.3s. On an STL ADFS floppy disc, jumping from the first file to the last, then scrolling down the last file, took 48s and jumping from the end of the last file to the start of the first took 9.8s. On a RAM disc, they took 22.2s, and 4.3s respectively.

Counting the words of an *Inter-Word* Multi-file document is best done by selecting the Status menu separately for each file, either manually or from an *EXEC file. This is because *Inter-Word* flushes the soft key buffer after each action — specifically to prevent auto-repeating.

Fig. 2

	PCW	BASIC	BENCHMARKS	
	average	time	- seconds	
Computer	B & 256 2MHz	Master 128	B & 256 4MHz	Master Turbo
Basic 2	14.28		7.35	
Basic 4	9.33	9.34	4.67	4.53

C O N T I N U E S ►

The merits of a RAM disc are even more convincing with *Scribe*, since it is a page-based word processor, and saves to and loads from disc at each change of page. A RAM disc allows this to be done in speed and silence — and for documents of up to 200K! This is particularly valuable when doing block moves, searches and word counts, and can give dramatic gains in productivity. Of course, this means that the whole document is held in volatile RAM, so it is wise to back it up frequently to a floppy disc. However, holding documents of 200K and more in RAM is quite normal with 16-bit MS-DOS machines.

With *Scribe* under the STL DFS, on a floppy disc, jumping from page to page takes only 2.5s. As *Scribe* does not format as it goes, it will jump forwards just as fast as backwards. So even though moving and copying are limited to nine lines, they are fast enough to deal with larger blocks in several parts. Jumping from the first page to the last, and scrolling down the last page took 9.3s, but jumping up goes direct to the top of the page, and takes only 3.5s. Using the STL DFS RAM disc, these are reduced to 6.5 and 0.5s respectively. A version of DataScribe is now available for ADFS on the Master, but not yet for ADFS on the Model B.

The Scribe word count utility operates on the whole document by default. Counting the words in FILER takes 29.5s on a floppy disc, but only 7.8s on a RAM disc.

The comparison of the benefits of RAM discs in Figure 1 may seem unfair to *View* — in that the document considered is just too large for two copies to fit on the RAM disc of 200K. Hence the times shown for *View* CP are all for the input file being on floppy disc (except for the case with the Acorn Winchester Hard disc). However, this serves as a reminder that *View* CP uses two copies of the document, whereas *Inter-Word* and *Scribe* use only one.

In *View* CP, a document can only be scrolled through (albeit in memory-size passages), and that only forwards. However, in both *Inter-Word* and *Scribe* it is possible to jump through the document, both forwards and backwards. In *Inter-Word* Multi-File mode, the jumps are passages of up to memory-size. When going forwards, this is little faster than scrolling (with Shift-Down held down), since *Inter-Word* reformats as it goes. However, when going backwards, it is possible to jump directly to the desired file (eg from the last to the first). In *Scribe*, the passages are only of single-page size and hence load and save very quickly. Moreover, it does not reformat automatically as it goes, and so the time taken is essentially the same, whether going forwards or backwards.

For the document FILER, a RAM disc makes *View* CP 1.5 times as fast, and hence more bearable, but it is still tedious — especially for doing block moves between passages. It makes *Inter-Word* in Multi-File mode (already nearly five times as fast as *View* CP), 2.3 times as fast again, and makes moving around a *Scribe* document (already some

27 times as fast as *View* CP), 1.4 times as fast again.

Spelling checkers can also benefit greatly from a RAM disc (see *A&B* May 86, p12 and June 86, p68). This is because they may check every different word at least once — and sometimes at every occurrence — which can require very many disc accesses.

For database programs such as *ViewStore*, a RAM disc can greatly speed the editing and searching of records. It can also considerably speed up the building of indexes, and may spare your disc drives from what can be very demanding use. However, while the DFS extends files in steps of 16K, the ADFS uses steps of 64K. Hence where several indexes can be built at once on a DFS RAM disc, there is room for only one or two at a time on an ADFS RAM disc. Again it is prudent to back-up your work frequently to floppy disc, as it would be with any big-RAM machine.

With spreadsheet programs, a particularly interesting possibility is that of recalculating linked sheets. These may be set up with *UltraCalc 2*, *ViewSheet*, or *Inter-Sheet* — eg to hold a model larger than will fit into the machine's memory. Such linked calculation may be carried out under the control of an EXEC file using one or more floppy discs (see *A&B*, January 86, p68 and April 86, p60). A RAM disc

however, allows it to run at much greater speed, and in silence. Recalculation can be further speeded by running at 4 MHz — see below.

For programs in BASIC and other languages, a RAM disc enables faster loading of complete 20K graphics screens (eg in "slide shows"), and of program overlays.

FourMeg

The FourMeg feature (selectable via a small switch which may be mounted at the back of the computer) gives machines fitted with the 256 or 32K boards most of the speed of a Master Turbo. (A lower-priced version of the 32K board lacks this feature, but may be upgraded subsequently). The processor frequency (2 or 4 MHz) is shown on screen at switch-on or after CTRL BREAK, but can often be changed over without this. Specifically, it speeds up the operations of the language ROMs mounted on the Solidisk board (or held in sideways RAM, in the case of the 32K board). I have described and measured the benefits of running at 4 MHz in my review of the Master 128, fitted with the "Turbo" co-Processor (see *A&B* April 86, p60). In fact, the speed advantage of the FourMeg feature is in general slightly less, since not all of the RAM

FIG. 3 TOOLKIT COMMANDS

BFREE	
CHECK	(fsp)
CURSOR	(ON/OFF)
EDIT	
ERASE	
EXCHANGE	<(str) (str)> <(G/S)>
EXPAND	
FIND	(str)
HARDBREAK	
JOIN	(fsp)
KEYLOAD	(fsp)
KEYSAVE	(fsp)
KILL	
LVAR	(<V I S A P F> <H D>)
MENU	(drive)
MSEARCH	(addr) (str)
MZAP	(addr)
PAGE	(addr)
PRINTER	(bank)
RCAT	
NUMBER	(<s,f;s,i>)
RECVDU	(bank)
REPORT	
RLOAD	(bank) (str)
RWIPE	
SALVAGE	
STATUS	
SOUND	(ON/OFF)

runs at the higher speed. On the other hand, the FourMeg feature can speed up applications which are not "Tube-compatible" (and so could not gain from the co-processors).

Of course, this FourMeg feature does not increase the maximum RAM available to documents or programs, unlike a 6502 or Turbo co-processor — particularly with re-located or "Hi-" versions of the languages. As against this, the Solidisk boards are mounted inside the Model B — like the Turbo in the case of the Master 128.

Among word processors, *View* can benefit considerably from running at 4 MHz, since it speeds up the screen handling, which is beginning to seem rather sluggish. With *View* running at 2 MHz, scrolling the Byte 4000-word document from top to bottom took 51.5s at a keyboard repeat period of 8, and the same at a period of 4. At 4 MHz, it took 38.3s at a period of 8, and 37.5s at a period of 4. This suggests that it is limited by screen writing at 2 MHz, and very nearly so even at 4 MHz, since shortening the keyboard repeat period does little to reduce it. Unfortunately, since the machine always runs at 1 MHz when performing filing system operations, the FourMeg feature (and the Turbo Co-Processor) can do very little to speed Continuous Processing, which is noticeably slow.

While *Wordwise Plus* (which is bundled with the 256 board), can run at 4 MHz, it hardly needs to, since the screen handling is already very fast, thanks to the use of Mode 7, with its resident character set and 40-column display.

Even *Inter-Word*, which uses screen modes 0 to 6, with redefined characters and up to 106 columns, has very fast screen handling. Hence there is little loss in the fact that it is not Tube-compatible, (and therefore cannot run on a 6502 or Turbo co-processor), and will not run at 4 MHz on a FourMeg board. *Inter-Word* is still much faster than any other word processor for the Acorn/BBC machines — and most others. Indeed, it is far from being code-limited even at the default settings for keyboard delay and repeat period, since it scrolls even faster when these are shortened. As I noted in my review of *Inter-Word* (*A&B*, August 86, p56), the Byte 4000-word document scrolls in only 16 s with the default settings, and these can be shortened until it takes as little as 9s.

Scribe may also be run at 4 MHz though, since it is page-based, the scrolling speed cannot be measured with the standard Byte 4000-word document. However, cursor movement is speeded appreciably and the scrolling rate increased from about 6 to nearly 8 lines per second at a repeat period of 8 — the default for the BBC Micro. It may be increased even further to 10 lines per second by setting the repeat period to 4 — the default for *Inter-Word*. Operating *Scribe* at 4 MHz and from a RAM disc gives it a performance that should satisfy even the most demanding user!

Databases such as *ViewStore* can take advantage of operating at 4 MHz to speed up processor-limited operations such as in-

memory sorting (see *A&B* April 86 p60). Similarly, spreadsheets can benefit directly from the faster recalculation of individual sheets.

In the case of programs in BASIC and other languages, the running speed is almost directly proportional to the processor clock speed. However, in the particular case of BBC BASIC, the use of a 65C02 processor on the Solidisk boards means that it will run ROMs which use the "CMOS op-codes" — including BASIC 4, as used in the Master 128. As measured by the *PCW* BASIC Benchmarks, this is some 60% faster than BASIC 2 (at the same clock speed), so the overall effect of BASIC 4, running at 4 MHz gives a speed about three times as high (see Figure 2).

Because the 256 board is capable of running them at 4 MHz, the ROMs run hotter than usual. However, this had no observable effect, although the machine was on for many hours at a time (and with the lid on!). Power consumption did not seem excessive, even though the two floppy disc drives were also powered from the computer.

The Manager ROM also contains the STL *Toolkit* and STL *Linemaster*. The STL *Toolkit* consists of a number of star commands, listed in Figure 3. Some are of value to the general user, and others more especially to programmers. The former includes *MENU — for moving around DFS and especially ADFS discs and directories, and for loading files into main or sideways RAM, running programs etc as appropriate. *PRINTER allows a sideways RAM bank to be used as a printer buffer of some 15.5K. This corresponds to about four A4 pages of text, and could avoid waiting up to 20 minutes to use the computer again, in the case of a daisy-wheel or NLQ printout. The STL *Linemaster* is reviewed by Clive Grace elsewhere in this issue.

Real Time Clock

*SETTIME is used to set the date, the time, or both. This is shown as eg Tue,15 Jul 1986.11:20:44 — as for the Master, but the syntax for input is relaxed.

*TIME displays the date and time.

*RTC displays the time in the top right corner of the screen.

*BELL HH.MM.SS sets an alarm bell, which then beeps when the time is reached, until you hit a key.

*ALARM HH.MM.SS sets the alarm time for *BOOT (string) (see below).

*CONFIGURE can be used to set some 19 parameters which determine the machine configuration at switch-on. (see Figure 4). These are similar to those for the Master (see *A&B* March 86, p16), but with some slight changes, and some enhancements. For example, FILE refers to the filing system by its number (eg 4 for DFS, 8 for ADFS), although LANG still refers to the language by the ROM socket number. Then EXTUBE/INTUBE is not needed, since the Model B has only an external Tube connector. BAUD on the Master is replaced by RX and TX, to

enable the storing of "split" baud rates — as used for Prestel.

*ROMS, *UNPLUG, and *INSERT allow ROMs to be managed just as in the Master 128.

*FX 162 clears the CMOS RAM — restoring *CONFIGURE to the default settings.

*BOOT (string) sets a string of commands which is actioned at switch-on, or when the *ALARM time is reached. This is a substantial enhancement over the Master 128, which does not allow such a command string to be stored, nor for it to be set off by the clock. It works by loading the command string into the (f0) function key buffer, and then "calling" it. (As a result, pressing f0 will issue the string again). However, rather than the 256 bytes of the KEY string on the Model B, the capacity (after the *CONFIGURE settings) is only about 35 bytes, allowing for M at the end. *BOOT is very versatile, and while *CON.MODE (n) can set the screen mode, it enables eg the foreground and background colours to be set, using VDU 19 m,n,0,0,0 followed by M.

Desk

The STL *Desktop* is an icon-based environment, similar to those of the Apple

FIG. 4 CONFIGURE COMMANDS

```

BOOT
CAPS
DATA (0-7)
DELAY (1-255)
DIR
FDRIVE (0-3)
FILE (fs number)
IGNORE (0-255)
LANG (0-15)
LOUD
MODE (0-7 / 128-135)
NOBOOT
NOCAPS
NODIR
NOSCROLL
NOTIME
NOTUBE
PRINTER (0-255)
QUIET
REPEAT (0-255)
RX (0-7)
SCROLL
SHCAPS
TIME
TUBE
TV (X,Y)
TX (0-7)

```

C O N T I N U E S ►

REALTIME CLOCK / CALENDAR

Macintosh, and Digital Research GEM. It requires an AMX ROM and a compatible mouse at present, although Solidisk plan to introduce their own driver ROM for mouse and other pointing devices. After entering with *DESK, the mouse may be used to select a File Menu for the current disc (and directory, under the ADFS), a Calculator, an Appointments Diary, and Time, by moving the mouse pointer to the top of the screen. Files may be selected from the Menu and then COPIed, DUMPed, EXECed, or TYPEd, by moving the pointer appropriately, and pressing the "Execute" (left) button. A further option allows the ROMs to be listed, and language ROMs to be entered by positioning a highlight, and pressing the "Execute" button.

With the calculator on screen, numbers and operators may be entered with the mouse pointer and "Execute" button. Selecting the "equals" sign will then display the result. The calculator works with either BASIC 1 or BASIC 2.

After selecting Appointments, they may be typed in directly from the "Desktop", with the syntax @HH:MM:SS string, or a sequence built with any word processor (such as *Wordwise Plus*) and saved to disc as \$.DIARY. Since it operates on an "interrupt", which causes

periodic checking, the computer can keep track of appointments, while still being used for other purposes. Typing *DALARM (or storing it in the *BOOT string) then causes the sequence of appointments to be read in turn from the disc, and the string displayed on screen at the appropriate times — until you hit a key.

A "Time" menu may be popped down from below the Desktop date and time display. The mouse pointer and "Execute" button can then be used to reset the date and time, and to write it to the Real Time Clock.

Documentation

The Solidisk ROM/RAM expansion boards come at present with an eight page A5 booklet covering the installation and all the simpler star commands. An expanded version will be available later dealing with more advanced use of the FourMeg 256, such as selection between multiple banks of shadow RAM. A separate 36-page booklet describes the STL Toolkit, which is included in the 32K Manager ROM of the FourMeg 256.

The Real Time Clock comes with a typeset A5 Owner's Manual of 20 pages. This has sections on installation, and on the Time,

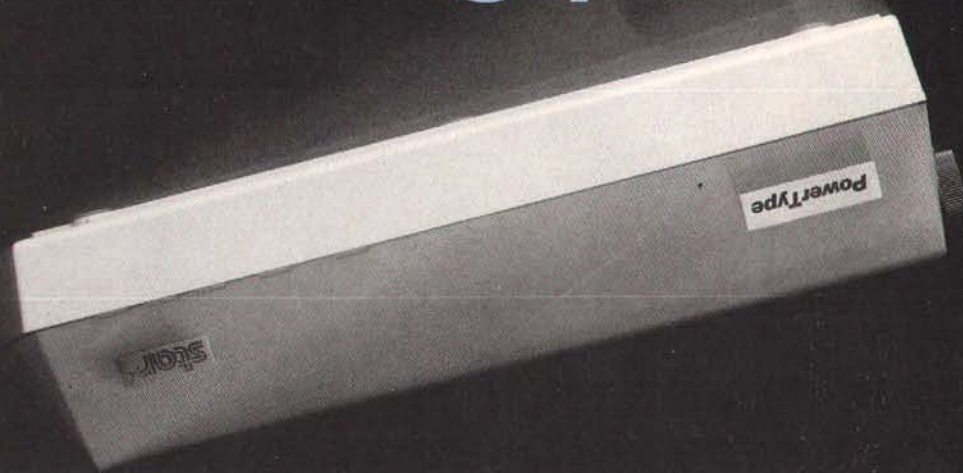
Configure and Desk commands. An additional section describes in detail how the Time and Configure settings may be read and written to by user programs in BASIC and machine code.

Conclusions

Having used a Master 128 since last December in connection with various reviews, I can confirm that these Solidisk products bring the Model B much closer to it. Shadow RAM, sideways RAM and more ROM sockets may be added with the 2MHz 32 board for £50, the FourMeg 32 for £70, or the FourMeg 256 for £175, and the Clock and Configure features with the Real Time Clock for only £29.95. (All prices include VAT). The 4 MHz operation and RAM discs of the former, and the Desktop features of the latter are valuable enhancements over the Master. Whether fitted separately or together, these boards are excellent value for those who want to add the facilities of a Master (and more) to their Model B.

Solidisk Technology Limited (STL), 17 Swayne Avenue, Southend-on-Sea, Essex SS2 6JQ Tel (0702) 354674.

We're standing printer



PowerType DAISYWHEEL PRINTER £229

With over 100 type fonts on widely available daisywheels and using standard ribbon cassettes, PowerType is remarkably cost efficient. A wide carriage giving up to 165 columns of beautiful print in the typeface of your choice, even a graphics capability, the flexibility of reverse paper feed and 18 characters per second means swift, classic correspondence. PowerType comes with Parallel and Serial interfaces as standard.

A&B Computing said in July that Powertype was a quality printer with a host of standard features, excellent value at £400 — How would they rate it now?!

STX-80 THERMAL PRINTER £79

This quiet and efficient machine prints at 60 characters per second and the compact thermal printhead, designed for dependable performance, will give you a lifetime service of 20 million characters.

Star Micronics U.K. Ltd. Craven House, 40 Uxbridge Road, Ealing, London W5 2BS. Telephone: 01-840 1800.

A division of Star Micronics Co., Ltd., Japan.

A&B

♦ T I P S ♦

Colourful Hidden Delights

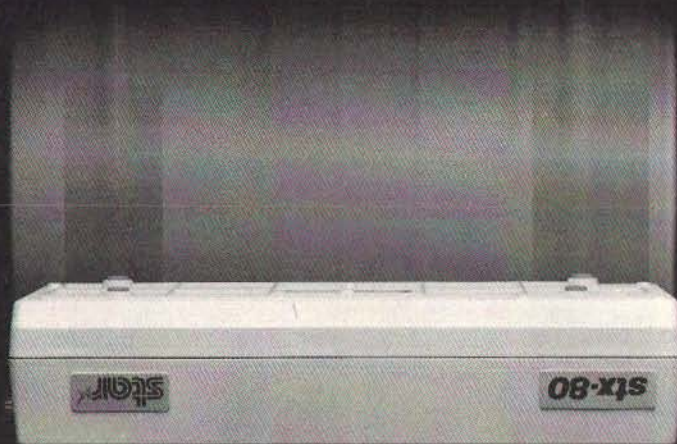
We hear so much about dithered colours and mixed pixels that it may come as a shock to find that there is life beyond GCOL4, try this little program, which starts at GCOL60, press any key to change the number which is at the top of the screen.

```
10MODE2
20FOR num%=60 TO 250
30 CLS
40 PRINTnum%
50 base%=127
60 FOR Y%=400 TO 100 STEP-300
70 FOR X%=0 TO 3
80 base%=base%+1
90
VDU24,(100+X%*248);Y%;((100+X%*248)+232);Y
```

```
%+250;
100 VDU18,num%,base%
110 CLG
120 NEXT
130 NEXT
140 J=GET
150NEXT
```

You will notice that a lot of the colours appear to be repeated but the combinations of colour tend to be different. One thing to watch out for, if you triangle plot to fill spaces you can end up with an ugly diagonal line across the picture. This is due to the way the machine is doing its plotting. At this stage it is worth while looking around for another colour! The best thing to do is to do flood fill or CLG filling if you possibly can.

prices on their heads.



The STX-80 has a carriage width of 80 columns, graphics and many of the features of much larger printers. It's so quiet, the only thing that will make you shout is the price!

PowerType and STX are part of a range of exceptional quality printers - With prices this good you'll go head over heels for a STAR!

Ring - 0272 217777
for more information
(24 hour manned switchboard).

star

For more information and the address of your local dealer complete the coupon and send it to Star Micronics U.K. Ltd. Craven House, 40 Uxbridge Road, London W5 2BS.

AB10

Name

Address

FEEDBACK

This month I've been busy again. Sifting through the postbag has brought out some unusual letters. Keep it up!



Which issue?

Marchino Sisi wrote in from Auchinleck, Ayrshire with another bit of fuel for the "which is the latest Electron issue?" debate.

I noticed an interesting point in the June 1986 review about the Slogger turbo board for the Electron; as I read through the paragraphs of the review, I noticed that one started with "If you have an issue one Electron (or four as revealed in Feedback) with the OS and BASIC ROMs in two different slots, then hard luck".

I opened up my Electron and noticed that it was one that was noticeably different from the one Adrian Kearney was working with, the PCB that he had, looked barer than the one in my Electron, his had a spare socket to fit a ROM, I presume, and in my Electron, there were empty spaces for other chips to be soldered on to. On my board, these were labelled ICs 4 through to 7. I saw printed on the PCB below the Acorn motif "ISS 6"

Do you think that this means that my Electron is an issue six board, if not, why is my Electron different to the others that I have seen?

Your Electron is, at present, the very latest issue that there is to be found in the Electron series, it was the last issue produced before Acorn decided to stop producing the machine and sell off the large stocks to shops such as Currys or Dixons (hence the cheap Electron deals offered with colour televisions and the like).

The extra sockets were a last minute addition, no one really knows what they are for, but I have a sneaking suspicion, judging by their position on your circuit board that they are either spare RAM sockets left over from the days when the Electron had lots of low memory chips to make up the 64K, or, as is more likely, more sockets for additional memory.

You will also notice the extension holes on the side of the board, these have a similar decoding function as the B+ 128 (these were originally a standby for different types of memory chips — Ed), sideways RAM board, this I can assume is a sideways RAM extension option that was planned but was never implemented.

Feedback reaches the parts other magazines cannot reach

The Electron is a strange beast it is true, it has undergone many changes under the lid of the case without any of us knowing! Most of the changes were attempts at making the machine easier and cheaper to produce in quantities by cutting down on components, by directly soldering the components onto the board and so on. If there are any readers with suggestions as to what these extensions are, please write in to me — it may be possible that more features of this remarkable machine can be uncovered.



Master Your Master?

Two letters this time, both concerning their new Acorn Machines Francis Vissers from Belgium had written in with a number of problems regarding his Master 128 as did Anton Mennes from Berlin.

I have recently replaced my good old BBC Micro with a Master 128 computer, I am very happy with the machine but I have run into a number of problems.

The first question I have is why does the 8271 emulation in the 1770 DFS only operate with a !BOOT file? With no disc in the machine, the disc drives keep on whirring, and I need to press BREAK in order to stop it. This has the effect of putting the Master out of 8271 emulation mode.

The second problem I have is that the "Welcome Guide" does not dedicate one single word to sideways RAM. Only after a *HELP SRAM, was I able to use this facility. I discovered that using shadow RAM on to load the contents of a ROM is much quicker than without the shadow RAM facility. Are there any books on sale which will help me find out what is going on inside my machine. It seems stupid that a B+ 128 user was the only source of information for the additional features of my machine.

The third problem is that some of my ROM images do not operate in sideways RAM properly. VIEWstore and VIEW will not operate at all, and VIEWsheet occasionally allows me to look at the contents of a sheet before crashing.

Printmaster hangs up the machine when a CTRL BREAK is issued, as is the case in a number of other ROMs... why?

The general problem is that there is a distinct lack of information and support where I live, most of my reliable information comes mostly from magazines and user groups, and not wishing to sound as if I am crawling, but your Feedback articles offer a great deal of suggestions and solutions to our problems over here.

The problem with the 1770 DFS is that both the BBC+ 128 and the Master series cannot generate the proper INKEY values for program loaders such as Elite and so on.

This is because Acorn wanted to discourage Electron programs from running on the BBC Micro, so they set up a "negative INKEY" facility that checks to see whether the machine being used is an Electron or a BBC micro. Sadly their plans fell foul of the BBC+ machine, that displays messages like "Only Suitable for a BBC Microcomputer" when you try and !BOOT a BBC Micro game on a BBC+ Microcomputer!

The solution was to check for this operation by having shift Z BREAK, which is a means of loading in some of the older protected discs that use this facility. However, if you do not want to use the !BOOT operation then you could only CTRL Z BREAK the machine and it will enter the emulation the same as before, but without attempting to load in any BOOT files.

By the way, if you are having problems with the shift Z BREAK function when using Elite or Revs, you could always type in *RUN ELITE2 (or REVS2) and this will totally bypass the menu loader program, and operate the loading sequence properly.

Moving on to your second problem. Acorn have released details on the sideways RAM commands with the Master 128 series computers, and these are also supplied with the BBC+ 128 machines as well as in the form of the sideways RAM supplement user guide, which is essentially three pieces of paper to accompany the BAS128 disc. Hence the assistance gained from you BBC+ 128 friend. The sideways RAM supplement should be packaged with the Master computers, if, however you have not got one, then send off for one through your dealer, or photocopy the one your friend has got.

The information you so desperately require is in the form of the reference manuals (volumes one and two are both available now) these are an additional cost of £14.95 each and they have all of the relevant details regarding the use of sideways RAM, the built in operations of the machine and the specialised applications available when using the 1770 DFS and the ADFS.

In your third problem, you have fallen foul of the protection system employed by software houses when protecting their ROMs from being loaded into sideways RAM and thus being more easily copied.

The complete VIEW range is protected to the hilt with lots of routines to check for the possibility of piracy, and there are embedded codes in the ROMs to find out what batch they were taken from and who distributed them.

The problem of software piracy and making ROMs into RAM images is partially the reason why Acorn use a cartridge system for people complaining about ROM congestion. The software for sideways RAM can still be used for loading languages and some utilities, but the integrated suites of software (such as the VIEW family or the Inter series) are intended to be installed *inside* the machine. VIEWstore is an expensive product, making it likely that people will want to pirate it. If however, you are a legitimate user of the ROM, then you can either install the ROMs in a cartridge (far more convenient than a disc image anyway) and you can plug them in to your machine where and when you like.

The problem with the protection system employed in the Printmaster ROM is that the software author's protection system does one of two things. Firstly, the software checks to see whether the ROM was in the machine on power up, to combat this you will have to have it fitted as a ROM cartridge, or have the ROM as a RAM image in battery backup. Secondly, the ROM will try to overwrite the contents of RAM with garbage, if this is successful then the program was in sideways RAM and is thus a pirate... technically, (even if you are a legitimate user who wants to save on the number of ROM sockets being used at one time in your Master).

The process of writing to this area of memory will corrupt RAM and stop the image from working properly. There are two possibilities, you can either set up the ROM image in battery backed RAM and set up a write protect switch (used to stop any write operations being made to the bank of RAM),

or you could again, plug the Printmaster ROM in the machine, when it is switched off, and then turn it on.

The subject of sideways RAM is a complicated one, and articles in A&B are not hard to find (a *Bit on the Side*, buffering software, Jonathan Evans on data storage in Master 128 and Model BB sideways RAM etc) and we will endeavor to uncover secrets about the whole sideways RAM issue in the future.

By the way Anton, flattery will get you everywhere!



Spot the Difference II

Our article, "Spot the difference" has caught a few readers' eyes, especially Martin Ellis who has come up with a few more lists of incompatible software between the BBC Master 128 and the BBC model B.

As a result of your article, "Spot the difference" I have compiled a list of new games that are incompatible with the BBC B and the Master series computers. On certain occasions I must disagree with your previous list, as I have not been able to get *Elite* working or *Magic Mushrooms* to even load, I have also found a problem with *Repton 2*, when an egg was cracked. The *AMX Super Art* package works fine, except that you have to issue a CTRL-BREAK to reserve space instead of typing *BREAK. I have had no problems with the *Hobbit*, or *White Knight 12*, but anyway, the games not covered in your list are:

Block Busters
Beach Head
Asteroids Deluxe (Atari version) **Banjax**
Frak
Firehawks
Mr Wiz
Manic Miner
Grid Wars
Qbert
3d Space Ranger
Hunchback
Space Adventure
Citadel.

Just as a matter of interest, I have found a number of idiosyncrasies on the Master series computer. There is a command in the MOS called "X". This command just creates an infinite loop by going back on itself. The command *CLOSE closes all of the opened files but with their length as when they were opened. Finally, by pressing the shift key followed by a 0, more

often than not, it causes a lot of weird effects, as a result of this some people may think their keyboard is faulty.

Finally, I would like to comment on the letter from P. Nettle from Bolton that appeared in an earlier issue of Feedback. Whilst I fully sympathize with his position of having purchased a BBC+ 128 a week before the announcement of the Master 128's release, if he had read A&B properly he would have known of the rumours of a new machine. Indeed, I nearly purchased a BBC+ 128 instead of the new Master machine, but because of the rumours, I decided to wait a bit and see what happened. Also, his letter was the first I had read about Acorn no longer supporting the B+.... it was news to me!

Thank you for your list of games Martin, as regards to your findings: it may be that you are using an early version of ELITE on the BBC Master, as I can use ELITE on all the Master 128s I have tried. I have even played tube ELITE on the Master 128 with an externally fitted 6502 second processor with no problems.

The MOS command "X" is actually used to switch between tubes. As you are aware the BBC Master 128 has the option for connecting two second processors, one can be fitted internally (as in the Master 512) and the other can be plugged in as usual outside the case (such as the 6502 second processor or the Z80 CP/M option).

*X will jump between the two connected tube interfaces if they are powered and if you need to work from one tube (say the Turbo board). You can issue this command to jump into the externally fitted device, after a CTRL and a BREAK.

There is a companion command in the CONFIGURE table called *CONFIGURE INTUBE, (or EXTUBE). this is a selection operation for users who use either the control panel or for users who wish to start up in a particular mode of operation, such as booting into the GEM operating system from powering on.

Thank you for your comments about Acorn's release of the Master so soon after the BBC+ 128. I have received quite a bit of feedback on the subject; some people are saying that it was not right for Acorn to release the machine so soon after the BBC+ 128, and other Beeb users were glad to see the back of what they considered a design that was "too conservative by half".

C O N T I N U E S ►

FEEDBACK

I do not think it was foolish to buy a machine so close to the imminent release of the Master series because if we always waited for when the next best computer gets released, then we would never get around to buying a machine at all. This was an old trick used by some county councils in order to stop schools buying computers at all, because they considered the computer as an expensive luxury. When the BBC Micro came along the structure of educational computing was given a good shake and made to realise that children needed to be taught basic skills before they left school for further education or training at a job.

The more I and many users fiddle about with the BBC+ 128 and tinker with the Master, the more I see similarities between the machines. Software has been written to utilize the shadow RAM and sideways RAM facilities of both Plus and Master computers (such as the Lintrack Plotter software, or the ImagiNA software package, designed to work on a Master 128 or a BBC+ 128 with Graphics Extension ROM).

The fact is, that Acorn will stop supporting the BBC Micro and the Plus series in favour of the Master series computer. This is not to say that the software written for the BBC Master or Model BB will not operate on a BBC Micro or a BBC+ 64K or 128K, as the Acorn family of machines are all highly compatible, but Acorn will be taking into account the facilities of all their machines, but concentrating on the Master. VIEWspell is an example of this new look software. It does not need shadow RAM, but the buffering and speed of operation would be greatly enhanced if you did use it, or a Turbo board (or, to a lesser extent, a 6502 second processor for the Model B and B+ series).



EpigRAM

Cheap sideways RAM caught on like a house on fire amongst you readers who were willing to put solder to your Beebs and the success rate has been very high, proving that such a project can be undertaken by most

people willing to wield a soldering iron in the direction of their computer's PCBs.

Mr K Bird has installed his sideways RAM unit and is using it for a number of purposes, however, in his own words:

My main use for the BBC micro is as a word processor and I wonder if the RAM could be used as a printer buffer or even as a RAM disc. Are there any further articles in this area being planned, and is there any available software for the sideways RAM users?

The sideways RAM system will be used as the basis for programming projects in these pages in the future, as I mentioned earlier, there is some printer buffering software on the way, however, a 16K RAM disc would not do a lot of good to anyone as sixteen 1K programs can be written as procedures and do not really require the use of a RAM disc.

There are always possibilities, certainly a buffer program would be useful, as would a program to move all program data into sideways RAM, such as that fitted in the BBC+ 128 and the Master series computers.

Additional screen modes could be set up using the sideways RAM and also, the prospect of a "virtual" machine could be written into the MOS by having a large, general purpose buffer for use by all of the buffers in the machine.



Printer Problems

This letter from Joseph Mangion reflects a great deal of printer users who are wanting more from their dot matrix printers:

Can you please tell me how I can obtain NLQ print with my Star Delta printer which is capable of producing 240 dots per inch, it has an 8K printer buffer and two 2764 ROMs for the international character sets which I hardly use. Is it possible to replace these ROMs with an NLQ ROM, does the Epson NLQ ROM from Watford Electronics work with my printer?

My second problem concerns the 32K Solidisk sideways RAM. When I auto boot the SWR system disc containing the software, the menu displays the BASIC, the DFS and the additional ROMs in ROM banks 9 through to 11 instead of

numbers 1 through to 3 as is shown on other systems. All my peripherals work fine and I am considering using the 256K Solidisk board, but I am somewhat confused as to why the software displays banks 1 to 8 as empty with the 32K Sideways RAM board and why the order of the ROMs are moved about.

First of all, your Star Delta printer is Epson compatible, to a point, so it is likely that the Epson NLQ ROM will work with your printer, although how reliably no one can tell. You may wish to use an NLQ designer in conjunction with your printer, and various ones are available, especially one very good one for the Kaga and the Canon series of printers. One is being planned, I am reliably informed, for the Epson series of printers but in the meantime, you might like to try the Epson NLQ functions on the Watford ROM.

Your second point is a good deal more straightforward; when the Solidisk SWR board is fitted, (like most other ROM boards), it changes the order of priority for the ROMs that are fitted in the machine.

In the unexpanded BBC machines the ROMs are scanned from left to right, this is changed in a ROM board, so that the order is more likely to be the ROM board being scanned first, and the sockets last. This is why the order of priority changes on boards such as the ATPL board, the Watford boards, and the Solidisk series of sideways RAM boards.

The banks 1 to 8 are indeed empty as there is only 32K RAM built into the board (equivalent to four 8K sockets or two 16K sockets) and as the priority of the ROMs now go downwards from 15 down to 0 then those that have no memory to be filled up, will be shown as empty. You will find that the more memory you have (all the way up to 256K) the more sockets will become available to you.

I'm afraid that's all I can fit in this month, so if you have any queries about your Acorn machines, or any associated hardware or software, please send your letters to

Feedback, A&B Computing, No 1 Golden Square, London W1R 3AB. Please don't forget to enclose a disc or a cassette if it is a problem regarding a program or programming, don't forget to enclose a ROM list so that I can look for command or workspace clashes. So until next month, cheerio!

1st in BROMLEY

6502 & Z80 SECOND PROCESSORS
TELETEXT ADAPTORS
TORCH Z80 DISC PACK
MICROVITEC MONITORS
EPSON PRINTERS
GRAF PAD
BITSTIK

EVERYTHING FOR THE BBC OWNER

ACORN
VOLTMAZE
QUICKSHOT
JOYSTICKS
RH VIDEO DIGITISER
ACACIA RTC & RAM UNIT
CUMANA & MIDWICH DISC DRIVES
NEW INDEX UTILITY ROM

THE DATA STORE
6 CHATTERTON ROAD, BROMLEY, KENT
01 - 460 8991

NEW
MICRO-MAILER

A LOW COST DISC BASED

PROFESSIONAL ACCOUNTING PROGRAM

For The BBC Computer

"Micro-Trader"

INTEGRATED SALES PURCHASE AND NOMINAL LEDGERS

Designed for business use by a business man. "Micro-Trader" Sales and Purchase Ledger Transactions are updated to the Nominal Ledger.

"Micro-Trader" offers full Sales and Purchase Ledger facilities including SALES INVOICE and STATEMENT PRINTING with a capacity of 450 accounts and 3000 transactions per month in each Ledger.

Normal Income, Expenditure, Assets, Liabilities & Journal Posting in the Nominal Ledger with full Reporting for individual accounts, Audit Trail, Trial Balance, Profit & Loss and Balance Sheet.

"MICRO-STOCK"

Stock Control program, fully integrated with "Micro-Trader". 4000 Stock Items with user defined Codes, Invoice and Credit Notes and Cash Sales routine. Full Stock Held Reports.

£95.00 + V.A.T.



NEW MASTER SERIES
COMPATIBLE

NEW "MICRO-MAILER"

A Mailmerge program, fully integrated with "MICRO-TRADER" With a user Database.

£45.00 + V.A.T.



PHONE TODAY FOR A FREE FACT SHEET

MEADOW COMPUTERS

11, LONDON STREET, WHITCHURCH, HAMPSHIRE, RG28 7LH

Telephone: Whitchurch (025682) 2008

DIGIMOUSE™ ACCURATE & POSITIVE MOUSE CONTROL



For BBC B,B+
or Master

DIGIMOUSE is especially designed to fit comfortably in the hand to give you a truly positive and stable movement control.

This quality British Mouse has a non-slip polyurethane ball and encoder system, precision engineered to give you lasting accuracy.

Connects to the user port and is compatible with many existing graphic art and word processing packages including AMX and Wigmore.

Price includes machine code routines to help you add mouse control to your own programs.

Grafik MOUSE SOFTWARE

A practical and inexpensive graphics software package for user-friendly introduction to CAD.

Input is by DIGIMOUSE and FUNCTION KEYS for the most efficient and accurate production of complex designs.

Some of the many features are:

Rubber Banding on all drawing options • Colour and fill • Adjustable brush size • Text insertion • Alignment grid • Mode selection • Printer dump • Large drawing area • Save and load to disk

GRAFIK is supplied with user routines on disk in 40T or 80T format plus a comprehensive operating guide and demonstration.

DIGIMOUSE with GRAFIK complete **£43.40** PLUS £1 P&P PLUS VAT
BBC DIGIMOUSE with user routines only **£30.40** PLUS £1 P&P PLUS VAT



PROGRAM SPEED CONTROLLER

A UNIQUE COMPUTER TEACHING AID FOR BBC B,B+ OR MASTER

SLOW MOTION — enables the teacher to set the speed of the program to individual pupil's ability.

Infinitely variable speed control for games and teaching programs without the need for special software.

Simply press for 'on', adjust speed, press for 'off'.

FREEZE FRAME — allows programs to be interrupted and halted at any point for discussion purposes or special emphasis. Press to 'Freeze', release to return to previously set speed.



**SLOMO WITH CABLE
AND CONNECTOR FOR
FITTING DIRECTLY TO
THE BBC TUBE PORT**
£13.00 + VAT

PARTICULARLY SUITABLE FOR YOUNGER CHILDREN
OR THOSE WITH SPECIAL NEEDS

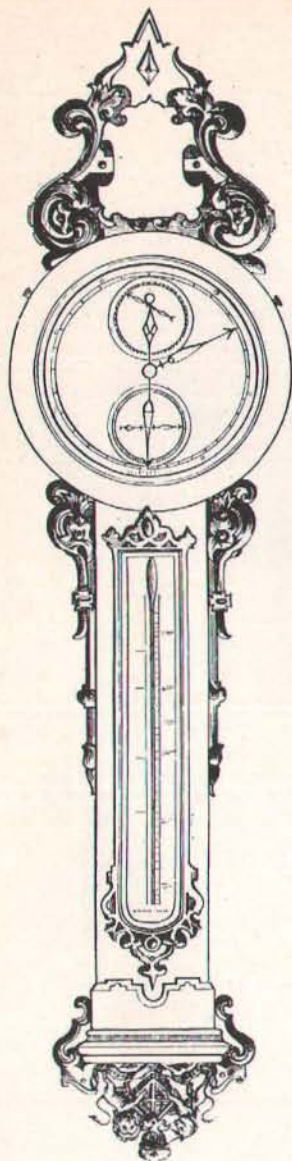
Fully guaranteed, high quality British products

ORDERING INFORMATION

Please send cheque, PO or Access details to the Department address shown below. We accept official orders from UK Government and educational establishments. Allow 14 days delivery. If you require more information or advice telephone Harrogate (0423) 864488.

NIDD VALLEY MICRO PRODUCTS LTD

Dept. AB 1086 FREEPOST, KNARESBOROUGH, N. YORKS. HG5 8YZ
Telephone: Harrogate 0423-864488



COMPETITION

Let's get trivial! Win our great Trivial Pursuits competition and go for gold!



Although some may say that A&B is known for serious, hard-hitting exposes of the scRAMbled world of microcomputing, we know better. We can get trivial, in fact we can get downright trivial.

What further excuse do we need, therefore, to expose our inner selves than the release by Domark of the computer game version of *Trivial Pursuit*? You probably know the original board game, if only by reputation and the computer game is supposed to be just as good. How would you like to win a solid gold set, and really keep up with the Jones'!

To coincide with the launch of *Trivial Pursuit*, Domark are organising a Golden Trivia Challenge for which the overall prize is a *Trivial Pursuit* board game with solid gold pieces — the only one of its kind and worth about £10,000!

Not bad for an A&B competition...

Of course, it's not that easy. Our competition is only the first stage on the road to gold, but it's a good start. The winner of the A&B *Trivial Pursuit* competition will win:

- A copy of the new Genus II Edition of *Trivial Pursuit* — the board game.
- An all expenses paid trip to London to take part in the grand final during November. The winner of the grand final will win the solid gold game.

And to show that even losers can be winners, the four runners-up will receive copies of the Genus II Edition and a further ten runners-up will receive a pack of *Trivial Pursuit* After Dinner Chocolate Mints. (It's almost worth coming in second...

How to Enter

The aim of *Trivial Pursuit* is to show yourself master of useless knowledge. We've based our questions on the six categories found in the board game and they're not that easy. Fill in the answers on the coupon to the best of your ability and then tackle the seventh question. Imagination here may be the key to the golden horde so think carefully!

The Questions

- 1 Geography Which country has Muscat as its capital?
- 2 Entertainment In which film did Duran Duran find inspiration for their name?
- 3 History What was the cover date of the very first A&B Computing?
- 4 Art & Literature Who wrote Beethoven's '10th' Symphony?
- 5 Science & Nature What is 999 in hex?
- 6 Sports & Leisure What is a chukka?
- 7 Tie Breaker Write your own *Trivial Pursuit* question (we'd quite like the answer too!) based on any of the categories. Domark might want to use your question in a future data tape for the game so make it a goodie and keep it trivial!

The rules

Entries will not be accepted from Argus Specialist Publications Ltd, their printers and distributors and staff of Domark Ltd. This restriction also applies to employees' families and agents of the companies.

The winners will be notified once the competition has closed and the results will be published in a future issue of A&B Computing.

No correspondence will be entered into with regard to this competition and it is a condition of entry that the Editor's decision is final. The How to Enter section forms part of the rules.

All entries shall become the property of Domark Ltd.



Trivial Pursuit Competition — A&B Computing October 1986

I think the answers are:

- 1
- 2
- 3
- 4
- 5
- 6
- 7 My Trivial Pursuit question is

The answer is

Name

Age (if under 18)

Address

Postcode

Telephone

Please complete this coupon (or a copy) and send it with your entry to Trivial Pursuit Competition, A&B Computing, ASP, 1 Golden Square, London W1R 3AB to arrive no later than 20th October 1986.



SLOGGER

SLOGGER'S LATEST PRODUCT THE 'MASTER' RAM BOARD

The massive 32k Shadow RAM gives you the first
64K ELECTRON

* Shadow Ram is one of the most powerful features of the BBC Master Series, which puts it in a class of its own.

In "Shadow Mode", not only your BASIC programs, but also your STARWORD, STARSTORE, VIEW, VIEWSTORE, VIEWSHEET files or MACHINE CODE programs, in fact virtually all correctly written programs (except most games), can now be as large as 28,000 BYTES IN ANY SCREEN MODE.

This means that your VIEW or STARWORD files can be more than twice as large (three times as large if you are working in 80 column mode).

If this is not enough, you also get a speed increase similar to the Turbo Driver.

It is common knowledge that games will not run with either Shadow RAM or Second Processors. for this reason, Slogger have designed in a "TURBO mode" so that games players can also reap the full benefit of this "Multi-function" unit.

A three position switch allows the user to quickly change between NORMAL, SHADOW and TURBO modes.

The screen uses a maximum of 20K which leaves 12,000 bytes free. Slogger has taken this into account in its operating system (fitted to the board) so that it can be used as 12K printer buffer for instance.

The Master RAM Board is FULLY COMPATIBLE WITH ALL CURRENT ELECTRON ADD-ONS except the Turbo-Driver (both units fit into the 6502 Microprocessor socket).

The Master RAM Board is available in two forms

1. kit form... a fully built board including components (except 6502 Microprocessor) and switch.

Order MR2 for only 54.95

2. Installation service... send your Electron to us FREEPOST and it will be upgraded to 64K and returned to you within seven days of receipt by SLOGGER (using the cut out below).

Fitted, tested including carriage paid both ways PLUS ONE YEARS FULL WARRANTY.

Order MR1 for only 64.95.

THE ELK TURBO-DRIVER



(DESIGNED BY ANDYK LTD)

INCREASES THE SPEED OF YOUR

ELECTRON COMPARABLE TO THE BBC

★★ UP TO 100% IMPROVEMENT IN SPEED ★★

★★ ABLE TO RUN BBC SOFTWARE (Non Mode 7)

WHERE SPEED WAS THE LIMITING FACTOR ★★

(Such as Acornsoft's Aviator Flight Simulator)

★★ MAKES ELECTRON SOFTWARE RUN FASTER ★★

**CAN BE SWITCHED BETWEEN NORMAL AND
"TURBO-DRIVE"**

★★ OPERATES IN ALL ELECTRON MODES ★★

★★ NO SOFTWARE MODIFICATION REQUIRED ★★

★★ COMPATIBLE WITH ALL ADD-ONS

ALL EXCEPT THE MASTER RAMBOARD

Plus 1, Plus 3, Rombox, Adaptor Boards, etc) ★★

Your upgraded Electron will be returned within 7 days of receipt
by SLOGGER

All Inclusive ONLY £42.00 (VAT included)

Fitted, Tested, Including switch, carriage paid both ways

PLEASE QUOTE T-D1 ON ORDER FORM

The Upgrade 'TURBO-DRIVER' Kit available

(including switch)

PLEASE QUOTE ON FORM T-D2 £29.95 Incl. P&P

Parcel Post
Amount of
postage to be
paid by
licensee

Postage Forward Parcel Service
Licence no. GJC1

No postage stamp
necessary
unless posted in
Channel Islands
Isle of Man or
Republic of Ireland

Date stamp

**SLOGGER LTD
107 RICHMOND ROAD
GILLINGHAM
KENT
ME7 1BR**

Slogger's unique guarantee!!!

The guaranteed seven day installation service
SLOGGER is providing a unique service with guarantees
to return your Electron with the "TURBO-DRIVER" or
**MASTER" RAM BOARD, installed WITHIN SEVEN
DAYS OF ITS RECEIPT!!!**

Simply enclose your order with your Electron (in its
original packing if possible) and send using the "Free
post" address label opposite.

T2P3

T2CU

T2P4

THE TAPE TO DISK COPIERS

A ROM utility for transferring the majority of all cassette software, Eg. Acornsoft and Micropower, to the various Electron Disk systems.

Please order:

T2P3 for the PLUS 3

T2CU for the CUMANA DFS

And, under development, coming Soon,

T2P4 for the A.C.P. 1770 DFS

STILL ONLY £19.95

VINE MICRO'S ADDCOM ROM

★ 40 Commands.

★ Graphics, Toolkit and Logic Graphics.

NOW ONLY £26.00

VINE MICRO'S MATRIX ROM

The Matrix ROM provides a comprehensive range of commands for performing matrix operations (including inversion).

ONLY £36.00 PLUS VAT

PLUS 1 ROM UPGRADE

Replacement 8K Eeprom to allow loading of cassette Software in High resolution Modes. Allows Basic to be called instead of being forced into another language on Switch On or CTRL-BREAK.

ONLY £7.95

STARGRAPH (8K ROM)

Graphics utility giving screen dump to a range of printers, with printings of TEXT at any angle or any size, circles, eclipses, polygons, dotted lines, colour filling plus saving of screens to tape or disk for future use.

ONLY £21.95

★ **NOW AVAILABLE** ★

★ THE SLOGGER ROM CARTRIDGE ★

TWIN ROM ADAPTORS DESIGNED TO CARRY ANY 8K or 16K EPROM FOR THE ACORN PLUS ONE, SLOGGER ROMBOX PLUS AND THE BBC MASTER SERIES.

ONLY £12.95.

16K SIDEWAYS RAM

Has the provision to run Sideways ROMS as well as being selectable as a 16,000 byte print buffer, provided that you have ROMBOX-PLUS or PRINTER ROM.

★ COMPLETE WITH RAMS

★ WRITE PROTECTED

★ NO SOLDERING

★ SIMPLY FITS INTO A ROM SLOT ON ANY SLOGGER ROMBOX.

★ ONLY £29.95.

ELKMAN (8K ROM)

An Electron system manager providing the ability to save and then load ROM images for use in sideways RAM.

Gives complete control of all ROMS and interface units present on the system.

ONLY £17.50.

*TREK (16K ROM)

A ROM disassembler with a difference. Ideal for beginners not only to Machine Code but to the Electron itself as this ROM Utility actually COMMENTS as it disassembles, a feature found in no other package.

SPECIAL INTRODUCTORY PRICE £17.50

RS423 SERIAL PORT

Has Drive capability and Software Interface as on the BBC Model "B". Plugs directly into Plus 1 Cartridge slot.

ONLY £39.99

STARMON (8K ROM) MACHINE CODE MONITOR

★ Display of memory in: ASCII and binary, decimal, octal or hexadecimal.

★ Full support of sideways ROMs.

★ Comprehensive debugging facilities, including breakpoints, traces and events.

★ "a very professional piece of firmware" ... Acorn User.

ONLY £22.50

SLOGGER'S AUTHORISED DEALERS

DA COMPUTERS LTD, 105 London Road, Leicester, Tel: Leicester (0533) 549407.

WEST WILTS MICROS, 3 White Hart Yard, Trowbridge, Wiltshire. Tel: Trowbridge (02214) 62759.

MICROWAY, 39 High Street, Rainham, Kent. Tel: Rainham (0634) 376702.

ELECTRONEQUIP, 59 West Street, Fareham, Hants. Tel: Fareham (0329) 230671.

GLASGOW COMPUTER DEPOT, 205 Buchanan Street, Glasgow G1 2JZ. Tel: Glasgow (041) 332 3944.

GAMER COMPUTERS, 71 East Street, Brighton BN1 1HQ. Tel: Brighton (0273) 728681.

VELOBYTE COMPUTERS, Schiedamsedijk 5A-6A, 3011 EB Rotterdam, Netherlands. Tel: Rotterdam, Holland (10) 4138197.

MICRO BRIDGE, 75 Goodramgate, York YO1 2LS. Tel: York (0904) 39449

MAIL ORDER ONLY

COMPUTER CUPBOARD, 53 Brunswick Road, Ealing, London W15 1AQ.

21ST SOFTWARE, 15 Bridgefield Avenue, Wilmslow, Cheshire SK9 2JS. Tel: Wilmslow (0625) 528885.

VISA



**SEND
FOR
THEM
TODAY**

Cheques payable to:
SLOGGER LTD.

Expiry Date

PLEASE SUPPLY

Cost

☐ Access No.

1 _____ £ _____

☐ Visa

2 _____ £ _____

Name

3 _____ £ _____

Address

4 _____ £ _____

5 _____ £ _____

Signed Tel. No:

Send Orders to: **SLOGGER LTD.**
107 RICHMOND ROAD, GILLINGHAM, KENT

Total £

DEALER ENQUIRIES WELCOME. TEL: 0634 52303 (2 lines)

(A+B)

New

ELECTRON THE ROMBOX PLUS

New

A direct replacement for the Acorn Plus I

- ★ Two Cartridge slots
- ★ Four ROM Sockets
- ★ Centronics Printer Interface
- ★ Joystick Interface available for the Cartridge slot. (Separate purchase £49.95)
- ★ Ability to carry 64K of sideways RAM

49.95**49.95**

STARWORD (16K ROM)

A Professional word Processor for UNDER £35

- ★ Does everything VIEW does plus MUCH MORE!

Designed for the home user, education or small business needs, STARWORD enables even those with limited typing skills to produce and print letters, manuals or reports using the Electron.

- ★ 40 and 80 column screen modes.
- ★ 132 column text width max.
- ★ Variable margins and tabs.
- ★ Formatting and justification.
- ★ Very extensive printer control facilities.
- ★ Very large documents, letters no problem.
- ★ Search, Find, replace.
- ★ Move, Copy, Insert.
- ★ Extensive single key editing.
- ★ Proper Mailmerge with STARSTORE & STARSTORE II.
- ★ Text spooling.
- ★ Headers, Footers, Page numbers.
- ★ Text remains through BREAK.
- ★ Printer driver for compatible EPSON printers.
- ★ Very easy to use.
- ★ 120 page well written manual.

"It is certainly the most powerful currently available for the Electron". ELECTRON USER April '86.

ONLY £34.50

STARWORD for CUMANA DISK (16K ROM) INTERFACE

Enhanced version of Starword using the Cumana clock to allow Day, Date and Time stamping when printing. A feature available on only the best Word Processors!

ONLY £34.50

PRINTER DRIVER for STARWORD (16K ROM)

Use any printer with STARWORD.

ROM £9.95

STARSTORE (ON 8K ROM)

Store and retrieve your names and addresses or any other information with the STARSTORE DATABASE, written specially for the Electron, STARSTORE works with STARWORD for personalising standard letters (mailmerging).

ONLY £21.95

STARSTORE II (16K ROM)

- ★ New improved more powerful Database for Disk Users.
- ★ Maximum of 90 Fields.
- ★ Maximum 10 character Field name.
- ★ 254 characters per field.
- ★ Maximum of 9999 records otherwise limited to size of disk.
- ★ Formatted printing to allow fields at specific point.

ONLY £29.95

ROMBOX

Now in its third year of manufacture, the ROMBOX still offers superb value for money giving the following features:

- ★ Runs all good (non Mode 7) BBC or Electron ROM software.
- ★ Fully compatible with Plus 1, Plus 3 and all Plus 1 and ROMBOX Plus add-ons.
- ★ Up to 8k ROMs instantly selectable.
- ★ Supports 8k and 16k sideways RAM.
- ★ Allows further expansion at rear.

STILL ONLY £44.95

ROMBOX - P

Offers all the features of ROMBOX Plus built-in centronics printer interface and FREE Printer ROM (worth over £20).

- ★ Up to 8 ROMs instantly selectable.
- ★ Selectable 8/16K Print buffer to increase throughput.
- ★ The ideal word processing station with Plus 3 fitted.
- ★ FREE Printer ROM included.
- ★ Superb value for money at **ONLY £69.95**

PRINTER ROM (8K ROM)

Allows use of sideways RAM as 8K or 16K print buffer and offers a host of useful utilities for ANY printer. Ideal for all your printing requirements.

- ★ Electron/BBC compatible.

ONLY £24.95

CUMANA DISK STARTER PACK

- ★ 40T Single Sided Double Density BBC Drive
- ★ Interface slots simply into Plus I or ROMBOX Plus Cartridges
- ★ Uses no RAM
- ★ Additional Sideways ROM Socket
- ★ Real Time Clock & Calendar with battery and backup.

Price **£169.95** with carriage etc.

S.E.D.F.S.

SLOGGER ELECTRON DISK FILING SYSTEM

A brand new upgrade ROM for the CUMANA INTERFACE allowing BBC compatibility. Please phone for details.

FEELING THE SQUEEZE

If you only ever store numerical data in your BASIC programs by using the standard variable formats, integers and reals, then the chances are that on many occasions you are using far more memory than is actually required for the job in hand. An integer variable, for example, uses four bytes, letting you store a range of numbers from -2147483648 to +2147483647, but how often do you really need anything like this range? Of course if you use the standard variables then you can exploit all the facilities provided in BBC BASIC for memory management of the stored numbers, and if memory is not at a premium then do this by all means, but if your application requires the maximum possible memory it may well be worth sacrificing the convenience of the standard variables and adopting a data compression technique, which simply means storing the data in such a way as to consume the minimum of memory necessary. Perhaps a couple of examples will make the point more clearly.

Suppose you are writing a data base which requires the storage of the ages of individuals, then you are hardly likely to need the full range available in integer variables. One byte, allowing storage of numbers from 0 to 255 will be more than enough, indeed four bits, from 0 to 127 is probably adequate. An even more extravagant situation arises if the information to be stored is simply a flag, that is a variable with only two values, say TRUE or FALSE. This only really requires one bit, set to the value one or reset to zero, to store all the information. Even using one byte to store this is a waste of seven bits and using an integer variable is a positively exorbitant squandering of memory. Nonetheless we all do it I suspect.

You are almost certainly using more memory for storing numbers than you need to. Let us show you how to be more mean with your RAM

Let me say at this point that the foregoing is not intended to be a critical comment on BBC BASIC, or indeed any other language which exhibits the same features and most languages do. The preset variable ranges, and the consequent pre-determined memory requirement, make for a high degree of flexibility in use of the variables and the programmer usually does not have to think about the range of values that might arise in the program. The available range is typically very large and a "Too Big" error most unlikely. Nonetheless, as we have seen, this approach can lead to an extravagant use of memory.

Some compiled languages, notably PASCAL, allow the definition of variable types by the programmer and the compiler will then arrange the most economical method of storage. You might, for example, define a new type of variable called BYTE and specify that it covers the range 0 to 255, the compiler will then allocate one byte to all such variables and send an error message if an attempt is made to assign a value outside the specified range. Similarly PASCAL has a variable type for flags called BOOLEAN. Such variables can only take the values TRUE or FALSE and a good PASCAL compiler will store them in a single bit.

Make Room

BASICs do not have these types of facilities but it is possible, by taking a more direct approach to storing your data, to operate with a similar economy of memory usage within BASIC. The first thing that you will need to do is to set aside space to store the data and the best way to do this is with the DIM statement, not the one used for setting up arrays but the one without brackets which reserves a block of memory of a specified size. You can see an example of this in line 2 of listing 1 where 30 bytes of storage are set up; notice that as with an ordinary array the number of members is one more than the number declared in the DIM statement. The address of the start of this reserved space is now kept in the variable store% and to access it you must use indirection operators, "?", "\$" and "!", so to write a byte into the first storage location we would need a line such as:

```
10 ?store%=byte%
```

and the value can be recovered by:

```
20 byte%=?store%
```

The second location in the store

can be accessed in a similar manner by replacing ?store% in these examples by ?(store%+1) and so on up to the last location which is ?(store%+29). What we really have is an array of 30 bytes and the nth byte is at address store%+n, where n runs from zero to 29. Any number from zero to 255 can be stored in these array elements, a big saving over a conventional integer array which would need four bytes per element, 120 in all.

Multiple Bytes

So far we have talked only about storing one byte, and also four byte numbers in the conventional integer array, but what about two bytes and three bytes? Two bytes will give you zero to 65535 and 3 bytes up to 16777215, so there is plenty of scope before you need to turn to integer variables.

Let us first consider two byte storage and it might be helpful to look, in the first instance, at a hypothetical computer which uses decimal rather than binary arithmetic. Let us further suppose that such a machine has as its basic storage location a memory cell which could store numbers from zero to 99, this cell is the equivalent of a byte in the conventional computer, I will call it a "dye", short for decimal byte.

If we wanted to store a number in the range zero to 99 then all would be well, we could use one dye, above 99 however we would need a second dye and the logical way to store the number would be to use one of the dyes to hold the first two digits of the number and the second to hold the second two digits. The first two digits represent the tens and units of the number and the second two the number of hundreds in it. So if the number were 1467 it would be stored as two dyes one holding 14

and the other holding 67. The dyte holding the bulk of the number, the number of hundreds, 14, would be called the "most significant dyte" and the 67 would be held as the "least significant dyte". To recover the number we merely retrieve the most significant part, multiply by 100, and then add the least significant part; our number is $(14 \times 100) + 67 = 1467$. The limit of storage of two dytes would be 9999 and three dytes could store up to 999999, one dyte holds the tens and units, one the number of hundreds and the third the number of ten thousands.

eight bits is the binary $\%11111111$, which corresponds to the decimal 255 so storing numbers up to 255 is straightforward enough. If we want to extend the range to two bytes then the most significant byte will hold the number of 256s in our number in just the same way as the most significant dyte in our decimal computer held the number of hundreds. So if we want to store the number 1467 the most significant byte will be $(1467 \text{ DIV } 256) = 5$ and the least significant byte $(1467 \text{ MOD } 256) = 187$. To reconstruct the number we recover the bytes and

ten, as we normally do, we work to the base sixteen, the hexadecimal system, then 256 decimal is &100 hexadecimal and everything looks neat again. Indeed the manipulation of the eight bit locations becomes exactly the same as would be the case for decimals if you regard the numbers stored in eight bit chunks as hexadecimal. Our number 1467 decimal is &5BB in hex, the most significant byte is &5, which is also 5 in decimal, and the least significant byte is &BB, which is 187 in decimal so everything matches up. If we go to three bytes the least significant

need to break them up into pieces based on the hexadecimal system and then store the separate bytes in a standard format so that we know which is the most and which the least significant. It is conventional to store the most significant byte in the highest memory location and the remainder lower in memory, in order of priority, ending with the least significant byte in the lowest address location. Listing 1 provides routines for the storage and recovery of two byte numbers and listing 2 extends this to three bytes.

You should be able to follow

The A&B Patent Memory Saver

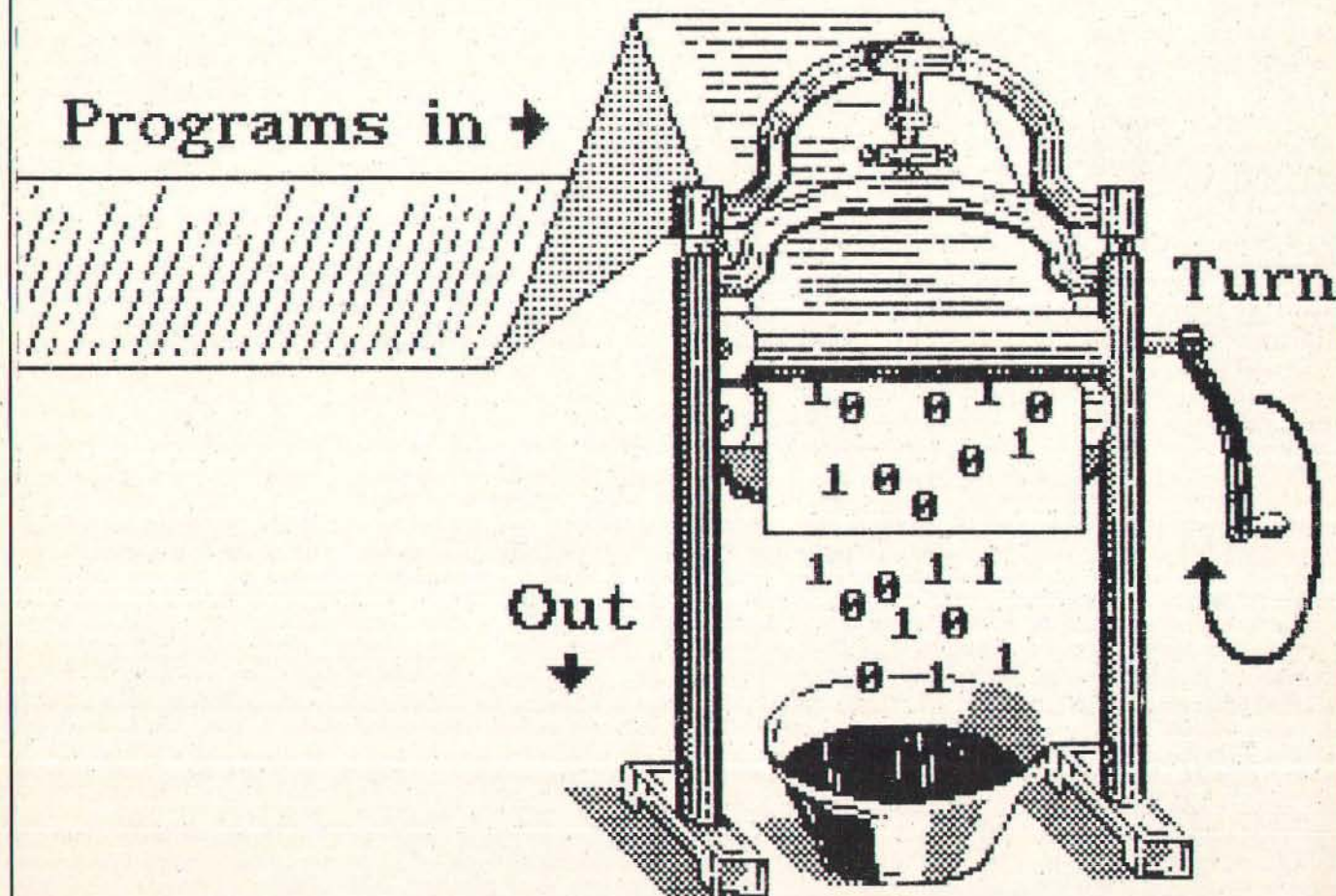


Illustration by Jonathan Inglis

Hexadecimals and Binary

What then about binary numbers stored in eight bit locations which is the conventional arrangement on most micros? The maximum number which can be stored in

perform the calculation $(5 \times 256) + 187 = 1467$.

So the method for binary numbers stored in eight bit bytes is exactly the same as with our decimal machine except that rather than 100 we have the rather odd value 256. However, if rather than working with numbers to the base

one contains the hex units and tens, the next the hex hundreds and the most significant byte will have the number of &10000s in the number.

Putting it into Practice

So to store multi-byte numbers we

Listing 1 without any trouble now, but splitting a number into three bytes, as shown in Listing 2 needs a little further scrutiny. Line 13 is simple enough, it calculates the number of &100000s in the number, but before we then go on to calculate the number of &100s, at line 15, we must discard the

&1000s since the &100s in these have already been counted, as it were. Hence the need for line 13, the effect of which is to strip off the most significant byte.

Bits of Bytes

Well so much for numbers which can be represented as whole numbers of bytes, but what about the question of the use of individual bits as flags and, for that matter, what about the question of using other sub-divisions of bytes? To take a practical example, suppose that you are logging the output of the BBC's analogue to digital converter, which returns a number precise to only ten bits. The most economical way to store the data would be to use one whole byte and then two bits from another byte. In this kind of case we will need to view a byte in a completely new way, not as a whole, but as a collection of bits each with its own, individual, significance. Moreover, we will need to have ways of manipulating specific bits in a byte without affecting other bits. The example that I have already referred to, that of using a single bit to represent TRUE or FALSE requires a similar capability.

Performing this kind of manipulation requires an excursion into Boolean, or logical, arithmetic but first we need to look at the way binary numbers themselves are constructed.

The binary system is exactly the same as the decimal system in the way the numbers are presented, except that base two rather than ten is used. The important part of the similarity is that the position of a digit in the number establishes its significance. So our decimal number 1467 can be represented as $(1 \times 1000) + (4 \times 100) + (6 \times 10) + (7)$ or $(1 \times 10^3) + (4 \times 10^2) + (6 \times 10^1) + (7 \times 10^0)$. The number in the n th position from the right is understood as being multiplied by 10 to the power of $(n-1)$. Binary numbers are exactly the same except that ten is replaced by 2. So $\%1101$ is $(1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0)$ which is 13 in decimal.

Now suppose that we want to construct the binary number with the third bit from the right hand end set to one and all the other bits reset to zero, i.e. $\%0100$, then this is simply given by $2^2=4$. In general the number with the n th bit set and all other bits reset will be

2^{n-1} . In a similar fashion we can get any bit pattern that we want into a byte and so use individual bits to have significance. However this is not quite what we require to do, what we really need is a mechanism that will let us set or reset a specific bit, or bits, in a number whilst leaving all the rest untouched. Then we really can use bits in isolation and forget about the byte as a whole. It is for this type of operation that the Boolean arithmetic comes in.

Masks and Bytes

You will find a full exposition of Boolean operations in any book on assembly language but here a few rules of thumb will suffice to get you started on the right lines for making use of Boolean operations to tackle the job in hand. Boolean arithmetic is similar to the more familiar type except that the operations are logical rather than numerical, so instead of operations like plus, minus multiplication and division we have transformations brought about by operators such as "AND", "OR" and "EOR". You will be familiar with AND and OR, at least, from normal logical comparisons in IF statements in BASIC. Here too Boolean arithmetic is actually being performed but the syntax of BASIC is such that you do not need to think of a multiple IF statement in Boolean terms, it looks more or less like English and the interpreter does the work.

The following rules are all that are needed to do most of the manipulations that you will need to manipulate bit patterns, you do not have to understand the mechanics of doing the logical arithmetic the computer will do it for you:

1. To reverse all the bits in a number it must be EORed with the binary number $\%11111111$, which is hexadecimal &FF. For example 23 decimal is $\%00010111$ so 23 EOR &FF is $\%11101000$, or decimal 232.

2. To set specific bits in a number the number must be ORed with another number in which only the corresponding bits are set. Suppose, again, we had a byte containing 23 decimal and we wanted to set bits 5 and 7 without affecting the remaining bits then we would need to OR 23 with the binary number $\%10100000$, 160 decimal. 23 OR 160=183 which is,

in binary, $\%10110111$ and the desired effect is achieved. The number used to carry out the transformation, 160 in the example above, is usually referred to as the "mask" since it defines the bits to be manipulated, so rule two can be re-phrased as "To set specific bits in a number OR with a mask with the corresponding bits set".

3. Resetting specific bits is achieved in a similar manner, again using a mask. To reset bits in a number AND it with a mask in which the corresponding bits are reset and all other bits are set. Taking our decimal 23 as an example yet again, to reset bits 1 and 2 we will need, as a mask, $\%11111001$, which is decimal 249. 23 AND 249=17 which is $\%00010001$, exactly as required.

An extension of this rule can be used to extract a particular bit or sequence of bits from a byte. The trick is to reset all the bits in the number except those of interest and then look at the resulting number. As an example let us consider the problem of retrieving the stored version of the 10-bit number derived from the ADC. The obvious technique is to store the value as one whole byte with the odd two bits being held in a second byte. If we are to benefit, however, this second byte must hold the odd two bits from four ADC readings and we must extract them individually. Suppose the byte in question holds $\%10110001$. Reading the value held in bits 0 and 1 is easy, we simply AND the byte with a the mask $\%00000011$ which will give $\%00000001$, effectively obliterating all but bits of significance to us, and the number held is 1.

Extracting values held in other than bits 0 and 1 requires a little more work, let us try bits 4 and 5. If we AND with the appropriate mask, which is $\%00110000$ we will get $\%00110000$. We have isolated the bit pattern that we want but we cannot just use the number that we get directly, the value that we have in the two bits of interest is $\%11$, or 3 decimal so to get the correct value we need to perform the binary equivalent of moving the decimal point four places to the left to transform $\%00110000$ into $\%11$. Moving the decimal point by four places is the same as dividing by 10000 or 10^4 , the binary equivalent is to divide by 2^4 , or 16. You can perhaps now see why it is useful to understand the way in which binary numbers work.

If we were extracting our value

from bits 6 and 7 the required operation would be to AND with $\%11000000$ and then move the binary point by six places, that is divide by 2^6 .

A Look at Listing 3

Listing 3 gives the complete procedure for storing and retrieving 10 bit numbers. Line 3 reserves space for the storage of 16 numbers, the array `lowbits%` being used for the eight least significant bits and `topbits%` holding the two remaining bits. The procedure starting at line 13 stores the number, the least significant eight bits being extracted at line 15. Line 16 determines which byte in `topbits%` will store the two most significant. Line 17 determines which two bits within this byte will actually be used by calculating a value for `shift%` which, when multiplied by three, will provide a mask with only the two bits in question set. For example if `shift%=1` then the mask will be $\%00000011$, bits 0 and 1 in use, and for bits 6 and 7 the mask will be $\%11000000$ which is 3×64 , that is `shift%=64`. What we are really doing is always starting with the mask $\%00000011$, decimal 3, and then moving the binary point by the necessary number of places to put the two ones in the position where we want them to give the actual mask needed.

Once we have the mask then manipulating the two bytes of interest is easy enough. Line 19 makes sure that the bits are both reset by reversing the mask (see rule 1) and then ANDing the byte with it. This means that all we need to do to get the value that we want into the two bits is to set the appropriate bits with the OR operation at line 20.

Recovering the value is done in the procedure at line 23 and uses the same mask, calculated at lines 26 and 27. The bits required are isolated by the AND operation, line 28, the point shift is carried out and then the two bit value multiplied up by 256 to take account of the fact that these two bits are the most significant ones in the 10-bit number. All that is then needed is to add the value stored in the least significant byte.

This probably all seems rather complicated but is well worth getting to grips with. Apart from the utility of the methods for saving memory the process of learning to use them will involve you in coming to a better understanding of

MODEL B/B+/MASTER 128/ELECTRON

the way binary numbers work and, perhaps, you will also appreciate why computers work with what is, at first sight, a very awkward number system!

A Final Piece of Logic

Let me leave you with Listing 4, which implements a PASCAL type array of Boolean already referred to, that is using only one bit to store

flags. The storage procedure at line 15 is similar to the one in Listing 3 except that, since only one bit is involved, all that is required is to identify it and then either set it or reset it, at line 21. Retrieval, in the procedure at line 24, is also simplified since we only need to identify whether the bit of relevance is set or reset. Line 30 does this by masking out all the other bits and then testing to see whether what is

left is zero or not.

Obviously I have only scratched the surface of the use of Boolean arithmetic and the full understanding of binary numbers but I hope that you will see how the efficiency with which you can use your memory can be enhanced by even this simple understanding and that you will be tempted to look further into this interesting subject. You will find that binary

numbers are not really as weird as you thought, and, if you can understand numbers from your computer's viewpoint rather than being constrained by the decimal system, you will find that many things become easier, especially if you are ever tempted into assembly language.

◆ LISTING 1 ◆

```
1 REM*STORAGE OF TWO BYTE NUMBER*
2 DIM store% 29
3 FOR i%=0 TO 9
4 INPUT LINE "No. "val%
5 PROCstore(val%,i%)
6 NEXT
7 FOR i%=0 TO 9:PRINT FNrecover(i%):NEXT
8 END
9
10 DEFPROCstore(val%,n%)
11 LOCAL addr%
12 addr%=n%*2+store%:REM*CALCULATE ADDRESS*
13 ?(addr%+1)=val% DIV &100:REM*STORE MSB*
14 ?addr%=val% MOD &100:REM*STORE LSB*
15 ENDPROC
16
17 DEF FNrecover(n%)
18 n%=n%*2+store%:REM*CALCULATE ADDRESS*
19 =?n%+?(n%+1)*&100
```

◆ LISTING 2 ◆

```
1 REM*STORAGE OF THREE BYTE NUMBER*
2 DIM store% 29
3 FOR i%=0 TO 9
4 INPUT LINE "No. "val%
5 PROCstore(val%,i%)
6 NEXT
7 FOR i%=0 TO 9:PRINT FNrecover(i%):NEXT
8 END
9
10 DEFPROCstore(val%,n%)
11 LOCAL addr%
12 addr%=n%*3+store%
13 ?(addr%+2)=val% DIV &10000
14 val%=val% MOD &10000
15 ?(addr%+1)=val% DIV &100
16 ?addr%=val% MOD &100
17 ENDPROC
18
19 DEF FNrecover(n%)
20 n%=n%*3+store%
21 =?n%+?(n%+1)*&100+?(n%+2)*&10000
```

◆ LISTING 3 ◆

```
1 REM*STORAGE OF TEN BIT NUMBERS*
2 MODE 7
3 DIM topbits% 3,lowbits% 15
4 FOR n%=0 TO 15
5 REPEAT
6 INPUT LINE "Number 0 to 1023 ? "val%
7 UNTIL val%>=0 AND val%<1024
8 PROCstore(n%,val%)
9 NEXT
10 FOR i%=0 TO 15:PRINTTAB(30,i%)FNrecover(i%):
NEXT
11 END
12
13 DEFPROCstore(n%,val%)
14 LOCAL byte%,shift%,mask%
15 ?(n%+lowbits%)=val%MOD256:REM*Store eight lo
w bits*
16 byte%=n% DIV 4+topbits%:REM*Byte in which to
p bits stored*
17 shift%=2^((n%MOD4)*2)
18 mask%=shift%*3
19 ?byte%=?byte% AND(mask% EOR &FF):REM*Reset b
its in byte to be used to store top bits*
20 ?byte%=?byte% OR((val% DIV 256)*shift%):REM*
Set appropriate bits in byte to be used to store t
op bits*
21 ENDPROC
22
23 DEFFNrecover(n%)
24 LOCAL byte%,mask%,shift%
25 byte%=n% DIV 4+topbits%:REM*Byte in which to
p bits stored*
26 shift%=2^((n%MOD4)*2)
27 mask%=shift%*3
28 =?(n%+lowbits%)+((mask% AND ?byte%) DIV shif
t%)*256
```

◆ LISTING 4 ◆

```
1 REM*ARRAY OF BOOLEAN IN BASIC*
2 MODE 7
3 DIM array% 1
4 FOR n%=0 TO 15
5 PRINT"TRUE-T or FALSE-F ?";
6 REPEAT a$=GET$:UNTIL INSTR("TF",a$):PRINTa$
7 IF a$="T" PROCstore(n%,-1) ELSE PROCstore(n%
,0)
8 NEXT
9 FOR i%=0 TO 15
10 IF FNrecover(i%) THEN f$="TRUE" ELSE f$="FAL
SE"
11 PRINTTAB(21,i%);f$
12 NEXT
13 END
14
15 DEFPROCstore(n%,logic%)
16 LOCAL byte%,bit%,mask%
17 byte%=n% DIV 8+array%:REM*Byte for n%*
18 bit%=n% MOD 8:REM*Bit for n%*
19 mask%=2^bit%
20 REM*If TRUE set bit otherwise reset it*
21 IF logic% THEN ?byte%=?byte% OR mask% ELSE ?
byte%=?byte% AND(mask% EOR &FF)
22 ENDPROC
23
24 DEFFNrecover(n%)
25 LOCAL byte%,bit%,mask%
26 byte%=n% DIV 8+array%
27 bit%=n% MOD 8
28 mask%=2^bit%
29 REM*If bit set return TRUE otherwise FALSE*
30 IF mask% AND ?byte% THEN =TRUE ELSE =FALSE
```


TEA, MR

Save your back with this handy program for interior design

If you move into a house or flat at any time in the future, the chances are that you would spend a fair bit of time and effort sliding different items of furniture across the floor while trying to decide where everything is going to eventually live. It doesn't take much imagination to realise that this somewhat laborious pastime is fraught with the sort of disadvantages that could make the most enthusiastic sideboard-shover lose interest pretty quickly! It's only too easy to put everything in a room, then to discover that perhaps it won't all fit in as neatly as you might have once hoped.

It's equally easy to begin feeling worn out after you've moved the largest bookcase across the living room for the third time, (even when it's empty!) However, type in the following listing and your room arranging problems should disappear (well, almost). The Room Planner Program will allow you to make all of your decisions before you've even moved house — at the comfort of your own keyboard.

Making it Easy

The first thing to do before using the program is to venture forth armed with a tape measure to note the dimensions (width and length) of all the articles of furni-

ture which you will be taking when you move. Then obtain the similar dimensions of the actual rooms in your new abode. Having done this, you're now in the position to use the program.

By specifying the above information, you can use the Room Planner to decide upon the best position for each item of furniture, in every room of the house. Rooms may be defined in terms of the area and shape of their floor and so may the actual pieces of furniture themselves. Once this has been done, the room is displayed as a birds-eye-view in two dimensions. Items of furniture may then be selected, displayed and moved around the screen, hence allowing them to be placed anywhere in the room. Additionally, pieces of furniture may be rotated in quarter-turn steps. Rooms arranged, or otherwise, may also be saved as a file on disk (or tape) to be later reloaded for study or alteration. As a result of using the features provided by the Room Planner, deciding upon the suitability, or even the possibility, of a particular room layout is simply a matter of studying a graphical representation shown on the screen.

Operating Instructions

Supposing that you have just loaded and RUN the Room Plan-

ner. You will be presented with a title page and asked if you wish to load a previously saved room. Simply reply to this question (and any others requiring a yes or no response) by pressing Y or N. If you want to end the program at this stage, hold down CTRL and E together.

Assuming that you have opted not to load a previous room, you will now have to enter the maximum floor dimension in feet. This is a single value. Therefore, if the room in question was (say), 9 by 11 feet, you should enter 12. This would ensure that the room neatly fitted on the screen. A block of equally spaced dots will then be displayed, the distance between adjacent horizontal and vertical dots representing one foot. This display of dots may be used as a scale for visual reference of distances.

The next thing to do is define the floor shape and area of the chosen room. This is done by defining the corners of the room in a clockwise direction. Position the cursor provided, using the arrow keys for movement and the scale for reference. (When moving the cursor about, it may be speeded up by additionally pressing a SHIFT key.) To fix the position of each corner, press the SPACE BAR. Up to ten corners may be defined in this way, but you can

just press RETURN when enough have been fixed.

Items of furniture are defined next, using the same technique of positioning the corners. Note however that pieces of furniture may only be defined as squares or rectangles. If, at this stage, you find that some of your tables and chairs are not the perfect rectangles that they should be, don't worry, since the program will square up any such misfits, for reasons of neatness if nothing else. Next, enter the name of the item (keep names different) and press RETURN.

When all the pieces of furniture that you need have been defined, you will enter the 'display' section of the program. Now the fun really starts!

Moving Your Bits About

Upon entering the 'display' section of the program, you will be presented with an empty room and a list of furniture items below it. Simply type in the name of the item you want and it will be displayed. You can now move it around the screen to your heart's content in any direction, using the arrow keys (and even SHIFT for the extra speed).

Once an item has been selected in this way you may also rotate it by pressing R (its proportions may seem to change, but not

Room Planner Program

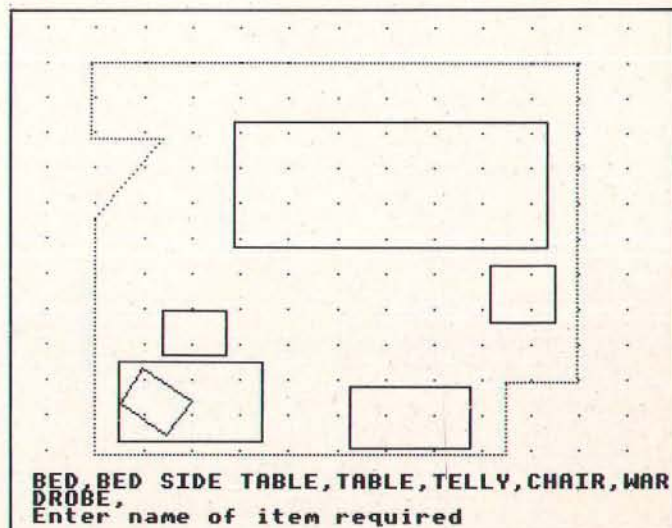
Commands available (on function keys):

- 'DEFINE' - Define a furniture item
- 'FLOOR' - Redefine floor area
- 'SAVE' - Save current room on disk
- 'END' - End program

Control Keys :

- Cursor keys - Move furniture
- <SPACE BAR> - 'Fix' furniture
- 'R' - Rotate furniture
- <DELETE> - Delete furniture
- <ESCAPE> - Rerun program

LOAD data of previous room ?



SHIFTER?

the measurements), delete it from memory with the DELETE key, or fix its position with the SPACE BAR.

You can then select another item of furniture again or alternatively

(1)define a new item

(2)redefine the floor area

(3)save the room on disk/tape, or even

(4)end

These options are selected by entering DEFINE, FLOOR, SAVE, or END respectively.

The programs in this article have been listed using the A&B Computing Checker. The four digit hexadecimal number in brackets at the end of each line is the "checksum" for that line. It is **not** to be typed in.

With Checker installed, each program line is assigned a unique checksum when RETURN is pressed to enter that line. Compare the checksum number on your screen with that in the magazine to be certain that a line has been correctly entered.

Checker is published periodically in A&B, featured on most Software Sale discs and is available on tape, price £1 (20p p&p). Cheques made payable to Phoenix software.

♦ LISTING ♦

```

0REM *****
*** (0ECC)
1REM *
* (4041)
2REM * Room Planner Progra
m * (8065)
3REM *
* (E340)
4REM * By James Tyler
* (8763)
5REM *
* (2600)
7REM * OCT '86
* (FC3C)
8REM *
* (4D62)
9REM *****
*** (03EF)
10ON ERROR GOTO3030:REM rem
ove this line while typing in
and debugging (4331)
20*K.8MODE7:M (7DA7)
30*K.9*FX4,0:M (FA68)
40 (9887)
60 (2A67)
80*TV255,1 (FD63)
90MODE4 (7173)
100 PRINTTAB(25,1)"J.T Oct
1986""TAB(7,3)"Room Planner Pr
ogram"" Commands available (
on function keys):"" (1EBD)
110MOVE220,B92:DRAW900,B92 (
790A)
120PRINTTAB(3)""DEFINE""TAB(
12)"" Define a furniture item"
""TAB(4)""FLOOR""TAB(12)"" Red
efine floor area""TAB(5)""SAV
E""TAB(12)"" Save current room
on disk""TAB(6)""END""TAB(12
)"" End program"" (79F9)
130PRINT""SPCB""Control Keys
:"""TAB(3)""Cursor keys""TAB(15)
"" Move furniture""TAB(3)""<SP
ACE BAR>""TAB(15)"" Fix furni
ture""TAB(6)""R""TAB(15)"" Ro
tate furniture""TAB(4)""<DELE
T E>""TAB(15)"" Delete furniture"
(D63C)
140PRINT""TAB(4)""<ESCAPE>""TAB
(15)"" Rerun program"" (D650)
150PROCinit (536B)
160VDU28,0,31,39,27 (627A)
170VDU29,0;-200; (A2C1)
180MOVE0,0 (8ABD)
190PRINT""LOAD data of pre
vious room?"" (42C5)
200REPEAT (9D03)
210G$=GET$ (4612)
220UNTILINSTR("YN",G$):CLG (
9AE7)
230IFG$="Y" PROCload ELSE PR
OCdefinefloor (6985)
240REPEAT (E698)
250IFLF$=0 OR N$="DEFINE" PR
OCdefinefurniture (DD60)

```

```

260PROCdisplayroom (C966)
270UNTILN$="END" (9369)
280MODE7:*FX4,0 (5DD1)
290END (117B)
300DEFPROCinit (0A31)
310DIMFLOORX(21),PTX(21,11),
FURN$(21) (D49F)
320P%=0:LF$=0:DF$=0:FF$=0:LP
%=0 (B254)
330NAME$=STRING$(10,""):N$=
"" (29E5)
340*FX4,1 (E0B5)
350*K.0DEFINE:M (EE3F)
360*K.1FLOOR:M (2A5B)
370*K.2SAVE:M (F29D)
380*K.3END:M (5AA5)
390ENDPROC (C36C)
400DEFPROCload (C330)
410VDU26,12:*CAT (510D)
420INPUT""Enter the name of
the room required :"" ,F$ (54
34)
430F%=OPENUP(F$) (6091)
440FORLX=0 TO 21 (E47B)
450INPUT#F$,FLOORX(LX) (9F4C
)
460NEXT (7D12)
470FORLX=0 TO 20 (ABC4)
480FORL2=0 TO 11 (EF70)
490INPUT#F$,PTX(LX,L2X) (893
3)
500NEXT (6971)
510NEXT (4C91)
520FORLX=0 TO 20 (66E6)
530INPUT#F$,FURN$(LX) (3D08)
540NEXT (FEF1)
550INPUT#F$,P% (BFEB)
560INPUT#F$,DF% (3CFF)
570INPUT#F$,LE% (B457)
580INPUT#F$,W1% (E1D0)
590INPUT#F$,LP% (9741)
600CLOSE#F% (6255)
610LP%=LP%+1 (7A2A)
620LF%=1:DF%=1:VDU28,0,31,39
,27 (A6D1)
630VDU29,0;-200; (643F)
640ENDPROC (CB94)
650DEFPROCdefinefloor (282B)
660IFFF%=1GCOL3,1:PROCdrawf1
oor (71CF)
670FORP2%=0TO21:FLOORX(P2%)=
0:NEXT (31D8)
680LOCALFLX(1A30)
690CLS:PRINT"DEFINE FLOOR AR
EA" (282D)
700IFFF%=0 REPEAT:INPUT"Ente
r the maximum floor dimensions
in feet "LE%;UNTILLE%>0
:W1%=LE%:PROCdrawscale:CLS (6E
C6)
710PRINT"Move cursor to corn
ers of room & then press <SP
ACE BAR> each time."" Press
<RETURN> when complete." (199E
)
720LX=0:CX=0 (E366)
730X%=500 (BD53)
740Y%=1000 (89E3)
750GCOL3,1 (BD09)
760REPEAT (2C0C)

```

```

770REPEAT (7AFA)
780PLOT69,X%,Y% (3619)
790PLOT69,X%+4,Y%+4 (3EF5)
800PLOT69,X%+4,Y% (79F1)
810PLOT69,X%,Y%+4 (EC24)
820PLOT69,X%,Y% (B6E6)
830PLOT69,X%+4,Y%+4 (5030)
840PLOT69,X%+4,Y% (AD3E)
850PLOT69,X%,Y%+4 (3BEB)
860IFINKEY(-1) S%=16 ELSE S%=
4 (742E)
870IFINKEY(-26) X%=X%-S% (A4
BB)
880IFINKEY(-122) X%=X%+S% (4
6A9)
890IFINKEY(-58) Y%=Y%+S% (6B
76)
900IFINKEY(-42) Y%=Y%-S% (FA
B4)
910K%=INKEY(0) (C234)
920IFK%=32 CX=CX+1 (A465)
930UNTIL K%=32 OR(KX=13 ANDC
X>3) (DF24)
940IFK%=13 THEN1000 (5FCE)
950PLOT69,X%,Y% (C17F)
960PLOT69,X%+4,Y%+4 (3377)
970PLOT69,X%+4,Y% (750E)
980PLOT69,X%,Y%+4:MOVEX%,Y%
(6E03)
990SOUND1,-10,200,5 (3690)
1000FLOORX(LX)=X% (1E7F)
1010FLOORX(LX+1)=Y% (E1AD)
1020IFLX>0 PLOT29,FLOORX(LX-2
),FLOORX(LX-1) (DE55)
1030LX=LX+2 (A993)
1040TIME=0 (336D)
1050REPEAT (A7DA)
1060UNTILTIME>20 (5A88)
1070*FX15,0 (24E9)
1080UNTIL(KX=13 ANDCX>3)OR LX
>20 (1651)
1090CLS (9A13)
1100FFX=1:GCOL0,1 (BE9D)
1110ENDPROC (9FAD)
1120DEFPROCdrawscale (0CEB)
1130SX%=1170/LE% (E276)
1140SY%=770/W1% (BA36)
1150CX=0 (9BE7)
1160FORX%=30TO1200STEP SX% (29
60)
1170FOR Y%=400TO1270STEP SY% (7
4EB)
1180PLOT69,X%,Y%:NEXT, (62CF)
1190ENDPROC (D213)
1200DEFPROCdefinefurniture (0
66F)
1210LOCALFLX(1EDE)
1220CLG (64B4)
1230G$="" (632D)
1240REPEAT (7262)
1250PROCdrawscale (B774)
1260CLS:PRINT"DEFINE FURNITUR
E ITEMS" (5307)
1270PRINT"Position cursor then
press <SPACE BAR>. to posit
ion each of the four corners
of the item of furniture." (
4177)
1280X%=500 (42FD)
1290Y%=1150 (01FE)

```



```

1300P2X=0 (612A)
1310REPEAT (1EAB)
1320GCOL3,1 (A455)
1330REPEAT (B344)
1340IFINKEY(-1) SZ=16 ELSE SZ=
4 (B2D0)
1350IFINKEY(-26) XZ=XZ-SZ (47
B1)
1360IFINKEY(-122) XZ=XZ+SZ (2
CC2)
1370IFINKEY(-58) YZ=YZ+SZ (71
3A)
1380IFINKEY(-42) YZ=YZ-SZ (C6
B3)
1390PLOT69,XZ,YZ (F73C)
1400PLOT69,XZ+4,YZ+4 (DC9D)
1410PLOT69,XZ+4,YZ (1B74)
1420PLOT69,XZ,YZ+4 (74E7)
1430PLOT69,XZ,YZ (7D2B)
1440PLOT69,XZ+4,YZ+4 (3EA4)
1450PLOT69,XZ+4,YZ (CFBB)
1460PLOT69,XZ,YZ+4 (A02B)
1470MOVEXZ,YZ (C9FB)
1480UNTILINKEY(-99) (05EB)
1490GCOL0,1 (A95F)
1500PTX(PZ,P2X)=XZ (3BF3)
1510PTX(PZ,P2X+1)=YZ (6EE6)
1520SOUND1,-10,200,5 (5E0C)
1530IFP2X=0PLOT69,XZ+4,YZ:PLO
T69,XZ+4,YZ+4:PLOT69,XZ,YZ+4:P
LOT69,XZ,YZ ELSE DRAWPTX(PZ,P2X
-2),PTX(PZ,P2X-1) (15BA)
1540P2X=P2X+2 (07EE)
1550TIME=0 (02E3)
1560REPEAT (3B8B)
1570UNTILTIME>20 (97D0)
1580*FX15,0 (AF5F)
1590UNTILP2X=0 (0419)
1600MOVEXZ,YZ: DRAWPTX(PZ,0),P
TX(PZ,1) (FA6D)
1610IF (PTX(PZ,0)-PTX(PZ,6))>16
)OR (PTX(PZ,1)-PTX(PZ,3))>16) TH
EN1630 (AAB4)
1620PTX(PZ,3)=PTX(PZ,1):PTX(P
Z,4)=PTX(PZ,2):PTX(PZ,7)=PTX(P
Z,5):PTX(PZ,6)=PTX(PZ,0) (06BB
)
1630HX=(ABS(PTX(PZ,1)-PTX(PZ,
7))) / 2:PTX(PZ,10)=HX (B013)
1640WX=(ABS(PTX(PZ,0)-PTX(PZ,
4))) / 2:PTX(PZ,11)=WX (70F5)
1650FORP2X=1TO7STEP2:PTX(PZ,P
2X)=PTX(PZ,P2X)-500:NEXT (BE7F
)
1660PTX(PZ,8)=PTX(PZ,0)+WX (
93F2)
1670PTX(PZ,9)=(PTX(PZ,5)+HX)O
R&10000 (5303)
1680GCOL0,1 (A30B)
1690REPEAT (BEE6)
1700TIME=0:REPEAT:UNTILTIME>2
0:*FX15,0 (AF7)
1710CLS (EF39)
1720INPUT"Enter item name "N$
(CFD9)
1730UNTILN$<>" " ANDN$<>"END"
AND N$<>"SAVE" AND N$<>"DEFINE
" (514E)
1740FURN$(PZ)=N$ (086C)
1750PZ=PZ+1 (969A)
1760CLG (4662)
1770IFPZ<21PRINT"Define any m
ore items?":REPEAT:G$=GET$:U
NTILINSTR("YN",G$) (9200)
1780UNTILG$="N" ORPZ>20 (2CD5
)
1790ENDPROC (0E06)
1800DEFPROCdisplayroom (90EC)
1810CLG (DC60)
1820CLS (E5B0)
1830PROCdrawscale (1B11)
1840GCOL0,1 (1BF0)
1850PROCdrawfloor (78C5)
1860GCOL0,1 (98BE)
1870IFDFZ=1 PROCarrangeroom (
3514)
1880REPEAT (303F)
1890REPEAT (66C9)
1900CLS:FORP2X=0TOPZ-1:PRINT;
FURN$(P2X);",":NEXT:PRINT (93
25)
1910PRINT"Enter name of item

```

```

required "INPUTN$ (FBDF)
1920UNTILN$<>" " (9104)
1930IFN$="SAVE" PROCsave ELSE
IFN$="FLOOR"PROCdefinefloor EL
SEIFN$<>"DEFINE" AND N$<>"END"
PROCmove (906A)
1940PROCdrawscale (9C99)
1950GCOL0,1:MOVEFLOOR$(0),FLO
OR$(1):P2X=2:REPEAT:PLOT29,FLO
OR$(P2X),FLOOR$(P2X+1):P2X=P2X
+2:UNTILP2X=20 OR FLOOR$(P2X+1
)=0:PLOT29,FLOOR$(0),FLOOR$(1)
(639C)
1960UNTILN$="DEFINE" ORN$="EN
D" (1FA1)
1970LPZ=PZ-1 (7E8B)
1980ENDPROC (9C3B)
1990DEFPROCmove (394A)
2000P2X=-1:DFZ=1 (685E)
2010REPEAT (226A)
2020P2X=P2X+1 (D959)
2030UNTILFURN$(P2X)=N$ OR P2X
=20 (7B66)
2040IFFURN$(P2X)<>N$ ENDPROC
(26AF)
2050CLS (FE09)
2060PRINTN$ (BB4F)
2070I=PZ (8B7A)
2080GCOL0,0:FORP2X=0TO6STEP2:
DRAWPTX(I,P2X),PTX(I,P2X+1):
NEXT: DRAWPTX(I,0),PTX(I,1) (
3F73)
2090REPEAT (D55C)
2100HX=PTX(I,10):WX=PTX(I,1
1) (27B9)
2110W=HX*1.6:h=WX*0.65 (E7EF)
2120FORLX=1TO2:GCOL3,1 (8DFB)
2130P2X=2 (36BF)
2140MOVEPTX(I,0),PTX(I,1) (
92B2)
2150FORP2X=2TO6STEP2 (9FEE)
2160DRAWPTX(I,P2X),PTX(I,P2
X+1) (54CB)
2170NEXT (0F46)
2180DRAWPTX(I,0),PTX(I,1) (
2485)
2190NEXT (DC45)
2200IFINKEY(-1) SZ=40 ELSE SZ=
8 (D031)
2210IFINKEY(-58)PROCvert(SZ)
(EDCF)
2220IFINKEY(-42)PROCvert(-SZ)
(06BE)
2230IFINKEY(-26)PROChorz(-SZ)
(93BF)
2240IFINKEY(-122)PROChorz(SZ)
(9FB7)
2250IFINKEY(-52)PROCrotate (C
D13)
2260KZ=INKEY(0) (F7C1)
2270UNTILINKEY(-99) OR KZ=127
(2709)
2280CLS (905C)
2290GCOL0,3 (676A)
2300IFKZ=127:GCOL3,0 (1E0F)
2310P2X=2:FL2X=1 (03BD)
2320MOVEPTX(I,0),PTX(I,1) (
1415)
2330FORP2X=2TO6STEP2 (5F6B)
2340DRAWPTX(I,P2X),PTX(I,P2
X+1) (F2B0)
2350NEXT: DRAWPTX(I,0),PTX(I,
1):GCOL0,3 (7BA3)
2355IFKZ=127 PROCdelete (42A6
)
2360*FX15,0 (C9C3)
2370ENDPROC (2369)
2380DEFPROCvert(DRZ) (4666)
2390FORLX=1TO9STEP2 (2F42)
2400PTX(I,LX)=PTX(I,LX)+DRZ
(61EE)
2410NEXT (5B6C)
2420ENDPROC (2DDC)
2430DEFPROChorz(DRZ) (5C5B)
2440FORLX=0TO8STEP2 (10D2)
2450PTX(I,LX)=PTX(I,LX)+DRZ
(8425)
2460NEXT (A2CC)
2470ENDPROC (4AA4)
2480DEFPROCrotate (0C46)
2490TIME=0:REPEAT:UNTILTIME>2
0:*FX15,0 (6022)

```

```

2500CXZ=PTX(I,8) (5B56)
2510CYZ=ABS(PTX(I,9)) AND&FF
FF (5EBE)
2520RZ=PTX(I,9) AND&10000 (A
B96)
2530LOCALTZ (46AB)
2540IFRZ=0TZ=HX ELSE TZ=-W (20
15)
2550PTX(I,0)=CXZ+TZ (BE27)
2560IFRZ=0TZ=WZ ELSE TZ=h (D85
4)
2570PTX(I,1)=CYZ+TZ (AAB1)
2580IFRZ=0TZ=HX ELSE TZ=w (552
5)
2590PTX(I,2)=CXZ+TZ (3B61)
2600IFRZ=0TZ=-WZ ELSE TZ=h (A5
F7)
2610PTX(I,3)=CYZ+TZ (88B8)
2620IFRZ=0TZ=-HZ ELSE TZ=w (D8
0B)
2630PTX(I,4)=CXZ+TZ (39BF)
2640IFRZ=0TZ=-WZ ELSE TZ=-h (F
DD9)
2650PTX(I,5)=CYZ+TZ (CF10)
2660IFRZ=0TZ=-HZ ELSE TZ=-w (5
A57)
2670PTX(I,6)=CXZ+TZ (58C8)
2680IFRZ=0TZ=WZ ELSE TZ=-h (B4
26)
2690PTX(I,7)=CYZ+TZ (4A56)
2700PTX(I,9)=PTX(I,9) EOR&1
0000 (5053)
2710PTX(I,10)=PTX(I,11) (29
3D)
2720PTX(I,11)=HX (5BF1)
2730ENDPROC (9250)
2740DEFPROCarrangeroom (65E7)
2750GCOL0,3:FORI=0TOLPZ (523
2)
2760P2X=2:FL2X=1:MOVEPTX(I,0
),PTX(I,1):FORP2X=2TO6STEP2:D
RAWPTX(I,P2X),PTX(I,P2X+1):N
EXT: DRAWPTX(I,0),PTX(I,1) (6
C37)
2770NEXT:ENDPROC (1AFB)
2780DEFPROCsave (8CBE)
2790VDU26,12:*CAT (9E0B)
2800INPUT""Enter the name o
f this room""F$ (3625)
2810CLS:PRINTTAB(7,14)"Don't
go away !" (9BF9)
2820FZ=OPENOUT(F$) (7B13)
2830FORLX=0TO21 (574F)
2840PRINT#FZ,FLOOR$(LX):NEXT
(F58C)
2850FORLX=0TO20 (424F)
2860FORLX=0TO11 (28B6)
2870PRINT#FZ,PTX(LX,L2X):NEXT
:NEXT (F16C)
2880FORLX=0TO20 (5149)
2890PRINT#FZ,FURN$(LX):NEXT (
EB32)
2900PRINT#FZ,PZ (FDD5)
2910PRINT#FZ,DFZ (8950)
2920PRINT#FZ,LEZ (FB4A)
2930PRINT#FZ,WI$ (0B55)
2940PRINT#FZ,LPZ (5251)
2950CLOSE#FZ (704D)
2960CLS:PRINTTAB(7,16)CHR$39;
F$:CHR$39;" saved onto disk...
":KZ=INKEY(250):CLS (487B)
2970VDU29,0;-200; (6997)
2980VDU28,0,31,39,27 (40FB)
2990LPZ=LPZ+1:PROCarrangeroom
:LPZ=LPZ-1 (771C)
3000ENDPROC (EBD7)
3010DEFPROCdrawfloor (65EA)
3020MOVEFLOOR$(0),FLOOR$(1):P
2X=2:REPEAT:PLOT29,FLOOR$(P2X
),FLOOR$(P2X+1):P2X=P2X+2:UNTIL
P2X=20 OR FLOOR$(P2X+1)=0:PLOT
29,FLOOR$(0),FLOOR$(1):ENDPROC
(9A92)
3030IFERR=17 RUN (7DCA)
3040MODE:PRINT"" (EAD3)
3050REPORT (AEAF)
3060END (2CFA)
4000DEFPROCdelete (9D16)
4010FORLX=I+1TO20:FURN$(LX-1
)=FURN$(LX):FORP2X=0TO11:PTX(
LX-1,P2X)=PTX(LX,P2X):NEXT:PZ=
PZ-1:LPZ=LPZ-1:ENDPROC (BC6C)

```


reflex^{MAGNETICS}

Now the Same High Quality but with Even More Choice

We ran the advertisement opposite and it certainly generated a lot of orders. We had a lot of people on the 'phone asking if we could supply slightly fewer disks, and as you can see, we're now offering quantities of 10's and 30's as well.

So now you can buy the same specification disks and we'll despatch the 10's and 30's in our unique Interlocking DiskBank filing system. For quantities of 50, we'll send them in a free lockable storage box.

Every disk carries a lifetime guarantee - if a disk is faulty send it back for two free replacements.

To order, just clip the coupon below.

We accept orders from all government bodies, schools, universities, PLC's etc. We despatch on receipt of an official purchase order.

If you've got a technical query ring 01-722 9727

If you're a credit card holder ring and place an immediate order on 01-722 9931.

Personal callers welcome.



To Reflex Magnetix Ltd, Unit 2, 32 Lawn Road, London NW3 2XU.
Please rush me:

5¼" SSDD 48TPI	10 disks in a Diskbank box	_____	qty.	£12.80	each
	30 disks in a Diskbank box	_____	qty.	£36.40	each
	50 disks in a Lockable box	_____	qty.	£54.80	each
5¼" DSDD 48TPI	10 disks in a Diskbank box	_____	qty.	£15.80	each
	30 disks in a Diskbank box	_____	qty.	£49.80	each
	50 disks in a Lockable box	_____	qty.	£63.90	each
5¼" DSDD 96TPI	10 disks in a Diskbank box	_____	qty.	£18.10	each
	30 disks in a Diskbank box	_____	qty.	£51.10	each
	50 disks in a Lockable box	_____	qty.	£78.00	each
3½" SSDD	10 disks in a Storage box	_____	qty.	£27.90	each
3½" DSDD	10 disks in a Storage box	_____	qty.	£31.90	each

Prices include VAT and postage & packing.

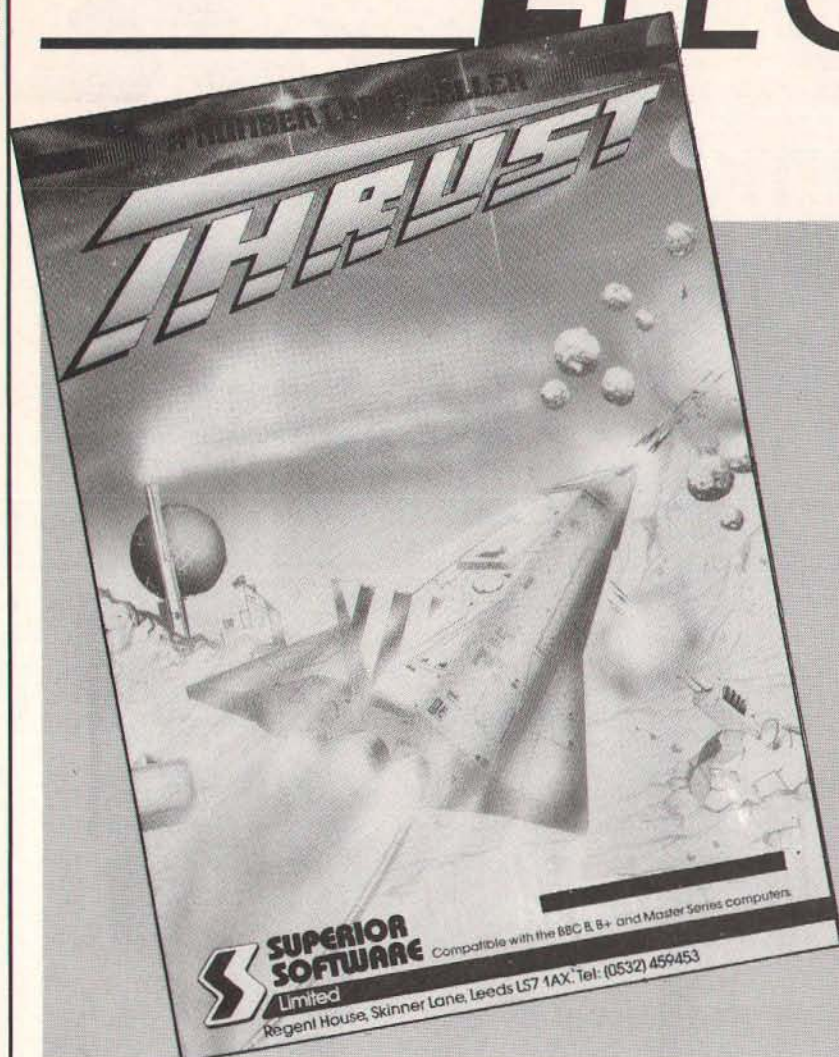
I enclose a cheque for _____
or debit my Access/Visa card
number _____
Signature _____
Name _____
Address _____

Postcode _____
Telephone _____

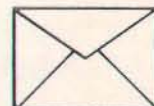
reflex^{MAGNETICS}
DISKETTES DIRECT BY MAIL
FROM THE MANUFACTURER

ELECTRON COMPUTING

ELECTRON

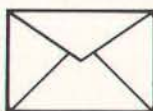
**Thrust**

Superior Software
Electron
Tape £9.95
Graphics 8
Sound 7
Playability 9
Life Span 8
Overall 9



The rebels are in desperate need of Klystron pods so they can kick the butt of the Empire. It is your duty to penetrate the Empire's storage planets and collect the pods. Things are made harder by the high gravity of each planet and also the heavy armaments. To disable the armaments you can knock out the nuclear reactors but only for a short while! The object is to collect 24 pods and it is no picnic.

Screen graphics are two colour medium resolution with full screen scrolling which is fast and smooth. The graphics are of a linear type which works well as it is the realistic movement of the ship which makes the game special. When towing a pod the forces of gravity and inertia make life interesting but difficult. Real skill is required to beat this game and that coupled with its highly addictive quality makes this little gem a winner!

Second Processor Compatibility

Dear Editor

I was delighted to see a review of the E2P Electron second processor in the April issue of A&B. I built the original from the article in Electronics Today International. Being a novice I was only too pleased to actually get it up and running.

I have one problem, which Clive Grace seems to have touched on — I can't use the Cumana Electron disc interface. Is there any way round this, or is it one of those hardware design clashes?

P Black
Cumbria

If this is a physical clash of hardware and there isn't an obvious solution. Some Electron add-ons for the Plus One are mapped into a particular ROM and so have to remain that cartridge slot.

Permanent Memory Systems, who have taken on the second processor as a commercial product, have done some checking on compatibility. The Electron, unlike the BBC, uses PAGE & FC for the software which interacts with the second processor. Both Cumana's and Solidisk's Electron disc filing systems retained the addresses for operating with the Tube on the BBC. PMS will change your disc filing software for you to point to the right locations. Give them a ring for details. The +3 is, of course, already compatible, as is the Advanced Computer Products +4. ACP will provide Tube I/O soon with their +5. PMS will provide a connection to allow the PMS second processor to work with the +5.

The second processor is also compatible with Slogger ROM boxes and Turbo board.

Nine out of Ten

Dear Ed

My home system is an Electron, Plus 1, Plus 3, Mitsubishi monitor and Mannesmann Tally MT80 printer. The main use for this is word

processing with VIEW. I also have Advanced Computer Products Disc Toolkit and Rom Manager in an ARA2 cartridge and an ASR sideways RAM cartridge. These products are great, but may I make a couple of points.

For ADFS users a sad omission is a directory copy utility. *DIRCOPY is available on the ADFS utilities disc and is of far more use than *BACKUP. You can copy any one directory or copy all the files on the disc by copying the root directory. *Dircopy copies the files only and puts them in order onto the destination disc, thus doing a compaction at the same time. Backing up the entire disc copies spaces as well as files.

If you have both ADT and ARM fitted, either in an Electron or BBC, put the ARM in a higher priority socket than ADT. Both these excellent ROMs have a *ROMS command which lists all occupied ROM sockets, but the ARM command also gives the ROM/RAM size eg 8k or 16k but the ADT command does not.

One annoyance I have with all Acorn related magazines is that software and hardware reviews are always done on a BBC computer unless the review is Electron spe-

ELECTRON COMPUTING

COMPUTING

cific. The same conclusions cannot always be made when reviews are carried out on an Electron. For example, a review of a Mitsubishi monitor like mine praised its quality and value. I had already bought mine, but it had to be modified before it would work properly because the Electron apparently has a lower power video output signal (and lower power tape output signal) than the BBC. If an Electron owner bought such a monitor on the strength of the review and the shop from where it was purchased could not modify it, the customer might unnecessarily change the monitor for one which works but is of less value for money.

One recent review of the ADT ROM was obviously done under DFS and ADFS was not used at all, thus certain features were glossed over. As the superior ADFS is now available to BBC users this seemed to be a silly omission.

Perhaps a review of A&B might read:

As a user of Electron, Model B, Master and Econet systems A&B is the most valuable of all Acorn computer magazines, but please reviewers, take the Model B blinkers off. Overall rating 9 out of 10.

Ian Taylor

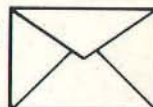
Always striving after the Electron coverage, Ian. We do rely on you readers to help out with your comments, questions and suggestions. The whole Acorn fraternity is now so diverse that we cannot hope to know everything that is going on. And even if we did, we couldn't fit it in the magazine! All our filing system utility reviews, especially those on ADT, have included extensive use with DFS and ADFS.

As far as possible our contributors have access to a wide range of Acorn equipment, but not all have the whole range. Some of them do, which I think is remarkable commitment to the Acorn products, but not all. Software is now reviewed separately in Electron Computing and let's hope that, with readers' help, we can expand this section of the magazine as it deserves.

Having brought you the most up to date and comprehensive coverage of the Master Series, we now have the challenge of the Model BB, which we all hope will do very well for Acorn. It marks their return to the high street for Christmas and looks very competitively priced. So too does the Electron — when will stocks run out?

Although we can understand the feelings behind Gary Gilchrist's peripheral poem, it does seem that the Electron owner has now got the definitive choices available in Plus 4, Rombox Plus, shadow RAM and second processor upgrades.

Peripheral Poem



I opened my A&B one day
And discovered an article
Which to my dismay
Was all about add-ons for the Electron
None of which I would want to lay my hands on.

I have already bought the Plus 1 and the Plus 3

To make my computer like a BBC
But such setups as Acorn and Slogger and more

Have gone and invented, oh no, a Plus 4
Oh Woe is me for no matter how I try
There's always something to drain my bank account dry

You can keep your ROM boxes and such like
I should have spent my money on a half decent bike

But there is a moral to my pitiful spell
At least I wasn't stupid enough to buy a QL.

So all ye who read this
Take heed from my plight
Your computer is never completed
Try as you might

Gary Gilchrist
Belfast
N.Ireland

A&B

♦ T I P S ♦

Thin Windows for Thick Lines

Talking of windows, if you are like me, it is frustration which drives you to discover new things. One such is the fact that windows are faster than plotting for drawing horizontal and vertical lines. We tend to think of a window as being a rectangle and a line as being a very thin thing. Well it's true, a line is a very thin rectangle.

In order to fill a screen with colour we use CLG; the same goes for filling a window. Set the colour, CLG. As a result of this, the way of drawing a line is to set a colour, set a thin window, CLG.

Regarding speed, the window method is considerably faster. Don't take my word for it, try this mini prog. The screen clears for Mode 0, it then starts to fill with drawn lines. When the screen is full, it clears and fills with lines generated by windows, fast!

```
10 MODE 0
20 FOR Y%=1 TO 1000 STEP 4
30 VDU25,4,0;Y%;:REM MOVE 0,Y%
```

```
40 VDU25,5,1270;Y%;:REM DRAW1270,Y%
50 NEXT
60 CLG
110 GCOL0,129
120 FOR Y%=1 TO 1000 STEP 4
130 VDU24,0;Y%;1250;Y%;
140 CLG
150 NEXT
```

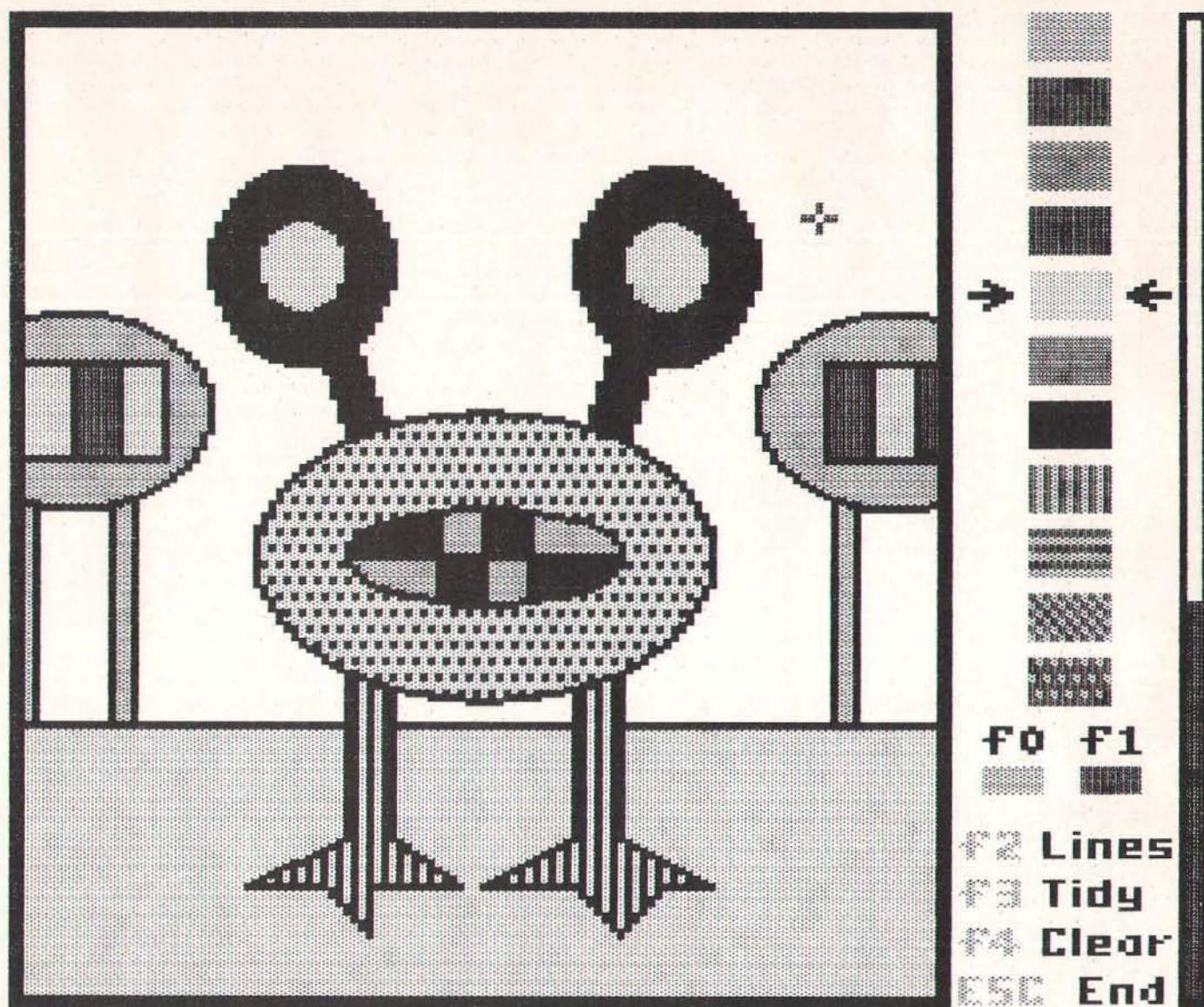
See what I mean? Now an interesting point about all this is that you can draw lines of any thickness without having to worry about triangle filling or flood filling, all you have to do is increase or decrease the end number in the VDU statement:

```
VDU 24,0;Y%;1250;Y%+12
```

It makes sense to add or subtract only in multiples of 4 as this is the minimum change the screen will notice.

PIC AND MIX

The Evolution of a program: Picture Craft



There is an enormous wealth of educational software available for the BBC micro, and much of the better software has been funded, at least in part, by the M.E.P. Now this source has ended, and the relatively small amount of government funding available from the new Micro Education Support Unit seems unlikely to be sufficient to sustain the recent level of software production. This, I believe, will be particularly true of many subjects in the secondary area, and virtually all 'A' level work. There will simply be too small a market to recoup development costs, and the plain fact is that software development is

a costly business. The commercial publisher who fails to make a profit quickly goes out of business, and many unfortunately have!

This article tells the story of the unfolding of a large software project from a simple idea, and reflects a growing awareness that, to be commercially successful, educational software in today's highly competitive market must be exceptional in terms of its design, usefulness and educational validity. It must also be good value, though I do not believe that this necessarily means it must be cheap. (Just look at how many schools have invested in relatively expensive word-pro-

Painting a picture in Picture Craft

cessing software). Finally, it was felt that it should appeal to as wide a market as possible, and to this end we always kept in mind that it should be just as much fun and just as useful for children at home, as at school.

Proposing and Seconding

I am not sure whether the story I have to tell will give encouragement to anyone considering a career as a freelance software designer and/or writer, but I do hope to give

an idea as to the amount of effort and resources that go into creating a major software project.

The story begins nearly two years ago, as I was completing the final touches of the *Maths With a Story* software which I had designed and written for BBC Publications. In the course of its development, I had had to write a fast machine code 'flood fill' routine, and I was wondering if I could put it to good use as the basis of a painting activity. This thought process was encouraged by the 'Oh-my-God, what-am-I-going-to-do-next' syndrome that always attacks me as I am about to run out of work!

My first idea was a simple magic colouring book in which a computer-drawn (but hidden) outline of a picture would be created, so that the screen appeared blank, except for a 'cross-hair' cursor and a number of coloured boxes down the right hand side of the screen. The child would select a colour, move the cursor to some initially random position, and press the RETURN key. On doing so, the area in which the cursor rested would fill with the chosen colour. Gradually, the picture would unfold as more regions were filled. I thought I would try to compact 26 pictures into the BBC's feeble memory, one picture for each letter of the alphabet. I would call it the *A.B.C. Colouring Book*.

I took my idea to Meyer Solmon who had been my editor on the 'Maths With a Story' project, together with a few program sketches. 'Nice idea' he encouraged, 'but its not enough!' (he always says that), 'come up with three more related programs and I might be interested!'

It had taken three solid weeks to get this far, and I started to wonder how much preparatory work I was going to have to do before I could even submit a formal proposal! (The answer turned out to be a great deal!)

I added two picture puzzle activities to the magic painting idea, and a simple design program to create pictures, and tried again.

Meyer was more enthusiastic this time, but I had still to persuade the educational side of the BBC of the worth of the ideas.

Over the next six months, I attended many meetings with BBC educational people, including a number of interested TV producers, and produced a draft version of the software which I tested in a couple of schools. All the time, the composition of the pack was changing. The original A.B.C. idea was scrapped as being educationally 'suspect', and the focus of the pack became the design program. The pack was destined to become *Picture Craft*.

Taking Shape

The design program had started life as a fairly simple affair. My idea was that pictures should be created from a number of geometric shapes, such as a square, rhombus and circle; each shape could be stretched or squashed either horizontally or vertically, rotated or reflected and positioned anywhere on the screen. I liked the idea of manipulating geometric shapes as there are many interesting mathematical concepts related to these transformations.

After the initial trials were completed, the project was formally agreed, and I set about enhancing the design program, adding a line drawing routine, and incorporating full editing facilities. The shapes were drawn in outline only, and the completed drawing was then painted using the usual seven colours provided as well as a range of two-colour patterned fills.

It also seemed like a good idea not to restrict the basic design shapes to those that I had chosen, so I provided the facility for children to design their own set of shapes to work with.

A fairly early decision was taken to produce the software on disc only. This allowed many possibilities which would have been tedious or impractical on a cassette system, such as facilities for children to save and recall their pictures and shape sets, as well as enabling me to use program overlay techniques which helped to overcome the restrictions of the BBC's memory shortage problems.

I had noticed that one shortcoming of all the design software I had seen was that once a picture had been completed that was the end of it. There was nothing further to be done with it except perhaps to dump it to a printer. It occurred to me that it would be nice to be able to do something with the pictures which children created. Why not allow children to use their own pictures as the basis of a series of puzzles?

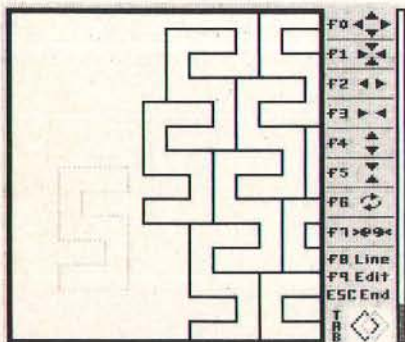
I thought of four puzzles which could be suitable: the jigsaw and sliding-block puzzles, which are not uncommon computer activities, and also a puzzle which involved the rotation of square puzzle pieces. A further puzzle was devised through combining the jigsaw and rotation ideas. By allowing the child to decide how many squares their puzzle could have (usually 4, 9, 16 or 25), a range of puzzles suitable for ages from about five to adult resulted.

I decided to include one more puzzle that even pre-school children could enjoy, so I resurrected my original colouring book idea, and provided fifteen 'magic' pictures for children to paint. By allowing these pictures to be saved, and subsequently used for a picture puzzle, access was provided for younger children to play games with pictures they had at least taken some part in creating. This seemed like a useful stepping stone for children who were not yet confident in designing their own pictures from scratch.

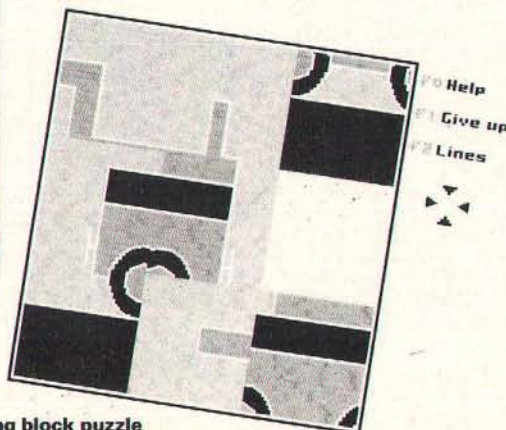
A further problem with the BBC system is that, if you save a copy of a completed Mode 2 screen to disc, it is only possible to save a few pictures before the disc becomes full. Instead of saving the completed picture, I decided to save the information about how the picture had been drawn. When a picture is later recalled, it is re-drawn and re-painted from this data. This method is slower than loading a saved screen (a picture reconstruction typically takes 20 seconds in *Picture Craft*) but has a number of advantages. Firstly, it allows up to 31 pictures to be saved to a single disc surface. Further, because the computer knows how the picture has been built up, it is possible to re-load a picture which has previously saved, and change it using the various editing facilities.

On Trial

At about this stage of the program's evolution, we decided that the time was right for its second set of school trials, and a four week period was allowed for this. Three primary schools and one secondary school agreed to help, and reports from both the teachers and the pupils were received. One of the most useful criticisms came from Godfrey Hall, the deputy head of a London primary school. His younger children found that some of the extra facilities I had incorporated were too much to cope with and had preferred the simple early versions I had



Tiling with the design unit



The sliding block puzzle

C O N T I N U E S ►

provided in the first trial! Fortunately, Stefan Nowac, the BBC's education officer for computing, came up with an idea to overcome this important criticism. Why not provide a facility to allow the parent or teacher to decide which activities and facilities should be accessible? I incorporated a 'hidden' key press into the main menu which calls up the 'Set Up' procedures. This part of the program allows the adult, or more experienced child, to turn many of the features on or off, to set the sound level, configure the printer option, remove unwanted picture files and so on. Thus the software could now be individually configured for each child.

Obviously, for such an extensive piece of software, very careful documentation was needed. I had lots of ideas about how the software might be used in the classroom, and had found that apart from drawing pictures, Picture Craft was particularly suitable for tessellation (or tiling) work and geometrical designs. There are also many colouring and other games for which picture Craft is suitable, and I wanted to describe these ideas in the Picture Craft booklet too. Stefan Nowac had the idea that it would be good to extend the documentation even further. We had found from the school trials that teachers had used Picture Craft to inspire work on colour and shape away from the computer. Other work away from the computer arose out of the pictures which the children created. Godfrey Hall had been most interested and helpful in both sets of school trials, and the BBC asked him to write this section. Since the aim was to produce a pack which was as suitable for the home market as for

the school, Godfrey included many suggestions which an interested parent could take up, though inevitably a few ideas would be more applicable to the school environment.

A range of 'copyright free' worksheets were designed to complement Godfrey's ideas and provide the basis for further work away from the computer.

The BBC are particularly good when it comes to presentation and production; hence they only panicked slightly when I asked for four separate 'help' cards to provide a quick reference for the function and other keys needed for the different activities. I handed over my drafts of these cards, and the BBC design experts went to work on them. I must say I was delighted with the finished results.

With the increasing number of schools now having linked networks of BBC micros, it was decided that we should make the software fully compatible with the Econet system. This was one of the last programming activities to be completed, along with a printer routine to dump a picture to a dot-matrix printer.

The final disc uses almost the entire 100K of standard disc space, and several features which might have been included had to be shelved. One of these was a facility to add text to a picture, but the attached program, at least partially gets around this problem.

Text Craft

The program works with any Mode 2 saved screen (there is a facility within Picture Craft for converting the picture data into an ordi-

nary saved screen). The program is therefore entirely suitable for adding text to any Mode 2 picture. With very simple alterations, it is equally suitable for screens saved in Mode 1. For Mode 1 pictures delete lines 100 and 110 and make the modifications in Listing 2 (Mode 1).

How to use the Program

You may wish to alter the file name in lines 90 and 1230 to suit your own purposes, or perhaps add a routine to allow the input of a filename within the program.

To use the program, position the cursor with the arrow keys, holding down the SHIFT key to move quickly around the screen.

The delete key works normally, until you press the RETURN key. Pressing the RETURN key commits the text to the screen. This is initially set to have a black background, but this can be turned off with key f3, and back on with f2. The colour of the text is initially set to white, but you can change this by pressing f4. The new colour will appear as a coloured rectangle in the top left of the screen. This disappears after a second.

If you lose the cursor off the edge of the screen, press f5 to return the cursor to the centre of the screen.

You can enter text vertically by pressing f1, and f0 returns the text direction to the horizontal.

Pressing f8 saves the screen with the text now added. You might like to make a simple function key strip to go with this program.

LISTING 1 - TEXT CRAFT

```
10 REM ***** (D4B1)
20 REM * Copyright * (69C3)
30 REM * Peter Smith * (E7B0)
40 REM * 1986 * (7D53)
50 REM ***** (9F94)
60 *FX 4,1 (B63F)
70 *FX 225,200 (B424)
80 MODE 2 (2D62)
90 *LOAD PICTURE (9C83)
100 VDU 19,8,7,0: (B9C6)
110 VDU 19,9,7,0: (0FBF)
120 VDU 5 (373C)
130 DIM x(100),y(100),l(100) (7165)
140 DIM hold 32 (28C4)
150 X=500:Y=500:col=7 (709B)
160 horiz=TRUE:black=TRUE (1A26)
170 VDU 23,224,*FF,*B1,*B1,*B1,*B1,*B1
,*B1,*FF (D9EC)
180 VDU 23,225,*FF,*FF,*FF,*FF,*FF,*FF
,*FF,*FF (3D36)
190 PROCcursor (6D74)
200 ptr=0 (363E)
210 REPEAT (145C)
220 *FX15,1 (EF32)
230 G=GET (AB64)
240 IF G=200 VDU7:horiz=TRUE (3096)
250 IF G=201 VDU7:horiz=FALSE (F05A)
260 IF G=202 VDU7:black=TRUE (9E00)
270 IF G=203 VDU7:black=FALSE (69D1)
280 IF G=204 PROCchange_col (E331)
290 IF G=205 PROCrecover (36B9)
300 IF G=208 PROCsavepic (ACC1)
310 IF G=136 THEN PROCmove(-8+24*INKEY-1,0) (4BES)
320 IF G=137 THEN PROCmove(8-24*INKEY-1,0) (ADA6)
330 IF G=138 THEN PROCmove(0,-4+28*INKEY-1) (2AFF)
340 IF G=139 THEN PROCmove(0,4-28*INKEY-1) (C97B)
350 IF G>31 AND G<123 PROCtemp(G) (9C81)
360 IF G=127 PROCrub (3802)
370 IF G=13 THEN PROCprint (5743)
380 UNTIL FALSE (E7E7)
390 END (9DE4)
400 (0B20)
410 DEFPROCmove(x,y) (3CBF)
420 PROCcursor (E34F)
```

```
430 X=X+X (CE7B)
440 Y=Y+Y (4BE0)
450 PROCcursor (AFBC)
460 ENDPROC (BE02)
470 (A633)
480 DEFPROCcursor (2CF3)
490 GCOL3,1 (5AA2)
500 MOVE X,Y (9B8C)
510 VDU224 (BAE7)
520 ENDPROC (CB47)
530 (E7B5)
540 DEFPROCrecover (B4EA)
550 PROCcursor (D2D5)
560 X=500 (2595)
570 Y=500 (41D2)
580 PROCcursor (C1D3)
590 ENDPROC (39E3)
600 (004A)
610 DEFPROCtemp(letter) (C0DB)
620 IF ptr=100 ENDPROC (9536)
630 SOUND1,-13,100,1 (0E71)
640 PROCcursor (2CBE)
650 GCOL3,7 (B044)
660 MOVEX,Y (EE3A)
670 VDU letter (0B26)
680 PROCstore(X,Y,letter) (F72C)
690 IF horiz X=X+64 ELSE Y=Y-32 (0B3F)
700 PROCcursor (97A4)
710 ENDPROC (B569)
720 (B69F)
730 DEFPROCstore(x,y,l) (EE31)
740 x(ptr)=x (46A4)
750 y(ptr)=y (E1B2)
760 l(ptr)=l (B5AF)
770 ptr=ptr+1 (1FBC)
780 ENDPROC (0F3E)
790 (D609)
800 DEFPROCrub (F64F)
810 IF ptr=0 ENDPROC (63E5)
820 SOUND1,-10,20,3 (0917)
830 ptr=ptr-1 (03B2)
840 PROCcursor (B926)
850 MOVE(ptr),y(ptr) (DASA)
860 GCOL3,7 (97B1)
870 VDU 1(ptr) (9421)
880 X=x(ptr) (C3A9)
890 Y=y(ptr) (37B6)
900 PROCcursor (323C)
910 ENDPROC (5CB7)
920 (BF89)
930 DEFPROCprint (121B)
```

```
940 IF ptr=0 ENDPROC (FFD7)
950 PROCcursor (BDF)
960 FOR I=0 TO ptr-1 (BF83)
970 MOVE x(I),y(I) (8440)
980 IF black THEN GCOL0,0:VDU 225,8 (F5DE)
990 GCOL0,col (BB1E)
1000 VDU 1(I) (AB9A)
1010 NEXT (9534)
1020 ptr=0 (BC66)
1030 PROCcursor (54C7)
1040 ENDPROC (7B4B)
1050 (B6E9)
1060 DEFPROCchange_col (9729)
1070 VDU7 (9431)
1080 col=(col+1) MOD 8 (8BAB)
1090 FOR I=0 TO 28 STEP 4 (CF25)
1100 I:hold=I:3000 (DA30)
1110 NEXT (C3C2)
1120 GCOL0,128*col (72DE)
1130 VDU24,0:992:56:1020:16 (49D2)
1140 PROCdelay(100) (D534)
1150 FOR I=0 TO 28 STEP 4 (FC98)
1160 I:3000=I:hold (7721)
1170 NEXT (33BE)
1180 VDU26 (2BD5)
1190 ENDPROC (B75A)
1200 (A270)
1210 DEFPROCsavepic (5AB3)
1220 PROCcursor (D7F5)
1230 *SAVE PICTURE 3000 8000 (05B5)
1240 PROCcursor (E2B6)
1250 ENDPROC (4D95)
1260 (5513)
1270 DEFPROCdelay(t) (7C10)
1280 TIME=0 (80B8)
1290 REPEAT UNTIL TIME>t (E1D0)
1300 ENDPROC (BE08)
```

LISTING 2 - MODE 1

```
80 MODE 1
150 X=500:Y=500:col=3
310 IF G=136 THEN PROCmove(-4+28*INKEY-1,0)
320 IF G=137 THEN PROCmove(4-28*INKEY-1,0)
650 GCOL3,3
690 IF horiz X=X+32 ELSE Y=Y-32
860 GCOL3,3
1080 col=(col+1) MOD 4
1130 VDU24,0:992:60:1020:16
```


SOFT SALE

DESK DIARY

Full diary facilities with search dates, key string search, full diary description per entry and browse facility. Desk Diary is so quick in operation that it actually makes using a computer based diary a practical possibility.

Order product number:

BBC Model B/B+/Master 128 disc: DB05
£6.00
+ 3 disc: DE03

VIDEOBASE

A specialist database written for library collections of video tapes. Information which can be included on the database handles running time of tapes and full descriptions. Tapes can be searched for by name or running time.

Order product number:

BBC Model B/B+/Master 128 disc: DB24
£6.00

EASY FONT

This is range of attractive fonts supplied on 1 80 track/2 40 track disc(s). There are 8 fonts in all:

Old English
Cloister
Tea Chest
Folio
Futura
Old Towne
Japanette
Corvinus

The fonts are controlled from BASIC and examples are given for each.

Order product number:

BBC Model B/B+/Master 128 disc: DB26
£10.00

ADVENTURE CRAZY

Six massive adventures:

Death in Poglovia
Puss in Boots
Secret Agent
The Orb
Mysterious Yeti
Diamond Adventure

Order product numbers:

BBC Model B/B+/Master disc: DB14 £6.00
BBC Model B/B+/master tape: CB14 £4.00

MUSICIAN

Musician is a suite of programs to help you compose, edit, store and play sounds and pieces of music on the BBC. The main program employs the Creative Sound Language with which you may compose or copy tunes to incorporate into your own programs. A further module allows the music to play in the background while loading a game. Example data include classical and modern pieces.

Supporting programs are *Soundstore*, an electronic library of envelopes and sound statements, *Player*, which turns your BBC into an electronic keyboard with digital recording, editing and playback and *Composer*, a music editor with standard musical notation on screen. Other musical examples from Cavatina to Bach are included. Make music, get *Musician*!

Order product numbers:

BBC Model B/B+/Master disc: DB06 £6.00
BBC Model B/B+/Master tape: CB07 £4.00

JINGLE COMPOSER

MENU

```
1 Practise
2 Final version
3 Playback
4 Parameters
5 Edit
6 Save
7 Quit
```

INSTRUCTIONS

```
Select from menu
Press number 1-7
```

BUSY

A disc based suite of useful programs for anyone managing business on the BBC Micro.

The programs will produce invoice and delivery notes, statements, orders and credit notes. Menu driven and very easy to use.

Also provided:

Notepad — 80 column wordprocessor
Financial Manager — bank and savings accounts processing
Filer — simple database program for names and addresses/telephone numbers

Order product number:

BBC Model B/B+/Master 128 disc: DB23
£6.00

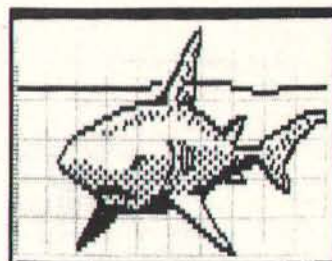
A&B GRAPHICS PACK

Four great programs for computer artists/art departments

IKON A&B's own answer to mouse software with full graphics facilities and icon editing. Keyboard or joystick.

TOUCH OF CLASS A very classy printer graphics program (Epson compatible) for designing and dumping personalised letter heads.

MOSAIC Multicoloured building blocks towards your own cartoon characters, landscapes and sprites.



CADPACK Computer Aided Design. Sophisticated drawing, filing and retrieving facilities. A full library of drawing routines, scale, post and redraw. Documentation supplied.

Order product numbers:

BBC Model B/B+/Electron tape A: CB03 (Ikon/Touch of Class) £4.00
BBC Model B/B+/Electron tape B: CB04 (Mosaic/Cadpack) £4.00
BBC Model B/B+ disc: (all four programs) DB03 £10.00
BBC Master 128 ADFS disc: (all four programs) DB17 £10.00
Electron +3 disc: DE01 (all four + ikon utilities/retouch of class) £12

COMBAT ZONE

Play our combat simulations and then go on to write your own. The wargame generator allows the author to simulate any battle, to juggle the type, number and strength of the forces involved and choose the terrain on which the battle shall be fought.

Sea Battle and Jungle Warfare are the example games. For strategy fans the tape/disc also contains Battle of Hastings and intergalactic struggle Mabwar.

Order product numbers:

BBC Model B/B+/Master 128 disc: DB21
£6.00
BBC Model B/B+/Master 128 tape: CB21
£4.00

IKON UTILITIES

Bring colour to your Ikon, AMX Art or other Mode 4 pictures and diagrams with Paintbox and then display them, slideshow style, on the Cascade. Mix your own colours, fast fill, foolproof operation. Many example screens included.

Order product numbers:

BBC Model B disc DB19: £6.00

BBC Model B/Electron tape CB19: £4.00

MURDER AT THE ABBEY

Murder at the Abbey is set in the 1930s and has a classic country house 'whodunnit' setting. You are Detective-Inspector Edward Carstairs, and you have been sent to investigate the mysterious death of Lord Arthur Melborough.

The cast of characters from which you have to detect the murderer includes Gerald Melborough, the victim's son, Lady Melborough, the widow, her French maid Suzanne, the ancient butler and a number of house guests, any or all of whom might have had a motive for killing their host.

Red herrings abound and your task is to find out 'whodunnit' and discover his or her motive. You must then confront the murderer with the murder weapon and some material evidence to support your theory and make your accusation.

Unlike conventional adventures, this game does not consist of solving devious puzzles in order to make progress. Instead you must walk around questioning suspects and making a thorough search of the house and grounds. The suspects move about, and you may receive extra information by questioning them more than once. Also, events occur over a period of time so you have the feeling of being involved with a real story which unfolds at its own pace.

If you don't seem to be making any progress, remember it is important to EXAMINE every object, SEARCH every location and QUESTION every suspect. If you learn nothing the first time there may be something to be discovered when you come back later on.

Because of the way the game is constructed, questioning suspects sets flags which enable later events to take place. This means that even if you have played the game previously, and you know what someone has to say, you must still question them each time you play.

If you attend carefully to all the clues you will receive, you should be able to work out the identity of the murderer and make an arrest!

Order product numbers:

Murder at the Abbey BBC Model B CB16 £4.00

XANADU/AMNESIA

Two superb Adventurescape productions to entertain and challenge you. Xanadu was the first game to be written with Adventurescape. It takes you into the mythical world of Kubla Khan and closely follows the famous Coleridge poem. Your light aircraft has crashed on the mountainside and you head for the luminous pleasure dome. Can you attain Paradise, negotiate the cavern of ice and reach the sunless sea.

Amnesia is a massive disc based adventure packed with interest. How do you get past the giant slug into the laboratory? Is there a connection between the concert tickets and a trip on the Thames? And, of course you've lost your memory so who are you?

Clue sheets supplied on request! Note that the Adventurescape generator is not on this disc but is available in the DB20 twin disc pack. The Electron tape version contains the original generator program.

Order product numbers:

BBC Model B/B+/Master 128 disc: DB02 £6.00

BBC Model B/B+/Master 128 tape: CB02 (Xanadu only) £4.00

Electron tape: CE02 (Xanadu only) £4.00

Kent

TOWNS TO VISIT	CHOICES
PURCHASES	
Doncaster	A. MOVE
Ventnor	COUNTY
Orange	
Bedlington	
Great Yarmouth	B. VISIT
Wylesbury	TOWN/CITY
Dorchester	
Necklace	
Gloves	C. VISIT
Barry	LANDMARK

TOP THREE

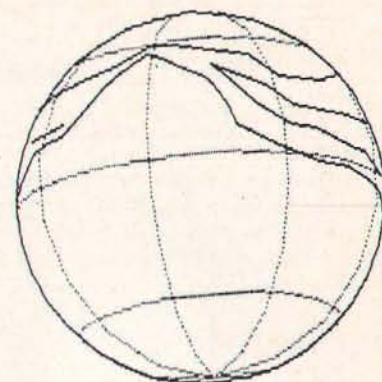
Three top educational programs. Treasure Hunt takes you on a countrywide quest. You move about the country from county to county, investigating the allocated towns and finally homing in on the famous landmark to log your time. Single or multiple player competing against the clock. You'll need your atlas! The geographical content can be redefined as required and full instructions are given. In Island Hopping you play ferry master, a test of judgement and planning at sea as you plot a course through various maritime hazards. Zim is a colourful shape matching game for young children incorporating Acorn speech.

Order product numbers:

BBC Model B/B+/Master disc DB18: £6.00

BBC Model B/B+/Master tape CB18: (with-out Zim) £4.00

Electron tape CE18: £4.00

**GLOBAL VIEW**

Global View is a stunning graphical representation of the earth's time zones and day and night around the globe. High resolution b/w and colour versions supplied as well as sister program Down to Earth.

Order product numbers:

BBC Model B/B+/Master/Electron tape CB01 £4.00

NEW: GLOBAL VIEW — 2 DISC PACKAGE**DISC ONE**

A complete global view package is now available, incorporating full global graphical displays of the seasons, day and night; alternative maps; continental drift; equidistance maps; a module to design your own world; model globes — section printouts with which to make your own model globes, of the earth today, 1 million years ago, or a planet of your own making!

Back in time with Global View - back to a time when the world didn't look quite the same!

The Panagea programs display the continents on the face of the earth as they were many millions of years ago. You can run through the history of the earth's development up to the present day. Further background information and additional graphics are displayed for each period.

And into the future! - you can even go into a predictive sequence to see what the earth may look like to future astronauts lucky enough to look down upon its surface.

As well as full on screen instructions, the package comes complete with technical and user documentation.

The whole suite is a uniquely educational and enjoyable package for the BBC Micro-computer, Model B, B+ or Master 128 (this version supplied on one ADFS disc). On two discs for just £10.00.

A single disc Electron +3 version of the suite contains all the above but not the animation facilities, which the hardware does not support.

DISC TWO

Our animation programs incorporate a DUMP key so that any of the screen windows can be saved to disc from any of the Glocal View suite of programs under a unique filename determined by the month/day/time parameters.

These displays are then retrieved from disc in sequence. Different screen windows can be animated up to the capacity of your disc drives. When using RAM disc, the effects are even more stunning.

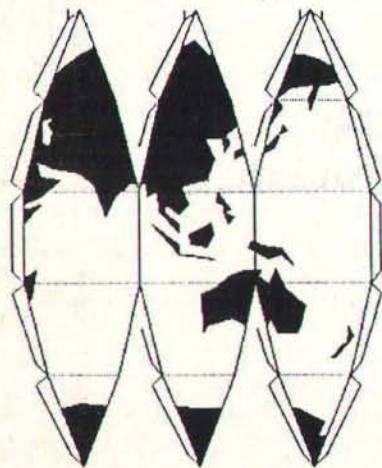
HAM Radio enthusiasts who wish to update the on screen information at regular time intervals will find this upgrade invaluable.

Order product numbers:

BBC Model B/B+/DB01 £10.00

Electron +3 disc DE06 £12.00

Master 128 DB16 £10.00

**DELIVERY**

Problem solving and map reading skills are both tested by this interactive travel game, full of humorous dialogue and rewards for children who do well.

Order product numbers:

BBC Model B/B+/Master disc DB25: £7.50

BBC Model B/B+/Master/Electron tape CB25: £5.00

'VENTURESCAPES

1. Adventurescape generated, a fun packed variety of adventure situations to solve. They include 2002, Jungle, Snow and Live Aid adventures!

Order product numbers:

BBC Model B/B+/Master disc: DB13 £6.00

BBC Model B/B+/Master tape: CB13 £4.00

ADFS MENU

The ADFS Menu is a sophisticated menu utility for ADFS discs on Model B/B+ or Master 128/Compac computers. The Menu becomes active automatically when the disc is booted. Files and sub directories are displayed along with other system information. Just move around the files with the cursor keys or 'games' keys and highlight the file required.

The menu handles files in an intelligent manner. BASIC, machine code and text files are treated appropriately. If View or View-sheet is fitted then the software will be entered automatically and the file loaded.

Sideways ROMs can be saved to disc and ROM images loaded into sideways RAM banks and automatically installed. This is an essential utility for Master 128, Master Compac (faster than the Desk Top) and Model B with ADFS fitted. The Menu will operate on floppies (5¼ or 3½) or Winchester discs.

Example files are included on the disc as well as full instructions and the source code in ADE.

Order product number:

BBC Model B/B+/Master 128/Compac disc: DB27 £12.00

EDUCATIONAL GAMES

A disc full of educational games with documentation files. From telling the time to interactive punctuation tests to a program generator for computer/audio combination.

Big Ben
Edu-dot
Bingo
Alpha
Hangman
Letters
Punctuation
Solar System
Walk the Plank
Words

80 track discs also contain Phonics, All Change and Invasion Times

Order product number:

BBC Model B/B+/Master disc: DB11 £6.00

GAMES

Tremendous value compilation
Grisley Gardens — adventure fun
Skoogs — takes you into the swamp
Formula One — antics at the track
Star Encounter — shoot out in space
Spacehawk — fast action duelling
Darts — classic pub game. Test your aim and your maths

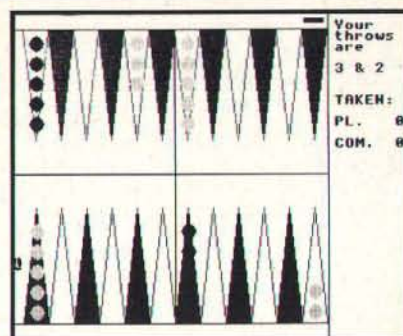
Classic games. Excellent value.

Order product numbers:

BBC Model B/B+/Master 128/Electron tape: CB08 £4.00

BBC Model B/B+/Master disc: DB09 £6.00

Electron +3: DE05 (includes Ally Pally) £8.00



A&B CHRISTMAS GAMES COMPENDIUM. Headed by Scrooge, the multiroom arcade game, Christmas Compendium is a massive compilation of games from A&B Computing.

Scrooge arcade adventure
1984 sliding block puzzle

Tank Battle
Back Gammon
Doodlebug
Domgrid
Dune Fighters
Falcon Pilot
Fortune Teller
Pontoon
Scissor, Stone, Paper

Order product numbers:

BBC Model B/B+/Master disc: DB10 £6.00

BBC Model B/B+/Master tape: CB09 £4.00

Electron tape: CE09 £4.00

+3 disc: DE04 £8.00

ANDROID/ALLY PALLY

Android transports you to a desolate alien planet for the ultimate shoot out. While Ally Pally lands you slap bang in the middle of a computer exhibition complete with all the well-known BBC Micro and Electron companies. Beat the crowds, find the kids, top up your failing energy at the bar! Disc only.

Order product number:

BBC Model B disc: DB08 £6.00

BOUNCER & CO.

The classic ladders and levels arcade game with the adoring Kangaroo trying to save her baby. The mischievous monkeys have got other ideas and the fruit is flying!

Also on this compilation:

Wiggler — fast worm game
Revsquare — mind bending puzzle
Grand Prix — taking the track officials to the cleaners!

Order product number:

BBC Model B/B+ disc: DB07 £6.00

PROCYON EPROM TOOLKIT

Many new commands at your fingertips with this value for money EPROM toolkit. BASIC error handling, packing, memory editing. You name it, it's on PROCYON.

Order product numbers:

BBC Model B/B+ EB1 £12.50

Electron EE1 £12.50

ADVENTUREScape III

The disc based adventure generator. Two disc package. Full documentation. Menu driven for ease of use. Huge adventures possible.

What is Adventurescape?

Adventurescape is an adventure writing system for disc based BBC Microcomputers (all series). The system consists of a 'shell' program (ADVRRUNF) which will run any one of a number of different adventure games, and two utility programs (TEXTGEN and PUZGEN) which provide friendly menu-driven editors to allow people to create the data files for a game of their own design. The system is unique in treating all the content of the game as a database — including the puzzles. This means that it is comparatively simple for anyone to use and no programming expertise is required.

The adventure games which can be created include the following features:

- (i) Up to 250 locations and 250 messages can be used. The descriptions may be lengthy and the total text far exceed the memory capacity of the computer, since these files (created by TEXTGEN) are accessed directly from disc while the games are run.

- (ii) A range of Mode 7 coloured text is used to distinguish different types of message, eg location descriptions, general messages and inventory lists.

- (iii) Locations are connected by pointers allowing one way exits, twisty passages, mazes etc to be constructed.

- (iv) Objects may be examined leading to messages which expand upon their usual description.

- (v) A very wide range of puzzles may be constructed using the unique puzzle generator of Adventurescape as will be explained in detail below.**

- (vi) Players may SAVE and LOAD game positions under their own choice of filename as often as required.**

What is more this package includes no fewer than three sample games written with the system: **Murder at the Abbey**, **Lost in Xanadu** and **Amnesia**, in addition to the files of a short demo game 'Dungeon' whose construction is explained as a fully worked example in the manual. A utility for squashing text files once a game is complete is also provided. Text from **Adventurescape** can be exported to the **Robico Midge Compression System** (utility in **A&B July**). A version for the **B+** and **Master 128** using sideways RAM to hold all the data was published in the September issue of **A&B Computing**.

Order product numbers:

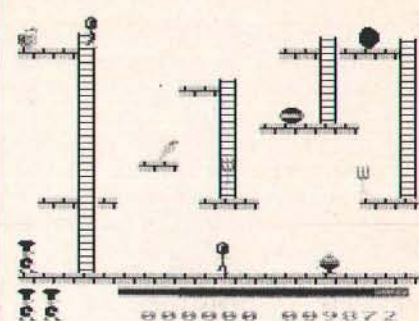
BBC Model B/B+/Master disc DB20 £15.00
BBC Master ADFS disc (utilises sideways
RAM) DB28 £15.00

MODE 7 UTILITIES

A full Mode 7 suite. Scrolling, text and graphics editor, pixel plotting, automatic conversion of Teletext screens to BASIC, a Mode 7 screen dump and frame management. Disc only.

Order product number:

BBC Model B/B+/Master disc: DB12 £6.00



GAMER GAMES

A compilation of games brought to you by Games Computing magazine, including Rokrace, Aladdin and Kitchen Capers. For Model B, B+, Master.

Order product numbers:

BBC Model B/B+/Master disc DB15 £6.00
BBC Model B/B+/Master tape CB15 £4.00

EASYWORD WORDPROCESSOR

Menu driven and simple to use but capable of sophisticated search and replace, block move and replicate, status information and 80 column viewing of text. For the finished document Easyword provides full printer control, headers, footers, incrementing page numbers, page control, top and bottom margins, line length etc.

Order product numbers:

BBC Model B/B+ disc DB22 £7.50
BBC cassette CB22 £5.00
Electron cassette CE22 £5.00
Electron+3 disc DE22 £9.50

A&B ♦ TIPS ♦

Through a Glass, Darkly

Have you looked at your Monitor or T.V. screen lately? Can you actually see anything through the dirt? Go on give it, and your eyes, a treat and clean the thing.

Cleaning glass is an arcane art, just because there are dozens of flashing bottles of window jollop on the shelves of your Super-Dooper Market does not mean that you have the answer. The average window cleaning preparation is like ****-Cola, once you have started using it, you need more.

The trouble is that most of these preparations deposit a thin film on waxy substance on the glass (no doubt prepared to a secret formula late at night in a Bohemian castle high on a craggy mountain to the sound of hysterical laughter and creaking doors) This substance seems to positively make the glass glow, in the right light, at the right angle, but not for long. The only one I

have come across that does a half decent job and is a joy to use is Ajax window cleaner, and I can't find any in our local shops.

Enough of this whimsy, heres a practical tip. Use ordinary household Ammonia in a dilution of about 0.1 pint to a gallon of water. I use one of the discarded window preparation sprays to hold it. This preparation cuts through the grease and muck and leaves the glass sparkling and clean for a much longer period. Cover the keyboard with a cloth, just spray the stuff on and then polish it off with a soft cloth. The only precautions you have to take when using it are the usual ones with liquids and electrical equipment, i.e don't have your bare feet buried in damp earth and try to spray the screen with all your equipment switched on at the same time. (I seem to recall reading somewhere that one of this country's greatest experimental Radar boffins killed himself by mowing his lawn, in bare feet, in the early morning dew, with an electric lawn mower.)

O R D E R F O R M

All disc copies of the Software Sale, when space permits, come complete with our Checker program. So if you do need to type in a listing, Checker will be at your fingertips making de-bugging easy.

When monthly listings are included on discs as added value, only the compatible software is supplied ie Electron discs have only Electron compatible programs.

The software is sold in support of the articles in A&B Computing. Where space permits the text of articles is included on your disc. Full documentation is also supplied where indicated and on request from three months after the publication of the relevant issue in which the programs were first listed and documented.

If you wish to order from the software sale simply tick the appropriate box in the table

of product numbers. All prices include VAT and postage and packing. Fill in the coupon and send this coupon together with your cheque/postal order to:

A&B Software Sale

Reader Services

PO BOX 35

Wolsey House

Wolsey Road

Hemel Hempstead

Herts.

HP2 4SS

Tel: 0442 41221

Telephone orders are taken for Visa and

Access.

Please allow 28 days for delivery

Please write your name and address clearly on the back of your cheque

Please complete the following form in BLOCK capitals.

I enclose a cheque/postal order made payable to ASP for

£.....

Name.....

Address.....

Postcode

Signed

Date.....

Name	Prod. No.	cassette	40	80	Name	Prod. No.	cassette	40	80
Global View	DB01	XX	<input type="checkbox"/>	<input type="checkbox"/>		DE04	XX	XX	<input type="checkbox"/>
	CB01		XX	XX					
	DE06	XX	XX	<input type="checkbox"/>	Educational Games	DB11	XX	<input type="checkbox"/>	<input type="checkbox"/>
	DB16	XX	XX	<input type="checkbox"/>	Mode 7 Utilities	DB12	XX	<input type="checkbox"/>	<input type="checkbox"/>
Amnesia/Xanadu	DB02	XX	<input type="checkbox"/>	<input type="checkbox"/>	Gamer Games	DB15	XX	<input type="checkbox"/>	<input type="checkbox"/>
	CB02		XX	XX		CB15		XX	XX
	CE02	<input type="checkbox"/>	XX	XX					
Ikon Suite	DB03	XX	<input type="checkbox"/>	<input type="checkbox"/>	Adventurescape III	DB20	XX	<input type="checkbox"/>	<input type="checkbox"/>
	CB03		XX	XX		DB28	XX	<input type="checkbox"/>	<input type="checkbox"/>
	CB04	<input type="checkbox"/>	XX	XX	Combat Zone	CB21		<input type="checkbox"/>	<input type="checkbox"/>
	DE01	XX	XX	<input type="checkbox"/>		DB21	XX	<input type="checkbox"/>	<input type="checkbox"/>
	DB17	XX	<input type="checkbox"/>	<input type="checkbox"/>	Procyon	EB1	EPROM only		
Ikon Utilities	DB19	XX	<input type="checkbox"/>	<input type="checkbox"/>		EE1	EPROM only		
	CB19	<input type="checkbox"/>	XX	XX	Easyword	CB22		XX	XX
Musician	DB06	XX	<input type="checkbox"/>	<input type="checkbox"/>		DB22	XX	XX	<input type="checkbox"/>
	CB07	XX	<input type="checkbox"/>	<input type="checkbox"/>		DE22	XX	XX	<input type="checkbox"/>
						CE22		XX	XX
Venturescapes	DB13	XX	<input type="checkbox"/>	<input type="checkbox"/>	Busy	DB23	XX	<input type="checkbox"/>	<input type="checkbox"/>
	CB13	<input type="checkbox"/>	XX	XX	Desk Diary	DB05	XX	<input type="checkbox"/>	<input type="checkbox"/>
Adventure Crazy	DB14	XX	<input type="checkbox"/>	<input type="checkbox"/>		DE03	XX	XX	<input type="checkbox"/>
	CB14	<input type="checkbox"/>	XX	XX	Videobase	DB24	XX	<input type="checkbox"/>	<input type="checkbox"/>
Top Three	DB18	XX	<input type="checkbox"/>	<input type="checkbox"/>	Delivery	DB25	XX	<input type="checkbox"/>	<input type="checkbox"/>
	CB18	<input type="checkbox"/>	XX	XX	Easy Font	DB26	XX	<input type="checkbox"/>	<input type="checkbox"/>
	CE18	<input type="checkbox"/>	XX	XX	ADFS Menu	DB27	XX	<input type="checkbox"/>	<input type="checkbox"/>
Bouncer	DB07	XX	<input type="checkbox"/>	<input type="checkbox"/>	Robase	DB24	XX	<input type="checkbox"/>	<input type="checkbox"/>
Android/Ally Pally	DB08	XX	<input type="checkbox"/>	<input type="checkbox"/>	Delivery	DB25	XX	<input type="checkbox"/>	<input type="checkbox"/>
Games	CB09	<input type="checkbox"/>	XX	XX	Easy Font	DB26	XX	<input type="checkbox"/>	<input type="checkbox"/>
	DB09	XX	<input type="checkbox"/>	<input type="checkbox"/>	ADFS Menu	DB27	XX	<input type="checkbox"/>	<input type="checkbox"/>
	DE05	XX	XX	<input type="checkbox"/>					
Christmas Games	DB10	XX	<input type="checkbox"/>	<input type="checkbox"/>					
	CB09	<input type="checkbox"/>	XX	XX					
	CE09	<input type="checkbox"/>	XX	XX					

CROSS COMPILING

To the assembly language programmer, a good cross assembler is probably one of the most useful tools of his trade; with this tool, he is able to write programs in one processor language, and convert them into another language, suitable for another processor and another machine.

This way, many non machine-specific languages and compilers are written using a cross assembler, as many routines can be transferred from its native processor language, into a set of instructions suitable, not only for another processor add on for your machine (as with the Z80 and 6809 second processors for the BBC micro), but for a whole host of machines.

Crossware Products have been successfully writing and producing cross assemblers for the BBC Micro for some three years now, starting with a modest disc only system. Their sideways ROM cross assemblers set a new standard.

The Crossware list of cross assemblers cover all sorts of processors, from the control bound euroracking 6801 series, all the way up to the *super chip* generation of processors such as the 68000, as used in the Torch Triple X; and the Cumana OS-9 BBC Micro upgrade.

I have looked in detail at two cross assemblers from Crossware. Because of its sheer popularity, I have looked at the Z80 cross assembler, a useful tool if you wish to convert your BBC Micro programs to Z80 second processor or Torch Z80 Disc Pack Format.

I have also taken a look at the cross assembler for the 68000. This processor is now becoming a popular chip in the world of industry and personal business computing because it is one of the most powerful 16 bit chips of its generation.

Cross Hatching

The cross assemblers operate in conjunction with BBC BASIC; strange as this may seem, it is a very logical way of using the built-in 6502 assembler in BBC BASIC. Versions supplied for the BBC Model B, B+ and B+ 128 operate with BASIC 2. However, if you have a BBC Master, a separate version is available. The version number indicates which version of BASIC requires which cross assembler, therefore for the BBC B+, BASIC 2 is fitted as standard and thus requires the use of the Z80 V1.2xx and so on.

A complete cross assembly system to replace your BBC Micro's mother tongue

If you are one of those people *still* using BASIC 1, then you will have to replace the old BASIC with the latest version. This is now undertaken at nominal cost by authorised Acorn dealers and repair centres.

Both the Z80XR and the 68000XR series are well packaged, consisting of a plastic wallet and a ROM. The wallet contains one or two 5.25" discs containing the necessary library files, utilities and example files, and a manual. The ROM is typically a 16K EPROM which can be fitted in the usual way, or alternatively in a special cartridge for the Master Series versions.

Any number of the different cross assembler ROMs can be installed in the BBC Micro at the same time, so if you want all of the Crossware cross assemblers fitted in the machine at the same time, you are perfectly able to have them, with no command or workspace clashes. However, only one cross assembler can be initialised at one time, thus reinitialising another cross assembler will take precedence.

The commands are very well documented in their respective manuals, and because many of the crossware commands are the same across the series, a generic manual is supplied, with only the relevant processor specific information kept separate on sheets of paper enclosed with the manual.

Trial Run

Whenever the command ***MCODE** is detected by the operating system, control is passed to the currently initialised cross assembler, this will usually be when a program is being RUN, but you can also type the commands directly (known as *immediate* mode) or by using word processed files (known as *batch* mode).

***MCODE** is similar to the BBC assembler command **[** (a square bracket in Modes 0-6 and a left hand arrow in Mode 7).

Once in control, the cross assembler will assemble the following instructions into absolute machine code. The cross assembler will attempt to do so until it reaches a **]** (close square brackets or right hand arrow) symbol, this will then pass control back to BASIC.

Using the assembler in *immediate* mode or *batch* mode has its obvious advantages, especially when space is at a premium, or if you are using spool files downloaded from a remote terminal (as I have done with many assemblers before using the Crossware series). However, for many users, a third mode of operation, (called *program*) mode is generally considered more useful.

Trying a few silly little programs is normally the best way of indulging oneself in the early days of learning a cross assembler, the Crossware manual is no exception, the example in Figure 1 is as good a place to start as any.

Figure 1 The example start

```
10 FOR I% = 0 TO 3 STEP 3
20 *MCODE OPT I%
30   ORG &2500
40   .start NOP
50   NOP
60   NOP
70   NOP
80   NOP
90   NOP
100  NOP
110 ]
120 NEXT I%
```

Of course this only sends a series of *no operation* commands to the processor, but the general idea is the same for all processor opcodes and operands.

There is another method by which you may find it more useful to use BASIC programs (and more importantly BASIC procedures). As whole libraries of procedures can be stored on disc (using either DFS or the ADFS) you can save yourself a lot of time by taking a routine that is debugged and ready for inclusion in a program, and either ***EXEC**ing it into place, or as is more likely, inserting a **PROC** in the program.

BASIC will attempt to find the **PROC**edure. If it cannot find one, the command is passed to the cross assembler, and a file (of the same name) is pulled from the disc — all very clever.

Built into the Crossware system is an interactive **HELP** screen. It can be called up at any time using the ***H/** command. This dis-

plays a menu of all the relevant commands in your currently selected cross assemblers, the mnemonic instruction set and, depending on which mnemonic command you select, important information regarding the chosen command, how many cycles the command takes, which registers it uses and how many T states the command requires. BASICALLY, the help system is an online data sheet, and can be called up at any time except during assembly.

I found this feature most useful when working on strange processors, such as the new 68000 and 68008 series, and is a real boon to programmers who have to switch from using one cross assembler to another in the same day on the same machine.

The assembler treats programs in a fairly open format; trailing spaces are optional, except after a variable name and TAB characters can be used (if you use a word processor to create your programs) to add indentation effects.

Labels are included in all the Crossware cross assembler series, and are in fact treated as ordinary BASIC variables; for instance, there is no distinction between variables, symbols and labels. They can be defined from within the assembler by preceding the label name with a full stop. As usual, it is best to keep the assembler convention of using lower case characters. The label is then assigned a value to the current program pointer (P%).

If you try to define a duplicate label, the assembler will produce an error message "duplicate label" and will stop operation. There is however one exception, and this is when labels have the value &0 or &FFFF, which are assumed to be local variables.

In addition, any value can be set using the EQU or SET commands, (for the Z80 series, this is changed to DEFL), comments are as usual given the backslash symbol /.

Larger Files

If the user wishes to assemble code and still hold it in RAM, as it is assembled, and it is not appropriate to store it at the location specified at P% (such as writing sideways ROM software), you may use the "ram storage pointer" variable called O%. This variable sets the assembler the task of assembling the code at whatever value you have set O%, but this time with the JMPs and CALLs set for the value in P%, thus you can assemble a program in memory that will run in sideways RAM, without actually assembling it into address &8000, the sideways RAM program space or by using the second processor OSHWM page (&800) for programs that use the 6502 second processor.

Instead of using O%, you may wish to use RORG as a companion to ORG.

The BBC BASIC pseudo-ops are all available, EQU, EQUW, EQUQ and EQUQ. The more conventional pseudo-ops EQU, SET, FCB, FDB, FCC, RMB and BSZ are also available with all the cross assembler packages (except that the Z80 system does not support SET and the 65C02 cross assembler does not support RMB). In addition to the

above, the 8085 supports the older pseudo-ops DB, DW and DS.

LIST and NOLIST are both supported in the entire range of assemblers.

The default format for the object code is absolute binary, however an alternative format can be selected for code being sent to the disc, this is called the Motorola "S" format.

"S" records are blocks of ASCII data. Each block contains data which specifies the address for the machine code in that block and thus the code generated by the cross assembler need not be contiguous. Each "S" record includes a check digit and is the most useful form by which data can be downloaded from one machine to another via a modem, as high order bytes are reorganised using a parity setting, thus there are none of the problems transferring binary data over the telephone line (as there is with ROMAS Intel files).

The first "S" record does not contain machine code, but instead is a header block which contains a program name. This is called an "S0" record and contains in the first two bytes of the file, an ASCII "S" and an ASCII "O".

The final block is an "S9" record which signifies the end of the program.

The command *SRHEADER is used to select the "S" record format and to create the "S0" header record for use with industry standard EPROM programmers that search for such data to delimit page boundaries.

The *SRHEADER command requires the file to be already open with its address handle stored in Q%. If Q% is set to zero, then the command is ignored. Naturally *SREND creates the "S9" end record block.

Procedural Programming

As I mentioned earlier, the Crossware cross assemblers can support a series of extensive modules in the form of BASIC procedures. When a procedure is called, the BASIC interpreter searches the program for such a procedure name. If this is not found, then the assembler will search for one on the currently selected disc drive.

Using this procedure management system, you don't have to keep pulling chunks of code from your old assembly language programs and hastily modifying and incorporating them into your newer programs.

I have successfully taken down a series of procedures from COMSHARE for the 68000 machine, and read them using the disassembler. I have managed to get a few of the CP/M User's Group utilities working on my BBC Micro, using the cross assembler options.

Admittedly the initial troubles caused when downloading a file from a foreign machine format to another, took so long that it was almost worth rewriting the damn routines themselves. But it is possible to copy files from one machine and have them read (and operating in one form or another) on your BBC micro, and to use them in your own cross assembled programs.

Which brings me to one point, the chances are that you will need to transfer

files from one machine to another, unless you are using the Z80 second processor in conjunction with the Z80XR cross assembler. The majority of the problems I encountered were not from writing the programs, but getting them from one machine into another.

As yet, only one cross assembler, (Watford Electronic's ROMAS) has a built-in transfer utility for the serial port. Thus additional software has to be connected to transfer the files via a serial line, or a network from one machine into a BBC Micro.

I have successfully uploaded and downloaded Z80 and 68000 files using the BBC Micro as a remote terminal, and I have even been able to transfer the files across to the 6809 FLEX disc format, however these were all done using a *Demon* modem or by using the ROMAS *TRANSFER command. So additional hardware is a consideration, if you are needing to transfer data from one machine to another.

The command *VDUMP will display all of the variables created in the assembly process (excepting the integer variables A% through to Z%). Numeric values will be displayed in hexadecimal, even if they were originally defined in decimal or octal. Non integer numbers will be converted into integers free of charge which is slightly annoying but nothing a good hexadecimal to decimal conversion calculator cannot cure.

The command FIND (operand) will find any occurrence of a certain operand in memory, this is useful if, like me, you keep lapsing into lazy programming habits and use NOPS everywhere to delimit procedures or routines.

There is a small text file converter built into the ROM, which converts the currently selected program in memory, and spools it to a disc as a special ASCII text file.

This file has been stripped of line numbers (necessary only for the BASIC interpreter) and inserts a NEW and an AUTO at the beginning of the file, ready for *EXECing back into BASIC. This is where structured assembly language programming is forced upon the user as the *TSAVE command will refuse to convert absolute jumps such as GOTO 100 or ON T GOSUB 100,200,300.

Some ROMS may conflict with other ROMS in your machine (currently documented ones are Oxford PASCAL and Beebug's Toolkit.... as usual), so Crossware have included a means by which you can de-socket the offending items of firmware. By using the command *ROMSOFF, you can deactivate any number of ROMs by typing the command *ROMSOFF followed by the sockets you wish to de-socket; you may reinitialise them by typing *ROMSOFF and pressing BREAK or typing CALL !-4.

Using sideways RAM couldn't be easier using the command *RAMSWITCH, which has the effect of sending the object code to a bank of sideways RAM and by setting the RAM storage address between &8000 and &BFFF (the 16K block set aside for sideways

C O N T I N U E S ►

RAM). You can select any of the four banks of RAM in the BBC Master or Plus 128, or the eight using the Watford Electronics 128K RAM/ROM board, or any of the pages using Solidisk's 32,64,128 and 256K sideways RAM systems. This can be used as buffer storage, or as a quick means of writing sideways RAM/ROM software.

Phasing Errors

A phasing error occurs when an instruction is generated with a certain number of bytes during the first pass and a different number of bytes on the final pass. This corrupts all the values in the label store generated on the first pass, and thus causes a great deal of problems when generating working code and writing programs with code that you can trust to be assembled correctly.

Because of the way the Z80 and the 8085 cross assemblers are arranged and due to their internal architecture, phasing errors cannot occur. However, with the rest of the Crossware series of assemblers, phasing errors are trapped and displayed when one is encountered.

A phasing error would normally occur when a variable is used in an expression before it is defined. During pass 1, the expression evaluator returns the value of the least significant word of the program pointer (P%).

This is somewhat different when dealing with 16 bit processors such as the 68000 (and the pseudo 16 bit 68008 processor), but on the whole, what happens is that an extended addressing mode may be required to call an address, this (in the 8 bit series) requires three bytes as opposed to the usual two (high order/low order) byte arrangements.

For the 16 bit series the phase lock error message is encountered when the cross assembler generates a 16 bit absolute effective address that requires an additional two bytes of code.

If the variable is later defined as having a 32 bit value during pass two, it will generate the 32 bit absolute effective address thus requiring an extra four bytes. These extra bytes would be confused by the assembler as being either the next line of opcodes or operands, or as trailing addresses from an extended mode of addressing!

Crossware prevents this error from occurring, by replacing the first byte of each instruction with a number representing the number of bytes in the instruction. This number is then used during the final pass to determine whether the direct or the extended addressing mode should be used irrespective of the number of significant bytes in the operand.

There are two error messages that can be generated in the presence of a phasing error, the first of these is *Phase lock error*. This indicates that the byte just read from pass 1 has an invalid value. The first and second passes have therefore somehow got out of phase.

The second error message, *Byte space error* is generated when the byte read back from the first pass is too small. This is most likely

commonly associated with local variables when it somehow selects a short addressing mode during pass one and a long addressing mode is set on the final pass.

To overcome this problem, you can define the value of the variable to have the local variable set at &FFFFFF immediately after the LOCAL statement. This will cause a long effective address to be generated during pass 1. A special provision has been made to prevent symbols having either &0 or &FFFFFF from generating the *duplicate label error* message.

Disassembly

If you are reading code that has already been written in another processor language, and you have successfully transferred the code into Acorn DFS format, you may disassemble the code by typing in the command ***MDIS**.

This command allows you to disassemble a filename from a start address in memory to an end address, all control codes can be used to turn on the printer. This is especially useful if you are using a cross assembler in conjunction with a second processor option connected via the tube (6502, Z80, &6809 and 68000) as you can examine the contents of RAM before you transfer the file to the second processor.

All the usual commands exist to step backwards or forwards in memory and is remarkably similar to HDIS.COM on the old mainframe DEC 10 systems.

Crossware in Use

The two processor types I tried using the crossware assemblers were the Z80 and 68000 processors. Obviously your own requirements will dictate which cross assembler you will need. If you are thinking of using

address bus (which represents some 98% of all the 68008 instruction set commands).

A number of 68000 second processors are available for the BBC micro, of most notable interest is the Cumana OS-9 interface which has been long in the waiting, and I will enjoy trying the 68000XR cross assembler out fully when they are ready, watch this space.

For the Z80 systems, I was able to transfer many routines from the CP/M User Group into BBC executable code. I was able to port across programs to NorthStar Horizon, RML 380Z and 480Z and the Acorn Z80 second processor as well as the Torch Z80 second processor. I can only assume that the *Technomatic Multiform Z80* system will work in all of the above CP/M emulation modes, as well as its own.

Conclusions

It is rare that I meet a cross assembler package so complete. It is well crafted and unusual in its approach in that it uses BBC BASIC for generating code. It is already a very popular system with many very satisfied users. I was particularly impressed by the friendliness of the system, making it easier to write code for machines not so well endowed in cross assemblers, such as the Sinclair QL and the Atari 520 and 1040 ST and I can safely recommend the Crossware series to the professional assembly language programmer and software engineer.

The Crossware software is well written and the programs are well packaged and come with a very useful manual (generic to all of the cross assemblers apart from the 68000XR series), the interactive help system is useful and handy as it can be called up from disc at any time and saves looking up endlessly for an obscure reference to a particular command.

Figure 2 Prices of the complete range

CROSS ASSEMBLER	TARGET MICROPROCESSORS	PRICE
6801XR	6800, 6801, 6802, 6803, 6301 6303, 6303X	£48
6805XR	6805/146805/6305	£48
Z80XR	Z80/HD64180 (Zilog Code)	£48
8085XR	8080A/8085 (Intel Code)	£48
6809XR	6809 family	£48
68000XR	68000/68008	£56
6502XR	65C02, 65SC02, 6502	£38

Prices do not include VAT.

a cross assembler for a second processor then with the crossware series you can't go far wrong.

Of the machines I was able to try, I successfully transferred text programs from and to the Sinclair QL, with a great deal of trouble. This was primarily due to the fact that the Sinclair QL uses a cut down 68000 processor, called the 68008, which admittedly is a 16 bit processor but has an 8 bit address latch and bus, thus slowing down the operation and performance of the computer by half in order to operate, as it effectively slows down when making any access to the

It is a shame that there are no transfer utilities for sending the generated and cross assembled code to another machine via the serial port, but with the help of a modem, (or the PIP utility if you are using the Z80 option) you should have no difficulty transferring the files once they have been cross assembled.

Prices for the individual processors are in Figure 2.

For more information contact Crossware Products, 2 The Lawns, Melbourn, Royston, Herts, SG8 6BA. (0763) 61539.

INTER-WORD for £7.00!

There is no doubt that word processing is the most important practical use of computers, in education, or business. With our special Bulk Purchase deals we can supply the latest word processor for only £7.00 per chip plus a site licence fee.

INTER-WORD is the newest word processor for the BBC. This is part of the only truly integrated series of ROMs for the BBC Micro. Other parts of the family include INTER-SHEET (the most powerful spreadsheet for the BBC), and INTER-CHART the graph and chart plotting package. INTER-BASE the complete data handling package will be available in the New Year.

INTER-WORD is a fully professional 80 column word processor and has the advantage of having been written by the authors of WORDWISE and WORDWISE PLUS (the most successful programs ever produced for the BBC Micro). It is even easier to use than WORDWISE (pull down menus, and no embedded commands), and is the most powerful and flexible word processor available for the BBC Micro range.

Some of the first reviews have said:

"the most significant program since WORDWISE."
... "INTER-WORD on the BBC Micro compares favourably with word processors costing five or ten times as much on the IBM PC and the like." ... "INTER-WORD is a real pleasure....a truly worthy successor to WORDWISE"

Gordon Taylor A&B Computing

"Rulers can be used to manipulate the text to your satisfaction. This is a joy to use".... "INTER-WORD is certainly an advance on most other word processor packages."

Popular Computing Weekly - July '86

"..But really there is no comparison between View and Inter-Word; leaps in programming, and an obvious struggle to produce the very best has resulted, in my opinion, in Inter-Word's supremacy in this field. Technically, too, the program is astounding.." ... "...quite stunning handling characteristics" *Viewfax Tubelink - August '86*

The basis of the Bulk Purchase Agreement is that we can supply a site licence for £200.00. Then any number of INTER-WORD chips may be bought (up to 40) at £7 per chip for installation into machines at this site. This means that with only 5 or 6 machines savings can be made over the normal retail price (£49.00 + VAT). With 10 or more machines very substantial saving are possible.

Further details

Simply telephone our offices and discuss your particular requirements, or send for written details.



Computer Concepts

Gaddesden Place • Hemel Hempstead
HERTS. HP2 6EX • (0442) 63933.

E L E C T R O N / B B C CHANNEL 7

Having hooked you with the heading, let's see exactly what teletext is before backing up those wild and whirling words with facts and information. Don't skip ahead! It'll be worth the wait, I promise.

The BBC's Mode 7 uses a teletext display. It is produced by a special teletext chip which leaves most of the Beeb's 32K memory free for programs. Graphic displays in Mode 7 are created differently to the displays in the so-called graphic Modes. Teletext graphics characters use a 2x3 grid the same size as an alphanumeric character which gives them a rather chunky look. Colours and effects are produced by VDU codes which affect characters printed after them on the same line. In spite of the low resolution and seemingly restrictive programming methods, some amazing displays can be created and examples can be seen daily on the Oracle and Ceefax teletext information services.

Many Electron owners have long wished for a Mode 7. Not only would they then be able to design teletext screens but they could run BBC programs which utilise Mode 7. And they would have all that extra memory to play with. Too much to ask? Not now, so carry on reading, Electron owners. Just to keep you on tenderhooks a little longer, a quick word from our sponsor.

The teletext service, whose displays the Beeb's teletext chip is intended to complement, is run by the television broadcasting authorities. It is a free service which broadcasts digital information along with the TV picture. This data can be read by a teletext decoder connected to a TV aerial and many television sets are now equipped with a teletext receiver. They provide a welcome relief from soap operas and sport.

Teletext information is broadcast in a series of pages, each one the equivalent of a Mode 7 screen. It gives you information about the weather, travel, news, TV programs, jokes, recipes and lots more. For example, the Micro Live programs are supplemented by pages of additional information. Teletext also offers free programs called telesoftware which can be downloaded into your computer if it has a suitable teletext adapter. Unfortunately, you can't download software through a teletext-equipped TV.

As the BBC's Mode 7 is compatible with a teletext display you only need a few more bits and bobs (and chips, etc.) to turn the Beeb into a teletext receiver. The *Morley Adapter* does just that. Because the Electron does not have a built-in teletext chip, one is 'built-in' to the Electron adapters.

Now, here's where it starts to get interesting because the Electron adapters support teletext level II. This means that all those VDU commands which do nothing in

Morley's Teletext Adapters bring Teletext to the BBC and Teletext and Mode 7 to the Electron — plus much, much more



the Beeb's Mode 7 actually have an effect in the Electron. For example, it permits black text on a coloured background, something I've always wanted to do on my Beeb — out of perversity, probably. Some people are never satisfied.

Threesome

There are three versions of the adapter currently available: a BBC version, an Electron RGB version and an Electron UHF version. The difference will become clear in a moment. The BBC version plugs into the User Port and the Beeb's power supply. An optional PSU is available but the power drain is minimal. Software is available on ROM or disc (for loading into RAM) and is compatible with the Master.

As well as connecting to the RGB or UHF sockets, the Electron adapters also have a PCB on a flying lead which must be plugged into the Cartridge Port. This is the equivalent of plugging into the Beeb's User Port and if you soldered a few wires to the protruding end of the PCB you would effectively have an Electron User Port. It could be used in a similar way to the Beeb's only the register address is &FC60 instead of &FE60. The Electron software is built-in to the adapter.

All adapters access teletext pages in a similar way. The first step, after plugging in, is to tune in to the stations. This is software

driven and will probably tune into the main channels automatically. If you are in a poor reception area you may need to use the fine tune option. This also lets you tune into other channels if, for example, you can receive more than four and it allows for any new teletext channels which may arrive in the future.

The channel data is saved to disc or tape for future use and must be loaded before the adapter will work. BBC users can blow this into their ROM as the relevant locations have been left unprogrammed (Morley will do this for you for £5 if you don't have an EPROM blower) or put it into their disc image.

Once you're tuned in, typing *TTEXT puts you into terminal mode. The main options from the menu screen enable you to save a selected page, dump the current page (text only) to a printer, download software, select a new channel, hold the page to prevent updating, reveal any hidden text, verify the page for errors and use OS (*) commands. You can, of course, just browse at leisure following a particular set of pages or branching from one to another. The nice thing about all this is that it doesn't cost you anything — apart from your licence fee. No telephone charges as you would incur with a modem.

To select a page you just enter the three-digit page number. This is shown on screen along with the number of the current page being broadcast which is constantly updating. There is usually a few seconds delay before your page is reached but the fact that it's not costing you anything it mollifies your impatience.

Most of the options are self-explanatory but let's look at the downloading process in a little more detail as this will be of major interest to most potential users. It is actually very simple. Pressing ° sets the download routine in motion and the program automatically selects the catalogue page and requests the relevant page number. Programs are loaded in blocks, each of which is checked for CRC errors. The program will cycle through the blocks until every one is error free. You are then prompted to hit 'Space' to save it.

Most programs can simply be chained but there are special instructions in the software pages which tell you exactly how to run each one. Best to read them, too.

That's basically how teletext adapters work but you can do much more than just look at information and download software. Morley's terminal software contains almost 100 * commands — I don't know they managed to cram them all in. A lot of them are convenience functions such as *BBCI and *ITV to select channels. Others such as *CITY, *FINANCE, *NEWS and *SPORT

select the correct channel and page and display them in a loop.

Delving Deeper

When you really start to dig into the system you find commands to select and display pages, header information, the time and the date. More dedicated teletext buffs can involve themselves with the TSDP (Teletext Service Data Packet) and the reading of various codes and bytes in the page headers. A bit much perhaps for the average user but the hacker will be in his (or her) element. The latest edition of the manual details all the * commands with a line of explanation but it would be nice to know to exactly what use you can put some of the more exotic functions.

OSBYTE commands can be used to program the adapter. *FX50 is used to write to it and a Register Map is given in the manual so you can see which bits and bytes do what. OSWORD can be used to read and write data to it, too. Sample programs illustrate how these can be used.

For the less technical user, the * commands can be used from BASIC and you can write programs which make use of the information transmitted by teletext. Morley have a utility disc at £5.95 (for the BBC) which includes screen and text dump programs, a page finder and spooler and a TV Times generator. The latter picks up information from the TV pages and prints it out. You can pick up a lot of information from these programs to help you write your own.

Morley also produce DESIGN 7, a Mode 7 screen designer at £8.95. It's a must if you want to create Mode 7 screens and it complements the adapter perfectly because you can load in teletext screens and modify them. Special functions give you various sizes of large text; they let you create instant boxes and frames; offer cut and paste options and there is even a line drawing facility. This is one of the most comprehensive and easy to use Mode 7 screen design programs I have yet seen and great value for money.

Not content with that, Morley have also produced DESFAX 7 (£24) which lets you design Mode 7 screens (it contains the DESIGN 7 program) and store up to 100 of them on a 40 track disc (200 on 80 track). The pages can be read in and displayed in a preselected order and for a predetermined time to produce a form of animation. Text can be printed at variable speeds, ideal for creating instruction screens or shop displays. It can even help run your own teletext service and again, this interfaces with the adapter. The demo supplied is certainly very impressive.

Electron Teletext

Now, for all you patient Electron readers, here's the news about the Mode 7 emulator. BBC owners keep reading, too, because there's also something here of interest to you.

The Electron adapters have a built-in level 2 teletext chip. You enter Mode 7 by typing *MODE 7 and away you go. The screen image is stored in RAM in the adapter and the new Mode should enable you to run 90% of BBC Mode 7 programs. It doesn't work exactly like the BBC's Mode 7 so I'll list the differences first and then move on to the things it lets you do that you can't do on a Beeb.

The first noticeable difference is in its method of updating the screen. Software scrolling would apparently take too long so the screen does not scroll but clears when full, after a keypress, and fills again — *a la* Sinclair. As the screen is in RAM in the adapter, any program using screen pokes will not work but all legally-written software will.

Programs can not be edited in the new Mode. You can enter new lines, of course, but the cursor and copy keys do not work although the cursor keys will function from within a program. For cursor editing you must revert to Mode 6 and go back to Mode 7 for running. This will only cause problems if your program is so long it can not be held in memory in Mode 6. Extra workspace is required to hold variables when you run a program and this will be gained when you revert to Mode 7 so you should be able to edit all but the very largest programs this way.

At the moment, the Electron adapters only work with tape because of a clash over workspace with the ADFS but it is hoped this will soon be sorted out and a disc version made available. If you're thinking of waiting before splashing out — don't! All software updates are free so you can familiarise yourself with the tape system and move up to disc at a later date.

Now let's look at the goodies. As mentioned earlier, the Electron chip can produce more teletext characters than the Beeb chip. Some codes produce special characters designed with the definition of the alphanumeric characters. There are also additional controls so that, for example, after issuing a VDUI14 command for double height text, all following text automatically appears in double height. You don't have to print the string twice. Electron owners can still pass on their screen designs to Beeb owners but, of course, the new level 2 characters will not be displayed.

If you plumb for the UHF adapter you get an added bonus. You will be able to overlay teletext designs onto a video screen and switch between video and teletext at will. The overlays can take many forms. You can superimpose a teletext box on the screen and you can frame the video picture inside a box. Any boxed area can be written in as usual. Simple software would enable you to, for example, define a series of boxes each holding text and stipulate their position on the screen. They could then be overlaid in order by pressing a key.

The manual only gives one simple program to demonstrate all this but the potential for titling videos and producing subtitles is all

there at an incredible saving over the price of dedicated video/titling hardware and software. This is in addition to a teletext adapter and the extra memory made available by Mode 7.

More to Come

If Beeb owners are feeling a little left out now, they'll be cheered to know that this adapter can also be made to work on their machine. All it requires is for the PCB which plugs into the Electron Cartridge Port to be removed and a BBC User Port plug substituted. Morley say they will do this for any interested parties. At the moment, however, the Beeb software has a few more functions than the Electron software so a phone call to see exactly what you're getting would be wise.

Morley are currently working on a digitiser with 4096 colours and full video processing so you will be able to digitise a video shot, save it and edit it. It will have a multiple page store facility (in RAM) so you won't have to wait while the teletext pages come around and you will be able to perform all the overlay functions mentioned above. It will be "very cheap" but not available until 1987. Something to look forward to, though.

Acorn's teletext adapter had the market to itself for a couple of years but it was quite expensive and made life complicated for the user especially when downloading software. Even now a software patch must be used (available on telesoftware) before downloading a program. BBC Publications, however, have brought out a replacement 16K ROM called the Advanced Teletext System ROM which doesn't need the patch and which seems altogether a lot more user-friendly. If you have an Acorn adapter it may be worthwhile dusting it off but it still won't give you screen overlays and it won't be much use to Electron owners either.

Morley's BBC adapter costs £74.45 but you must also buy the software which costs £24.95 on ROM or £23.95 on disc. The optional PSU is £9.95. The Electron RBG adapter is £149.95 and the UHF adapter is £177.90. Morley will customise an Electron UHF adapter to fit a BBC (getting complicated, isn't it?) for £175.

As you may have guessed, I am very impressed with the Morley adapters although I would have like to have seen even more information in the manual (the sign of an Infomaniac, so I've been told) and an on/off switch. A most worthwhile and fascinating addition to your BBC and I just don't know how an Electron owner could resist one: teletext, Mode 7, 32K memory and video overlays...

Morley Electronics, Unit 3, Maurice Road Industrial Estate, Wallsend, Tyne and Wear, NE28 6BY. Tel: 091 2627507

BBC Soft's new Advanced Teletext System ROM will be reviewed next month in A&B Computing (out October 3rd).

ADFS DISC

The ADFS Menu makes using your ADFS discs, built-in software and sideways RAM a joy. No long directory names, no * commands and memory locations. Just highlight entries on screen and choose from menus. Full prompts and protective checking make this the friendliest menu imaginable.

The ADFS Menu system was primarily designed to facilitate the loading and executing of files. There are, however, various types of files, so the program is intelligent enough to find out which type of file it is, and to act accordingly:

BASIC CHAINED
Machine code *RUNed
Protected *RUNed
Text ASCII dump
View View entered, file loaded
Viewsheets View Sheet entered, file loaded
ROM images loaded into sideways RAM bank (if any)

The program also has the ability to control the following sideways RAM boards (if present):

Acorn as in the B+128, and Master
Solidisk RAM extension boards, not the 4MHz boards
Watford ROM/RAM board

Any other boards that use the ROMSEL latch for their RAM select latch will also work, and will be considered to be 'Acorn'. The menu program will automatically determine which of the above boards is present.

Facilities are also provided for LOADING and SAVEing of sideways ROM images, DELETEing a ROM in sideways RAM (unplugging it first!) and TESTING the RAM for any bad bits.

As well as loading and executing files as above, the program is also capable of entering any language ROM that is currently recognised by the Machine

Operating System.

This program is Tube compatible (6502 second processor and 65C102 co-processor)!

Entering the Program

The Menu program consists of two distinct sections, machine code and BASIC.

BASIC section

The BASIC section is shown in the first listing, "BASpart". It should be typed in and saved to disc as "BASpart". Remember to use the A&B Checker when typing in this program to avoid making any mistakes.

Machine Code Section

The machine code section is shown in the second listing, "HEXloader". This is a hexadecimal loader. As the source was written for the SYSTEM ADE macro assembler, and we considered that two pages of hexadecimal numbers would be preferable to the 30 pages of the source. It should be typed in and saved to disc as "HEXloader". The program contains checksums in each line of the data so that when the program runs, it will automatically check your typing. If any errors have been made, so that the checksums don't match, the erroneous line will be listed and you should make the required correction(s) and re-run the program. If everything is correct, the object code will then be saved as "Obj".

Before the ADFS Menu system can be used, the machine code and the BASIC sections must be joined together. To do this, you must type in the following commands:

```
MODE 7
PAGE=&2F00
NEW
LOAD "BASpart"
*RUN "Obj"
```

To save the Menu program to

This friendly menu system is an essential utility for users of ADFS on any system

disc, press S, and respond to the question:

```
SAVE the Menu system to disc as
!BOOT
Are you sure (Y/N) ?
```

by pressing Y. The disc drive should whirr for a few seconds and the program will be saved as "I!BOOT". When the display then returns to that of Figure 1, the file "I!BOOT" should appear in the top left hand corner.

To execute the Menu system from now on, either type in

*RUN "I!BOOT"

or boot up the disc in the normal manner (ie press SHIFT-BREAK, releasing BREAK, then SHIFT).

Using the Menu Program

Now that the program has been assembled, you can explore its functions. When the program is first executed, the display will resemble that of Figure 1.

The top section of the display shows the current status of the Menu System. It contains the current drive number (0, 1, 4 or 5) and indicates whether it is a floppy disk drive or a Winchester disc drive. If it is a floppy disc drive and a Winchester controller is present, the type will be suffixed by a "(W)".

At the end of the same line, will appear the amount of sideways

RAM present (if any) and which board it is:

```
ACN Acorn (or equivalent)
STL Solidisk
WAT Watford
```

The bottom line of the display contains the current directory name and title. If they are the same, only the name is displayed, to avoid repetition. If the Tube is connected and active, it will be indicated by the word "TUBE" in the top right hand corner of the status area.

Selecting Files

Below the status lines, the files and sub-directories (if any) in the current directory are displayed. One of them will be highlighted by the cursor which is shown in inverse. This file (or directory) is the currently selected one. To move the cursor about, the cursor keys are used. If you find these difficult to use (because of their arrangement, for example) you can also use:

```
Z Left
X Right
: Up
/ Down
```

To move the cursor from the files to the directories, or vice-versa, press the space bar. If there are no objects in the other section to the current section, the space bar will be ignored.

To activate the currently selected file or directory, press RETURN. If it is a file, the action

MENU

Variables Used

NS(46) The object names
RS(15) The titles of the sideways ROMs
dn\$ The NAME of the current directory
dt\$ The TITLE of the current directory
r\$ The name of the sideways RAM board (if any)
R%(15) The ROM type bytes as read from the MOS ROM information table
c%(15) The size of the sideways ROMs
C%(0) Current position when choosing files
C%(1) Current position when choosing sub-directories
CH% File handle for opened file
dr% Logical drive number
exit% Set if ok to leave main REPEAT...UNTIL loop (lines 90-310)
N%(0) Number of files
N%(1) Number of sub-directories
S%(15) The RAM bank flags
top% Set if at Root (\$) directory
tub% TUBE flag
W%(10,1) W%(a,0)—Start line for window a; W%(a,1)—Number of lines for window a
ver\$ The ADFS Menu version number
win% Winchester controller present flag
load% Load address of file as determined by FNfiltyp
exec% Execution address of file as determined by FNfiltyp
type% File type as determined by FNfiltyp

Any other variables used are temporary.

taken will depend upon its type, as in the table above. If however, it is a directory, the program will enter the directory and display the files and directories (if there are any for that directory).

If at any stage an empty directory is entered (ie one that has no files or directories in it), the message:

!! EMPTY DIRECTORY !!

will be displayed. This is to allow you the option of saving sideways ROM/RAM images into it.

Returning to Parent Directories

To return to the parent directory of the current directory, press ^ (the CARET key). Alternatively, to return to the Root directory of a disc, press SHIFT and ^ (~ the TILDE).

ROM/RAM Operations Displaying the ROMs

To display the ROMs installed in your machine, press D. The display will change to show the ROMs as in Figure 2.

The bank numbers run down the left edge of the screen. Next to those which are RAM banks is a square marker. If the ROM is not recognised by the MOS, it is considered to be unplugged and a U will indicate this. The size of the ROM, indicating whether it is 8 Kilobytes or 16 Kilobytes, is shown next. After these will appear three letters which indicate what the ROM can do. These are:

S the ROM has a Service entry
 L the ROM has a Language entry
 T the ROM has a second processor (Tube) relocation address provided.

Loading ROM Images (into sideways RAM)

If the file selected from the menu is a ROM image, then you will be given the opportunity of loading it into a sideways RAM bank (if any exist). The screen display will change to show the sideways ROM/RAM banks with the RAM banks marked with a block by their bank number (see Figure 2). Entering an invalid number (ie not a RAM bank) or any other key will abort the operation. You will then be asked to confirm your choice, to avoid accidentally overwriting an incorrectly selected bank.

During the loading procedure, the screen memory is used as a temporary buffer. Therefore, as the ROM is loaded in, it will appear on the screen.

If the ROM image being loaded is less than or equal to 8 Kilobytes in length, it will be loaded twice — the second image starting at address \$A000. This is so that the routine that calculates the length of a ROM image, for saving ROMs for example, gets it right (as 8 Kilobytes).

Saving a ROM Image to Disc

To save a sideways bank, press @. The display will change to show the ROMs in the machine and prompt you to enter the bank number to save. An invalid bank number will abort the save option. You will then be asked for the file name under which the ROM image will be saved. Entering a null name (ie just pressing RETURN) will cause the program to generate a valid name from the ROM's name. When entering the file name, please remember that you are restricted to 10 characters at most and you cannot use any of the following characters:

AMPERSAND (&)
 ASTERIX (*)
 AT (@)
 CARET (^)
 COLON (:)
 DOLLAR (\$)
 HASH (#)
 PERIOD (.)
 QUOTES ("")
 SPACE ()

These are not allowed as the ADFS reserves them for special uses. You are then asked to confirm the file name. Responding with N will re-ask you for the file name to use for the ROM image. To abort the operation, enter a null name and answer N to the confirmation. If the file name given already exists on the disk, you will be asked if you want the file to be overwritten. If you answer N to this last prompt, the operation is aborted.

During the save operation the screen memory is used as a temporary buffer. Thus, as in loading, you will see the ROM contents flash before your eyes.

Deleting a Sideways RAM Bank

Pressing the DELETE key allows you to wipe a RAM bank, and hence remove the ROM that you no longer need, but which, if left installed, would interfere with other ROMs' commands.

Testing the Sideways RAM Bank(s)

To test all sideways RAM banks, press T. The screen will clear and the computer will go through all the RAM bank(s) in turn, checking them. If any RAM locations aren't working properly, their address(es) will be shown as they are

CONTINUES ►

ADFS DISC MENU

found. To abort the RAM bank currently being checked, press the ESCAPE key.

Entering a Language ROM

To select this option, press L. This will then change the display to show a list of the sideways ROMs, those with a language entry will be highlighted. You are then prompted to enter the ROM bank number. An invalid entry will abort the operation. Otherwise, the language is entered.

For View, if you need to load a file, it is easier to use the "file load" command above (which runs View and loads the file).

Miscellaneous Commands Changing Drive (s)

To change the drive that the program looks at, press 0, 1, 4 or 5, corresponding to the drive required.

By convention, drives 0 and 1 refer to Winchester (hard) disc drives; drives 4 and 5 refer to Floppy disk drives. If you attempt to access a Winchester disc drive, and no such device is attached to the computer, then the equivalent floppy disk unit will be accessed instead.

Copying the Program to Disc

To put a copy of the menu program into the currently selected directory, press S. You are then asked for confirmation. If this is given, the menu program is saved in the current directory as !BOOT, and *OPT 4 2 performed (ie !BOOT will be *RUNed when that directory is booted up).

Free Space on Disc

To find out the amount of free

space available on the currently selected disc drive, press F.

Power-on Reset

To simulate the effect of a power-on reset, press CTRL-R. You will then be asked for confirmation.

NB if the menu system is running on a second processor, you will be asked to press the BREAK key.

This facility to all intents and purposes, emulates CTRL-BREAK, which is necessary to tell the MOS to look and see which ROMs are installed. Thus this must be used after a ROM image has been loaded into sideways RAM.

Quitting the Menu System

To quit the menu system, without doing a power-on reset, press SHIFT-ESCAPE. You will then be dropped into BASIC.

Errors!

All errors are trapped. Recoverable errors will generate a message that explains what has happened, and the menu system will do its best to remedy it. For unrecoverable errors, the menu system will report it and stop, leaving you to try and sort it out.

If there is an error in the BASIC program, the bad line will be listed. If this does occur, it means that the program has become corrupted and it should be re-loaded from disc.

Program Documentation

This month we are going to concentrate on the BASIC section, with the machine code being looked at in greater detail in follow up articles over the next few months.

We hope that the routines described and listed will be found useful by readers in their own programs.

Electron Version

This version of the Menu system will not work on an Electron since it utilises Mode 7. However, an Electron version is currently under compilation and will be made available later this year.

Further Improvements

If you have any comments or suggestions about this program or any ideas for improving it, please send in your ideas to A&B Computing. Future improvements will of course be published, and these may include intelligent downloading of files (for the Inter Series for instance).

Next Month's Article...

Next month's article will look at part of the machine code section. The method for transferring parameters between BASIC and machine code, and vice versa, will be explained, along with how we made the program Tube compatible.

Special Disc Offer

The whole of the Menu system is available as part of the reader service. The disc costs £12.00 and contains the following:

the two programs in this article BASpart and HEXloader
the ADFS Menu program
the source code in VIEW format for the SYSTEM ADE macro assembler, fully annotated (all 30 pages of it!)
example files. See the Software Sale section of this magazine.

The BASIC Section

Lines 90-310 makes up the main loop of the program. This scans for specified keys being pressed, and calls the main PROCedures as necessary.

Lines 360-680 contain the lowest level functions (ie they don't utilise any other PROCedures or FunctionNs). These are:

FNcomp(F\$) Returns F\$ with the illegal ADFS characters removed.

FNdec(N%,W%) Formats N% in a field of W% zeros (0) wide, right justified

FNdrive(D%) If no Winchester controller is present and drives 0 or 1 are selected, they are changed to become 4 or 5 respectively.

FNfiltyp(F\$) Returns a value which represents the type of file F\$. Values returned are:

-1 Directory

0 Not found!

1 Protected

2 Text

3 BASIC

4 VIEW

5 Machine code

6 ROM image

7 ViewSheet

FNfind(N\$,T%) Returns the position of N\$ in the array selected by T%. If N\$ is not found, it will return a value of -1. The arrays selected by T% are:

0 Filenames — N\$(0 → N%(0)-1)

1 Directories — N\$(46 → 47-N%(1))

2 Rom titles — R\$(0 → &F)

FNhex(N%,W%) As FNdec, but formats N% as a hexadecimal number.

FNx(P%) Calculates the X position for object P%.

FNy(P%) Calculates the Y position for object P%.

Lines 700-950 contain the lowest level procedures.

PROccolour(B%,F%) Sets up the background (B%) and foreground (F%) on the current line.

PROccsr(M%) Turns the BBC'S blinking cursor on (M%=TRUE) or off (M%=FALSE).

PROInsert(C\$) Inserts command C\$ into the BBC's keyboard buffer.
PROCmsg(M\$,B%,F%) Displays message M\$ centred on a line of colours B% and F% (see PROCcolour above for details). The message is not followed by a carriage return.
PROCcsr(M%) Displays the program cursor on the currently selected object. If M% is TRUE, the cursor is "on" and the object appears in reverse. If M% is FALSE, the cursor is "off" and the object that was displayed in reverse is displayed in normal again.
PROCfnms Reads in the filenames and sub-directories in the current directory, and sets up the filename and directory windows.
PROCtab(M\$) Displays message M\$, wrapping words round to the next line whenever they would normally have been split.
PROCwin(W%,C%) Selects window W% as the current window. If C% is TRUE, the window is also cleared.

Lines 970-1150 contain the highest level functions.

FNget(M\$,O%) Prints message M\$, prompts the user to enter a hexadecimal digit (&0-&F). O% modifies the allowed hexadecimal digits:
 0 Only RAM banks are allowed (checked in array S%).
 1 ROM has a language entry (checked in array R%).
 2 Is a valid ROM (checked in array R%). If the digit given is not valid, the value returned is -1.
FNgetstr Gets a string for a filename. Any illegal ADFS characters are ignored. The string is also limited to 10 characters in length.
FNyn Gets confirmation about a displayed command and returns TRUE if Y is the response, else returns FALSE.

Lines 1170-1650 contain level 2 procedures.

PROCbanner(B%) Prints one of a set of messages at the bottom of the screen, defined by B% in the range of 0 to 2.
PROCdnms Displays the current filenames and sub-directories in the current directory. The currently selected object is shown by the program cursor (in reverse).
PROCdrom(R%,H%) Prints ROM in bank R%. If H% is TRUE, the ROM's information is highlighted.
PROCexit(C%) Resets the ESCAPE and cursor keys to normal. If C% is TRUE, the whole screen is cleared.
PROCmsgcr(M\$,B%,F%) Uses PROCmsg to print message M\$ in colours B% and F%, and then prints a carriage return.
PROCTest(B%) Tests RAM bank B% for any errors. Messages are included to give information on the state of the bank.
PROctitle Prints the menu title at the top of the screen.

Lines 1670-1780 contain level 3 procedures.

PROCcompact If the disc runs out of space, the user is given the chance to COMPACT it. This prompts the user if s/he requires this to be done, and does it if so desired.
PROCdir(D\$) Takes the disc down into the directory selected (D\$).
PROCdroms Displays the banks and the ROMs in them.
PROCmount If the user has changed the disc, the error handling routine uses this to mount the disc.
PROCpaktc Prompts the user to "press any key" and waits for a key to be pressed.

Lines 1800-2670 contain the main procedures.

PROCaccess This is used to activate the currently selected object.
PROCbrk Allows the user to do a power-on reset.
PROCdirup(D%) If D% is TRUE, the current directory is changed to the root (\$) directory, otherwise, the current directory's parent is selected.
PROCdrive(D%) Changes the current drive to D% (modified when necessary if there is no Winchester controller present).
PROCfree Displays the current free space on the current drive.
PROClang Displays the ROMs with a language entry and, after user selection, enters a language ROM.
PROCmsrlr(d%) Moves the program cursor left or right the columns of the current object names.
PROCmsrud(D%) Moves the program cursor up or down the columns of the current object names.

PROCramdel Deletes the ROM and contents of a user selected RAM bank.
PROCramsve Saves the contents of a user selected bank as a ROM image.
PROCramtst Test all the RAM banks present for errors, reporting the state of each RAM bank as it goes.
PROCromdis Displays the ROMs in the machine and waits for a key to be pressed before continuing.
PROCsvemnu Saves a copy of the Menu system in to current directory as IBOOT. The user is prompted for confirmation.
PROCswcsr Swaps the program cursor between the filenames and the directory names. If none of the opposite type exist, the program cursor remains where it is.

Lines 2690-2820 contain the initialisation procedure.

PROCinit Initialises the Menu system.

Line 2840 contains the data for the windows.

Lines 2860-3050 contain the error handling procedures.

PROCerror The error handling routine.

PROCentry When the error is recoverable this is executed to set things going again.

Machine Code Entry Points

The machine code routines are executed using BASIC's CALL command followed by various parameters. The routine will then read/write data from/into these parameters. (Next month's article will explain how this is achieved). The machine code routines are:
INTLSE This is the address of the machine code initialisation code. It is used when the Menu system is saved to disc as its execution address. Line 2590. This routine is never executed from within the Menu system, it is only executed when the Menu program is *RUN.
RDFNMS This routine is used to read in the information about the currently selected directory. The parameters are:

CALL rdnms,N\$(0),N%(1),N%(0),dt\$,dn\$

N\$(0) This is the string array that the object names are to be stored into. The array should have dimensions of DIM N\$(46), and each element of the array should be of minimum length 10 bytes, ie FOR I=0 TO 46:N\$(I)-STRING\$(10," "):NEXT should be performed.

N%(1) This contains the number of sub-directories found. N%(0) This contains the number of files found.

dt\$ This is the TITLE of the directory. It should be at least 19 bytes long, ie dt\$=STRING\$(19," ") should be performed.

dn\$ This is the NAME of the directory. It should be at least 10 bytes long, ie dn\$=STRING\$(10," ") should be performed.

RDROMS This routine is used to read in various pieces of information regarding the sideways ROMs. The parameters are:

CALL rdroms,R\$(0),R%(0),c%(0)

R\$(0) This is the string array that the ROM titles are to be stored into. The array should have dimensions DIM R\$(15), and each element of the array should be of minimum length 25 bytes, ie FOR I=0 TO 15:R\$(I)-STRING\$(25," "):NEXT should be performed.

R%(0) This is the integer array that the MOS ROM information bytes are to be stored into. The array should have dimensions DIM R%(15). Each element corresponds directly to a sideways bank.

c%(0) This is the integer array that the 'Copyright count' bytes are to be stored into. The array should have dimensions DIM c%(15). Each element corresponds directly to a sideways bank. The elements have the following values returned:

0 it's an empty bank
 1 it's a 16 Kilobyte ROM
 2 it's a 8 Kilobyte ROM

♦ BASIC PART ♦

```
10REM ADFS Disc menu Utilit
y (F14F)
20REM (C)July 1986 David Fa
hy & Rob Newson (886B)
30REM Published by A&B Comp
uting (9E4D)
40: (BEEC)
50MODE 7 (405E)
60ON ERROR PROCerror:RUN (E
D6B)
70PROCinit (4214)
80ON ERROR PROCerror:PROCre
ntry (B752)
90REPEAT (324A)
100GZ=GET (98B7)
110IF INKEY(-58) OR INKEY(-7
3) PROCmsrlr(-3) (5D51)
```

```
120IF INKEY(-122) OR INKEY(-
67) PROCmsrlr(1) (E190)
130IF INKEY(-42) OR INKEY(-1
05) PROCmsrud(3) (E664)
140IF INKEY(-26) OR INKEY(-9
8) PROCmsrlr(-1) (0EDA)
150IF INKEY(-25) PROCdirup(I
NKEY(-1)) (FA2B)
160IF INKEY(-99) PROCswcsr (
B301)
170IF INKEY(-82) PROCsvemnu
(9DC8)
180IF INKEY(-40) OR INKEY(-1
07) PROCdrive(0) (019E)
190IF INKEY(-49) OR INKEY(-1
08) PROCdrive(1) (91BF)
200IF INKEY(-19) OR INKEY(-1
23) PROCdrive(4) (C417)
210IF INKEY(-20) OR INKEY(-1
24) PROCdrive(5) (1B5E)
220IF INKEY(-87) PROClang (F
```

```
42B)
230IF INKEY(-36) PROCramtst
(625F)
240IF INKEY(-72) PROCramsve
(272E)
250IF INKEY(-51) PROCromdis
(97FB)
260IF INKEY(-90) OR INKEY(-7
6) PROCramdel (2FAF)
270IF INKEY(-68) PROCfree (1
7D4)
280IF INKEY(-2) AND INKEY(-5
2) PROCbrk (DA37)
290IF INKEY(-74) OR INKEY(-6
1) PROCaccess (AD6F)
300IF INKEY(-113) exit%=INKE
Y(-1) (0AD6)
310UNTIL exit% (2A2C)
320PROCexit(TRUE) (93D1)
```

C O N T I N U E S ►


```

330VDU 26 (24E1)
340END (110E)
350: (2E33)
360DEF FNcomp(F$) (98BF)
370LOCAL C$,I$ (36F5)
3800$="":FOR I$=1 TO LEN(F$):C$=
MID$(F$,I$,1):IF INSTR(" &.#:
~*0$""",C$)=0 0$=0$+C$ (EB7C)
390NEXT (B39E)
400=LEFT$(0$,10) (AB9D)
410DEF FNdec(N$,W$)=RIGHT$(S
TRING$(W$,"0")+STR$(N$),W$) (F
DB7)
420DEF FNdrive(D$)=D$-(D$<4
AND win%=0)*4 (29E0)
430DEF FNfiltyp(F$) (7C66)
440LOCAL A$,B$,C$,CH$,L$,LH%
(D732)
450exec%=0:load%=0:type%=0:C
ALL filinf,F$,load%,exec%,type
%:IF type%=2:=-1 (FE7D)
460IF type%=0 =0 (F675)
470IF type%=&FF =1 (DE9F)
480L%=load% AND &FFFF:LH%=lo
ad% DIV &10000:IF L%=&4556 OR
L%=&657E OR L%=&6576 =4-(LH%=0
OR LH%=&FFFF)*3 (362E)
490IF exec%=&D9CD OR exec%=&
E364 OR L%=&8000 OR exec%=&800
0 =6 (18E2)
500IF exec% AND &FF00 =&8000
=3 (7DD9)
510IF L%=0 OR exec%=&FFFF =2
(9340)
520CH%=OPENUP(F$):A$=BGET#CH
%:PTR#CH%=(EXT#CH%)-2:B$=BGET#
CH%:C$=BGET#CH%:CLOSE#CH%:IF A
%=&0D AND A%=B% AND C%=&FF =3
(D59E)
530=5 (C2F9)
540IF NZ(T%)=0 RETURN (FD3F)
550FOR I$=0 TO NZ(T%)-1:IF F
Ncomp(N$(I$))=F$ A$=I$:I$=NZ(T
%):H$=T% (4A97)
560NEXT:RETURN (6C6D)
570IF NZ(T%)=0 RETURN (12E3)
580FOR I$=0 TO NZ(T%)-1:IF F
Ncomp(N$(46-I$))=F$ A$=I$:I$=N
$(T%):H$=T% (C60C)
590NEXT:RETURN (8C6B)
600FOR I$=0 TO &0F:IF (FNcom
p(R$(I$))=F$)AND(R$(I$)<>FALSE
) A$=I$:I$=&0F (6604)
610NEXT:RETURN (A745)
620DEF FNfind(N$,T%) (FF71)
630LOCAL A$,I$,F$ (DC44)
640F$=FNcomp(N$):A$=-1:ON 1+
T% GOSUB 540,570,600 (2161)
650=A$ (2155)
660DEF FNhex(N$,W$)=RIGHT$(S
TRING$(W$,"0")+STR$(N$),W$) (
421D)
670DEF FNx(P%)=(P% MOD 3)*13
(6404)
680DEF FNy(P%)=(P% DIV 3)+1
(65AE)
690: (F457)
700DEF PROCcolour(B$,F%):VDU
129+B$,157,129+F$:ENDPROC (5F
01)
710DEF PROCcsr(M%) (DD59)
720IF M% VDU 23;10,96;0;0;0
ELSE VDU 23;10,32;0;0;0 (B882)
730ENDPROC (9A7A)
740DEF PROCinsert(C$) (0A76)
750LOCAL I$ (27FA)
760FOR I$=1 TO LEN(C$):OSCLI
("FX 153 0 "+STR$(ASC(MID$(C$,
I$,1))):NEXT (70A2)
770ENDPROC (BCA5)
780DEF PROCmsg(M$,B$,F%) (C2
E4)
790PROCcolour(B$,F%):PRINT T
AB(20-(LEN(M$)DIV2),VPOS);M$;
(76E6)
800ENDPROC (3ED1)
810DEF PROCcsr(M%) (B9B3)
820LOCAL B$,F% (DB51)

```

```

830IF M% F%=132:B%=134 ELSE
B%=132:F%=134 (F88C)
840VDU 31,FNx(C$(H%)),FNy(C$
(H%)),B$,157,F% (FF6F)
850ENDPROC (59A9)
860DEF PROCrfnms:CALL rdnfms
,N$(0),NZ(1),NZ(0),dt$,dn$:W$(
3,1)=FNy(NZ(0)-1):W$(4,1)=FNy(
NZ(1)-1):W$(4,0)=W$(3,0)+W$(3,
1)+1:ENDPROC (5307)
870DEF PROctab(M%) (BD12)
880LOCAL S$,T$ (A089)
890M$=M$+" ":VDU 133:REPEAT:
S$=INSTR(M$," "):T$=LEFT$(M$,S
$):M$=RIGHT$(M$,LEN(M$)-LEN(T$
)):IF POS+LEN(T$)<39 PRINT T$;
ELSE PRINT CHR$133;T$; (FB0D)
900UNTIL M$="" :PRINT (6F0D)
910ENDPROC (CAAE)
920DEF PROCwin(W$,C%) (Aafb)
930VDU 28,0,W$(W$,0)+W$(W$,1
),39,W$(W$,0),30:IF C% VDU 12
(ABB3)
940IF W%=5 VDU &0A,&0A,&0A (
DFB6)
950ENDPROC (EC71)
960: (EC61)
970DEF FNget(M$,O%) (92C0)
980LOCAL A$ (717F)
990OSCLI("FX 15 1"):PROCcsr(
TRUE):PRINT " M$ (0-F) ? ":
A$=INSTR("0123456789ABCDEF0!
"#$%&'()abcdef",GET$)-1 MOD 1
6 (5B00)
1000IF A%>0 PRINT ;~A$;IF (
O%=0 AND S$(A%)=0) OR (O%=1 AN
D (R$(A%) AND 64)=0) OR (O%=2
AND R$(A%)=0) A$=-1 (6F34)
1010PRINT:PROCcsr(FALSE) (BBB
B)
1020=A$ (3A7E)
1030DEF FNgetstr(AE2E)
1040LOCAL A$,B$,C$,L$ (162F)
1050B$=STRING$(10,".")+STRING
$(10,CHR$(8):OSCLI("FX 15 1"):P
ROCcsr(TRUE):PRINT CHR$130":
"B$;A$="":L$=0 (347C)
1060REPEAT C$=GET:IF C%=21 AN
D L%>0 PRINT STRING$(L$+(L%=10
),CHR$(B$):L$=0 (5DA6)
1070IF C%=127 AND L%>0 L$=L$-
1:A$=LEFT$(A$,L$):VDU 8+(L%=9)
*8,46,8 (4E32)
1080IF C%>32 AND C%<127 AND L
%<10 AND INSTR("&.#:~*0$""",CH
R$(C%))=0 A$=A$+CHR$(C%):L$=L$+1:V
DU C$:IF L%>9 VDU 8 (C255)
1090UNTIL C%=&0D:PROCcsr(FALS
E) (4DA6)
1100=A$ (7786)
1110DEF FNyn (DF10)
1120LOCAL C$ (55FA)
1130PRINT " Are you sure (Y/
N) ? ":OSCLI("FX 15 1"):PROCcs
r(TRUE):C$=GET AND &DF:PROCcs
r(FALSE):IF C$=B9 PRINT "Yes"
:=TRUE (64E9)
1140PRINT "No" (7536)
1150=FALSE (EB37)
1160: (7F27)
1170DEF PROCbanner(B%) (4D4B)
1180PROCwin(1,TRUE):IF B%=0 P
ROCmsg(" (C)1986 David Fahy and
Rob Newson",3,5) (9C5A)
1190IF B%=1 PROCmsg("Press an
y key to continue...",3,6):SOU
ND 1,-15,230,5 (37BE)
1200IF B%=2 PROCmsg("Press"+C
HR$(136)+"SHIFT"+CHR$(137)+"to
continue...",3,6) (B352)
1210ENDPROC (6186)
1220PROCmsg("Files",6,3):FOR
I$=0 TO NZ(0)-1:PRINT TAB(FNx(
I$),FNy(I$))CHR$(B%)CHR$157CHR
$(F%)N$(I$):NEXT:IF (NZ(0)MOD
3) VDU 31,FNx(NZ(0)),FNy(NZ(0)
),132,157 (4FAA)
1230RETURN (B973)

```

```

1240PROCmsg("Sub-directories"
,6,3):FOR I$=0 TO NZ(1)-1:PRIN
T TAB(FNx(I$),FNy(I$))CHR$(B%)
CHR$157CHR$(F%)N$(46-I$):NEXT
:IF (NZ(1)MOD3) VDU 31,FNx(NZ(
1)),FNy(NZ(1)),132,157 (7D67)
1250RETURN (5F04)
1260DEF PROCdfnms (518E)
1270LOCAL B$,F%,I$ (BEFC)
1280PROCinfo:B%=132:F%=134:PR
OCwin(5,TRUE):PROCwin(3,FALSE)
:IF NZ(0)+NZ(1)=0 PROCmsg("!!
Empty directory !!",6,3):ENDPR
OC (8CEB)
1290IF NZ(0) GOSUB 1220 ELSE
PROCmsg("++ No files ++",6,3)
(9A7F)
1300: (802E)
1310PROCwin(4,FALSE):IF NZ(1)
GOSUB 1240 ELSE PROCmsg("++ N
o sub-directories ++",6,3) (EE
4D)
1320IF NZ(H%)=0 H%=1-H% (C064
)
1330PROCwin(3+H%,FALSE):PROCc
sr(TRUE) (1F34)
1340ENDPROC (B326)
1350DEF PROCdrom(R$,H%) (2BAB
)
1360LOCAL B$,F% (08DB)
1370IF H% F%=132:B%=134 ELSE
F%=134:B%=132 (5BCC)
1380PROCwin(6,FALSE):VDU 31,0
,15-R$,B$,157,F%:PRINT ;~R$ "
:IF S$(R%) VDU &FF ELSE VDU 3
2 (FF99)
1390IF C$(R%) AND R$(R%)=0:PR
INT "U "; ELSE VDU 32,32 (1A61
)
1400IF C$(R%)+R$(R%)=0 ENDPR
OC (A98B)
1410IF C$(R%)=1 PRINT"16"; EL
SE IF C$(R%)=2 PRINT" 8"; ELSE
PRINT"..."; (C5FD)
1420IF R$(R%) AND 128 PRINT"
S"; ELSE VDU 32,32 (AD1A)
1430IF R$(R%) AND 64 PRINT "L
"; ELSE VDU 32 (9F4F)
1440IF R$(R%) AND 32 PRINT "T
"; ELSE VDU 32,32 (060F)
1450PRINT R$(R%), (1DD1)
1460ENDPROC (59A5)
1470DEF PROCexit(C%) (4A1C)
1480OSCLI("FX 4"):OSCLI("FX 2
29"):PROCcsr(TRUE):IF C% VDU 2
6,12,10,10,10 (EBF0)
1490ENDPROC (F02D)
1500DEF PROCinfo (2F33)
1510PROCwin(2,TRUE):PROCcolou
r(3,5):PRINT ;"Drive"CHR$(135)
;dr$CHR$(134):IF dr$<4 PRINT"
Winchester"; ELSE PRINT " Flo
ppy";IF win% PRINT " (W)"; (2
ABF)
1520VDU 31,30,VPOS:IF ram% PR
INT FNdec(ram%,3);"K ";r$ ELSE
PRINT "No SW RAM" (DC02)
1530IF dn$=dt$:PROCmsg(dn$,3,
5) ELSE PROCmsg(dn$+" "+dt$,3
,5) (C726)
1540ENDPROC (6F33)
1550DEF PROCmsgcr(M$,B$,F%):P
ROCmsg(M$,B$,F%):PRINT:ENDPROC
(2C6D)
1560DEF PROctest(B%) (7951)
1570LOCAL E$ (AC63)
1580E$=0:PRINT "" Testing RA
M bank ";~B$:CALL ramtst,B$,E$
:VDU 7,32:IF E%>7FFF PRINT "E
xported by user"" ";E%=E%-&80
00 (94F7)
1590IF E%>0 PRINT "&FNhex(E$
,4); ELSE PRINT "No"; (B7F9)
1600PRINT " error(s) found !"
(7B65)
1610ENDPROC (F660)
1620DEF PROctitle (6F91)
1630PROCwin(0,TRUE):PROCcolou

```



```

r(3,6):PRINT "The";CHR$(141);"AD
FS Menu System";CHR$(140)ver$;
:IF tub% PRINT "TUBE" ELSE PRI
NT (C7A2)
1640PROCcolour(3,6):PRINT"
";CHR$(141);"ADFS Menu System"
; (CFB1)
1650ENDPROC (D0BF)
1660: (63AC)
1670DEF PROCcompact (62E6)
1680PROCmsgcr("COMPACT drive
:"+STR$(dr%),3,5):IF FNyn PROC
msgcr("COMPACTING drive:"+STR
$(dr%),3,5):PROCmsg("Please wa
it...",3,5):OSCLI("COMPACT 7C
4"):PROCtitle:PROCbanner(0):PR
OCdfnms (FC2F)
1690ENDPROC (BBDE)
1700DEF PROCdir (D$):PROCwin(5
,TRUE):PROCmsg("Entering direc
tory "+D$,6,3):OSCLI("DIR "+D$
):top%=FALSE:C%(0)=0:C%(1)=0:P
ROCrfnms:PROCdfnms:ENDPROC (C0
CB)
1710DEF PROCdroms (083D)
1720LOCAL I% (D6C7)
1730PROCwin(8,TRUE):PROCwin(6
,FALSE):FOR I%=0 TO 0&F:PROCdr
om(15-I%,FALSE):NEXT:ENDPROC (
649A)
1740DEF PROCmount:PROCmsg("MO
UNTING drive:"+STR$(dr%),3,5)
:OSCLI("MOUNT "+STR$(dr%)):top
%=TRUE:H%=0:C%(0)=0:C%(1)=0:PR
OCrfnms:PROCdfnms:ENDPROC (FA0
6)
1750DEF PROCpaktc (1CAA)
1760LOCAL G% (2E25)
1770PROCbanner(1):OSCLI("FX 1
5 1"):PROCcsr(TRUE):G%=GET:PRO
Ccsr(FALSE):PROCbanner(0) (F9B
0)
1780ENDPROC (4FA1)
1790: (42BC)
1800VDU 26,12,10,10:PROCmsgcr
("PROTECTED file",3,5):PROCmsg
cr("RUNING "+F$,3,5):PROCexit
(FALSE):OSCLI("RUN "+F$):NEW:R
ETURN (4A3D)
1810PROCbanner(2):PROCwin(8,T
RUE):PRINT":PROCmsgcr("TEXT f
ile",3,5):PROCmsgcr("TYPEING "
+F$,3,5):VDU 10,14:PROCcsr(TRU
E):OSCLI("TYPE "+F$):VDU 15:PR
OCpaktc:RETURN (F833)
1820VDU 26,12,10,10:PROCmsgcr
("BASIC file",3,5):PROCmsgcr("
CHAINING "+F$,3,5):PROCexit(FA
LSE):PAGE=load%:CHAIN F$:RETUR
N (2AB9)
1830IF FNfind("VIEW",2)>=0 PR
OCexit(TRUE):PROCinsert("NEW"+
CHR$(0&D)+"L "+F$+CHR$(0&D)):O
SCLI("WORD") (7B21)
1840PROCwin(5,TRUE):PROCmsgcr
(F$+" is a View file",3,5):PR
OCmsg("!! But VIEW is not pres
ent !!",3,5):PROCpaktc:RETURN
(7C5D)
1850PROCexit(TRUE):PROCmsgcr(
"MACHINE CODE file",3,5):PROCm
sg("RUNING "+F$,3,5):OSCLI("R
UN "+F$):RETURN (1C37)
1860IF ram%=0 PROCmsgcr("No S
W RAM to load",3,5):PROCmsg("R
OM image "+F$+" INTO!",3,5):PR
OCpaktc:RETURN (6654)
1870PROCdroms:PROCwin(7,TRUE)
:B%=FNget("LOAD "+F$+" into SW
bank",0):IF B%<0 RETURN (F7E9
)
1880PROCdrom(B%,TRUE):PROCwin
(7,TRUE):IF FNyn=FALSE RETURN
(6F69)
1890CALL ramdel,B%:VDU 26,12:
M%=1:CALL ramlos,F$,B%,M%:VDU
12:PROCtitle:PROCbanner(0):CAL
L rdroms,R$(0),R%(0),C%(0):RET

```

```

URN (AF1E)
1900IF FNfind("ViewSheet",2)>
=0 PROCexit(TRUE):PROCinsert("
NEW"+CHR$(0&D)+"L "+F$+CHR$(0&
D)):OSCLI("SHEET") (557C)
1910PROCwin(5,TRUE):PROCmsgcr
(F$+" is a VIEWSHEET file",3,5
):PROCmsg("!! But VIEW SHEET i
s not present !!",3,5):PROCpak
tc:RETURN (4440)
1920DEF PROCaccess (E061)
1930LOCAL P%,F$,T% (4270)
1940PROCwin(5,TRUE):P%=ABS(46
*HZ-C%(HZ)):F%=LEFT$(N$(P%),IN
STR(N$(P%))+" ",")-1):T%=FNfi
ltyp(F%):IF T%=-1 PROCdir(F%):
ENDPROC (27AF)
1950ON T% GOSUB 1800,1810,182
0,1830,1850,1860,1900:PROCbann
er(0):PROCdfnms (563D)
1960ENDPROC (7414)
1970DEF PROCbrk (8A59)
1980PROCwin(5,TRUE):PROCmsg("
Power-on reset",3,5):IF FNyn=F
ALSE PROCdfnms:ENDPROC (04FD)
1990IF NOT tub% OSCLI("FX 151
7B 127"):CALL -4 (3735)
2000PROCmsg("Please press BRE
AK",3,5):OSCLI("FX 151 7B 127"
):REPEAT UNTIL FALSE (D409)
2010ENDPROC (78D3)
2020DEF PROCdirup (D%) (1429)
2030LOCAL T% (B37C)
2040IF top% ENDPROC (78B4)
2050PROCwin(5,TRUE):IF D% PRO
Cmsg("Returning to root ($) di
rectory",6,3):OSCLI("DIR $"):H
%=0:C%(1)=0 ELSE PROCmsg("Retu
rning to parent directory",6,3
):OSCLI("DIR ^"):T%=dn% (D353)
2060PROCrfnms:C%(0)=0:top%=(d
n%="$"):IF NOT D% C%(1)=FNfind
(T$,1) (2134)
2070PROCdfnms (7F55)
2080ENDPROC (74CA)
2090DEF PROCdrive (D%):PROCwin
(5,TRUE):dr%=FNdrive(D%):PROCm
sg("Drive:"+STR$(dr%),5,3):OS
CLI("DIR "+STR$(dr%)):OSCLI("
LIB $"):top%=TRUE:H%=0:C%(0)=0
:C%(1)=0:PROCrfnms:PROCdfnms:E
NDPROC (05C0)
2100DEF PROCfree:PROCwin(5,TR
UE):PROCmsgcr("Free space on d
isc",5,3):PRINT:OSCLI("FREE"):
PROCpaktc:PROCdfnms:ENDPROC (9
799)
2110DEF PROClang (C11E)
2120LOCAL B%,I% (FEBD)
2130PROCwin(8,TRUE):FOR I%=0
TO 0&F:PROCdrom(15-I%,(R%(15-I
%)+64)/-64):NEXT:PROCwin(7,T
RUE):B%=FNget("Enter Language
ROM",1):IF B%>0 PROCexit(TRUE
):OSCLI("FX 142 "+STR$(B%)) (C
F17)
2140:PROCdfnms (62F9)
2150ENDPROC (EBD4)
2160DEF PROCmsr1r (D%) (FE16)
2170IF N%(H%)=0 ENDPROC (ADA1
)
2180PROCcsr(FALSE) (1372)
2190C%(H%)=(C%(H%)+D%+N%(H%))
MOD N%(H%) (874A)
2200PROCcsr(TRUE) (FB31)
2210ENDPROC (3320)
2220DEF PROCmsrud (D%) (9B40)
2230LOCAL N%,P% (CC5E)
2240IF N%(H%)=0 ENDPROC (481C
)
2250N%=N%(H%):P%=C%(H%)+D%:IF
P%>N% P%=(P%+1)MOD 3)MOD N%
(ADE7)
2260IF P%<0 P%=N%+(P%+5-(N%
MOD 3))MOD 3)-3:IF P%<0 P%=P%+
N% (1F58)
2270PROCcsr(FALSE):C%(H%)=P%
:PROCcsr(TRUE) (F1ED)

```

```

2280ENDPROC (3F39)
2290DEF PROCramdel (934C)
2300LOCAL B% (C7CB)
2310IF ram%=0 ENDPROC (C8CB)
2320PROCdroms:PROCwin(7,TRUE)
:B%=FNget("DELETE SW RAM bank"
,0):IF B%<0 :PROCdfnms:ENDPROC
(BD66)
2330PROCdrom(B%,TRUE):PROCwin
(7,TRUE):IF FNyn CALL ramdel,B
%:CALL rdroms,R$(0),R%(0),C%(0
) (2A72)
2340:PROCdfnms (91F9)
2350ENDPROC (A027)
2360DEF PROCramsve (F74A)
2370LOCAL A%,B%,T% (57C0)
2380PROCdroms (D077)
2390PROCwin(7,TRUE) (702A)
2400B%=FNget("SAVE SW bank",2
) (A990)
2410IF B%<0 :PROCdfnms:ENDPR
OC (BCC8)
2420PROCdrom(B%,TRUE) (991E)
2430PROCwin(7,TRUE) (9715)
2440PRINT" Enter filename for
r:" "R$(B%)" to be saved unde
r": (17BA)
2450A%=FNgetstr (A9C9)
2460IF A%="" A%=FNcomp(R$(B%
) (CA23)
2470T%=FNltyp(A%) (C2B2)
2480IF T%=-1 PRINT:PROCTab("A
lready exists as a sub-directo
ry !"):PROCpaktc:PROCdfnms:END
PROC (64EB)
2490IF T%=1 PRINT:PROCTab("Fi
le already exists protected wi
th 'E' attribute !"):PROCpaktc
:PROCdfnms:ENDPROC (E076)
2500PRINT"" SAVE "R$(B%)" a
s "A%" :IF FNyn=FALSE PROCdf
nms:ENDPROC (6D0B)
2510IF T%=0 ELSE PRINT " Over
write file "A%";IF NOT FNyn :P
ROCdfnms:ENDPROC ELSE OSCLI("A
CCESS "+A%+" W") (E265)
2520T%=0:VDU 26,12:CALL ramlo
s,A%,B%,T%:VDU 12:PROCtitle:PR
OCbanner(0):OSCLI("ACCESS "+A%
+" LWR"):PROCrfnms:C%(0)=FNfin
d(A%,0):PROCdfnms (EE9B)
2530ENDPROC (D9A3)
2540DEF PROCramtst (A74E)
2550LOCAL I% (ACA4)
2560PROCwin(8,TRUE):FOR I%=0
TO 0&F:IF S%(I%)=1 PROCTest(I%
) (669B)
2570NEXT:PROCpaktc:PROCdfnms
(0843)
2580ENDPROC (56F4)
2590DEF PROCromdis:PROCdroms:
PROCpaktc:PROCdfnms:ENDPROC (B
C33)
2600DEF PROCsvemnu (2897)
2610PROCwin(5,TRUE):PRINT " S
AVE the Menu System to disc as
!BOOT":IF FNyn OSCLI("SAVE !B
OOT 2400 "+STR$(TOP)+" 0000"+
STR$(intlse AND &FFFF)):OSCLI
("OPT 4 2") (CACF)
2620PROCrfnms:PROCdfnms (BF32
)
2630ENDPROC (2788)
2640DEF PROCswcsr (DAEB)
2650IF N%(1-H%)=0 ENDPROC (0B
46)
2660PROCcsr(FALSE):H%=1-H%:P
ROCwin(3+H%,FALSE):PROCcsr(TR
UE) (B6CF)
2670ENDPROC (0157)
2680: (E39E)
2690DEF PROCinit (938D)
2700DIM N$(46),R$(15),R%(15),
S%(15),C%(15),C%(1),N%(1),W%(
1),1) (9A20)
2710ver$="2.4a":PROCcsr(FALSE)

```



```

):OSCLI("FX 229 1"):OSCLI("FX
4 1") (CEAC)
2720FOR IZ=0 TO 46:N$(IZ)=STR
ING$(10," "):NEXT (B66B)
2730FOR IZ=0 TO 46:R$(IZ)=ST
RING$(25," "):NEXT (6397)
2740dn$=N$(0):dt$=STRING$(19,
" ") (D1A1)
2750FOR IZ=0 TO 8:READ WZ(IZ,
0),WZ(IZ,1):NEXT AX=&2400+?&24
00 (96D2)
2760intlse=AX!0:rdfnms=AX!2:r
droms=AX!4:ramget=AX!6:ramlos=
AX!8:ramdel=AX!10:ramtst=AX!12
:status=AX!14:filinf=AX!16 (E1
22)
2770ram%=0:Z%=0:FOR IZ=0 TO 2
:CALL ramget,IZ,SZ(0):YZ=0:FOR
JZ=0 TO 15:YZ=YZ+SZ(JZ)*16:NE
XT:IF YZ>ram% ram%=YZ:Z%=IZ:r$
=MID$( "ACNSTLWAT", IZ*3+1,3) (0
B33)
2780NEXT:IF ram% CALL ramget,
Z%,SZ(0) (1EE7)
2790PROCwin(0,FALSE):AX=0:BX=
0:CZ=0:CALLstatus,AX,BX,CZ:win
%=(AX AND 32)=32:dr$=FNdrive
(BX):tubZ=(CZ>0) (A961)
2800PROCtitle:PROCbanner(0):C
ALL rdroms,R$(0),RZ(0),CZ(0) (
594B)
2810exit%=FALSE:PROCrfnms:PRO
Cwin(0,TRUE):HZ=0:CZ(0)=0:CZ(1
)=0:PROCdfnms:topZ=(dn$="") (
37BD)
2820ENDPROC (B5B5)
2830: (BA1E)
2840DATA 0,1,24,0,2,2,5,0,0,0
,5,18,3,15,20,3,2,21 (8F55)
2850: (4D7D)
2860DEFPROCerror:VDU7,7:PROCw
in(5,1):PROCcolour(3,5) (0EFE)
2870IFERR<45 PRINT"ASIC":EL
SE:IFERR<58 PRINT"M/Code":ELS
E:IFERR<FF PRINT"ADFS":ELSE
PRINT"UBE": (4CB7)
2880PRINT" Error ";:ERR;" at
line ";ERL:REPORT:PRINT":e$="
"+STR$(ERR)+" " (BB59)
2890IFERR=&BD:PROCtab("An att
empt has been made to read (or
load) a file with the 'R' att
ribute not set, or to write to
a file with the 'W' attribute
not set.") (DB0D)
2900IFERR=&AA:PROCtab("RAM is
corrupted, which prevents ADF
S from being able to close a f
ile or read or write to it. Th
e system needs to be restarted
.") (B7DB)
2910IFERR=&A9:PROCtab("Either
RAM or disc sectors 000 or 00
1 are corrupted. The system mu
st be restarted.") (8426)
2920IFERR=&AB:PROCtab("An att
empt has been made to access a
directory which in some way c
orrupt and as such should not
be accessed. This error implie
s that the disc is in an incon
sistent state and should be re
formatted if possible.") (EC21
)
2930IFERR=&B3:PROCtab("An att
empt has been made to create a
new object in a directory alr
eady containing 47 entries.")
(F0C7)
2940IFERR=&C6:PROCtab("There
is not enough free space on th
e drive to carry out the requ
sted operation. The disk will
need to be compacted.") (B2FA)
2950IFERR=&C3:PROCtab("An att
empt has been made to overwrit
e an object which is locked.")
(C4EB)

```

```

2960IFERR=&99:PROCtab("The fr
ee space map is full. The disc
should be compacted, otherwis
e it may not be possible to sa
ve further information to it."
) (3C54)
2970IFERR=&C8:PROCtab("The di
sc has been swapped and the dr
ive hasn't be mounted.") (1A1C
)
2980IFERR=&C9:PROCtab("This d
isc has a write-protect tab in
place. Remove it if you wish
to write to the disc.") (6712)
2990IFERR=&FF:PROCtab("Illega
l TUBE os call!") (FBA9)
3000IFINSTR(" C6 98 99 ",e$):
PROCpakt:PROCwin(5,1):PROCcom
pct:ENDPROC (30FE)
3010IFINSTR(" BD FE B3 C9 C3
",e$):PROCpakt:ENDPROC (D5A4)
3020IFINSTR(" AA A9 AB CB ",e
$):PROCpakt:PROCwin(5,1):PROC
mount:ENDPROC (2394)
3030PROCexit(FALSE) (6B0B)
3040IFERR<>11 AND ERR<>FF:P
ROCinsert(CHR$(11)+CHR$(10)+
"L.00"+CHR$(10)+"L."+STR$(ERL
)+CHR$(11)+CHR$(10)+CHR$(10)
) (5690)
3050END (D0AD)
3060ENDPROC (4D46)
3070DEF PROCentry:VDU 26,12:
PROCtitle:PROCbanner(0):PROCrf
nms:PROCdfnms:ENDPROC (4CCF)

```

```

360ENDPROC
370:
380DEFPROCerror
390SOUND 1,-15,230,5
400PRINT "STRING$(40,"=");:C
HECKSUM ERROR !!!"
410PROCinsert("LIST "+STR$(10
00+line*10)+CHR$(10))
420ENDPROC
430:
440DEFPROCsumerror
450SOUND 1,-15,230,5
460PRINT "STRING$(40,"=");:T
OTAL CHECKSUM ERROR !!!"
470PRINT "Probably caused by
missing lines"
480ENDPROC
490:
500DEFPROCinsert(a$)
510AX=&99
520XZ=&00
530FOR i=1 TO LEN(a$)
540YZ=ASC(MID$(a$,i,1))
550CALL &FFF4
560NEXT
570ENDPROC
580:
590REM Data format is a foll
ows :

```

```

600REM d0 d1 d2 d3 d4 d5 d6
d7 d8 d9 dA dB dC dD dE dF,Sum
610:
1000DATA 78 00 00 41 44 46 53
20 4D 65 6E 75 20 53 79 73,4AA
1010DATA 74 65 6D 0A 0D 28 43
29 20 32 30 20 4A 75 6C 20,3DE
1020DATA 31 39 38 36 20 44 61
76 69 64 20 46 61 68 79 20,4AB
1030DATA 28 45 4C 49 54 45 29
20 61 6E 64 0A 0D 20 20 20,3BE
1040DATA 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20,2C3
1050DATA 20 4E 65 77 73 6F 6E
0A 0D 50 75 62 6C 69 73 68,58B
1060DATA 65 64 20 62 79 20 41
20 26 20 42 20 43 6F 6D 70,47C
1070DATA 75 74 69 6E 67 0A 0D
00 F0 2A 92 24 07 2A E9 25,54D
1080DATA 7D 26 37 26 94 28 EC
2B 81 25 00 00 00 00 00 00,379
1090DATA 00 00 20 65 2C 05 72
00 81 04 04 81 81 A9 00 A2,3FE
1100DATA 09 95 80 CA 10 FB A9
B8 85 81 A2 B6 A0 2D A9 05,82D
1110DATA 20 D1 FF A5 78 85 8C
A0 00 AE 00 06 A5 79 20 2B,6DB
1120DATA 2C A9 06 A2 B6 A0 2D
20 D1 FF A5 7A 85 8C A0 0F,7CF
1130DATA A2 00 BD 02 06 7D 00
06 EB 88 D0 F6 AE 00 06 BD,6B1
1140DATA 00 06 C9 20 D0 03 CA
D0 F6 A5 7B 20 2B 2C A9 0A,69C
1150DATA 85 8B A9 00 BD BF 2D
20 58 25 F0 48 AE 00 06 E0,69B
1160DATA 0A F0 0A A9 20 7D 01
06 EB E0 0A D0 F8 A5 84 C9,7FD
1170DATA 02 D0 12 AD 01 06 C9
21 F0 25 A5 81 A8 E9 04 85,607
1180DATA 81 E6 80 D0 11 AD 01
06 C9 00 F0 13 A5 83 AB 18,730
1190DATA 69 04 85 83 E6 82 A5
72 85 8C A5 73 20 2D 2C 20,686
1200DATA 58 25 D0 B8 A9 00 A0
03 91 74 91 76 88 D0 F9 A5,853
1210DATA 80 91 74 A5 82 91 76
60 A9 01 BD B8 2D A9 08 A2,785
1220DATA B6 A0 2D 20 D1 FF 90
03 A9 00 60 AE 00 06 A9 0D,679
1230DATA 9D 01 06 A9 05 A2 D0
A0 2D 20 DD FF 85 84 C9 00,75F
1240DATA 60 2D 65 2C 04 70 00
81 04 04 04 A0 03 B1 70 99,46F
1250DATA 80 00 88 10 F8 A4 83
D0 14 00 35 42 61 64 20 53,5CA
1260DATA 74 72 69 6E 67 20 4C
65 6E 67 74 68 00 8C 00 06,538
1270DATA A9 0D 99 01 06 88 B1
80 99 01 06 88 10 F8 20 73,5D2

```

◆ HEX LOADER ◆

```

10REM ADFS Disc Menu system
20REM Written by and (C) 198
6 David Fahy and Rob Newson
30REM Published by A & B Com
puting
40REM "Hexloader" program
50:
60MODE 7
70:
80DIM buffer &A00
90RESTORE
100length=0:line=0:mainsum=0
110REPEAT
120READ B$,A$
130PRINT "Line ";1000+line*10
;
140checksum=EVAL("&"+A$)
150csum=0
160FOR pos=1 TO LEN(B$) STEP
3
170IF MID$(B$,pos,2)="*":60T
0 220
180value=EVAL("&"+MID$(B$,pos
,3))
190buffer?length=value
200csum=csum+value
210length=length+1
220NEXT
230IF csum=checksum VDU 30:EL
SE:PROCerror:END
240mainsum=mainsum+csum
250line=line+1
260UNTIL INSTR(B$,"*")
270READ A$
280IF mainsum<>EVAL("&"+A$):P
ROCsumerror:END
290PROCsave
300END
310:
320DEFPROCsave
330SOUND 1,-15,150,5
340PRINT "STRING$(40,"=");:S
aving Object code"
350OSCLI("SAVE obj "+STR$(bu
ffer)+" "+STR$(length)+" "+ST
R$(buffer!buffer)AND &FFFF)+
" 2400")

```


A D F S D I S C M E N U

```

1280DATA 25 8D DA 2D A9 00 A0
01 8D DB 2D 99 D8 2D 99 DC,7AB
1290DATA 2D 88 10 F7 A0 03 B9
D2 2D 91 72 B9 D6 2D 91 74,7DB
1300DATA B9 DA 2D 91 76 B8 10
EE 60 20 65 2C 02 70 00 04,5D4
1310DATA 04 A9 B8 A2 04 20 F4
FF 20 BE 2D A2 0F A0 3C B5,70B
1320DATA 80 91 72 B8 B8 B8 B8
CA 10 F5 60 20 5D 29 20 9B,733
1330DATA 29 20 84 2D A0 0F 20
78 29 AD DF 80 49 FF 8D DF,72A
1340DATA 80 CD DF 80 D0 0A 49
FF 8D DF 80 A9 01 99 80 00,87D
1350DATA 88 10 E3 20 A1 29 60
20 65 2C 01 70 00 04 A0 00,48B
1360DATA B1 70 A8 A9 B8 A2 01
20 F4 FF 60 84 72 20 9B 29,7EA
1370DATA 20 78 29 A9 AA A2 00
A0 FF 20 F4 FF 86 F6 84 F7,95F
1380DATA A9 00 A4 72 91 F6 85
F6 A0 80 84 F7 A8 A2 40 91,977
1390DATA F6 C8 D0 FB E6 F7 CA
D0 F6 20 A1 29 60 20 65 2C,9F1
1400DATA 03 70 00 B1 04 04 A0
03 B1 70 99 80 00 B8 10 F8,569
1410DATA A4 83 D0 0F 00 35 42
61 64 20 46 69 6C 65 6E 61,5B1
1420DATA 6D 65 00 8C 00 06 A9
0D 99 01 06 88 B1 80 99 01,50D
1430DATA 06 88 10 F8 C8 B1 72
30 04 C9 10 90 11 00 36 42,5A7
1440DATA 61 64 20 52 4F 4D 20
4E 75 6D 62 65 72 00 A4 83,583
1450DATA 99 02 06 A9 01 A2 00
BE B9 2B A0 7C 8C BA 2B A0,68C
1460DATA 06 20 8A 2B A0 00 B1
74 85 72 A8 A9 B8 A2 00 20,632
1470DATA F4 FF 90 A9 8C 01 01
BE 00 01 6C 00 01 A5 72 C9,5F6
1480DATA 01 D0 01 60 20 73 25
C9 01 F0 11 00 26 46 49 4C,4B6
1490DATA 45 20 4E 4F 54 20 53
41 56 45 44 00 A9 CD 8D D6,5C2
1500DATA 2D A9 D9 8D D7 2D A9
03 A2 D0 A0 2D 20 D0 FF A9,8D0
1510DATA FF 8D D5 2D 8D D4 2D
A9 80 8D D3 2D A9 00 8D D2,8DA
1520DATA 2D A9 02 20 D0 FF 60
AE 00 7C 8D 02 7C 85 74 C0,752
1530DATA 01 D0 03 4C F0 27 A8
20 9B 29 20 78 29 A9 A0 85,652
1540DATA F7 A9 00 85 F6 A0 07
B1 F6 85 F6 A0 03 B1 F6 D9,A07
1550DATA D4 2A D0 07 88 10 F6
A9 A0 D0 02 A9 C0 85 76 A2,884
1560DATA 01 A0 7C A9 80 20 CE
FF D0 19 A2 90 A0 27 38 60,7AD
1570DATA 00 37 43 61 6E 6E 6F
74 20 6F 70 65 6E 20 66 69,55B
1580DATA 6C 65 00 85 75 8D C3
2D A9 80 85 F7 A9 00 85 F6,811
1590DATA 85 BE A0 04 84 8D A0
7C 84 8F A0 00 B1 F6 91 BE,85D
1600DATA C8 D0 F9 E6 F7 E6 8F
C6 8D D0 F1 A9 04 8D C9 2D,827
1610DATA A9 7C 8D C5 2D A9 02
A2 C3 A0 2D 20 D1 FF A5 F7,90D
1620DATA C5 76 90 CE A9 00 A4
75 20 CE FF 20 A1 29 18 60,7AA
1630DATA A2 E2 A0 2D A9 05 20
DD FF C9 01 F0 06 A2 90 A0,88D
1640DATA 27 38 60 AD ED 2D C9
21 B0 08 A9 A0 85 7C 85 7F,776
1650DATA D0 04 46 7C A9 C0 85
7D A2 01 A0 7C A9 40 20 CE,797
1660DATA FF C9 00 F0 D8 85 75
8D C3 2D A9 80 85 F7 A9 00,955
1670DATA 85 F6 85 7E 85 BE 8D
CC 2D 8D CD 2D 8D CE 2D 8D,8B3
1680DATA CF 2D 20 9B 29 A4 74
20 78 29 A0 7C 84 8F C5 75,739
1690DATA 2D A0 04 84 8D 8C C9
2D A9 03 A2 C3 A0 2D 20 D1,733
1700DATA FF A0 00 B1 8E 91 F6
C8 D0 F9 24 7C 10 09 B1 8E,8EE
1710DATA 91 7E C8 D0 F9 E6 7F
E6 F7 E6 8F C6 8D D0 E4 8C,8EA

```

```

1720DATA C4 2D A5 F7 C5 7D D0
C2 A9 00 A4 75 20 CE FF 20,930
1730DATA A1 29 18 60 20 65 2C
02 70 00 04 04 A0 00 B1 70,42E
1740DATA AB A9 B8 A2 02 20 F4
FF 98 A0 01 91 72 B8 B8 91,86F
1750DATA 72 60 20 9B 29 20 78
29 A9 80 85 F7 85 76 A0 00,6B7
1760DATA 84 F6 84 7A 84 7B B1
F6 49 FF 91 F6 D1 F6 F0 36,ADA
1770DATA 85 75 24 76 10 1A A9
4D 85 78 A9 29 85 79 84 74,679
1780DATA 06 76 A0 00 B1 78 F0
06 20 E3 FF C8 D0 F6 A4 74,8E3
1790DATA A9 82 20 EE FF A5 F7
20 37 29 98 20 37 29 E6 7A,7CC
1800DATA D0 02 E6 7B A5 75 49
FF 91 F6 C8 D0 B9 A9 B1 A2,A39
1810DATA 01 A0 00 20 F4 FF B0
0C E0 1B D0 08 A9 80 05 7B,6EC
1820DATA 85 7B D0 0A A0 00 E6
F7 A5 F7 C9 C0 D0 98 20 A1,9A5
1830DATA 29 A4 7B A6 7A 18 60
48 4A 4A 4A A4 20 42 29 68,543
1840DATA 29 0F 09 30 C9 3A 90
02 69 06 4C EE FF 0E 0C 20,4EB
1850DATA 46 61 69 6C 65 64 20
61 74 3A 0D 0D 00 A0 00 B1,4DF
1860DATA 70 A0 A8 B9 72 29 8D
70 29 B9 73 29 8D 71 29 60,678
1870DATA 00 00 7E 29 7F 29 97
29 20 AB 29 6C 70 29 60 C0,528
1880DATA 08 90 01 60 8C 96 29
A0 0F 8C 62 FE AC 96 29 8C,6D6
1890DATA 60 FE AC 96 29 60 00
99 30 FF 60 A5 F4 8D A4 29,84A
1900DATA 60 AD AA 29 85 F4 8D
30 FE 60 00 84 F4 8C 30 FE,8A6
1910DATA 60 20 9B 29 A9 80 85
F7 A2 23 86 85 A2 08 86 86,76F
1920DATA A2 00 86 84 86 81 86
82 84 80 20 AB 29 A9 09 85,6EA
1930DATA F6 A2 FF 86 83 E8 A4
83 C8 84 83 B1 F6 F0 10 C9,AE
1940DATA 0D F0 0C A4 81 C8 84
81 91 84 E8 E0 18 D0 E7 8A,931
1950DATA A4 82 91 84 98 18 69
20 85 82 85 81 A4 80 C8 C6,833
1960DATA 86 D0 C5 20 A1 29 60
20 65 2C 03 7A 00 81 04 04,51C
1970DATA A9 00 85 72 85 70 AB
A9 88 A2 06 20 F4 FF A9 00,7D2
1980DATA 8D B9 2B A9 23 8D BA
2B A9 01 A0 06 A2 00 20 BE,67F
1990DATA 2B A9 08 85 71 A5 7A
85 8C 18 69 84 85 7A A5 7B,6A6
2000DATA 90 02 E6 7B AE 00 06
A0 00 20 2B 2C 00 A4 72 57,676
2010DATA B9 20 06 9D 00 06 C8
E8 E0 20 D0 F4 84 72 C6 71,823
2020DATA D0 D3 A9 08 18 65 70
C9 10 D0 A9 A9 88 A2 03 20,789
2030DATA F4 FF 20 8E 2D A2 0F
A0 3C 85 80 91 7E 88 88 88,837
2040DATA 88 CA 10 F5 A9 88 A2
05 20 F4 FF 20 8E 2D A2 0F,7CE
2050DATA A0 3C 85 80 91 7C 88
88 88 88 CA 10 F5 60 20 84,811
2060DATA 2D 20 9B 29 A9 80 85
73 20 AF 2A A9 A0 85 73 A0,70C
2070DATA 0F 20 AB 29 84 74 AD
07 80 85 72 A0 03 B1 72 D9,6C5
2080DATA D4 2A D0 07 88 10 F6
A6 74 F6 80 A4 74 88 10 E1,884
2090DATA 20 A1 29 60 20 28 43
29 A9 AA A2 00 A0 FF 20 F4,686
2100DATA FF 86 F6 84 F7 A0 0F
B1 F6 99 80 00 88 10 F8 60,955
2110DATA A9 00 A0 00 20 DA FF
C9 08 F0 16 00 01 41 44 46,5E5
2120DATA 53 20 4E 4F 54 20 43
55 52 52 45 4E 54 20 46 53,460
2130DATA 00 A9 5B 8D 89 2B A9
00 8D 85 2B A2 85 A0 2B A9,6C6
2140DATA 06 20 F1 FF A9 2D 8D
89 2B A9 01 8D 85 2B A2 85,73B
2150DATA A0 2B A9 06 20 F1 FF
A2 00 8E B9 2B A0 24 8C BA,7AB

```

```

2160DATA 2B A9 0A 20 8A 2B A9
0F A2 00 20 F4 FF A9 8A A2,6F5
2170DATA 00 BC 71 2B F0 0C 86
70 A2 00 20 F4 FF A6 70 E8,7FD
2180DATA D0 EF A9 B8 A2 00 A0
FF 20 F4 FF A9 BE 4C F4,AEED
2190DATA 00 50 41 47 45 3D 26
32 46 30 30 0D 4F 4C 44 0D,351
2200DATA 52 55 4E 0D 00 00 02
FF FF 00 84 7D 86 7C 85 7E,608
2210DATA A0 00 B1 7C 8D 8D 2B
8C B8 2B A2 B9 A0 2B A9 06,786
2220DATA 20 F1 FF AC B8 2B EE
B9 2B D0 03 EE BA 2B C8 D0,9AF
2230DATA E1 E6 7D C6 7E D0 DB
60 00 00 00 FF FF 00 85 77,88D
2240DATA 86 78 84 79 A0 00 8C
B8 2B A2 B9 A0 2B A9 05 20,6FE
2250DATA F1 FF AC B8 2B AD BD
2B 91 78 EE B9 2B D0 03 EE,980
2260DATA BA 2B C8 D0 E1 E6 79
C6 77 D0 D8 60 20 65 2C 03,8B9
2270DATA 70 00 04 04 04 A9 70
A2 29 A0 2C 20 F1 FF AD 2A,613
2280DATA 2C A0 00 91 70 A9 05
A2 B6 A0 2D 20 D1 FF AC 00,73C
2290DATA 06 C8 C8 B9 00 06 A0
00 91 72 A9 EA A2 00 A0 FF,7CC
2300DATA 20 F4 FF BA A0 00 91
74 60 00 00 86 B8 85 8D B1,776
2310DATA 8C 85 8E C8 B1 8C 85
8F C8 A5 88 D1 8C 90 16 F0,9A3
2320DATA 14 00 34 42 61 64 20
53 74 72 69 6E 67 20 4C 65,4B7
2330DATA 6E 67 74 68 00 C8 91
BC A8 F0 09 88 B9 01 06 91,710
2340DATA 8E 88 10 F8 60 68 85
F6 68 85 F7 A0 01 B1 F6 C9,956
2350DATA 00 D0 13 00 01 4E 6F
20 70 61 72 73 20 72 65 71,4DF
2360DATA 75 69 72 65 64 00 C9
55 90 19 00 02 54 6F 6F 20,534
2370DATA 6D 61 6E 79 20 70 61
72 73 20 72 65 71 75 69 72,643
2380DATA 65 64 00 CD 00 06 F0
2D B0 16 00 03 54 6F 6F 20,4D4
2390DATA 6D 61 6E 79 20 70 61
72 73 20 67 69 65 6E 00,5C4
2400DATA 00 04 54 6F 6E 20 66
65 77 20 70 61 72 73 20 67,4F5
2410DATA 69 76 65 6E 00 69 02
8D 00 06 C8 B1 F6 85 F2 C8,75E
2420DATA B1 F6 85 F3 A2 00 86
F0 C8 84 F1 D0 03 06 D1 F6,A01
2430DATA F0 2E A2 13 BD 47 2D
9D 00 01 CA 10 F7 88 88 88,70B
2440DATA 98 A0 11 E8 38 E9 A0
10 FA 69 0A E0 00 F0 09 48,6FA
2450DATA 8A 09 30 8D 11 01 C8
68 09 30 99 00 01 4C 00 01,3B2
2460DATA A4 F0 BD 01 06 91 F2
C8 BD 02 06 91 F2 C8 84 F0,927
2470DATA E8 E8 E8 A4 F1 C0 00
06 D0 AE 98 18 65 F6 A8 A5,9F5
2480DATA F7 69 00 48 98 48 60
00 DF 42 61 64 20 70 61 72,631
2490DATA 20 49 6E 20 50 6F 73
20 30 00 00 C9 00 F0 02 38,46C
2500DATA 60 8A 0A AA BD 76 2D
8D 74 2D BD 77 2D 8D 75 2D,6BC
2510DATA 6C 74 2D 00 DF DF 47
27 4B 26 B2 28 9E 2A 0B 26,57D
2520DATA D8 2A B1 29 A9 00 A2
0F 95 80 CA 10 FB 60 A2 0F,731
2530DATA A9 8F 8D B1 2D 8E 80
2D A2 B1 A0 2D A9 05 20 F1,7ED
2540DATA FF AD B5 2D AE 80 2D
95 80 CE B1 2D CA 10 E6 60,8FA
2550DATA 00 8F 00 FF FF 00 00
00 06 00 00 01 00 00 00 00,294
2560DATA 00 00 00 00 00 7C FF
FF 00 01 00 00 00 00 00 00,27B
2570DATA 01 06 00 00 00 00 00
00 00 00 00 00 00 00 00,7
2580DATA 00 00 01 7C 00 00 00
00 00 00 00 00 00 00 00,7D
2590DATA 00 00 00 00 **,0
3000DATA 451DC

```


MAKING THE MOST OF ASSEMBLER

Machine code music — finding out about writing in assembler

Our example program this month uses machine code to plot a few triangles using the Operating System routine OSWRCH at &FFEE for the equivalent of a BASIC VDU command. The musical accompaniment is also in machine code.

The sound channel 1 buffer is examined to check if it is empty. This is done with the equivalent of *FX128, the negative ADVAL command. The Operating System command OSBYTE that starts at address &FFF4 is used. The accumulator is set to 128, the Y register to 255, and the X register to 250 before going to the routine. Afterwards the number of free spaces in the sound channel 1 buffer will be in the Y register. There are 15 free spaces when the channel is empty.

Whenever the channel is empty the next note in the tune is played otherwise the computer gets on with plotting the next triangle. I have used a short silence to separate the notes of the tune in case two adjacent notes have the same pitch. On the Beeb the notes could be separated by cunning use of an ENVELOPE instead. The program is over when the last or 22nd note has been played.

The sound can be made using the operating system routine OSWORD which starts at &FFF1. The accumulator is set to 7 for a sound command. The sound needs eight bytes of information, two bytes each for the channel, loudness, pitch and duration of the note. This is too much information to carry in the X and Y registers as they only have room for one byte each.

Music ...Program Description

Main Program

20 The initialisation procedure
30 Assembles the machine code
40 Selects Mode 2
50 Plays the tune

Procedures

70 PROCAS
80-100 Labels the operating system routines
110 Assigns a space for the machine code
120 Two pass assembly
130 Sets the program pointer
140 Sets the assembly options
150 TUNE
160 Checks whether the sound channel is empty
170 Adds 8 to the OSWORD parameter block
180 Makes the sound with the parameter block starting at the addresses in 424 and 425
190 Makes the sound with its parameter block in starting at &70
200 Returns from the subroutine
210 GRAPHIC The equivalent of a BASIC GCOL command ie VDU18
220 A random colour from location &86
230 The equivalent of a BASIC PLOT command ie VDU25
250 PLOT 85 fills a triangle
250 The horizontal coordinate of the point plotted is in &80 and &81, the low byte goes through the VDU command first
260 The vertical coordinate of the point to be plotted is in &84 and &85
270 Returns from subroutine
280 End of machine code, next pass of assembly
290 PROCINIT
300 Clears an area of memory for the music data
310-320 Reads in the data for the music
330 Puts channel 1 in the first byte of each block, and loudness -15 in the third byte of each block
340 Puts the pitch in the fifth byte of each block
350 Puts the duration in the seventh byte of each block
370 PROCPLAY
380 Sets I% to the value of &2C00-8, which is eight less than the first block of music data. The integer variables from Z% to Z% are stored on Page &400, with four bytes each. So PRINT I% would be the same as PRINT !&424
390 Puts channel one in &70, loudness zero in &72, and duration one in &76. This is the equivalent of SOUND1,0,0,1 to separate the notes
400 Repeats the following routine
410 Gives a random number for the horizontal and vertical coordinates plotted
420 Gives a random value for the colour. CALLs the routine to play the tune and plot the triangle
430 Until the last note of the tune is reached
DATA
460-490 Contains the pitch and duration of each of the 22 notes of the tune

Instead the X and Y registers contain the information about where the eight bytes of data are to be found. The address of the first byte of data is a two byte address. The low byte of this block of data is put into the X register and the high byte is put into the Y register before going to the OSWORD routine. The block of data for the sound to be made is usually called a *Parameter Block*.

The other OSWORD calls with different values in the accumulator cover other commands when a block of information is needed.

During PROCINIT the sound data is read in and a parameter block set up for each note. Before the tune is played the locations &424 and &425 are given the address of the first byte of the parameter block address. The low

byte of the address is stored at &424 and the high byte at &425. When a note is played eight is added to the address at &424 and &425 to make it equal to the parameter block address for the next note.

During this series most of the programming has been concerned with displaying and moving multicoloured sprites on the screen. For this purpose short machine code routines can be written and used with your own BASIC program. Three of the Operating System's many routines, OSWRCH, OSBYTE and OSWORD have been included to show how BASIC commands have their machine code equivalent. These are used when writing

complete games in machine code.

This is the final part in the original *Making the Most of Assembler* series but we will be presenting further machine code routines in the coming months under this heading. If you have encountered any particular problems when working in assembler or if you have any specific requests for routines then send them in to us at *Making the Most of Assembler*, A&B Computing, Number One Golden Square, London W1R 3AB, and we will do our best to answer your questions.

this stage could be the wrong number of bytes following the GCOL or PLOT commands.

If the graphics are working and the computer still hangs up, the lines pushing the register values to the stack, and pulling them off again may be at fault.

If no music is playing the computer may not be using the correct parameter blocks for the OSWORD routine.

When the tune sounds decidedly odd then the data could be at fault.

Hints on Debugging

If the computer is not plotting coloured triangles, check the GRAPHIC routine. Any hang up at

◆ LISTING 1 ◆

```
10REM MUSIC
20PROCINIT
30PROCAS
40MODE2
50PROCPLAY
60END
70DEFPROCAS
80OSWORD=&FFF1
90OSBYTE=&FFF4
100OSWRCH=&FFEE
110DIM TUNE 300
120FORPASS =1TO2
130P%=TUNE
140DOFT PASS
150.TUNE
160LDY#&FF:LDX#250: LDA#128: J
SR OSBYTE: CPX#&0F: BNE OUT
170CLC: LDA#424: ADC#8: STA#424
: LDA#425: ADC#0: STA#425
180LDA#7: LDX#424: LDY#425: JSR
OSWORD
190LDA#7: LDX#&70: LDY#0: JSR O
```

```
SWORD
200.OUT RTS
210.GRAPHIC LDA#18: JSR OSWRC
H
220LDA#0: JSROSWRCH: LDA#86: JS
ROSWRCH
230LDA#25: JSROSWRCH
240LDA#85: JSROSWRCH
250LDA#80: JSROSWRCH: LDA#81: J
SROSWRCH
260LDA#84: JSROSWRCH: LDA#85: J
SROSWRCH
270RTS
280J: NEXT: ENDPROC
290DEFPROCINIT
300FORX%=0TO252STEP4: ! (&2C00
+X%)=0: NEXT
310FORX%=0TO21
320READPITCH, DUR
330? (&2C00+8*X%)=1: ? (&2C00+8
*X%+2)=-15
340? (&2C00+8*X%+4)=PITCH
```

```
350? (&2C00+8*X%+6)=DUR
360NEXT: ENDPROC
370DEFPROCPLAY
380I%=&2C00-8
390!&70=1: !&74=&10000
400REPEAT
410!&84=RND(1023): !&80=RND(1
279)
420?&86=RND(7): CALL GRAPHIC
430CALL TUNE
440UNTIL I%=&2C00+21*8
450ENDPROC
460DATA69,24,81,8,81,32,69,2
4,61,8,53,32
470DATA61,16,69,16,81,24,69,
8,61,64
480DATA69,24,81,8,81,32,69,2
4,61,8,53,32
490DATA61,16,69,16,61,24,53,
8,53,64
```

A&B ◆ T I P S ◆

Douglas Tate

Never Watch an Artist at Work

I am not fond of seeing screens being formed, to me it takes away any professional look to a program. The normal way of getting around this on the Beeb is to use VDU19 to change all colours to the background colour, draw the screen, return the colours back to what you want. This is a slightly messy procedure which works.

Here it is:

VDU 23;0;0;0;0; — blanks out the screen completely.

VDU 23;0,X;0;0;0; — brings it back again.

Where X is 127 for Modes 0-3 and 63 for the rest of the modes.

So, what you do is to put the first line before your drawing routine and the second one after it.

There is a problem, the screen is blank (black) and the picture does reappear rather like a startled deer. If you prefer to have a more seemly entrance for your screen and do not mind the little extra programming, it goes something like this:

VDU19,0,1;0; — Turn all colours to, say, colour 1.
VDU19,2,1;0;
VDU19,3,1;0;
VDU19,4,1;0;

VDU19,0,0;0; — Turns all colours on to own palette.
VDU19,2,2;0;
VDU19,3,5;0;
VDU19,4,7;0;

Classy large format fonts from BASIC

EASY FONT

In the November 1984 issue of A&B Computing we ran a program/article called Old English Font. Since then many different fonts have been designed using the original format supplied by John Kortink's program. The best set of fonts we have seen are those of J.C.Davison and we decided to make them available through the Software Sale. This article includes the instructions on how to use the programs supplied via the Sale and also the new version of the driver program, to which data for new fonts can be added.

The main new feature of the program is the box procedure which allows a string of characters to be printed in a fancy framework box. The fonts are ideal for producing printed artwork for photocopying and printing and especially useful for title pages of booklets and documentation.

Instructions for FONT Program

Font characters are printed by calling procedures with the appropriate parameters. The procedures are called with the command (using FOLIO as the example):

PRO-Cfolio(CE%,DD%,B%,I%,Q-\$)

ie. PROCfolio(-1,0,2,0,"String")

CE% = True (-1) — the string will be centered on the line.

— False (0) — the string will be left justified.

DD% if the broad font is called for and double density printing is required DD% should be set to true (-1). If single density broad letters are required, set DD% to 0. (If B% is set to 2 — DD% will automatically be set to 0 — as it is not required.)

B% = 1 — broad letters will be printed — set DD% to -1 if double density is required.

— 2 — the narrow double density font is called. (The value of DD% will have no effect. It is not possible to print the narrow letters in single density.)

I% = 0 — normal black printing on white background.

— 1 — inverse printing, white letters on a black background.

Q\$ — string to be printed — with the attributes above.

The programs use proportional spacing for all characters. Lines 250 to 310 count the number of sets of data required to fill a line — if the string is long enough. The procedure will strip from Q\$ the number of characters it can print on a line — and carry over any spare characters to the next and subsequent lines — though there will be no line spacing between the lines printed.

The maximum number of characters Q\$ can hold is dependant upon the length of the line in which the string is held. To obtain the required line spacing — it is best to call the procedure once for each line of printing. Procedure calls should be entered as program lines between lines 40 and 180.

Any character called for which has not been defined (ie. '\$') will simply be ignored as its width in the proportional spacing array is zero. The procedure prints the rest of the string as though the undefined character did not exist. The defined punctuation and special characters vary from font to font.

All the fonts carry a 'box' procedure — allowing a string to be printed within a fancy framework box for headings, etc. Call 'PROCbox' before making a call to 'PROCfolio' thus:

PROCbox(DD%,B%,P\$)
ie. 40 PROCbox(0,2,"String")
50 PROCfolio(-1,1,2,0,"String")

DD% = The four possible combinations of DD% and B% are as follows:-

DD%=-1 B%=1 — the box is printed in double density for broad font.

DD%=0 B%=1 — the box is printed in single density for broad font.

DD%=-1 B%=2 — the box is printed in double density for broad font.

DD%=0 B%=2 — the box is printed in double density for narrow font.

The box procedure carries the necessary command to reverse feed the print roller to print the string inside the box. The string to be printed within the box should always be centered. It is possible to call for a box using B%=1 (broad font) and then print the string using B%=2 (small font). It is not possible to print the box in single density

OLD ENGLISH DEMONSTRATION

ABCDEFGHIJKLMNOPQR
 STUVWXYZ - 0123456789
 abcdefghijklmnopqrstuvwxyz
 ("-&'/?/£;:,.")
 ABCDEFGHIJKLMNOP
 NOPQRSTUVWXYZ
 0123456789
 abcdefghijklmn
 opqrstuvwxyz
 ("-&'/?/£;:,.")

CORVINUS DEMONSTRATION

ABCDEFGHIJKLMNOPQRSTUVWXYZ
 abcdefghijklmnopqrstuvwxyz
 0123456789-(!&'/?;:,.")
 ABCDEFGHIJKLMNOP
 OPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 0123456789
 ("!&'/?;:,.")

FUTURA DEMONSTRATION

ABCDEFGHIJKLMNOPQRSTUVWXYZ
 abcdefghijklmnopqrstuvwxyz
 0123456789-(!&'/?;:,.")
 ABCDEFGHIJKLMNOP
 OPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 0123456789
 ("!&'/?;:,.")

FOLIO DEMONSTRATION

ABCDEFGHIJKLMNOPQRSTUVWXYZ
 abcdefghijklmnopqrstuvwxyz
 0123456789-(!&'/?;:,.")
 ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 0123456789
 ("!&'/?;:,.")

to fit Q\$ printed in the narrow font — unless calculations are made as to the length of Q\$, etc. One way of increasing the length of the box is to print a space (or spaces) before and after Q\$.

Font Features

(1) Underlining — this can be started and stopped at any point using the "square" brackets — ie "[" start underlining; "]" stop underlining. Just one letter, one word or the entire row may be underlined. Enter the "[" and "]"

symbols at the required positions within the string to be printed.

(2) To avoid the clash of string delimiters — the opening and closing quotes have been defined using the "" and "" characters.

(3) If you wish to emphasise one word in a line of broad letters printed in single density, it is possible to reverse feed the printer and print the word to be emphasised in double density. The procedure should be called twice using the single density attribute the first time and the double density attribute the second time. On the first

run place the " " sign in front of the word to be missed and the " " sign behind it. During the first (single density) run the printer will allow space for the word to be printed — but will not print it. In the second call — all the other words should be similarly enclosed to avoid printing over them — leaving the emphasised word alone to be printed in double density. The reverse feed VDU statement to print the second run can be found in the program at line 200.

(4) The normal space (CHR\$32) does not underline. The

tilde (~) symbol will give a full space and will underline. The ~ symbol will give a half space which will be underlined. The cross hatch has been defined as a single print row for the purposes of shadow printing.

(The use of the underline start and stop symbols ([]) can be used to enable/avoid underlining any character other than CHR\$32).

The use of the [], < and > symbols in the middle of Q\$ does not affect spacing in any way — as they all have zero width in the proportional
 C O N T I N U E S ►

CLOISTER DEMONSTRATION

ABCDEFGHIJKLMN O P Q R

STUVWXYZ - 0123456789

abcdefghijklmnopqrstuvwxyz

["'!&'/?/£;:,."]

ABCDEFGHIJKLMN

O P Q R S T U V W X

YZ - 0123456789

abcdefghijklmnopqrstuvwxyz

abcdefghijklmnopqrstuvwxyz

["'!&'/?/£;:,."]

TEACHEST DEMONSTRATION

ABCDEFGHIJKLMN O P Q R S T U V W X Y Z

0123456789 - !&'/?;:,.

ABCDEFGHIJK

LMNOPQRSTU V

WXYZ - !&'/?;:,.

0123456789

EASY FONT

spacing array — although the computer will acknowledge their presence within the string and act accordingly.

Line spacing can be varied in the VDU statement before each procedure call. An example VDU call for line spacing can be found at line 205 in yellow. The last parameter of this call represents x/216ths. of an inch forward feed on the printer roller. Using the Beeb's copying facility is the easiest way to insert a line spacing command before a call to the printing procedure.

Disc Matters

On the disc bearing the fonts are demonstration programs — one

for each font. The appropriate 'demo' should be *EXECed into the font program to print out the font demonstration.

Also on the disc are 'line count' programs which will assist in the presentation of sentences, showing how many words/letters can be set on each line — depending on the width of printing called for. These line count programs all carry the same proportional spacing data that the appropriate font program carries. Calls to the procedure require only two parameters, ie. 'PRO-Cfolio(B%,Q\$)'. As in the font programs, B%=1 for the broad font and B%=2 for the narrow font. Q\$ is the string to be printed.

Program Description

10 clear out all previous variable and DIMmed requirements as memory is at a premium in some of the fonts.

20 call initialisation procedure.

30 the error trap — necessary to turn off the printer should anything go wrong.

40 to 180 for the user to enter calls to the procedures.

183 turns off the printer and ends the program.

190 to 205 should never be encountered by the BASIC interpreter and therefore do not need to make sense.

220 if narrow printing is called for (B%=2) then DD% is set to zero as the narrow letters are printed in double density anyway.

230 sets the underline flag and the miss flag to FALSE.

240 set bit image data to 480 or 960 depending upon the parameter B%. Now set B% to 75 or 76 (normal or double density printing). Set I% to 0 or 255 (normal or inverse printing).

260 to 290 strip from Q\$ as many letters as will fit into the length of line called for (480 (broad) or 960 (narrow)) allowing for the proportional spacing array PS%(x). If 'Enough' is reached before the end of Q\$ is reached, 'All' remains FALSE otherwise 'All' becomes TRUE, and the entire string requested within the procedure call (Q\$) is printed.

300 if all the letters in Q\$ will not fit onto one line, strip from Q\$ as many as will fit — put them into P\$, strip P\$ away from the front of Q\$ and leave the remainder (now termed Q\$) to be printed on the next or subsequent line(s). The procedure will continue to print until Q\$ is empty.

310 if all the letters in Q\$ will fit onto one line then Q\$ is transferred to P\$ and Q\$ becomes empty.

320 counts the number of characters to be printed (N%). Then it counts the number of print lines to be printed if the line is to be centred (Spaces%)

330 if line is to be centred (CE%=TRUE) but not printed in double density (DD%=FALSE) then add together the line length plus Spaces%. B% has been set to 75 (single density) in line 240.

340 if CE%=TRUE and DD%=TRUE the program needs to know the total line length (LT%=LT%+Spaces%) which is doubled (LT%=LT%*2) as DD%=TRUE. The program also needs to know the number of sets of bit-data that are required before printing anything — multiplied by two (Spaces%=Spaces%*2). B% is set to 76 for double density printing.

350 if DD%=TRUE but CE%=FALSE all the program needs is LT%*2 and to set B%=76. As CE%=FALSE — Spaces% can now be ignored — the line is to be left justified not centred.

360 calculates the parameters to send to the printer telling it how many sets of 8-bit image data to expect — as per section 3-75 of the Epson FX80 manual. L%=n1 (low byte) and H%=n2 (high byte)

370 starts feeding the data to the printer, passing the parameters B% (narrow or expanded font) L% and H% (low byte and high byte of the number of sets of data the printer can expect) to the printer.

380 if the string is to be centralised (CE%=1) send the requisite number of zero bytes (Spaces%) to the printer.

390 start finding the data for the individual characters (N%=LEN(P\$)). C% is set to ASC(required character — 32) — thus the first printable character (CHR\$32 — Space) is set to zero. The width of each character (PS%(C%)) is added to LL% (line length)

MODEL B/B+/MASTER 128/COMPACT/ELECTRON

400 toggle the underline flag on if C%=59 (ie. CHR\$(91-32)) is encountered. (")
410 toggle the underline flag off if C%=61 is encountered. (")
420 toggle the miss flag on if C%=28 (ie. CHR\$(60-32)) is encountered. This flag causes the printer to leave the correct space for any characters called for but prints nothing. It can be used for emphasis by reverse-feeding the printer or for TAB purposes. ('')
430 toggle the miss flag off if C%=30 is encountered. ('')
435 if the character in P\$ has zero width in the proportional spacing array (ie. [] < >) GOTO 570 and proceed with the next character.
440 the calculated RESTORE line to retrieve the correct data for the character required.
450 this line reads the data for the particular line of print. This depends on the value of Y% above. (370).
470 if double density is not called for GOTO 510. This applies to both narrow and expanded printing. If narrow printing has been called for then it will be printed in double density as the necessary codes have already been sent to the printer.
480,490 & 500 simply take the data and duplicate every byte — eg. 'C0' within the C\$ becomes 'C0C0'. It doubles the leading and trailing spaces also — making C\$ exactly twice as long as it was. This enables double density printing of the expanded font.
510 sets up the entire string from which the print data will be extracted.
520 if the miss flag is set GOTO 560 and send all zero bytes for the correct width of the character required.
530 if the width of the character required is zero in the proportional spacing array GOTO 560.
540 if the print row has been reached where the underscore will be printed, go to the underline procedure.
550 send all the data for the required character to printer buffer. This is where the parameter I% comes into the program — and will invert the data if set to 1 in the procedure call causing inverse printing.
560 the line that sends all zeroes to the printer — called from 520 & 530.
570 go back to line 390 for the next character data on this row of printing. When all the data for this print row has been read execute a carriage return and line feed.
580 return to line 370 for the next print row.

590 keep on going back to line 250 until Q\$ is empty and all the characters in the procedure call have been printed.
600 ENDPROC
620 DEFPROCunderline
630 XX% in this line is a counter for making fancy underlining eg. **690 IF XX% MOD 6:3 THEN AS="CC" ELSE AS="33"**
640 sets up the strings and makes sure the array UL%() is empty.
650 fills the elements of UL%() with hex-byte values from P\$ for the width of the character being printed. The array UL%() is DIMmed to 130 to cover twice the width of the widest letter in the fonts, the "W" in CLOISTER, to cope with double density printing of the expanded font.
660 put into A\$ the first byte of P\$ and increment the counter XX%.
670 if the byte is one of the first two bytes of the string, skip line 680.
680 check for zero value of the byte in question, the two bytes before and the two bytes after. If any of the five bytes does not equal zero do not change the byte ie. skip line 690. This prevents the underlining going through a descender.
690 if the byte in question is at least 2 print lines clear of the descender, change the byte to the underline character.
700 if the byte in question is within 2 print lines of a descender just add it to the holding string (B\$).
720 put the holding string back into C\$ and return to the printing process.
730 to 830 the initiation procedure, which is mainly concerned with filling the proportional spacing array. The items of data in lines 780 to 820 are the widths of each of the characters between ASCII 32 to 126. Any character undefined has a width of zero.
840 to 990 the box procedure. The procedure measures the length of the string passed to it. As the box is to be centred it will then print the appropriate number of zero bytes before it prints the left hand end of the box according to the data. A middle section is then printed. The middle section of the top row consists of bytes of "D8", the middle section of the bottom row consists of bytes of "1B" and the middle section of the other rows are "00". The right hand end of the box uses the same data as the left hand, it just prints it back to front.
990 sends the correct amount of reverse feed to the printer for the following procedure call prints the string in the middle of the box.

◆ LISTING ◆

```
10CLEAR
20PROCinit
30ON ERROR VDU3:REPORT:END
185VDU3:END
190"Reverse feed for printin
g
195"missed' letters....
200"VDU1,27,1,106,1,144
202"Sample forward feed - 50
/216"
205"VDU1,27,1,74,1,50
210DEFPROCold_eng (CE%,DD%,B%
,I%,Q$)
220IFB%=2DD%=0
230UNDL%=FALSE:MISS%=FALSE
240BD%=B%*480:B%=B%+74:I%=25
5*I%
250REPEAT:LT%=0:S%=LENQ$:R%=
0:Enough=FALSE:A11=FALSE
260REPEAT:R%=R%+1:C%=ASC (MID
$(Q$,R%,1)):C%=C%-32
270IFLT%+PS%(C%)<=BD%LT%=LT%
+PS%(C%)ELSEEnough=TRUE:R%=R%-
1
280IFR%=S%Enough=TRUE:A11=TR
UE
290UNTILEnough
300IFNOTA11 P$=LEFT$(Q$,R%):
Q$=MID$(Q$,R%+1)
310IFA11 P$=Q$:Q$=""
320N%=LENP$:Spaces%=INT ((BD%
-LT%)/2)
330IFCE%ANDNOTDD%LT%=LT%+Spa
ces%
340IFCE%ANDDD%LT%=LT%+Spaces
%:Spaces%=Spaces%*2:LT%=LT%*2:
B%=76
350IFDD%ANDNOTCE%LT%=LT%*2:B
%=76
360H%=LT%DIV256:L%=LT%MOD256
370FORX%=0TO5:VDU1,27,1,B%,1
,L%,1,H%
380IFCE%THENFORX%=1TOSpaces%
:VDU1,0:NEXT
390FORP%=1TON%:C%=ASC MID$(P$
,P%,1):C%=C%-32:LL%=PS%(C%)
```

```
400IFC%=59UNDL%=TRUE
410IFC%=61UNDL%=FALSE
420IFC%=28MISS%=TRUE
430IFC%=30MISS%=FALSE
435IFPS%(C%)=0 GOTO570
440RESTORE (1000+10*C%)
450FORT%=0TOY%:READSP1%,SP2%
,C$:NEXT
470IFNOTDD%THENS10
480SP1%=SP1%*2:SP2%=SP2%*2:S
$="":R$="":U$=(LENC%)/2
490FORW%=1TOU$:R$=MID$(C$,W%
*2-1,2):R$=R$+R$:S$=S$+R$:R$=""
":NEXT
500C$=S$:LL%=LL%*2
510C$=STRING$(SP1%,"00")+C$+
STRING$(SP2%,"00")
520IFMISS%GOTO560
530IFC%=0GOTO560
540IFY%=SANDUNDL%PROCunderli
ne
550FORX%=1TOLL%:VDU1,EVAL("&
"+MID$(C$,X%*2-1,2))EORIX%:NEXT
:GOTO570
560FORX%=1TOLL%:VDU1,0EORIX%:
NEXT
570NEXT:VDU1,13
580NEXT
590UNTILQ$=""
600ENDPROC
610:
620DEFPROCunderline
630IFP%=1XX%=-1
640E%=LENC%/2:B$="":A$="":D$
="":FORX%=0TO129:UL%(X%)=0:NEX
T
650FORX%=1TOE%:D$=MID$(C$,X%
*2-1,2):UL%(X%)=EVAL("&"+D$):D
$="":NEXT
660FORX%=1TOE%:A$=MID$(C$,X%
*2-1,2):XX%=XX%+1
670IFX%<2GOTO690
680IFUL%(X%-2)<>0ORUL%(X%-1)
<>0ORUL%(X%)<>0ORUL%(X%+1)<>0O
RUL%(X%+2)<>0ORUL%(X%+3)<>0GOT
O700
690A$="36"
700B$=B$+A$
710NEXT
720C$=B$:ENDPROC
```

```
730DEFPROCinit
750DIMP$(94),UL%(130)
760RESTORE780
770FORT%=0TO94:READPS%(T%):N
EXT
780DATA30,0,0,1,0,0,38,11,13
,13,0,0,11,22,14,27,29,16,27,2
6
790DATA29,28,29,30,29,28,14,
14,0,0,0,27,15,39,33,33,30,32,
36,33
800DATA32,29,27,35,32,44,36,
35,31,35,32,34,32,33,32,44,31,
30,28,0
810DATA0,0,0,0,29,23,24,21,2
3,20,21,24,24,13,13,24,16,34,2
4,24
820DATA25,24,22,22,17,24,23,
34,24,24,21,20,10,20,30
830VDU2,1,27,1,65,1,8:ENDPRO
C
840DEFPROCbox (DD%,B%,P$)
850BD%=B%*480:B%=B%+74:SL%=0
:FORX%=1TOLENP$:SL%=SL%+PS%(AS
C (MID$(P$,X%,1))-32):NEXT
860IFDD%SL%=SL%*2:BD%=960:B%
=76
870LT%=0:LT%=SL%+66:Van%=INT
(BD%-LT%)/2:LT%=LT%+Van%:Middl
e%=SL%-50
880H%=LT%DIV256:L%=LT%MOD256
890FORX%=0TO9:VDU1,27,1,B%,1
,L%,1,H%
900FORX%=1TOVan%:VDU1,0:NEXT
910RESTORE (2000+10*Y%):READS
P%,P$
920C$=P$+STRING$(SP%, "00")
930FORX%=1TOSB:VDU1,EVAL("&
"+MID$(C$,X%*2-1,2)):NEXT
940IFY%=0THENFORX%=1TOMiddle
%:VDU1,0DB:NEXT:GOTO970
950IFY%=9THENFORX%=1TOMiddle
%:VDU1,01B:NEXT:GOTO970
960FORX%=1TOMiddle%:VDU1,0:N
EXT
970FORX%=58TO1STEP-1:VDU1,EV
AL("&"+MID$(C$,X%*2-1,2)):NEXT
980VDU1,13:NEXT
990VDU1,27,1,106,1,180:ENDPR
OC
```


DYNAMIC DUO

A dynamic duo to extend the scope and computing power of your Electron

Advanced Computer Products Electron Plus 4

True BBC micro disc compatability at last! This little box of tricks will allow you to use any 3.5" or 5.25" disc drive and will handle any Acorn DFS disc.

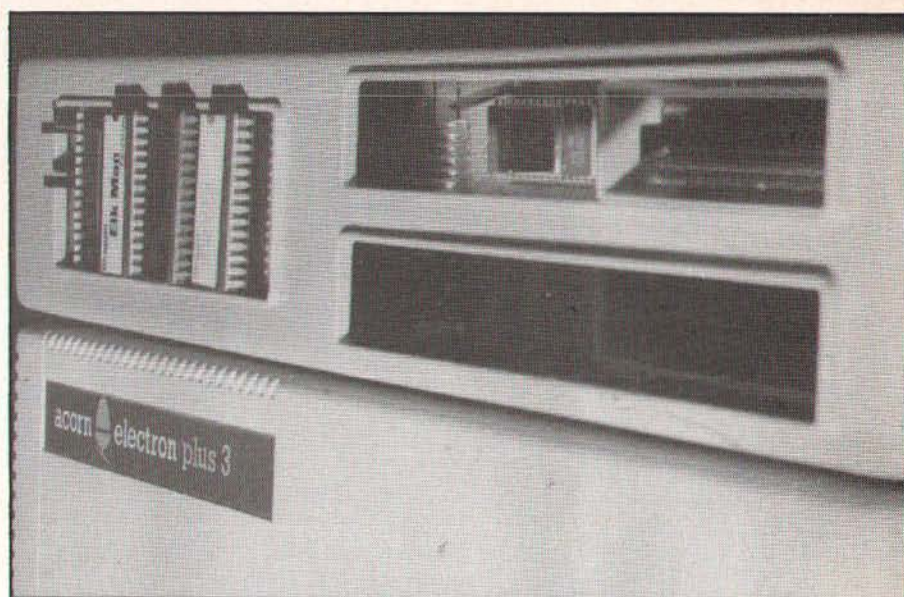
Originally only the ADFS 3.5" format was available through the Acorn Plus 3. More recently Soldisk have provided DFS and ADFS compatibility with the Electron Filing System interface. Cumana provide their own DFS and transfer software on disc with their interface. The Plus 4 cuts out the need for such converters.

The physical housing of the Plus 4 is better than the Cumana or Solidisk interface in that it is smaller and feels much more solid in the Plus 1 slot. The cable to the disc drive does not have to bend double as on the Cumana design. The Cumana and Plus 4 both have default PAGE settings of &E00 but the Plus 4 lacks the battery backed RAM of the Cumana interface.

With the Plus 4 you can also fit an ADFS chip and have full compatability with the BBC B+ and Master Series ADFS discs. As a further alternative you could use the A.C.P. sideways RAM cartridge and load up an image of the ADFS which works just as well. Indeed any 1770 based filing system should plug in and run.

The DFS which is supplied with the Plus 4 is a fairly standard Acorn lookalike. There are some nice touches however, such as an extra parameter with the FORMAT command to allow automatic formatting of two sides of a disc. If you fit the Advanced Disc Toolkit into the spare socket then you are in total command of any filing system you care to install. An ideal combination.

In conclusion the Plus 4 is a very neat and well built interface which will best serve the needs of any one wanting to upgrade to discs. The full BBC compatability is more than just a bonus since a healthy percentage of BBC BASIC and even machine code programs will run on the Electron Plus 4. Anything written for BBC Micro Model B



with DFS, even in Mode 7, stands a good chance of transferring to an Electron with PAGE set at &E00. This setting will also aid and abet the transfer of tape based software, an important point in these days of tape-only games houses and handsome collections of Electron games software.

The Plus 4 costs £79.98. Details from ACP on 0276 76545 or from Advanced Computer Products, 6 Ava House, High Street, Chobham, Surrey, GU24 8LZ.

Slogger ROM Box Plus

Another Plus for the Electron owner to consider. Slogger's provides two cartridge slots, four sideways ROM/RAM sockets and a centronics printer port and is plainly aimed at the Electron being asked to perform serious computer applications.

The ROMbox Plus is not very pretty to look at. Compared with the Plus 1 expansion box it looks quite rough with no dust flaps covering the cartridge slots. The idea of ROM sockets with no covering has always looked cheap to me although BBC owners often expose alot of bare circuit board to the elements without a qualm. The box itself is a beige colour which doesn't match the cream colour of the Electron — the same colour as the original ROM box in fact.

The ROMbox is easy to fit onto the back of your Elk or Plus 3 and feels safe enough although it is not half as sturdy as the Plus 1. At the rear all alone is the serial printer port. There is no analogue to digital port as on the Plus 1 but to make up for its absence there are the four ROM sockets which can be used for RAM if required. The supplied instruc-

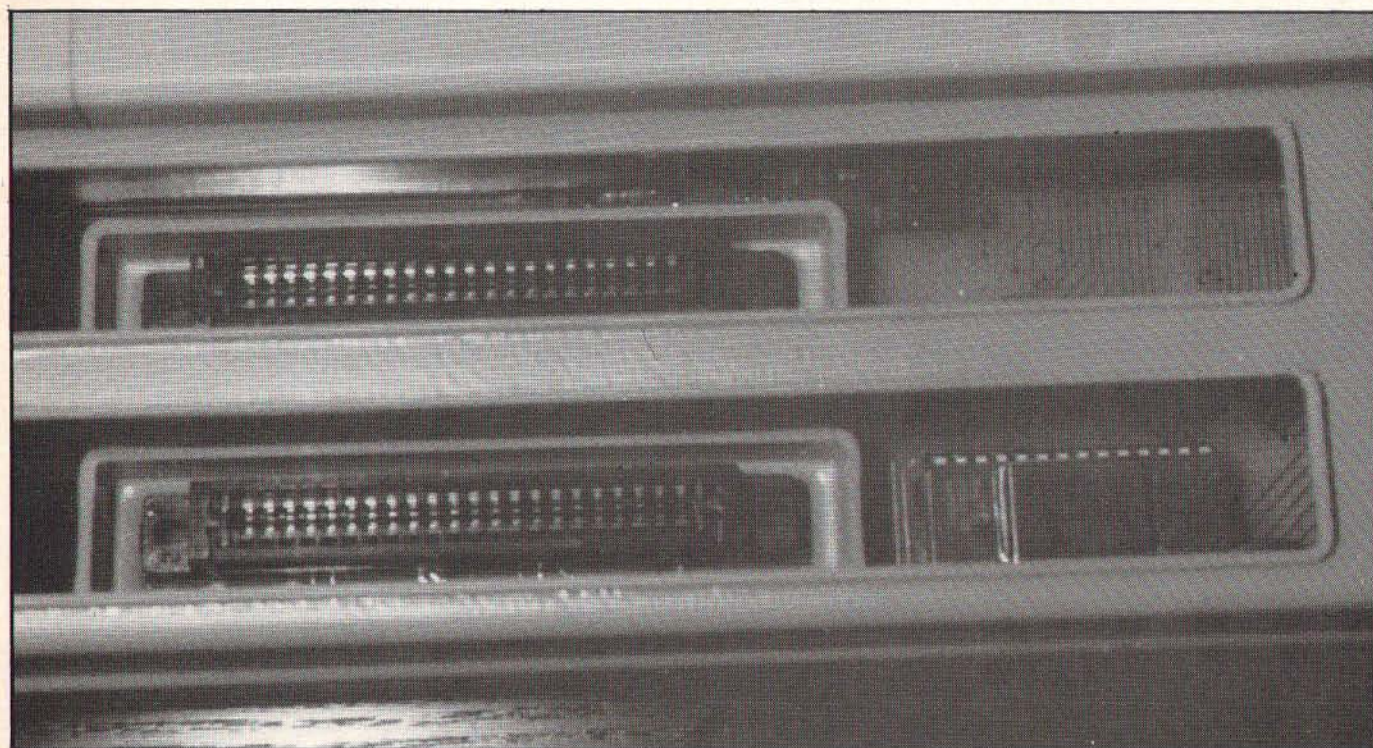
The ROM sockets are all available for RAM

tions are clear and comprehensive though not very robustly presented. The features of the ROMbox, full fitting instructions, link settings and technical details are supplied. The links on the top of the box determine the use of the sockets.

The first thing I tried to do was to fit my Cumana disc interface to see if it worked with the box. But, try as I might, I could not get the interface edge connector to fit in the cartridge slot. It was very slightly too long !!!

Next I tried the Advanced Computer Products Plus 4 which both fitted and worked perfectly, as did the A.C.P. sideways RAM cartridge. As for Acorn compatability the ROMbox Plus did not interfere at all with the Plus 3. I made good use of the ROM slots to convert tape software to disc with the T2P3 ROM, also by Slogger. The results were very pleasing (a high percentage and some surprise successes) as were those of using Acornsoft's View and Viewsheets ROM cartridges, both of which worked as if on the Plus 1. The ROM slots which can also handle RAM are useful for holding ROM images.

A further use for sideways RAM and an advantage over the Plus One is the ability to use an 8K RAM chip (or 2 8K chips on a card) as a printer buffer. The buffer software is built into the onboard EPROM and provides commands *BUFFER, *BUFFER ON, *BUFFER OFF, *BUFFER FLUSH, *BUFFER PAUSE and *BUFFER RESUME. This is a welcome addition to the software and means that long listings and text files can be quickly dispensed to the printer and other tasks begun.



The parallel printer port means that you can add a printer to the system

Using a printer is very easy once it has been configured for use as on the BBC Micro. One suggestion is that Slogger should supply their excellent Printer Driver documentation with the ROMbox Plus so that printer owners can get going with style codes and effects straight away without struggling with the usual supplied manuals. The uses of a printer are countless and I highly recommend all Elk owners to consider

purchasing one if they haven't already done so. With the ROMbox Plus and printer setup I was able to use all the wordprocessors and screen dumps as supplied through A&B Computing's Software Sale and of course business type applications such as Starword and Starstore II require a printer to be truly useful.

Overall the ROMbox Plus is an extremely useful addition to your Elk and a worthy alt-

ernative to the Plus I. It's an effective interface to all sorts of add-on equipment. My only gripe is that the box is not very strong and the cartridges are hard to insert and remove (my Cumana interface being *impossible* to fit).

The ROMbox Plus costs £69.95. Details available from Slogger on 0634 52303 or from Slogger Ltd, 107 Richmond Road, Gillingham, Kent.

H O U S I N G T H E B B C

A micro's sensible new clothes — for the serious minded

At one point, the BBC Micro was considered to be a large computer, with plenty of space for expansion inside the case, lots of plugs to connect the computer to the outside world and a keyboard that was considered to be an excellent typing tool, with plenty of response and a *natural* feel..... oh well, those were the days.

Since those early days of the humble 32K BBC Model B, a lot has happened to change people's conceptions about a *standard* home computer setup; a disc drive is now considered standard fare, as is a ROM board with sideways RAM. More and more products are released every month to connect the BBC Micro to all sorts of peripheral devices and to the outside world, and as more and more products are released and snatched up, so the space inside the Beeb diminishes.

Pear Tree Computers have come up with a possible resolution to all of these spatial problems, in the form of the KBL PC.

It's a sturdy plastic case with an integral 3 inch fan, a durable IBM style keyboard (rubber lined to ensure its coffee proof status) and it sports a tidy curly cable. The KBL 128 PC is definitely a contender for the most rugged PC enclosure for the BBC Micro yet; it safely accommodated all 15 stone of Mr Vartan Mundigan, Pear Tree's MD when I went to visit Pear Tree's premises last month. For more realistic uses, the PC case will sit any television or monitor and will not bend under the weight of a Microvitec 1451 Cub — surely the heaviest brand of RGB monitor around.

The connections usually made to external devices can be fitted internally, or at the back of the PC enclosure. The power outlet for the BBC Micro and all of the enclosed peripherals (including a disc drive) can be made from one cable connection and is certainly a respite from the spaghetti junction billowing out at the back of most home computer systems I have seen. Building the case is easy and can be done in about half an hour if care is taken, although fitting extra peripherals such as the 6502 second processors may take more time and ingenuity as there are no instructions as to fitting devices other than the BBC Micro and associated disc drives.

The PC enclosure is well packaged, all of the fixing screws are either ready screwed into place, or are included in two small plastic bags, each clearly labelled. A vent for the internal air conditioning system is made on the underside of the case. The lower half of the enclosure screws to the fixing base for

the power supply and radio frequency screening. The three inch fan is extremely quiet and keeps the BBC's circuit board cool and free from the problems of overheating or from extra heat dissipation from a fitted ROM board or similar power greedy memory expansion device.

Building Blocks

First things first, you should examine the parts list carefully, making sure that nothing is missing. The intention of the KBL case was to make sure that there was no soldering to be made to the board or the additional power supplies inside the case. The most devastating thing you have to do to your machine is to snip a few wires in order to connect the power supply leads to the power distribution block (also known as a chocolate block) so as to allow the power distribution to internally driven devices that once were externally powered, such as the 6502 second processor.

Unscrewing the four top screws reveals a wrap around shield of black coated metal, and the circuit board for the decoding of an IBM encoded keyboard; on top of this circuit board (and it is quite a large board) is a smaller circuit board, used to receive the infra red bursts from the keyboard when in remote control mode.

The remote control interface is reliable and very useful, especially in cramped working conditions. The remote control option is the same as that employed on the ill fated IBM PC jr, except the system used on the KBL interface is faster, more reliable and less prone to outside interference. It is charged from the BBC's power supply and a single charging session of about ten minutes will last a total of 72 hours disconnected from the socket. In fact, part of this review was written about twenty feet away in the kitchen of my home whilst I was waiting for the microwave to boil me a coffee! Like I said, the keyboard is reliable and very very useful.

Building the System

First of all, you should start to dismantle the BBC Micro. If you don't like the idea of *that* then Pear Tree will do the work for you... at a price.

Assuming that you want to do the work yourself (and thus save yourself a bit of money and time) you should first unscrew the power supply unit from the base of the BBC Micro case. This is then fitted into the KBL case *behind* a large cover with the words "Warning" emblazoned across it for all to see, a sensible move when dealing with the potentially lethal voltages being used. All it takes is to forget to unplug the BBC Micro from the mains socket and *poof!* one well fried BBC Micro hobbyist done to a turn! not

to mention a totally ruined power supply and probably a damaged BBC motherboard.

The power supply connects to a chocolate block for further connections that can be trailed off to power internal devices that use the 5 volt rail.

Next, the disc drives are detached from their case and power supply unit (again these can either be powered from the BBC's auxiliary socket or the power supply units to the disc drives can be installed by drilling holes at the right points in the KBL enclosure's metal chassis. The power feed can be connected to an unused input power line to the KBL enclosure so only one power socket need be connected to the wall to serve your entire processor system.

The three inch fan is fitted next; this, as I mentioned earlier, is a very low power consumption model and consequently low on noise. You will also find this type used in the smaller Winchester disc drives and interfaces for the BBC Micro.

With a hypothetical BBC Micro fitted with a shadow RAM board and a 16 socket ROM board as well as an active pair of disc drives installed, the computer can naturally get a little hot under the collar and start to do weird things! The cooling fan keeps the board at an even temperature and as a result makes the internal circuitry more reliable and likely to last longer.

After the fan is connected to the power supply, the cables to the disc drive are plugged in. These cables, which are custom built by Pear Tree, are designed to connect the two disc drives together with a minimum of wasted space. Likewise the power cable just fits into its allotted space and can be run around the base plate in order to make the cable unobtrusive.

After this the base plate is screwed back on and a preliminary power on is made to ensure that the power supply made its transition from BBC case to KBL PC in one piece. This is important so as not to connect the computer and then realise that power isn't getting through to the computer so you have to disconnect everything again!

If the disc drives make their characteristic power on "clunk" and the fan starts whirring (you'll know this by the fan blowing off the sweat you will no doubt have been giving off in buckets from sheer worry!) then you are ready to proceed. Turn off the power supply, leave it a couple of seconds to wait for the supply to discharge itself into the socket, then unplug it so that the supply is once more completely isolated from the mains. You can now continue to work on the motherboard.

The connections for the 1Mhz bus, the user port, the tube interface and the printer interface are all made externally, Pear Tree have had the foresight to make sufficient room inside the case for a 6502 or a Z80 second processor, and this fits next to the

AND A MICRO

H O U S I N G T H E B B C

cooling fan with a trailing cable connecting the unit to the back of the case; however, if you want the customary big beige Acorn box to sit next to the KBL PC then there is a socket at the back.

The connections to these interfaces are all made by a series of ribbon cables with plugs that go into the sockets on the BBC's main board (under the keyboard at the front on the BBC Micro case). They fit to a set of connectors at the back and all work without any problems, even the 6502 second processor worked properly with the extended cable, scotching Acorn's insistence that the second processor won't work unless the proper length of cable is used.

The next thing to do is to unscrew the BBC's circuit board from the base of the BBC Micro case in order to move the board onto the elevated metal shelf. There are bolts at each point on the base plate corresponding to the points where screws went into the BBC circuit board.

The board is bolted down and the keyboard connector is plugged into the link for the IBM decoding board. The circuit board connections are then made by plugging in the jumper connections, and you are ready to try the computer again, by plugging in at the wall socket and trying the power supply.

If you have a ROM board installed, now is the time to fit on all of the ancillary devices such as shadow RAM, and sideways RAM etc, some boards will not fit properly inside the enclosure because the covering plate (again, made of black coated metal) pushes down too low for a board to be fitted. This annoying problem can be cured by either extending the top plate of the PC chassis, or by connecting everything via ribbon cable, however the ribbon cable is not recommended practice unless you are a dab hand with DIL connectors.

Finally, after fitting the top plate for the case, you can screw the top back on the case and you have assembled the housing.

The keyboard is next: by simply plugging the DIN plug in the socket at the back of the case, and then trailing the cable round the front you can plug the other end (a British Telecom type phone connector) into the keyboard. Upon powering up, you can use the keyboard either as a connected desk top keyboard, or as a remote control — reliable up to twenty feet with an unobstructed view of the receiving solenoid above the disc drives.

When using remote control the keyboard is very impressive, giving credence to the term "lap held computing"... well almost. You can at least sit down in the comfort of your favourite armchair and type away to your heart's content. You don't even need to be head on with the solenoid receiver to operate the keyboard perfectly. You can type at various angles, on your side or even

upside down, you can use it in another room, providing there is at least one clear connection to the computer room, and you don't have to be head on, providing the board is no higher than roughly sixty degrees.

The IBM PC jr keyboard was unreliable and full of transmission errors, rumour has it that it didn't work properly for certain applications such as Lotus 123 and some keyboard dependant software such as the VisiON suite of packages running under MS-DOS, but for the BBC Micro the remote control feature is a truly liberating feeling, and possibly one of the most immediately useful features.

The keyboard itself is a full travel 86 key layout with the typical IBM function key arrangement to the left of the QWERTY layout. To the right of this, there is a numeric key pad and an additional "enter" button for fast numeric entry.

The cursor keys are arranged in an up/down and left/right corner cluster and are wide spaced so as not to interfere with the 'BREAK' key.

All of the symbols are properly printed on the key tops in a fetching two tone grey and white with a small shelf at the front. The key tops are curved in a concave manner so that the keys fit under the fingers better than a diagonal shelf arrangement. Indeed, I felt so comfortable with the new keyboard arrangement, that I don't think I could ever work on a new BBC keyboard again, no matter how good the Master keyboards are.

Hot Under the Collar

I was able to try out a number of BBC motherboards using the KBL system. Easiest of all was the BBC B+ 64K, as the connecting cables plug onto the board easier because of the higher quality sockets used in the Plus series. The BBC model B was second only in that sideways ROM boards and shadow RAM expansion boards needed some space to themselves and thus required a small modification to the metal plate covering the BBC circuit board.

Of all the BBC machines I tested, the most difficult to fit was the BBCB+ 128. This was due to the fact that the extra 64K RAM board is hard soldered to the board and makes things difficult to replace the lid of the PC case. The only solution was to fit the 64K RAM board to the underside of the BBC motherboard, trailing wires or ribbon cable from the memory expansion board to the Beeb, and sticking it to the underside with double sided adhesive tabs. *This is not to be undertaken by anyone who is not sure exactly what they are doing as the BBCB+ 128 upgrade is a very fiddly operation. Ask a service dealer or Pear Tree to perform the retro fit if you are less than a virtuoso with a fine — tipped soldering iron.*

Conclusions

I would like to have said that I had committed the ultimate sacrifice for A&B by throwing the PC case, computer and disc drive (with 6502 second processor installed) down the stairs as a test of its ruggedness but, in truth, I accidentally dropped the case halfway down the stairs after a long session fitting the BBC B+ 128. I gave the computer a thorough test after this accident and all was well, so I can vouch that the PC case protects the BBC Micro. It also makes the computer difficult to steal due to the extra weight added by the black metal shelving and the fan arrangement.

The KBL PC will be a valuable housing for use in control and industrial situations because the BBC Micro can be bolted into a workstation on the shop floor. The IBM keyboard makes data entry very easy, and word processing is so fast that I would say that my typing has improved by about 12% in speed and accuracy — in terms of a journalist writing five hours a day, this figure is a significant increase in productivity.

Programs that are function key orientated are well suited to the KBL PC keyboard. View and Viewsheets work fine, Elite is very sensitive now — three good indications of compatibility with professional business and games software. All of the correct mapping functions are made and it has the added advantage of being compatible with the IBM function key booklets that can be used in the same manner as the Z80 second processor software function key booklet with the red function key arrangement.

For the future, a Master version will be available supporting the cartridge system in addition to being able to accommodate the 512 processor board, so that Lotus 123 like software can be properly operated from an IBM PC keyboard, and with the correct key strip aids.

Together, the KBL PC keyboard and processor enclosure are well matched, the KBL enclosure is by far the best looking of the batch of cases for the BBC Micro. It will fit neatly onto any table or workstation and is especially useful in an office environment where desk space is at a premium.

The price of the kit is £199 which includes the PC case, the keyboard and interface, the 3 inch cooling fan for the enclosure as well as printed and illustrated fitting instructions and the spares to fit the power supply and the disc drives internally. The infra red remote control comes as an option and costs an extra £27. Pear Tree also include a fitting service for a nominal cost.

For more information contact Pear Tree Computers, Falcon House, High Street, Huntingdon, Cambs, PE18 6SS. (0480)5059.

IN A PEAR TREE

SMOOTH

Software to make your life online far easier

Recently, computer communications have been at the forefront of any new computer's specifications; now it seems it is no longer enough to have a serial interface fitted to a computer in order to connect a modem to the telephone line, now these facilities have to be fitted internally so as to allow the RS423 or serial port to be put to better use.

Acorn have expressed a long standing interest in computer communications technology. With the launch of the Communicator machine, a desk top computer designed for direct computer access on any desk equipped with a telephone socket, Acorn have committed themselves to the struggle for the lucrative "one per desk" market, pioneered by sir Clive Sinclairs offshoot technology of the Sinclair QL machine. The specification for the basic Master series machine is yet more proof of Acorn's commitment to this rapidly expanding field of the computer industry; with physical space to allow the fitting of a modem inside the case, the communications possibilities for the Master 128 are seen as a brave (and unusual) step from many sides of the industry.

A year or so ago, I reviewed the Demon modem, which, after a shaky start, is doing quite well as a comprehensive, low cost modem, with all of the facilities of many of the larger, higher priced modems but at a fraction of the cost.

The past few months has seen a lot of good British Telecom approved modems for the BBC Micro (see A&B April), and with the Voyager 7 modem being modified so as to be the first internally fitted Master series modem, the marketplace is fast becoming full of different modems, with different software packages to drive each model.

The Demon modem is still up there amongst the most comprehensive modems, with facilities such as the built in auto dial and auto answer operations. Since the Demon's initial release, a lot has happened to the BBC Micro and the hardware specification of the machine, and now it seems that the original Demon modem software and the B+ and Master series computers are mutually incompatible, a point not made clear enough in Demon's advertising.

To be more precise, the original Demon software fails to operate with any shadow RAM memory expansion options, this includes the Master series, the B+ and any Beebs fitted with an Aries B32 board.

A Helping Hand

Solidisk have released a 16K EPROM with facilities that enable the user to auto dial and

auto answer the telephone using just a modem and a telephone wall socket; you can set up the software to conform to any of the popular telecommunications standards, you can upload and download software and set up your Beeb as a Viewdata host, whereby people can ring you up with their modems, and can read from a series of user defined pages — exactly the same as a bulletin board or a Prestel type Viewdata base.

The software arrives, neatly wrapped in foil accompanied by a thin eight page booklet; at first, this seemed a little on the small size at first but the online help soon changed my mind. I plugged in the ROM and issued a *LMS, (this enters the main options menu in "Terminal" mode) whereby the software configures the RS423 port as a 300/300 baud terminal. The command options are very simple to access and understand, and anyone with only a smattering of knowledge about "baud rates" and "word lengths" cannot fail to get on like a house on fire with this software. In fact, the commands are not dissimilar in layout or in ease of use to Pace's Commstar terminal ROM, as used by the Nightingale modem.

Linemaster, although able to control modem functions such as auto dial and auto answer or auto baud select etc, cannot make the cheap modems (such as the bottom range Telemod and OEL) auto dial etc. In order for the software to access these advanced features, the modem has to be fitted with the facilities as a standard feature, thus the auto dial option will work only if the modem can auto dial.

In the case of the Demon modem, all the auto dial and auto answer facilities operated better than with the original Demon software, and although the Demon software-switched baud rate selection is not catered for in the Linemaster ROM, by simply setting the "baud scan" rate switch on the front of the modem to "on", most problems are completely removed.

Prestel Software

To set up the computer and the modem for operation with Prestel and similar databases, type *PRESTEL, and you will be dropped into the Prestel menu, the operations on the screen are the same as in terminal mode, but this time certain functions are inhibited, such as screen mode change and non essential Prestel operations.

The function keys are programmed to do specific tasks, there is a reduced function key strip printed on the back of the booklet, and it is wise to copy these out for future reference. In Prestel mode, the keys are set up thus:

f0 (function key 0) allows the current page to be tagged for later retrieval; this means that you can browse through a database, pulling only the relevant pages off for use at a later date, up to 16 such pages can be stored in this manner and is a great time saver.

f1 allows the tagged pages to be retrieved starting with the most current one, if there are no tagged screens then the computer will ignore the key.

f2 clears all of the tags stored in the machine, and is a quick way of clearing the tags stored from a previous session.

f3 is a boon to all hackers, as it displays any hidden text on the screen, it strips control codes that are used to hide numbers or data (for example storing the password to a system on screen, with a code to convert the password to the background colour).

f4 allows a prepared frame to be sent off from disc, this is useful for fast or bulk update in a Viewdata gallery.

f5 is as per the standard telesoftware downloader, it is used in all Prestel terminal software, and is useful for taking programs from Viewfax 258 or the many pages of Prestel Microcomputing and storing them in the machine. If a program is too long to be stored in memory, then the current contents of the RAM buffer is saved and then switched to a disc buffer.

f6 serves the tagging facilities as built into the function keys 0 through to 3. This key allows the users to sequentially search for the last tagged page. If page 200 was the last tagged page, then pressing f6 will search through pages 200, 201 and so on, all the way up to 999 if needs be. This is however somewhat dangerous with Prestel, as some pages may have a frame charge accounted to them. It is most useful for quickly browsing over a new database.

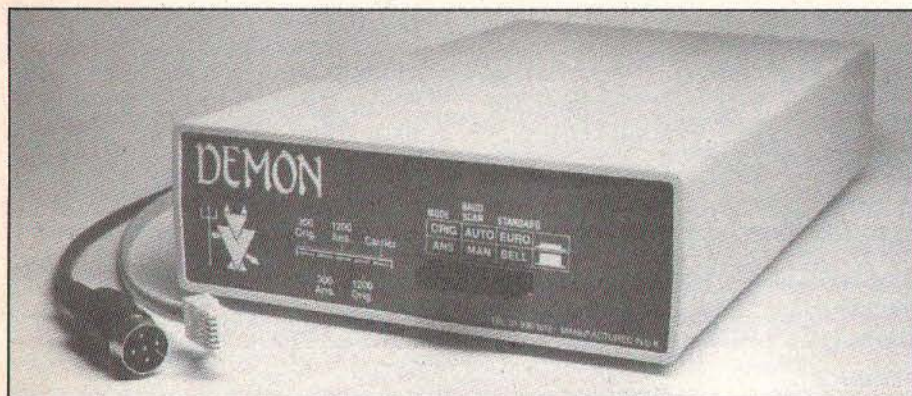
f7 sends a sequence of escape codes for colour and height information.

f8 allows the currently selected page to be redisplayed in case it is corrupted due to a bad telephone line. With priced frames, this facility is properly implemented in that the request is made free of charge, if the incoming signal does not correspond to the check digit at the top of the stream of data.

f9 simply allows the previously selected frames (to the level allowed by the database) to be accessed. As with the terminal mode, the cursor keys send the correct Viewdata value for positional information and is useful if you are using a remote frame editor such as the Prestel on-line frame editor for information providers.

The COPY key is implemented, and is used to save a page to disc. Unlike the Demon software, this does not use the Pres-

OPERATOR



tel frame number, but any user filename, with any drive and any directories, it operates well with the ADFS, and the larger filenames allowable in ADFS mode, mean that the full Prestel frame number can be saved if needs be.

Terminal Software

The *TERMINAL* section of the software allows communication from the slowest 75 baud and 150 baud (as favoured by some universities, to avoid the hacking problem as 150 baud modems have to be custom built), all the way up to the fastest 19200 baud rates, which is normally reserved for land lines and local communications to a computer via a cable as opposed to a telephone line. Still, the 9600 baud line operates (just) with a good line, and it is entirely possible for a computer user to telephone a large computer installation that operates at these speeds.

The terminal function keys are needed for different requirements and thus are different to the Prestel operations.

f0 is a local echo on/off toggle, which basically allows the user to have the terminal display a keyboard character on the screen. What happens when you communicate with a computer is that you type a letter in on the terminal, the signal gets put down the serial port and gets sent up the telephone line to the computer with which you are communicating. When the signal is received, the computer you have dialled will make a copy of that character and then sends it back down the line, when the screen displays the letter it shows that the host computer has received the letter.

Depending on the speed of the RX and TX rates of the host computer this can be so immediate as to be unnoticeable, or as in the case of 150/150 baud terminals, annoyingly slow.

f1 selects a buffer toggle. Should you wish to save the contents of a file to RAM — only to discover that the file is so long, that you need to dump it to disc, then by pressing this, you will halt the buffer operation, it will store

the contents on disc, and continue to do so until disc space runs out, or you cancel the incoming data or reset the switch.

f2 toggles auto line feeds and is most useful when using a gateway computer system that enables computer users to communicate with a number of different host computers with different communication standards and protocols, for instance, a gateway I often use requires going through a DEC VAX (with auto line feeds sent) and then to an Amdahl mainframe running an IBM 3083 emulation package which does not have the line feeds sent. If I am communicating with a proper IBM terminal, the information to turn on auto line feeds is received as a 19200 baud burst and tells the modem controller to do likewise, but on a BBC Micro the same protocols do not exist, so the changeover has to be done by hand. Prior to the Linemaster software, this caused so much trouble, going out of chat mode into the software's menu system, thus cutting off the carrier and setting the Beeb offline. This function key is very very useful and often used.

f3 turns the printer on or off and is most useful if you are using a system that uses large 105 x 80 column screens and vital information is lost off the top of the screen.

f4 sends a prepared file to the host computer and is used for complicated log-on sequences or even for an IML (initial machine load) or an IPL (initial program load) for a large system requiring lots of command input that works along a set pattern such as starting up a DEC VAX from a remote terminal.

f5 permits the user to swap between 40 and 80 character width screens; many of the professional database systems require a 64 column screen, and Mode 3 is the most useful screen when dealing with systems that require their presence. Many of the older systems may use 40 column, but it is often best to try out a new bulletin board in 80 column mode, just to be sure.

f6 sends a break level down the telephone line, this is sometimes used to initialise the remote computer's log on procedure.

f7 sends the character byte 27 down the

line, this is the ESCape code, but as the BBC's ESCape key is used to enter the main menu and exit Terminal, Prestel or Chat mode, this facility has had to be built into a special key.

f8 resets the duration clock to 0:00 and starts counting in seconds, this facility is most useful when timing communications so as to keep an eye on your telephone bill and generally keep tabs on how long you are spending on a terminal.

f9 will turn off the clock, if it is not required, or hide from you the truth that you have been using the modem for too long.

Viewdata Host and Teletext Editor

The other section of the Linemaster ROM is the Teletext editor. This is used to build up screens for use with your own Viewdata system or a software carousel of Mode 7 art or screens for advertisements or a CEEFAX — type information system or the like.

A Viewdata host is a facility that enables the user to set up a bulletin board or Prestel type database for people to ring up and get information. A good example is the Hackney bulletin board system. It has information regarding health, education, local news, exhibitions and an excellent section on the Hackney archives which are used to record books in print and locate them in Hackneys efficient integrated library system.

The host system software is more at home with a winchester disc drive, but this is not necessarily needed as ordinary disc drives (both 40 or 80 track) are supported. Using the DFS, the page number is the same as its filename, whereas the ADFS holds the frame page as the route to the page from the base directory. If the name of a page is 126a, then the ADFS filename will be "S.FRAME-BASE.1.2.6.a". The ADFS is thus logically partitioning the screens in a hierarchical structure, the same as the directory structure in the ADFS mode and is probably more efficient this way as the speeds associated with the ADFS are more likely to be used with a winchester disc drive.

The editor is a little terse and difficult to use to begin with, but it beats using the on-line Prestel frame editor any day. It works on the typical control code sequence, ie. ESC S will enter graphic yellow and enter the graphic editor. When the desired screen is completed, pressing the "copy" key will automatically take you into the route editor (to determine which route the currently edited screen will take you as you go deeper into the database).

You can use screens taken from other bulletin boards, and looking at systems such as "The Gnome at Home" and the "Hatfield Gateway" which are graphically colourful and very eye catching, you can take borders

COMMUNICATIONS

SMOOTH OPERATOR

and designs straight down the line and edit them and use them in your own systems!

The Demon modem operated reliably and quickly when in auto answer mode, this proved to be so good in localised tests using friends terminals, that I am considering opening a special bulletin board service for readers of A&B computing, but things only in their infancy yet....

Other Modems

Since receiving the Linemaster ROM I have used the Demon modem almost exclusively in my tests as it is a good all-purpose and very flexible modem for general and semi professional use. Now that the Linemaster ROM can replace the Demon chip and thus enable it to work with shadow RAM systems, the B+ and Master series; it means that more people can use the Demon modem without having to physically remove the shadow RAM board every time the modem needs to be used!

I have tried the Nightingale modem, the Telemod and the OEL models as well as the Tandata TM100. The Acorn Prestel adapter will not operate with the Linemaster ROM as the Linemaster software requires the RS423 to be the active communications interface

(whereas the Acorn Prestel adapter uses the 1MHz bus). All modems with an auto dial facility can make use of the auto dial software in the ROM, and some extra features and facilities are actually brought to light on the cheaper OEL modems with additional near Prestel modes, that are not supported in the OEL and Telemod software packages.

Linemaster will not operate with the 6502 second processor connected, so the power to the 6502 processor box has to be switched off before issuing the *LMS or *LINEMASTER commands, it will work with shadow RAM and most of the currently available ROMs, although VIEW keeps setting up odd markers (3 and 4) in the command screen when Linemaster is fitted.

I like the Linemaster ROM for a number of reasons, firstly it is very simple to use (hence the small amount of documentation) and because it rationalises telecommunications to the point where communicating with a large mainframe computer is as easy as dialling the telephone. It makes public databases easier to access because of the auto carrier wave search facility built into the software.

With the Linemaster ROM installed, you can use most modems with ease, especially the ones that are not intended for the BBC

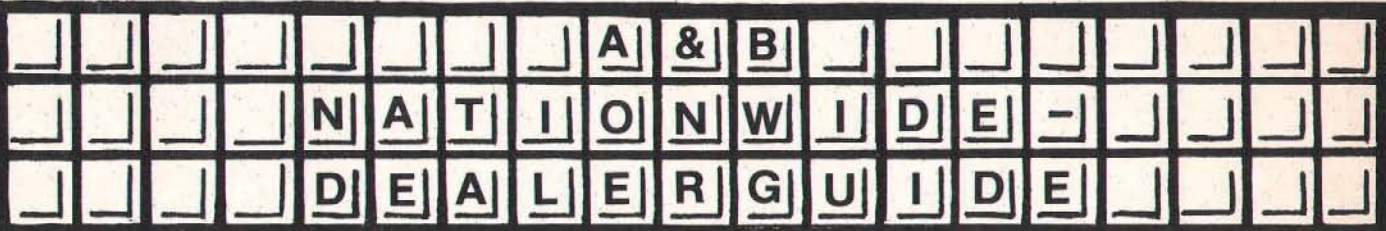
micro, that users have come across "on the cheap" (see A&B April page 11) such as ex-stock modems or modems for other computers that are defunct.

Many people will be interested in the Viewdata facilities in the ROM and these are well supported if you have an auto answer modem. You can create a decent sized system for most applications ranging from a local schools Viewdata system, all the way up to a local area Viewdata information network. There are facilities for uploading and downloading text, frames and programs, so if you are really committed, you could set up a good Viewdata host or bulletin board system in no time at all.

The Linemaster ROM and manual costs £11 including postage and packaging which in software terms is very inexpensive, in terms of what the software has to offer, it is excellent value for money and well worth every penny.

For more information about Linemaster, please contact Solidisk Technology Ltd, 17 Sweeney Ave, Southend, SS2 6JQ.

Demon Modem is available from Walk-bury Consultants, Alfric Square, Woodston Industrial Estate, Peterborough, PE2 0JA. 0733 235187.



U.K.

MICRO-AID

2000 SHEETS LISTING PAPER £12.45
(incl. Postage and VAT)
SEND FOR BROCHURE FOR OTHER
ITEMS.
25 FORE STREET, PRAZE, CAMBORNE,
CORNWALL TR14 0JX.
Tel. 0209 831274.

EDUCATIONAL SERVICES

CHADDINGTON SOFTWARE

14 Selkirk Close, Worthing,
West Sussex BN13 1PB.
SCHOOL ADMINISTRATION AND
'O'-LEVEL MATHS

SCOTLAND

THE COMPUTER DEPOT

205 Buchanan St. Glasgow G1 2JZ
Tel: 041-332 3944

Contact John Stewart
Full selection of Electron Games
always in stock.
Solidisk Dealer.

CHESHIRE

FAIRHURST INSTRUMENTS LTD. (Incorporating National Micro Centres)

BBC MASTER SERIES. Complete range of Printers,
Software, Plotters, etc. including Apple, IBM, Amstrad.
**WE HAVE EVERYTHING YOU
MIGHT NEED!**
Dean Court, Woodford Road, Wilmslow Cheshire
SK9 2LT. Tel: 0625 533741

ESSEX

CAREY ELECTRONICS

for
The BBC Microcomputer System
COMPUTERS PERIPHERALS SOFTWARE
Mail Orders/Enquiries:
Frinton-on-Sea (02556) 6993
7 Church Road, Walton-on-Naze,
Essex CO14 8DF.

YORKSHIRE

...BUSINESS OPPORTUNITIES,
GAMES, SWOPS, EDUCATION,
COURSES, BOOKS &
PUBLICATIONS - ALL IN
CLASSIFIED!
PHONE 01-437-0626
FOR DETAILS

A & B CLASSIFIED

Lineage: 42p per word. 48p (incl. VAT)
Semi display: £9.50 per single column centimetre + VAT.
 minimum 2cm.

Ring for information on series bookings/discounts.

All advertisements in this section must be prepared.
 Advertisements are accepted subject to the terms and conditions
 printed on the advertisement rate card (available on request).



01 - 437 0699

EXT 291

Send your requirements to:
DUNCAN NEILSON ASP LTD,
1 GOLDEN SQUARE, LONDON W1.

REPAIRS

COMPUTER BROKEN?

Have it repaired and working again in no time at a fixed price.
 Price includes parts, VAT, labour and return postage.

ACORN APPROVED SERVICE CENTRE

BBC (A or B)	£29.95
ELECTRON	£24.95
SPECTRUM/PLUS	£16.95
QL	£34.95
AMSTRAD 464/664	£34.95
COMMODORE 64	£29.95
C64/VIC 20 PSU (EXCHANGE)	£29.95

PLEASE SEND COMPUTER WITH CHEQUE/P.O. TO:

MICROMEND
OLD SCHOOL, MAIN ST, FARCET, PETERBOROUGH
PE7 3DB. TEL: (0733) 241718

(TRADE AND CONTRACT ENQUIRIES WELCOME)
 SPECIAL DISCOUNTS FOR EDUCATIONAL ESTABLISHMENTS.

SOFTWARE LIBRARIES

STAR-SOFT (BBC & ELECTRON SOFTWARE LIBRARY)

We are a specialist BBC & Electron library with over two years experience,
 we know the market.

We stock arcade, educational & business software.

We also specialise in adventure games.

Large selection of software inc. disks

Hire rates from .75p for 14 days.

Take the **Star-Soft** option and join our computerized library

** Fast service at the cheapest prices around. **

Send stamp for catalogue and cheque/P.O. for £6 to cover membership.

Please state BBC or Electron

STAR-SOFT

16 Martland Cresc, Beech Hill, Wigan, Lancs. Tel: 094247574

UTILITIES

CYGNET ELECTRONICS

Presents

'RAMWISE'

16K RAM MODULE FOR BBC B & B+

Just £21.50 + £1.00 p&p

Expand the ROM capability of your micro without the need to fit a ROM expansion board. RAMWISE is the
 powerful, easy-to-use 16K sideways RAM module, with the flexibility of a board in one easy-fit module.

*No soldering required

*Already used in schools on level 1 and 2 Econet systems

*Small module plugs directly into any spare ROM socket

*Runs all existing ROMs

*More than one module can be fitted

*Write protect switch included

*Free utilities disk to load and save ROMs

*Compatible with ATPL ROM board

The utilities disk can also be purchased separately for £6.95 + 50p p&p

Post to Cygnet Electronics, PO Box 27, Bordon, Hants GU35 0HH

Tel: (04203) 5229

AA74

LONDON COMPUTER REPAIR CENTRE

- * Spectrum, Commodore, BBC, Atari, Amstrad etc.
- * Low cost repairs from £12.00
- * Collection & delivery optional
- * Used Micro's bought, sold, exchanged

Call NIGEL: 01-863 7166

MICRO SUPPORT

Unit 3, 15 Springfield Road,
 Harrow, Middx, HA4 1QF.

BBC COMPUTER REPAIRS

All machines despatched within 72
 hours of receipt.

For Example:

BBC B (not DFS) £25.00

ACORN ELECTRON £20.00

(Inc. PARTS VAT RETURN POSTAGE)

ACORN APPROVED SERVICE CENTRE

For a fast and reliable service, send
 machine, brief description of fault and
 cheque or postal order to the experts:

Capital Computer Services,
 Unit K2, Cardiff Workshops, Lewis Rd,
 East Moors, Cardiff CF1 5EG.
 Tel: (0222) 461801

FOR ADVERTISING PHONE

01-437-0626

ASTROLOGY

ASTROLOGY

for beginners. Special starter
 pack for only £11.50. Consists of
 a simple programme to
 calculate a horoscope, an
 introductory booklet and 2 self-
 teaching programmes (how to
 interpret the horoscope).

NO PREVIOUS KNOWLEDGE REQUIRED

for the Commodore and many
 other micros, also wide range
 of programmes for more
Experienced Astrologers.

Cash with order (add 50p out-
 side UK) or large SAE for free
 Catalogue to:

ASTROCALC (Dept A&B),
67 Peascroft Road, Hemel
Hempstead, Herts HP3 8ER.
Tel: (0442) 51809.

CLASSIFIED ADVERTISING TERMS & CONDITIONS

Our terms for new advertisers (semi-
 display and lineage) are strictly pro-forma
 payments until satisfactory reference can
 be taken up (excluding recognised
 advertising agencies). Cheques and P.O.'s
 should be crossed and made payable to
 ARGUS SPECIALIST PUBLICATIONS
 LTD. and sent together with the advertise-
 ment to:

"The Classified Dept. L/H,
 No. 1 Golden Square,
 London W1R 3AB.

There are no reimbursements for can-
 cellations. Advertisements arriving too late
 for a particular issue will be inserted in the
 following issue unless accompanied by
 instructions to the contrary.

All advertising sales are subject to
 Government Regulations concerning
 VAT. Advertisers are responsible for
 complying with the various legal
 requirements in force eg: The Trade
 Description Act, sex discrimination act &
 the business advertisements (disclosure)
 order 1977.

Full Terms & Conditions of Advertising
 available on request.

"D-MASTER"

The most powerful Disk-Analyser
 and Back up program. Copes
 with 40, 80 or mixed 40/80 tracks,
 deleted, short tracks, duplicated
 sector numbers, sectors of any
 size etc.

This program is not protected
 like other available products!
 Price £7.00. Many other utilities.
 Ask for our leaflet.

R-SOFT, 22 Marriots Close,
Felmersham MK43 7HD.
0234 781730

DISCS

FREE LIBRARY CASE with every
 box of discs. Massive Floppy Disc
 Sale. DS/DD discs 5.25" only
 £12.00. 3.5" only £32. 10 per box.
 Add 80p per box for p&p from
 D.C.R. Systems, 32 Washington
 Ave, Blackpool FY2 0QB or send
 S.A.E. for details.

PRINTER Difficulties? If your
 printer doesn't unleash its full
 potential, for example justified,
 proportional text, contact the
 experts, New Horizon, P.O. Box 35,
 Plymouth, PL1 1UZ, telephone
 (0752) 550700.

DUPLICATION

jbs records
COMPUTER PROGRAMS
 REAL-TIME or (Slow) HIGH SPEED pro-
 fessional Cassette Duplication and Blanks
 1 to 1,000+. Computer printed cassette
 labels, BBC Disk copying 1 to 500+. Fast
 Security Delivery Service.
 jbs records—a division of **FILTERBOND**
LTD
 19 Sadlers Way, Hertford SG14 2DZ.
 0992 551188

**TO ADVERTISE
 YOUR
 EDUCATIONAL
 SOFTWARE IN A&B
 PHONE 01-437-0626**

WARNING NOTICE

Advertisements placed in this magazine are to be in strict compliance with our standard conditions (copies of which conditions are available on request) and on the clear understanding that the advertiser warrants that his advertisement(s) does not infringe any copyright or condition of sale of any interested party in the advertised product.

Further, the advertiser indemnifies the proprietors of this magazine in respect of costs, damages, or any other claims brought against them as a result of legal action arising from the publication of the advertisement.

Any breach of these terms or the said conditions may result in prosecution of the advertiser by the proprietors.

SOFTWARE

WHEN ONLY THE BEST WILL DO

TYPING TUTOR (BBC B)

£12.95 tape "Best of its kind on any home micro."

£14.95 disc **HIGHLY RECOMMENDED.** (A&B COMPUTING MAY 1985)

EARLY MATHS (BBC B, Electron)

£7.95 tape A package of 4 programs to teach the basic concepts of numeracy using animated

(4-8 yrs) routines.

Available now at your BESA store or direct from:

EARLY WORDS (BBC B, Electron)

£7.95 tape A package of 6 colourful programs to teach the names and spelling of

£9.95 disc (3-8 yrs) common words.

THE PERILS OF PERCIVAL PENGUIN (BBC B)

£4.99 tape A unique and amusing m/c arcade game.

LANDING PARTY (BBC B, Electron)

£3.99 tape A space adventure game

Willow Software,

The Willows, Wrington Lane Congresbury, BRISTOL BS19 5BQ Yatton (0934) 834056

MILLENNIUM

The 2-Computer Strategy Game

All is silent save the insistent tapping of keys. The unearthly light of the two screens gleam in the power-hungry eyes of the arch-rivals as they grapple to control their star-flung empires, where the populations steadily increase, rebellion and catastrophe strike, new Colonies must be built. Out in the blackness of space the alien forces of the enemy could be anywhere poised to attack.

Beeb shall speak unto Beeb!

The wargamer's dream come true — simultaneous play on 2 BBC-B's linked via modified RS423 cable. Also 1 computer option.

3 Scenario x 3 Victory Levels

Disc only £8.95 (state 40/80 track). Disc with Cable £12.95.

Cheque/PO to:

Falconsoft, PO Box 141, WELLING, Kent DA16 2EB.

**IF YOU REQUIRE
ADVERTISING IN
A&B
COMPUTING
NOVEMBER AND
DECEMBER
ISSUES PHONE
DUNCAN
NEILSON NOW
ON
01-437-0626
BUY NOW FOR
CHRISTMAS!**

COMPUTER CLEANERS

COMPUTER CLEANERS

STOP LOCK UPS AND DATA CORRUPTION

If this is due to mains interference then our plugs may be the answer. As well as cutting high voltage spikes they smooth the cut spikes and filter RF interference from 1 to 30 MHz (Better than 30db) and up to 130 MHz.

Some customer comments:

"With the cleaner ... (locking up) ... is no problem now" — Electrical engineer.

"... these computer cleaners work" — "Commodore" user group.

"... the device is the answer ... (loading problems)" — BBC owner.

"Lock-ups are cured" — Golf Club QL.

"It seems to work fine. No lockups yet" — for use in Papua New Guinea.

ADAPTOR — 1 three pin socket £14 inclusive

ADAPTOR — 2 three pin sockets £18 inclusive

TRAILING 4-WAY SOCKET £24 inclusive

Simply plug in — no wiring required.

TONY FIRSHMAN SERVICES

43 Rhyl Street, London NW5 3HB. 01-267 3887

COMPUTER SERVICES

MARLBRO' COMPUTER SERVICES Enthusinet

The Antedote to bitter experience

Do You Offer? or Do You Need? Computer-related Services such as:—
* Word processing/Printing * Fault Diagnostics/Repair * Lectures, Seminars, Tuition * Graphics/BB Design etc. * Newsheet Production * Network Access (Modem) * EPROM programming/Erasing * Video Tape/Photo work □ etc...however esoteric!

Then contact us by mail, phone or mailbox so that we may put you in touch.

Those offering such services may also apply to become one of our Nationwide chain of **Enthusiasts**. Make your hobby pay for itself while keeping up with the **Latest Products**.

Services provided by MCS via its **Enthusinet** include:—

- Try-Before-Buy...New or Used H/W, S/W
- Up-Soft...Software Upgrades
- Marlbro' Mart...For Sale/Wanted Deals
- Down-Soft...Software Downloading
- Buy-Back Service...For those upgrading
- Cheer-n-Moan...Feedback to Producers
- Get-U-Home...Loans during repairs
- Play-Away...New Product Sampling

Marlbro' Computer Services, (Proprietor John S Churchill), Upper Springfield Road, Uplands, STROUD, Glos., GL51SN. Tel. or Mbx. 04536 4310 (open all hours for your convenience)

Disk Drive and I/F kits to your specification from £89.90 (160K). Send SAE and spec. for quote. See A&B June.

FOR HIRE

AEROSOFT

- * the **BEST DISCOUNT SALES** on all the main computer software.
- * the most up-to-date **ELECTRON** software library in Britain.
- * with over 180 games, adventures and utilities on cassette and disc the largest **ELECTRON** software library.
- * **WE ARE OFFERING** at least 20% discount on **ALL** computer software and special reduction for club members.
- * **SO FOR DETAILS OF DISCOUNT SALES OR LIBRARY —**
(£6 life membership, first tape hire **FREE** and a **FREE GAME**)

Send S.A.E. to

AEROSOFT

15 DENNIS ROAD, GRAVESEND, KENT DA11 7NN

TEL. 0474 327775



**BE A WISE OLD
BIRD.
ADVERTISE YOUR
EDUCATIONAL
SOFTWARE IN A&B
COMPUTING
PHONE DUNCAN
NEILSON ON
01-437-0626**

ALREADY A NUMBER 1 BEST SELLER

COMPATIBLE
WITH THE BBC
B, B+ AND
MASTER
SERIES

THRUST



The first mission — destroy the reactor for a bonus score.



Retrieve the Pod and make your escape.



Collect the fuel and steer clear of the limpet guns.



Shoot the activator to open the sliding entrance door.



REVIEWS OF THRUST ALREADY PUBLISHED

Zzap! 64: "The most enjoyable game we've played for ages..." — A ZZAP! SIZZLER.

Computer & Video Games: "Thrust is a simple but totally addictive game..." — A C+VG HIT!

Now available for the BBC Micro and Electron

The Commodore-64 version of Thrust (published by Firebird Software) shot immediately to No.1 in the software charts and was greeted with rave reviews throughout the computer press. Equally addictive and just as enjoyable, the BBC Micro and Electron versions of the game are set to emulate this performance.

Thrust is simple, fun-to-play, yet totally realistic and intensely challenging. Your mission is to visit 24 planets in turn collecting the Klystron Pods and, if possible, destroying each planet's reactor system. Your spaceship and the pods, which are heavier than the spaceship, move authentically subject to the laws of gravity, inertia and momentum — indeed the game's author, Jeremy Smith holds a First-Class Honours degree in Physics! Careful planning of your manoeuvres is essential in order to prevent the pods swinging out of control and dragging your spaceship to destruction.

To add to the challenge, the planets have different gravity rates and, as you progress through the game, some have "reverse gravity" or "invisible landscapes". They are defended by automatic limpet guns strategically placed to protect the pods and fuel tanks — the only source of replenishment for your limited fuel supply. The smooth screen-scrolling, which is exemplary, and the realistic action gives the player a fascinating feeling of floating through space.

PRICE: £7.95 (cassette), £11.95 (BBC disc)

COMPETITION COMPETITION COMPETITION COMPETITION

If you complete the mission by collecting the pods from all 24 planets, you can enter our competition. The prizes include the beautiful trophy (pictured on the right), £250 cash, and 3 copies of the captivating book "The New Atlas of the Universe" by Patrick Moore. Closing date: 31st January, 1987.



**SUPERIOR
SOFTWARE**

Limited

Dept. TH6, Regent House,
Skinner Lane,
Leeds LS7 1AX.
Telephone: 0532 459453.

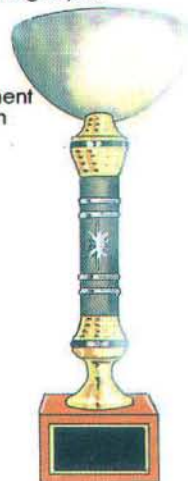


24 HOUR TELEPHONE
ANSWERING SERVICE FOR ORDERS

OUR GUARANTEE

- All mail orders are despatched within 24 hours by first-class post.
- Postage and packing is free.
- Faulty cassettes and discs will be replaced immediately.

BBC
MICRO
ELECTRON



WE PAY TOP ROYALTIES FOR HIGH QUALITY SOFTWARE

GALA FORCE



Big Dipper formation



Crazy Funnel formation



The Deck of Cards



Acorn Electron version



Compatible with the
BBC B, B+, Master
and Master Compact
computers

BBC
MICRO

ELECTRON



GALA FORCE for the BBC Micro, Master Series, and Acorn Electron

In the midst of the 25th century, the United Cosmological Federation declared war on the savage, belligerent aliens inhabiting the Magellanic galaxy. Only the most experienced of the U.C.F. pilots were chosen to embark upon the perilous mission of conquering and overthrowing the hordes of Magellan, the Galaforce.

Little is known of the inner zones of the galaxy, but on reaching the perimeter of Magellan all intruders are met with spectacular, non-hostile warning displays. However, venturing further will incite the aliens' wrath. Few and awestruck are the pilots who have returned from within — they have identified 10 types of fearsome alien: the most powerful being the scaly-skinned Calliston.

In common with the warmongering galaxies of yesteryear, the Magellanic aliens appreciate the maxims of "safety in numbers" and "strategy before action" — they always fly in selected preconceived formations. Surviving pilots have logged many such formations, and the pilots have given the formations laconic names: the Big Dipper, the U-Turn, the Staircase, Purple Rain, the Ski-Jump, the Corkscrew, Barbed Wire. Only one pilot has ventured beyond the 8th zone and survived — now retired from active service he relates stories of a perplexing formation which he named the Snaker.

The U.C.F. is now offering rewards to pilots for supreme acts of bravery within the Magellanic galaxy. Fast reflexes, trigger-happiness and a degree of calm cunning are required by all prospective pilots.

The game features include: 8-directional movement of the player's spaceship; fast and slow-speed bombs which home in when later zones are reached; keyboard and joystick control options; self-play demo mode; high-score tables; and superb atmospheric music.

PRICE: £9.95 (Cassette), £11.95 (BBC 5¼" disc), £14.95 (BBC Master Compact 3½" disc).

PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES

To encourage pilots to venture forth further into Magellan, a substantial reward has been offered for the first pilots to cross the outer 48 zones of the galaxy. The successful competitors will be entered for a prize draw, the winner receiving a radio-controlled aeroplane worth £300. Two runners-up will each receive a £10 consolation prize and a trophy. Closing date: 31st March, 1987.

**SUPERIOR
SOFTWARE**
Limited

ACORNSOFT

Dept. GF2, Regent House,
Skinner Lane,
Leeds LS7 1AX.
Telephone: 0532 459453.



24 HOUR TELEPHONE
ANSWERING SERVICE FOR ORDERS

OUR GUARANTEE

- All mail orders are despatched within 24 hours by first-class post.
- Postage and packing is free.
- Faulty cassettes and discs will be replaced immediately.

