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THE MICRO USER

Volume 1
Number 5
July 1983
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Kill those cassette bugs

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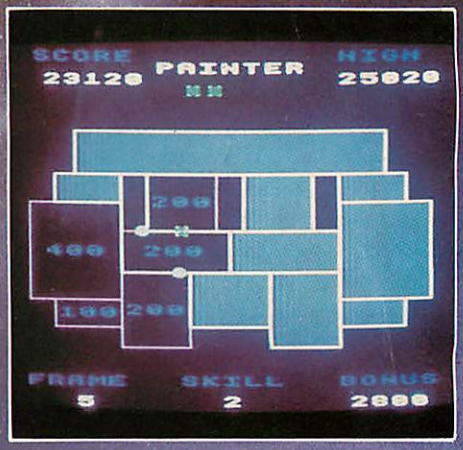
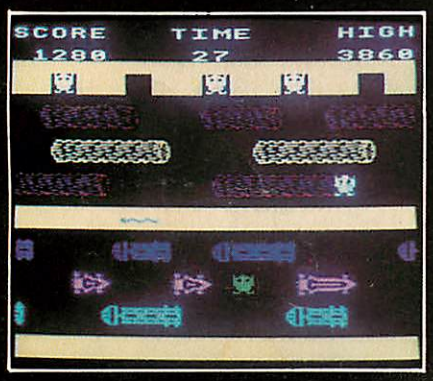
Part 2 of our PULL-OUT GUIDE to software for the BBC Micro

32K BBC ALL O.S.'s

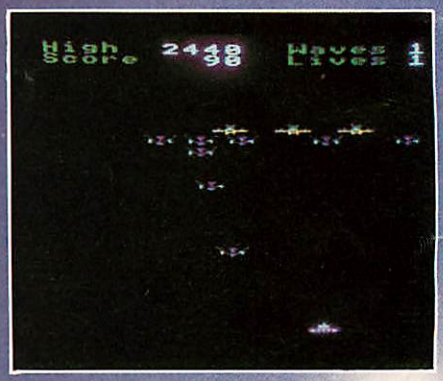


PAINTER Written entirely in machine code this fast arcade style game features sixteen different screen presentations and six skill levels which make the game harder as you get better. **£8.00**



PLANES Another A&F machine code special. Select either 'fast' or 'slow' and stand by your keyboard for action. Hi-score tables and brilliant graphics **£8.00**

FROGGER Also written in machine code this is a frustrating exercise in crossing the road, fording a river and trying for extra points by picking up the lady frog. Beware of the snake and don't forget the crocodile! **£8.00**



TOWER OF ALOS An excellent adventure game which has the feature of saving your character if you want to. Also for the Model A.

PHARAOH'S TOMB The interactive adventure game for the BEEB. Pick up the gold pieces, fight the spider and be scared penniless by the mummy. Work out the magic words and you are on your way. **£8.00**

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Announcing more exciting programs for the BBC.

Acornsoft is the software division of Acorn Computers, the company that designed and built the BBC Microcomputer. Here are four more exciting programs, all designed to get the most from your BBC Micro.

Starship Command (£9.95) is a demanding high-resolution graphics game in which you command a starship against attacking alien ships. You control the forward drive and rotational thrust of your ship, which is equipped with shields, long and short-range scanners and a sector display of the stars and alien ships.

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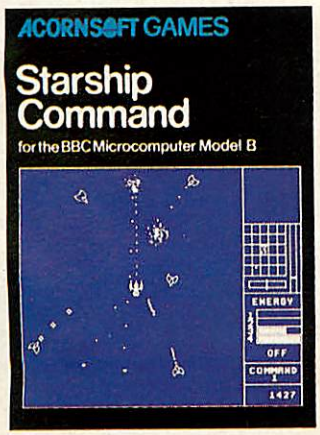

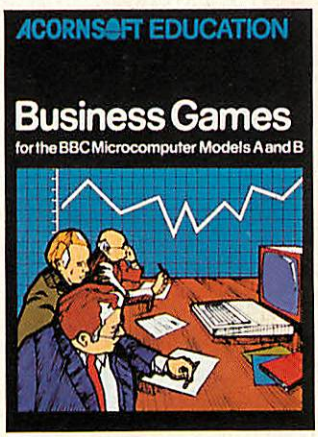

How to get Acornsoft programs.

If you're a credit card holder and would like to buy cassettes of the programs shown in this advertisement, or if you would like to know the address of your nearest stockist, just phone 01-200 0200.

Alternatively, you can buy the cassettes directly by sending off the order form below to: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.

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Vol.1 No.5 July

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

Distribution to the news trade in the UK and Ireland is by Wells Gardner, Darton and Co Ltd., Faygate, Horsham, West Sussex RH12 4SU (tel: Faygate 444). Enquiries regarding overseas distribution should be made direct to the publishers.

CONTENTS

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The Pace range of drives include two drives which are switchable between 40 and 80 tracks. As these drives are double sided they give a massive 400 k *per drive* in 80 track mode, whilst in 40 track mode they retain compatibility with Acornsoft and other commercially available software. These dual track drives feature multi-colour LED's to indicate mode selection.
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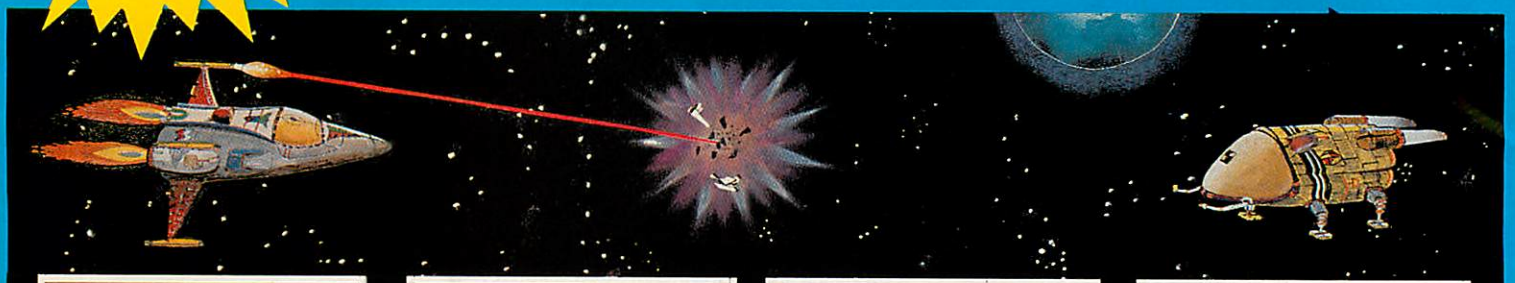


CENTIPEDE (32K) **£7.95 Cassette**

Incredible arcade type game featuring mushrooms, snails, flies, spiders and the centipedes of course. Excellent graphics and sound. 6 skill levels, hi-score, rankings, bonuses, and increasing difficulty as the spiders become more active and the number of mushrooms increases.

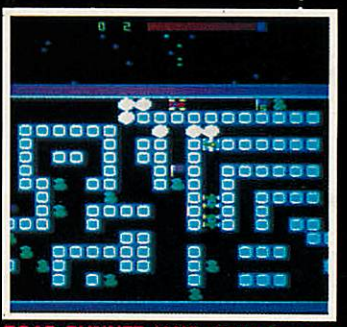
"Visually this game compares well with the arcade version, being colourful and clear."

. . . YOUR COMPUTER

FROGGER (32K) **£7.95 Cassette**

Not just another version of Frogger . . . this is the proper high-quality version that you've been waiting for. Graphically brilliant, with gaping-mouthed crocodiles, diving turtles, and frogs that flex their legs as they jump along. Increasing difficulty, hi-score, responsive controls, sound effects, flies and bonus frogs.

●●● *NEW RELEASE* ●●●



ROAD RUNNER (32K) **£7.95 Cassette**

The only full feature machine-code version of the arcade game available for the B.B.C. micro. Features include: scrolling screen, radar display, checkpoint flags, fuel gauge, smoke screens, 6 skill levels, rankings, increasing difficulty, and sound effects.

Suitable for use with keyboard or joysticks.

●●● *NEW RELEASE* ●●●

ALIEN DROPOUT (32K) **£7.95 Cassette**

Based upon the arcade game of ZYGON, but our version improves upon the original arcade game itself. You have to shoot the aliens out of their "boxes" before the "boxes" fill up. Once full, the aliens fly down relentlessly, exploding as they hit the ground. Suitable for use with keyboard or joysticks.

"Do not be fooled by their placid appearance – these moths are out to get more than the clothes in your wardrobe." . . . YOUR COMPUTER

SPACE FIGHTER (32K) **£7.95 Cassette**

Arcade-style game based upon features from DEFENDER and SCRAMBLE. 5 types of menacing alien fire at you and may attempt to ram you. Separate attack phases, fuel dumps, repeating laser cannon, asteroids, smart bombs, hi-score, rankings, 6 skill levels, sound effects.

"A thoroughly enjoyable program, well worth the money . . ."

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GALAXIANS (32K) **£7.95 Cassette**

Fast action version of the popular arcade game. 4 types of Galaxian (in 3 initial screen formations) swoop down individually or in groups of two or three. 6 skill levels, high score, rankings, bonus laser bases and increasing difficulty. Superb sound effects and graphics.

"Both . . . are well-produced, with colourful graphics, responsive controls and the usual bunch of extra-terrestrials." . . . YOUR COMPUTER

INVADERS (32K) **£7.95 Cassette**

Superb version of the old classic arcade game, including a few extras. 48 marching invaders drop bombs that erode your defences, and two types of spaceship fly over releasing large bombs that penetrate through your defences. Increasing difficulty, high score, superb graphics and sound.

FRUIT MACHINE (32K) **£7.95 Cassette**

Probably the best fruit machine implementation on the market. This program has it all . . . HOLD, NUDGE, GAMBLE, spinning reels, realistic fruits and sound effects, multiple winning lines. This is THE fruit machine program to buy.

"The graphics are very good and with a little imagination you might be able to convince yourself you are in Las Vegas."

. . . YOUR COMPUTER

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THE MICRO USER NEWS
July 1983

PROCESSOR No 2 'SOON'

ACORN now says the second processor option will be available some time next month – it was originally due to be released in April.

A spokesman said the release date was dependent on the availability of applications software which is being written as a "bundle" concept.

Two extra processors will be available and will plug into the underside of the machine. Each will give the micro a total capability of 64k RAM.

The second 6502 processor will cost around £200 and the Z80, giving CP/M capability, around £300.

Obvious

Was the BBC Micro developing a potential as a business machine? The spokesman said: "It is the obvious route, but whether Acorn will follow that or go for another machine I don't know.

"What we are really saying at this stage is that more and more power is being given to the home user."

Micro boosts AB's profits by million

BUT METTOY'S SHARES SLUMP

PROFITS are soaring for a Welsh hi-tech company, AB Electronic Products – thanks to the BBC Micro.

AB, one of the companies making the machine under contract to Acorn, recently announced its best ever half year profits. In the six months to the end of December they rose 166 per cent to a record £806,000.

Now stockbrokers are forecasting that group profits for the year should jump £1.3 million to a massive £2.5 million. And in the next financial year they should be boosted to over the £4 million mark.

AB make no secret of the fact that this success is due to the tremendous demand for the BBC Micro.

They supply about 60 per cent of Acorn's needs and machines are now leaving the Welsh factory at the rate of more than 2,000 a week. These alone are putting about £15 million a year on to AB's turnover.

Now the group is hoping for an even greater involvement with Acorn. It has put in a tender to start churning out the forthcoming Electron – and in even greater quantities.

All of which is good news for AB shareholders – especially those who bought when shares could be had for 92p. By last October they had jumped to 428p, when there was a one-for-four rights issue.

In the last six months the shares have risen by 112 per cent.

But there's not such good news for another Welsh computer manufacturer, Mettoy, who make the Dragon. They suffered a loss in the last 12 months of £3.8 million, and their shares took a steep dive when the news was announced.

Mainframe link breakthrough

COMPUTER buffs at some of Britain's major universities have succeeded in converting the BBC Micro into a terminal emulator, enabling it to talk directly to giant mainframes.

Working completely independently, a number of universities have revealed they have been able to produce a sideways EPROM that fits onto the BBC Micro board and allows it to interact with its much bigger counterparts – but at a fraction of the cost of a conventional terminal.

These normally sell for around £2,500. But the cost of an adapted BBC Micro, including the EPROM, is no more than £450.

The breakthrough opens up the possibility of cheap, low-res graphics terminals tapping the massive power of mainframes.

CARRYING his enthusiasm for the BBC Micro to the limit, Hampshire schoolteacher Mike Walton turned the recent London marathon into a personal micro marathon.

He responded to a challenge from Tim McBrown, managing director of Haslemere Computers, who promised to donate a BBC Micro to Mike's school if he completed the 26 mile event.

Mike (pictured in the centre receiving his system from Mr McBrown) clocked in at 4 hours 8 minutes.

Bohunt School already has 17 micros, including six BBC machines, and many of its 1,050 pupils sponsored Mike's run to raise money for more equipment.

Computer studies are included in the curriculum for all pupils.

16k DFS is here

THOSE enterprising backroom boys at Watford Electronics have done it again.

Their latest product is the first independently produced Disc Filing System for the BBC Micro.

Their DFS is on a 16k EPROM, compared to the 8k DFS supplied by Acorn.

And it has a number of other special features. It allows you to read 40 track discs on an 80 track drive.

It can also be formatted to store 61 files compared to the normal 32.

Latest news is that another company, Pace Software Supplies, are also about to bring out a DFS chip.

One advantage over the Watford chip is that it can be used to perform several tricks to help protect the software.

MIKE COOK JOINS MICRO USER

AN electronics wizard who built his first computer on a plank of wood seven years ago has joined *Micro User* as technical editor.

He's Mike Cook, who has been a contributor since our first issue and whose monthly Beeb Bodybuilding Course is producing many appreciative comments from readers.

Mike, now 31, left his secondary modern school at 16 to go into industrial electronics, then went to Newcastle upon Tyne to study towards his degree in physical electronics.

From there he went to work at the Admiralty's Underwater Weapons Establishment at Portland, to Salford University to do research into digital communications, and then became a lecturer at Manchester Polytechnic.

One of his current tasks is conducting a two-year course for teachers – using the BBC Micro, of course.

At the end of the course they get the Poly's diploma in microcomputing in secondary education.

Mike made his first micro in 1976. It had 256 bytes of memory, no software and no keyboard. He programmed it by flicking switches.

When the BBC Micro was launched Mike was one of the first people to get hold of one – and was immediately hooked.

"I think it's one of the most exciting computers that has ever been produced", he said. "There's so much going for it."

'Dead' Bug-Byte bites back

A SUGGESTION by Chesterfield software house Kansas that their rivals Bug-Byte are no longer in existence has brought a strong protest from the Merseyside company.

Bug-Byte's premature "death" is reported in the latest Kansas newsletter, in an article about the many problems the BBC Micro's new Basic interpreter is creating for software suppliers.

Says Kansas: "No less than 27 different modifications have caused havoc with many programs, with virtually all the software suppliers being affected, with perhaps the now defunct Bug-Byte suffering worst."

The remark made Bug-Byte's Tommy Baden almost as crimson as one of the crosseyed monsters forming the company's trademark.

"It's a load of rubbish" he said. "In fact the opposite's the case. We are expanding in all directions – moving into new offices, taking on more staff. We've never been more alive!"

Back in Chesterfield Kansas executive Tom Crossley was most apologetic. "I thought the lads had split up", he said. "I'm sure I read it in one of the trade magazines."

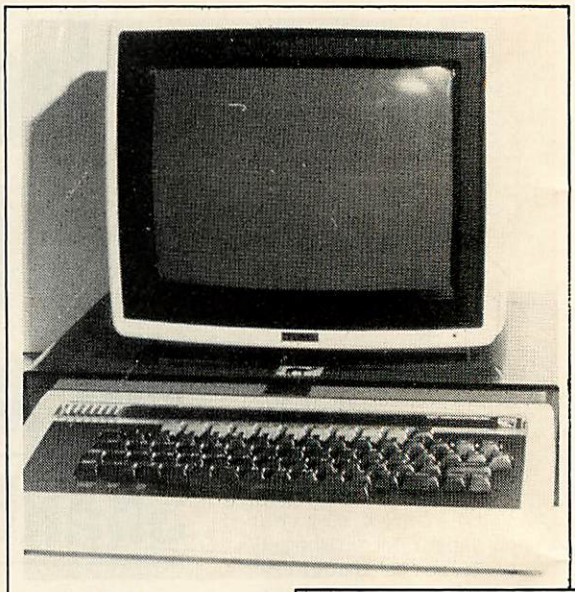
The offending article had really been intended to get at Acorn, not Bug-Byte.

It claimed that the BBC Micro had been put on the market way before it was ready – a view which they said was borne out by the "seemingly endless" modifications to the operating system, as well as the revised Basic.

Unnecessary

"It is the simple – and many people believe unnecessary – things in the new Basic that are causing all the trouble", says the newsletter. "Many believe these are a ploy on Acorn's part to actually give other suppliers problems.

"What is really hurting Acorn is the vastly superior service offered by other software suppliers of just a few days as against a few weeks."



A MONITOR can now be placed above the BBC Micro instead of behind or beside it, with the release of a perspex stand from Camel Products.

The stand, which measures 17 × 12 × 3.75in and costs £19.95, sits over the micro but still allows access to the machine from front or rear.

Orders pour in for teletext adapter

THREE thousand orders have been received for Acorn's teletext adapter, which is designed to enable the BBC Micro to download pages transmitted over the air by Ceefax and Oracle.

But latest news is that the adapter is still under development, and the first will not be going out to customers until August at the earliest.

Two hundred are at present undergoing field trials. Full scale production of the adapters will not be started until these trials are complete.

The volume of the orders – worth £675,000 – show the tremendous public interest there is in the adapters, even though they have not yet been advertised.

A BBC spokesman told *Micro User:* "We don't want to be saddled with a long waiting list as has been the case with the BBC Micro itself, so we are keeping rather quiet about the adapter.

"The backlog of orders will have to be dealt with first, so anyone ordering one now will have to wait until late September or early October."

The £225 adapter consists of a sideways ROM which fits inside the BBC Micro. Signals are received off-air via a normal aerial feed that plugs into the machine's 1mHz bus.

With the adapter an ordinary TV set or monitor can receive all teletext transmissions. It has a number of extra features, such as downloading a page while reading another page, or stepping through a sequence of pages.

Users will be able to download free software programs which the BBC transmit as Ceefax pages. Once in memory they can be used as ordinary programs and can be edited or used within other programs. Pages can also be stored on disc or cassette.

CHIP ROM

A SERIAL processor chip to run the long awaited cartridge ROMs for the BBC Micro is due for release at any time, according to a spokesman for Acorn.

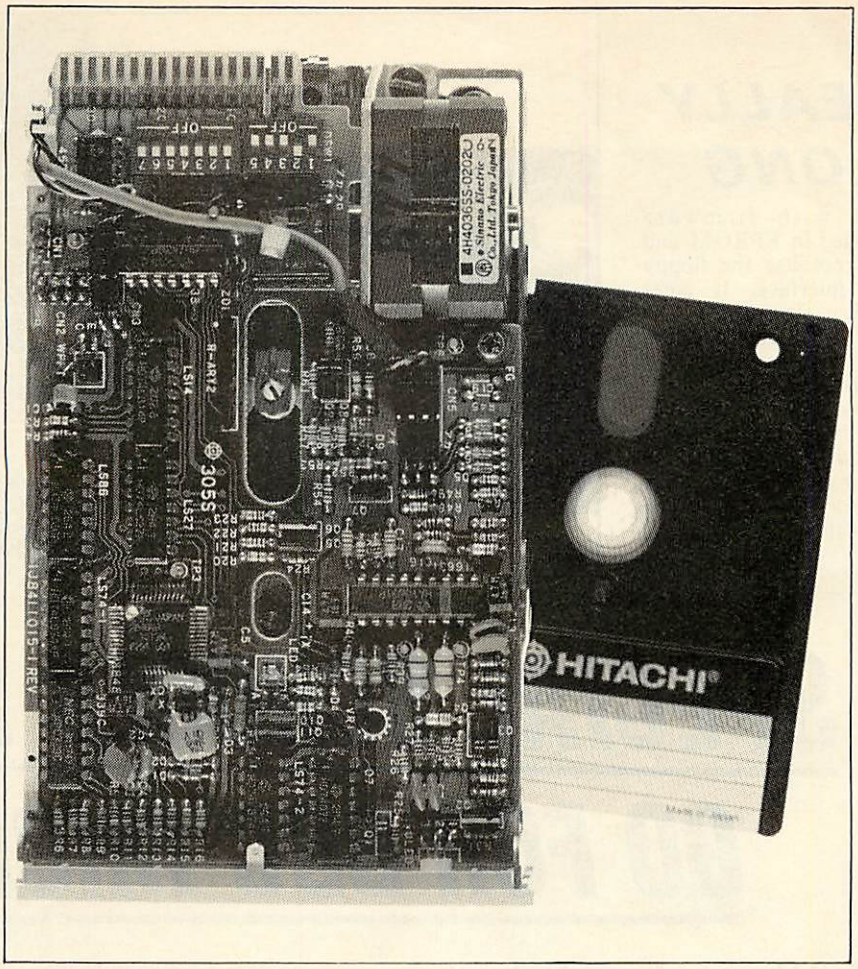
However the cartridge ROMs themselves are not yet available and it seems that the serial processor can only be ac-

Micro to

A SYSTEM which uses the BBC Micro to control a videodisc player is due for release in the UK at the end of the month.

Aimed at the educational market, the videodisc is used to display the text and pictures of a presentation under the control of a BBC Micro, which is

The 'new standard' drive



A 3in floppy disc drive launched at the BBC Micro User Show is claimed by distributors Advanced Memory Systems to be a new standard for home computer storage systems.

It is an Hitachi drive that can accept either double or single density rigid-cased floppies and which can be integrated with standard 5.25in floppy drives.

It uses a standard disc interface and looks like an ordinary 5.25in drive to the micro so that programs can be easily copied between a 5.25in and 3in drives.

The single drive retails for £225 and the double version for £399.

Blank discs cost £4.95 each and offer BBC Micro users 100k storage each side.

The MUGs are coming!

IN response to numerous requests from readers in all parts of Britain, plans are now well under way to set up a nationwide chain of Micro User Groups – exclusively for users of the BBC Micro.

It is hoped that MUGs will be formed in every town and city in Britain.

Membership will bring many benefits. They will be able to:

- *Meet other local users of the BBC Micro.*
- *Share ideas and swop programs.*
- *Arrange visits with neighbouring MUGs.*
- *Enjoy worthwhile discounts on hardware and software.*

As a first step in forming a network of MUGs, *Micro User* is compiling a register of people who would like to join their local group.

We also want to hear from people who would be interested in taking a more active role in the formation of the group.

All we ask you to do at this stage is to complete the form below and return it to us as soon as possible.

If you do not want to cut your copy of Micro User you can send the details on a separate sheet of paper.

But please write soon because we want to take immediate steps to get you all together and start meeting on a regular basis.

Those of you who have already been to meetings of computer clubs know how enjoyable they can be – and how much you can learn from fellow enthusiasts.

We want local MUGs to play a leading role in helping you get lots more fun out of your BBC Micro.

So don't delay. Fill in the form below and let's get the ball rolling!

SEND TODAY!

☐ *I would like to become a member of of my local Micro User Group.*

☐ *I would like to help in setting up a local Micro User Group.*

Name .....

Address .....

.....

.....

Phone No .....

POST TO: MUG, Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

FOR CARTRIDGE DUE FOR RELEASE

quired through buying Acorn's new speech synthesiser at the same time.

For £55 the synthesiser will incorporate two extra sockets to the left of the keyboard – the infamous "ashtray" of the earlier models.

The cartridge ROMs will plug into the ashtray – the concept is similar to that used by cartridge based computer games systems, but it has a much more versatile and powerful result.

Combined

The two things are combined because the ROMs will use one of the two chips – the serial processor – employed by the speech synthesiser package to send data to the computer.

A BBC Micro dealer told *Micro User:* "If Acorn marketing men had been cleverer they would have announced the serial processor chip – which everyone has been waiting for – and then declared, as an added bonus, that they'd thrown in a speech synthesiser capability – which not everyone had been waiting for – for the same price."

Instead, an Acorn spokesman says he doesn't know whether the cartridge serial processor chip will be made available separately, and so it seems that a user will have to buy the synthesiser to be able to use the cartridges.

Observers say Acorn was worried that a third party developer would beat it to the post with the project.

The 1.2 operating system will be needed to use the cartridge socket. Acorn says that users with the old 0.1 OS will be given a free upgrade when they have the speech synthesis/cartridge ROM system installed by a dealer.

control videodisc

programmed to allow the user to influence the presentation as it unfolds.

With rival systems costing more than £5,000 this package, which retails at under £2,000, should be attractive to the education and industrial training sectors at which it is aimed.

It is the product of more than two years research by Michael Grove, who is a BBC Micro enthusiast.

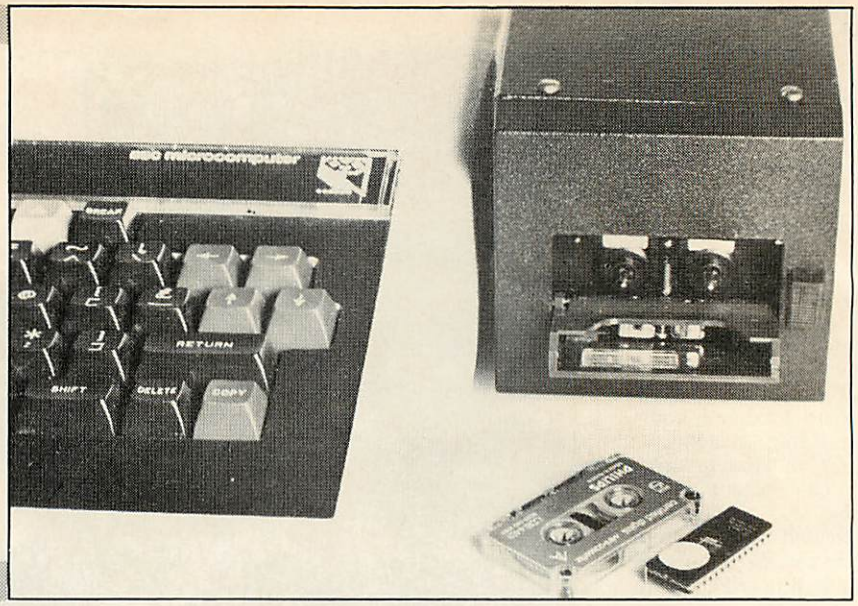
The software is both EPROM and disc-based and, as well as Basic, it supports the authoring language Microtext Plus, which it is claimed allows the system to be used by a complete novice.

HOBBIT REALLY HOPS ALONG

A DIGITAL cassette recorder, claimed to be seven times faster than a standard cassette recorder and a cheaper alternative to a floppy disc drive, has been released by Ikon Computer Products.

The Hobbit is compatible with all versions of the operating system, including 0.1. It connects to the BBC Micro's I/O port with firmware supplied in EPROM and does not use the floppy disc interface. It costs £135.

It measures 4 x 4 x 4in and up to two units can be daisy-chained to the micro. In use five files can be opened simultaneously for reading or writing, and random access files are supported.



Survey selects Beeb

THE Daily Express has carried out a detailed survey of 14 home computers. And the one that came top of their league table was the BBC Micro.

They compared the computers in six different categories – games, education, business, learning to programme, software availability and value for money – and said whether they were "good", "average" or "only fair".

The BBC Micro was the only machine to get a "good" rating in each category.

Said the Express: "The BBC – particularly its B version.

SPECIAL SCHOOLS MAY GO FOR BBC MICRO

SPECIAL schools could be the next beneficiaries to take a slice of the £40 million being spent by the government in its micros in schools project.

And this may mean another big boost for the BBC Micro, which is especially suited to schools for the handicapped because of its enhanced sound and colour capabilities.

It is understood that the Department of Education and Science is considering several plans, including one which would be substantially better than the present £ for £ subsidy on approved micro systems, to take into account the needs of special and handicapped pupils.

A government spokesman confirmed that the Department had been considering several related options.

Extended

Meanwhile the government's micros in secondary schools has been extended for a further year – with another £3 million in the kitty.

The extension allows the 6,500 secondary schools which took advantage of the original offer, which ended last December, to upgrade their systems and still receive the 50 per cent subsidy.

For schools which opted for the BBC Micro the new package includes provision to upgrade from the model A to the model B machine and to acquire disc drive and Econet interfaces, a colour monitor (from Microvitec), a dot matrix printer (from Walters Microsystems) and a special selection of software from either Acorn or Tecmedia.

Extras

The upgrade package costs about £700, of which the Department of Industry will pay half.

Optional extras, also subsidised, include an Economatics micro controlled robot device which can move in any direction, detect collison, operate a pen and even read music from a bar code and play it back, and scientific measuring equipment from Education Electronics.

BARRY WOOD'S TAILPIECE

DESPITE all the claptrap about the 8271 not being obsolete, Acorn still can't get hold of it. At least, if they're doing so, the chips aren't reaching the public.

Of course, this might be because the machines aimed at the American market will all be fitted with disc interfaces.

However, 8271s are readily available if you are willing to search them out for yourself.

Even if you do get one, your problems aren't over, since Acorn won't sell you the DFS you need to run it. Talk about a "my bat and my ball" attitude.

★ ★ ★

I WAS in my local hostlery the other night when I met another Beeb-owning regular.

"You know something about computers. I've just paid £11 over the odds to get my BBC Micro upgraded to 1.2 OS. While I was there a guy in the shop paid exactly what I'd paid for my machine originally and he got not only OS 1.2 but also Basic II," he said.

"I had to pay £11 more and didn't even get Basic II. Can you give me a good reason?"

It's not often I'm lost for words, but that stumped me. So here's the Barry Wood competition: Can you think of a reason that would satisfy my friend?

The prize will be a 0.1 Operating System . .

★ ★ ★

ACTUALLY, I suppose I have been a little naughty to Acorn since they do produce a marvellous product. So I've decided to produce a letter of apology.

I've got a prototype apology drafted and it seems to be going well. At this point, though, I don't want to release it as it has one or two bugs, but I guarantee it will be out in time for Christmas, I think, and I am taking orders if anyone wants a copy.

When it finally comes out, its only rival will be Acorn's apology for customer relations.

★ ★ ★

THE BBC's next series on the micro will be concentrating on using the computer to control the outside world.

Rumour has it that the BBC would dearly like to interface a micro to a few people at Acorn.

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BBC

Model B £399

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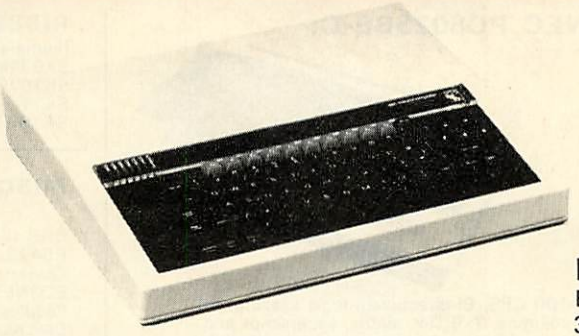

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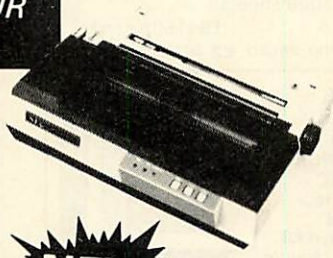

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BBC SYSTEM PACKAGE

SPECIAL OFFER

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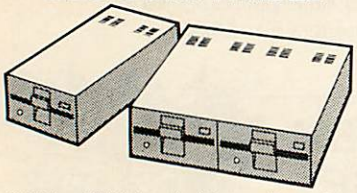

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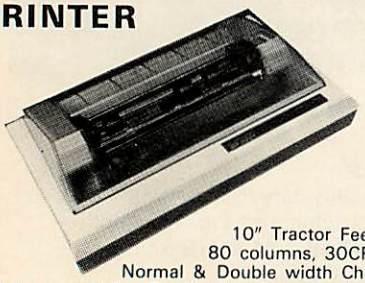

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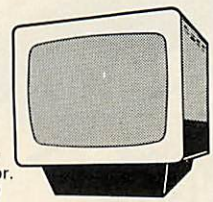

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By
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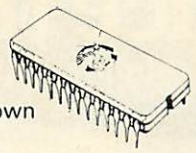

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The special features includes facilities like: TABULATE, MODIFY, FILL, COPY, COMPARE, SEARCH (Hex & ASCII), CHEKSUM, DISASSEMBLE, RE-LOCATE, SINGLE STOP, SET BREAK POINTS, SCREEN DUMP ROUTINE, DUMB TERMINAL and many more facilities.

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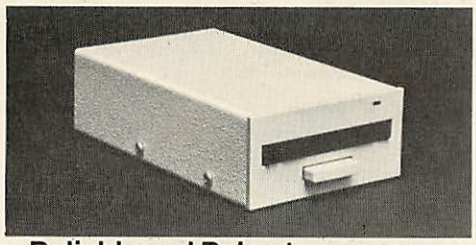

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Epson FX80 – fast and flexible

Review by JIM NOTMAN

EPSON, best known as manufacturers of medium priced dot matrix printers, have recently released two new models.

These replace the workhorse of their range the MX80, which has had an enviable reputation for reliability.

The replacements are the FX80, which is around the same price as the MX80, but has more features and double the printing speed, and the RX80, a cheaper model which appears to be aimed more at the home user market. This review concentrates on the FX80.

The printer is housed in a low cream case, somewhat wider and heavier than the MX80, measuring 100 x 420 x 347mm and weighing 7.5kg.

On the top on the front right hand corner is a small control panel with three switches (on/off line, form feed and line feed) and four status lights.

An easily removable hinged lid gives access to the ribbon cartridge and printer head. There is also a brown plastic strip to cover the platen, but this must be removed to adjust the width for continuous paper. To the left of the platen is the paper release lever for the friction feed.

The manual supplied is well produced and spiral bound. It is written in good clear English, with a new page for each command and often including an example of its use.

However since this printer can be used by a large number of different micros, the examples are given in Microsoft Basic which sometimes requires deciphering to find the best way to translate it into BBC Basic.

For instance the control codes are sent as a stream of LPRINT CHR$ and LPRINT "string" statements, whereas it is easier to use the VDU command of BBC Basic.

The best way round this problem is to pencil into the manual the equivalent Ascii value for each string value.

Loading continuous paper is a bit more fiddly than on the MX80, but if you follow the instructions to the letter you should have little difficulty.

Connecting the FX80 to the BBC Micro is easy. All that is needed is a 20 way ribbon cable with a 26 way ribbon header at one end and a 36 way Amphenol (for the FX80) plug at the other.

If you don't want to make one up yourself a dealer will supply one for about £15 to £18.

A small panel on the right of the printer can be removed to expose a number of DIP switches. Depending on the position of these switches a number of "startup" options are available.

These control:

- The selected international character set.
- Column width.
- Whether the zero has a "slash" across it.
- Print mode.
- Operation of the paper-end detector.
- Whether 2k of RAM will be a printer buffer, or used to store software defined characters.
- Whether the internal buzzer will sound.
- Automatic line feeds (useful to set ON, to match the Beeb default).

In use the most striking feature is the speed at which the printing takes place. The FX80 has bidirectional printing rated at 160cps – noticeable when compared alongside an MX80 with half the speed. And especially so alongside a daisy wheel rated at 15cps!

If all that speed is too much for you, there is a half speed mode which prints more quietly.

A large number of different printing modes are available and even combinations of these modes are possible.

There is a proportional spacing mode if you really want to impress. See the panel below for some of the other print modes.

Although there are nine different international character sets in the printer, there isn't one that precisely matches the BBC Micro's character set, although the American one comes closest.

The speed of printing in the graphics modes is also very welcome. A full graphic dump in Mode 0 took only 100 seconds. In the other modes it took only 50 seconds. Since the printer is no slowcoach, having a good graphic dump program is necessary to make the most of the speed. (I forsee many graphics dump routines being rewritten!)

This machine has a large number of features which allow it to be tailored to the user's requirements, whether it be text or graphics.

To appreciate this you really need to see it in action. This flexibility in use enables it to make a formidable combination with the BBC Micro.

Although it is not cheap, it certainly gives value for money.

Normal print	subSCRIPT
Elite size	superSCRIPT
Enlarged	Underline
Condensed	Double-strike
Condensed Enlarged	Emphasized mode
Italics	Proportional spacing

What the FX can do

Now win your own FX80. Full details overleaf

THE MICRO USER

Get clued WI Epson's FX80

THIS month's competition is open to everyone, expert programmer or not. All you have to do is to solve our crossword puzzle.

The answers are based on programming the BBC Micro, so you'll have to know a bit about that. Mind you, that won't be a problem if you're a regular *Micro User* reader.

Oh yes, there's one more thing: We've already given you the answer to 16 across. But we forgot to include the clue.

We want you to devise what you consider would be the most appropriate clue for the letters "BBC".

The magnificent prize will be Epson's latest printer, the FX80, reviewed this month by Jim Notman.

To be in line for it, all you have to do is to send in the coupon containing the completed crossword, together with your clue for the letters "BBC".

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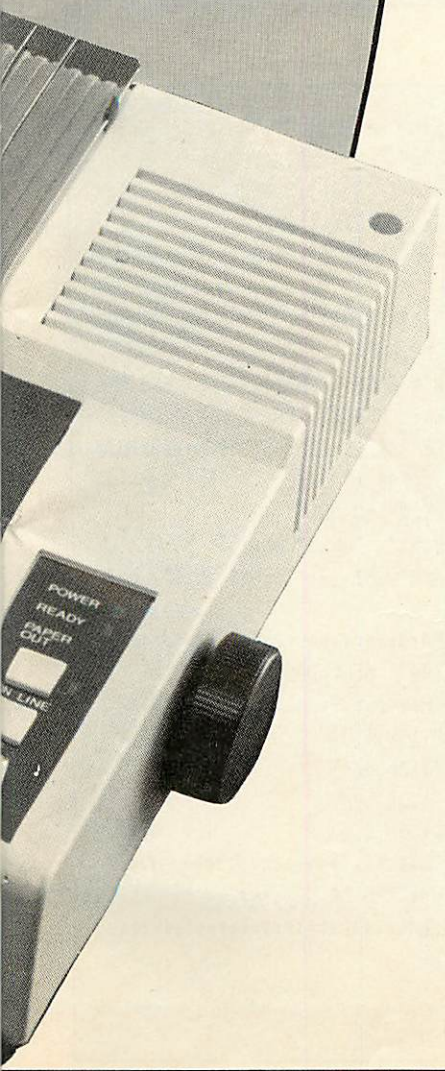


CLUES

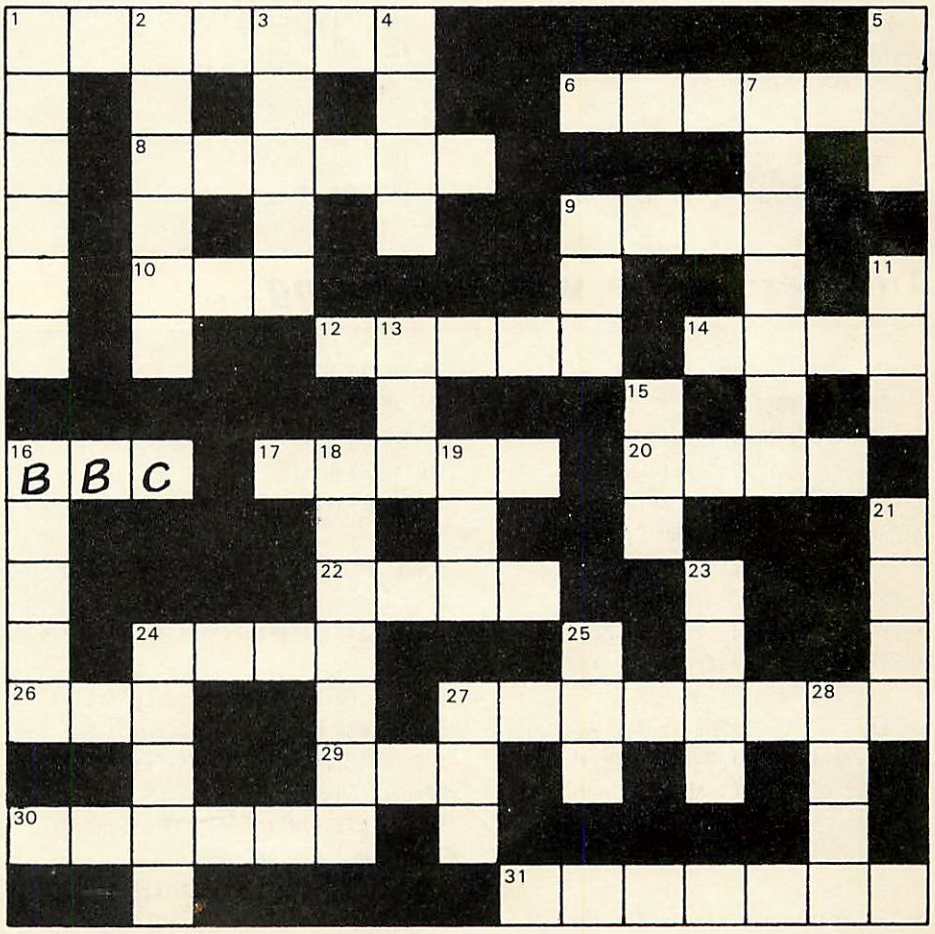
ACROSS

1 and 24 Automated language? (6,4)
6 and 9 The best way to get from A to B . . . and beyond (6,4)
8 Play it again, Sam (6)
10 You have a choice (3)
12 Fundamental language (5)
14 You can see it through the wrong slit (4)
17 and 20 Small-time operator? Not us! (5,4)
22 We all crave it . . . but there's never enough (4)
26 Plot 64-71 (3)
27 If you lose the money, it's just a number (8)
29 Strangely enough, it can be found anywhere (3)
30 Actually it's all very logical (6)
31 Sounds like procedure needs a little aid (7)

DOWN

1 and 16 Fed-up female? (6,5)
2 Without it you would never know where you were (6)
3 You'll get it with a little prompting (5)
4 The answer is in the value. Work it out! (4)
5 A brief comment (3)
7 Slightly clever? (7)
9 Room to breath? (3)
11 A function in that new ROM (3)
13 - - - and you'll receive the code (3)
15 and 21 Would ointment help this software house? (3,4)
18 There's no point in these variables! (7)
19 The larger it is, the more powerful the weapon (3)
23 Plot 5 (4)
24 Everybody's trying to. Depressing isn't it? (5)
25 Interrupt your rest (3)
26 A driver on the telly? (3)
28 Sign language (4)

Your FREE entry form



My clue for the letters "BBC" is .....

.....

Name .....

Address .....

.....

Tel No .....

Send this completed entry form to:
Printer Contest, Micro User, Europa House,
68 Chester Road, Hazel Grove, Stockport SK7 5NY.

The man from Beddau collects a Cumana disc drive

THE lucky winner of the contest in the May issue of *Micro User* was Mr H.C. Leivers of Beddau, near Pontypridd. A new Cumana disc drive is on its way to him.

The competition, which was to write a program to set up the function keys, attracted a large number of entries. Some of them were very clever indeed but rather limited in their scope.

Mr Leivers' program was simple to use, generally useful and – always a nice touch – it documented itself.

The program sets up the keys as follows:

f0	Amount of free memory
f1	Program length
f2	Paged list
f3	Cassette verify
f4	Alter page
f5	Chain
f6	Run
f7	Renumber
f8	*CAT
f9	*KEY
f10	Break and Old

It then deletes itself from memory, ready for other programs.

As it stands, the program works on OS 1.0 and 1.2.

Lines 160,170 would have to be omitted for OS 0.1. Also lines 520,580 – the self-destruct routine – would have to go.

As these are just a clever way of entering NEW from the program you can omit the lines and simply enter NEW yourself after running the program.

And here's the winning listing . . .

```
 10 REM*******************************
 20 REM* **KEYSET by H.C.LEIVERS** *
 30 REM*******************************
 40 REM* A PROGRAM TO SET THE
 50 REM* FUNCTION KEYS AND WHICH
 60 REM* WILL SELF-DESTRUCT,LEAVING
 70 REM* ONLY THE KEYS SET.
 80 REM* (i.e.THERE WILL BE NO
 90 REM* TRACE OF IT IN USER-MEMORY)
100 REM*******************************
110 REM* INITIALISATION
120 REM* (CLEAR BUFFERS ETC.)
130 REM*******************************
140 MODE7:REM SELECT MODE 7
150 *FX15
160 *FX18
170 *FX21
180 REM*******************************
190 REM* ROUTINE TO SET UP KEYS
200 REM*******************************
210 *KEY0|V7@%=0:DIMP%-1:P.H.-P%" BY
TES FREE,FROM &"~P%|L|M
220 *KEY1|V7P."PROGRAM IS ";LOMEM-PA
GE;" BYTES LONG"|L|P|M
230 *KEY2|V7LISTOO|M|NL.|M
240 *KEY3|V7*LOAD""8000|M
250 *KEY4|V7PAGE=
260 *KEY5|V7CHAIN""|M
270 *KEY6RUN|M
280 *KEY7|V7RENUMBER
290 *KEY8|V7*CAT|M
300 *KEY9*KEY
310 *KEY10LD|M
320 REM*******************************
*
330 REM  TITLE PAGE AND DESCRIPTION
340 REM         OF FUNCTIONS
350 REM*******************************
*
360 CLS:PRINT:PRINT:PRINT'CHR$(130)"
THE KEYS ARE NOW SET AS FOLLOWS.."
370  PRINT:PRINTCHR$(129)"KEY      "
CHR$(131)"FUNCTION"
380 PRINT:PRINT" "CHR$129"0"CHR$131"
.MEMORY FREE & START POINT"
390 PRINT" "CHR$129"1"CHR$131".PROGR
AM LENGTH"
400 PRINT" "CHR$129"2"CHR$131".LIST(
PAGED;CTRL-B ENABLES PRINTER)"
410 PRINT" "CHR$129"3"CHR$131".VERIF
Y"
420 PRINT" "CHR$129"4"CHR$131".ALTER
 PAGE(ENTER START ADDRESS)"
430 PRINT" "CHR$129"5"CHR$131".LOAD
AND RUN"
440 PRINT" "CHR$129"6"CHR$131".RUN"
450 PRINT" "CHR$129"7"CHR$131".RENUM
BER (PARAMETERS AND RETURN)"
460 PRINT" "CHR$129"8"CHR$131".CATAL
OGUE (TURNS CASS. MOTOR ON)"
470 PRINT" "CHR$129"9"CHR$131".*KEY(
FOR QUICK REDEFINITION)"
480 PRINTCHR$129"10"CHR$131".BREAK A
ND OLD"
490 PRINT:PRINT"     -THE PROGRAM HA
S NOW GONE,BUT"
500 PRINTCHR$141CHR$129"THE KEYS ARE
 STILL SET!"CHR$140:PRINTCHR$141CHR$12
9"THE KEYS ARE STILL SET!"CHR$140:PRIN
T"ENTER"CHR$134"'CTRL-L'(CLS) "CHR$135
"BEFORE CONTINUING.";
510 PRINT" (PRESS"CHR$133"'BREAK'"CH
R$135"THEN"CHR$129"f2"CHR$135"TO LIST
PROGRAM)"
520 REM*******************************
530 REM*   SELF DESTRUCT ROUTINE
540 REM*******************************
550 *FX138,0,78
560 *FX138,0,69
570 *FX138,0,87
580 *FX138,0,13
590 REM*******************************
600 REM* END OF PROGRAM
610 REM*******************************
620 END
```

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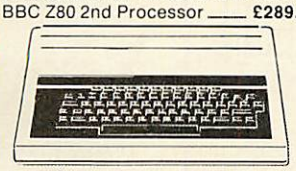

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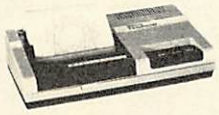

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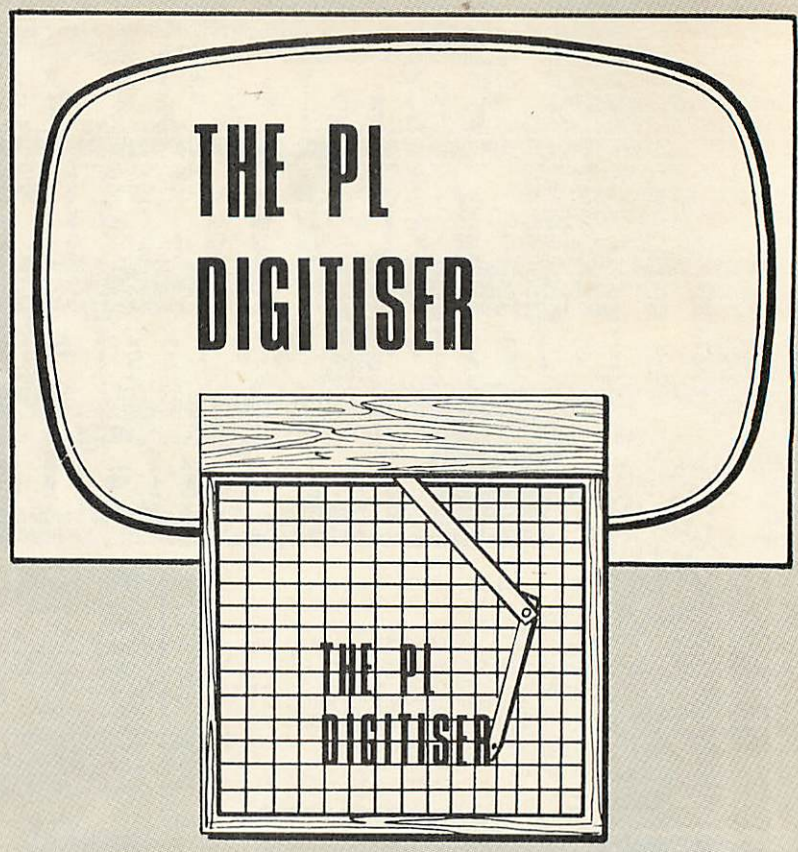

By JOHN LORD

THE idea behind a digitiser or graphics tablet is a simple one. A drawing is positioned on the tracing pad and the tracing probe moved over the picture. During this process the computer makes a record of the data and draws the picture on its own screen.

The PL Digitiser package consists of a digitiser, a control program, a shorter display program and a very detailed manual. The programs are available on tape or disc. I used the tape version.

The program works on all operating systems and requires a model B or a model A with 32k of ROM and the analogue port.

The digitiser is of a very solid wooden construction which could support a monitor. The tracing pad is mapped out in a rectangular grid to facilitate composition.

Connection of digitiser to computer is straightforward. The Index program, which details the programs and files on the tape, calls the main control program.

The first prompt is to "Place the probe at A" and press A, followed by "Place the probe at B" and press B. This is in order to calibrate it.

If the digitiser voltages are outside preset limits then you are requested to repeat the operation. If this fails it may be necessary to adjust the potentiometers which provide the voltages to map the tracing pad. This is not too difficult.

The digitiser can map the probe to about 1mm, or 5 units on the graphics screen.

The red programmable keys control the following options:

- **f1** *Enter Instruction mode*
- **f2** *Enter Edit mode*
- **f3** *View picture*
- **f4** *Read picture file*
- **f5** *Create picture file*
- **f6** *Dump screen to printer*
- **f8** *Restart the program*
- **f9** *End program*

After initialisation you choose the graphics mode, either mode 4 and two colours or mode 5 and four colours. As always in any graphics program, a compromise has to be made between the memory to be used for the display and the memory allocated for the program and the data.

An extra 10k of memory is available for the program if modes 0, 1 or 2 are not used, hence the restricted modes available.

To draw or copy a picture you enter the Instruction mode by pressing f1. At this stage the versatility of the system becomes obvious.

You have the choice of drawing lines of any shape, straight lines, rectangles, circles, filling the shape with colour with or without an outline.

The width of the lines can be adjusted, as can the foreground and background colours and the GCOL mode used. Initially the colours take default values.

The GCOL mode controls the effect when two coloured regions overlap and some interesting effects such as stripes can be generated.

One interesting feature is the way you write text. When you type it in its position is not immediately fixed. The centre of the first character is "tied" to the cursor, so moving the probe causes all the text to be moved. It can then be positioned by trial and error before being fixed.

The Edit mode, entered by pressing f2, is one of the most important features of this package. The sequence of instructions already created may be reviewed and modified.

The displayed image can be moved to a new position and a duplicate drawn. In addition the displayed image can be enlarged or reduced about a point on or off the screen.

Pressing f3 allows you to view the picture produced by the sequence of instructions up to the first halt marker.

Pressing f4 enables picture files which have been saved on tape to be loaded into the computer, provided that there is sufficient room.

Pressing f5 saves picture files on tape or disc.

Pressing f6 dumps the screen to a printer. At the moment the routine is in Basic and so is rather slow but effective.

In addition to the index and control programs, a much shorter display program is included which you can use in your own programs to display picture files you have previously created with the digitiser.

This is a well-engineered package which should give long and reliable service.

While it is quite simple to use at first, to take full advantage of all the facilities offered you should read the manual thoroughly.

It would have been useful if more illustrative exercises had been provided. Despite this, the digitiser will prove invaluable in all sorts of applications, particularly educational.

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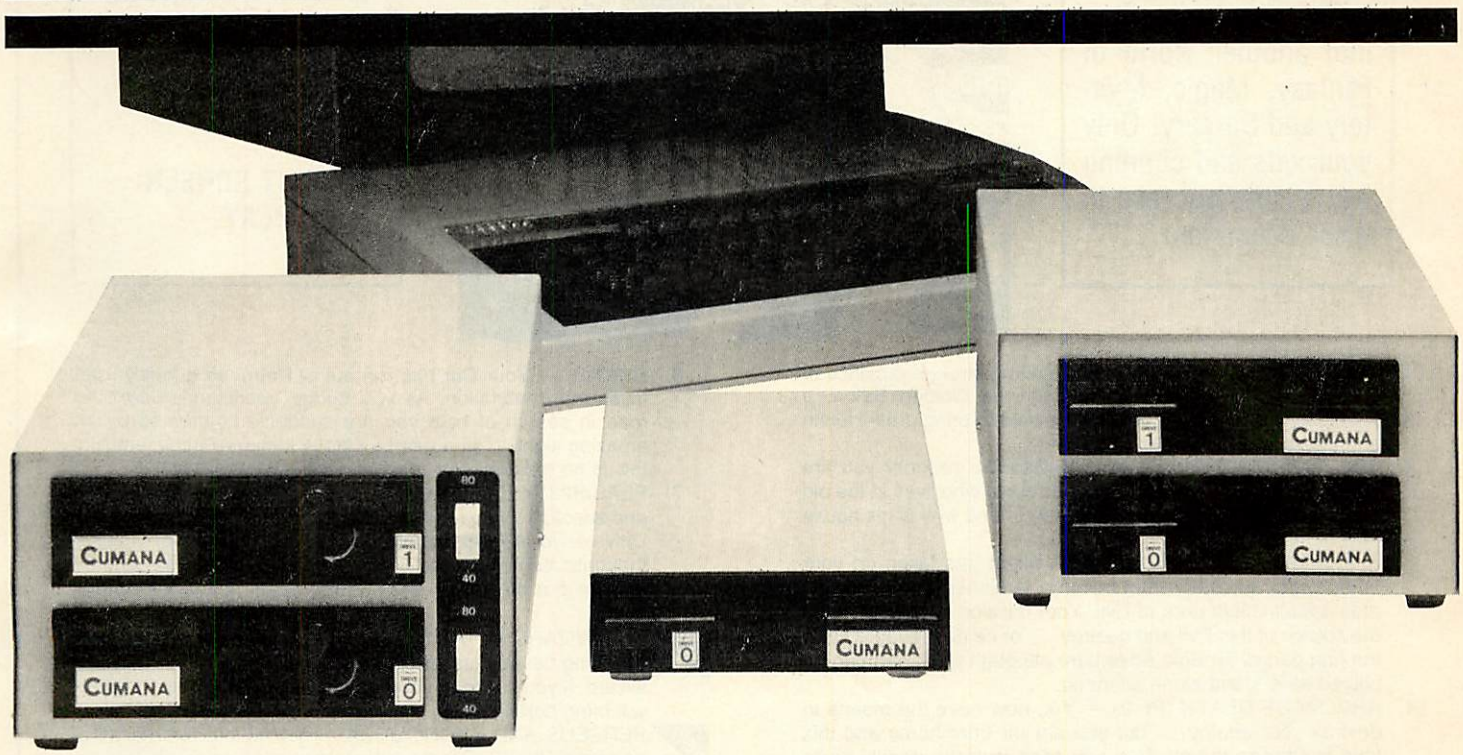

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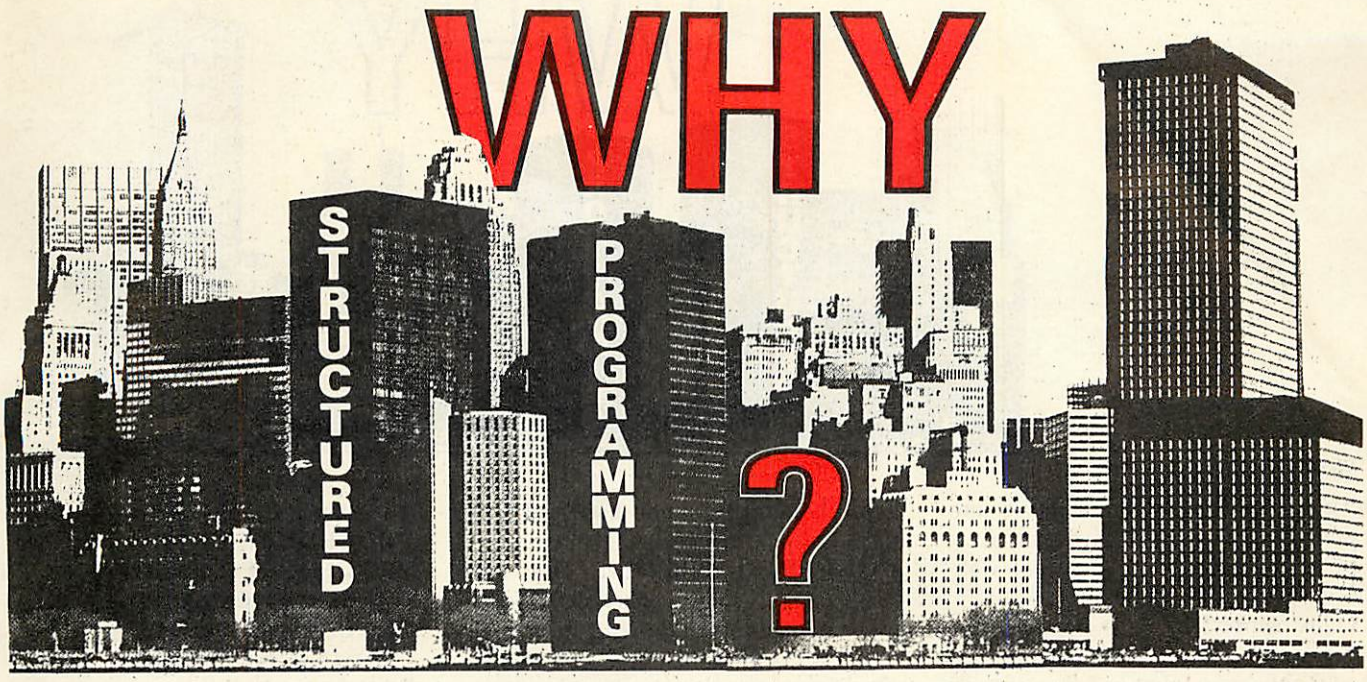


Speak low, talk slow, and don't say much..

To quote John Wayne

By ROY ATHERTON

FOR the computing pioneers, computer memory was a major pre-occupation. The greatest advantage of a procedure or subroutine was that it enabled the same piece of code to be used more than once in the sense of being called from different parts of a program.

For example a five-second delay might be needed at different points in a game as shown in Figure I.

It was also appreciated that procedures have other advantages. They can be transported to other programs, they help a programmer to retain control of a complex program during its design, coding and testing, and they help others to understand it more easily.

In the 1980s the first reason is not so important and becoming even less so as memory technology advances.

On the other hand the value of clarity, control and portability have increased as the world of computing has grown. In my experience, which covers teaching and the writing of small and medium-sized programs, the value of procedures cannot be overstated.

One hallmark of a good programmer is the care with which a task is broken down, like a book is divided into chapters. The main program of, for example, a simple CAL (Computer Assisted Learning) program could include:

PROCinitialise
PROCchoose
PROCplay
PROCscore

This not only controls the com-

* *Roy Atherton is with Bulmarshe Computer Education Centre.*

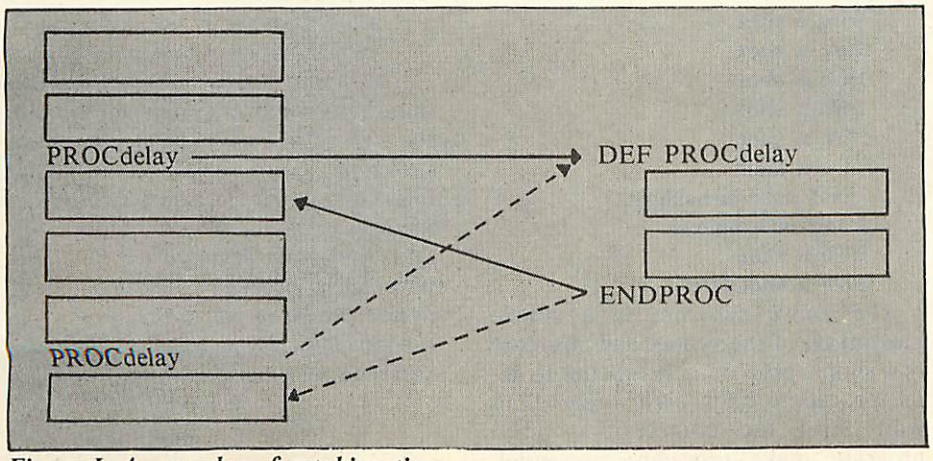
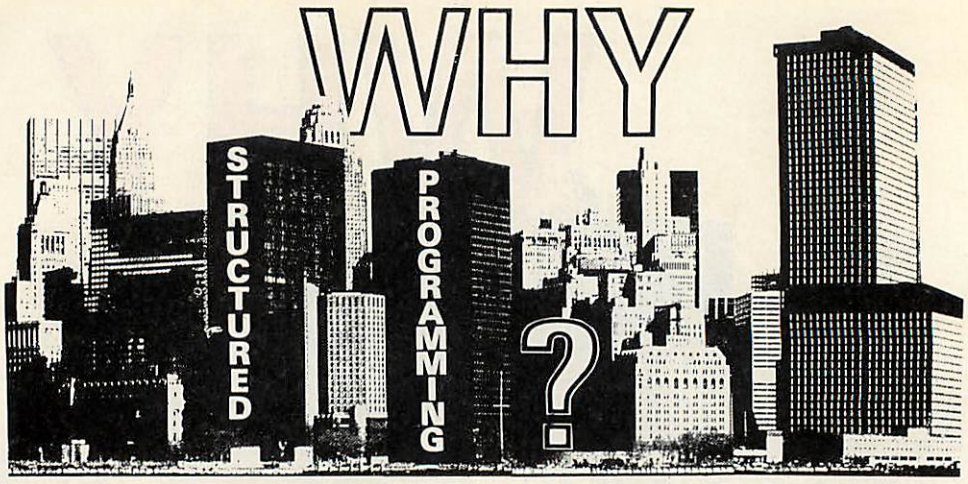


Figure I. A procedure for taking time



From Page 25

plexity of a job by breaking it into "mind-sized bites" but gives an overview of the whole with a list of well-chosen procedure names.

Quite simply, there is no better or easier way. The procedure definitions should appear roughly in order of their use:

```
DEF PROCinitialise
  –
  –
  –
ENDPROC
DEF PROCchoose
  –
  –
  –
ENDPROC
DEF PROCplay
  –
  –
  –
ENDPROC
DEF PROCscore
  –
  –
  –
ENDPROC
```

In BBC Basic procedures take on an extra importance. While the structures for handling repetition are reasonably good, the structures for handling the other major aspect of program control – decisions – are weak. The judicious use of procedures enables this weakness to be overcome without too much difficulty.

Remember the aim is to keep things simple. For this reason procedures are discussed before decision-making, though some might prefer such an order of treatment anyway.

A procedure should embody an idea. The idea may entail only a few lines of code – sometimes just one – or it may entail so much detail that it needs to be broken down still further. For example, Wyatt Earp's deputy might be firing shots at the bandit and he may need to reload.

We shall use a simple binary decision, though this is not discussed fully until the next article.

CONCEPTS: Procedure call and procedure definition.

The deputy should fire at the bandit until he throws his gun out. When necessary the deputy should reload. Ensure that the gunfight is likely to be prolonged by using a "20-sided die".

```
DESIGN
    REPEAT
    Fire a shot
    IF gun empty THEN reload
    UNTIL bandit throws out gun
    END
    DEF PROC reload
    Eject empty cartridges
    Insert new cartridges
    ENDPROC
PROGRAM
shot = 0
    REPEAT
    gunout=RND(20)
    PRINT "Fire a shot"
    shot=shot+1
    IF shot=6 THEN PROCreload
    UNTIL gunout=20
    PRINT "Bandit throws out gun"
    END
    DEF PROCreload
    PRINT "Eject used cartridges"
    PRINT "Load new bullets"
    shot=0
    ENDPROC
OUTPUT
    Fire a shot
    Fire a shot
    Fire a shot
    Fire a shot
    Fire a shot
    Fire a shot
    Eject used cartridges
    Load new bullets
    Fire a shot
    Fire a shot (etc.)
```

The above program is a simple illustration of the syntax and structure of a simple procedure. It is better to get the procedure habit early rather than wait until the complexities of a program make procedures essential. The structure is shown below:

```
PROCEDURE CALL
PROCEDURE DEFINITION
OPENING KEYWORDS
PROCEDURE BODY
CLOSING KEYWORD
PROCreload
DEF PROCreload
PRINT "Eject used cartridges"
PRINT "Load new bullets"
ENDPROC
```

CONCEPT: Passing information to a procedure

Suppose that the deputy wished to vary his reload procedure depending on circumstances. The bandit may have been counting his shots and try to rush him while he reloads. It would be useful if the reload procedure could handle anything between one and six new bullets, thus allowing a faster process sometimes.

It is convenient to write:

PROCreload(2)

to insert two new bullets, or:

PROCreload(6)

for a full reload.

The procedure needs to be re-written using the variable, *number*, to determine how many are loaded:

```
DEF PROCreload(number)
FOR shell=1 TO number
PRINT "Eject used cartridge"
PRINT "Insert shell"
NEXT shell
shot=0
ENDPROC
```

The number specified in the procedure call would automatically become the value of the variable, *number*, in the procedure. The advantages of passing information this way are not all immediately obvious. The numbers 2,6 and the variable,*number*, are called parameters and are examples of a major concept in computing. The obvious immediate advantages are convenience and clarity.

PROCreload(2)

→

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From Page 26

is closer to saying in English

"Reload two shells"

than

```
number=2
PROCreload
```

A further advantage is that the parameter,*number*, is treated by the computer as "local" to the procedure. This means that it cannot alter the value of a variable,*number*, used in the main program or in another procedure. The importance of this becomes greater as programs get longer or when procedures are transported to other programs.

It should be noted that the decision to allow reloading of fewer than six shells would imply a rethinking of the criterion for reloading. An alternative program is given, assuming the deputy starts with six bullets in his gun:

```
shots=6
REPEAT
gunout=RND(20)
PRINT "Fire a shot"
shots=shots-1
IF shots=0 THEN
    number=RND(6):
PROCreload(number)
    UNTIL gunout=20
    PRINT "Bandit throws out gun"
    END
    DEF PROCreload(number)
    FOR shell=1 TO number
    PRINT "Eject used cartridge"
    PRINT "Insert shell"
    NEXT shell
    shots=number
ENDPROC
```

After execution of the FOR loop in the procedure the new value of shots is the number of shells loaded. This information is passed back to the main program using an ordinary (global) variable, *shots*.

The reader may wonder why information is passed to the procedure with a parameter but back to the main program with an ordinary variable. The short answer is that the designers of BBC Basic were unable, or did not wish, to provide a parameter mechanism for the latter.

There is not a choice, but if there were, it might be argued that, in the early stages at least, the use of parameters in one direction and ordinary variables in another is an easier learning approach.

SUMMARY

- Procedures should be sensibly named.
- The definition should have a single entry point (the opening keyword) and a single exit point (the closing keyword).
- Information can be passed to a procedure by using parameters.
- The main advantages of using procedures are that they enable the programmer to concentrate on "mind-sized bites", one at a time and keep an overview of the whole program.
- Other advantages are ease of reading and the avoidance of repeated code.

Perhaps the concluding observation should be that the program does not provide for anyone actually getting killed or so seriously wounded that the fight terminates.

John Wayne once gave advice about acting: "Speak low, talk slow and don't say much." This article is intended to be a low-key, easy-paced introduction using a program contrived as an illustration. To make it more realistic at this stage would be saying too much.

MOST complaints received by Micro User from readers concern cassette loading and saving problems. We are continually being asked: "Which is the best recorder to buy?" Here's some timely advice from audio expert PETER ROCHFORD.

WHILE browsing around various computer shops that stock the BBC Micro, I have noticed that customers who arrive with their computer tucked under their arm proclaiming faults invariably have a cassette deck dangling from the other arm.

The conversation with the shop assistant that ensues normally follows the pattern of, "It won't load", "It won't save" or "Sometimes it loads", etc.

This observation leads me to the conclusion that despite the "Cassette Capers" articles in previous issues of *Micro User,* some of you are still struggling. Either that, or some owners of the Beeb are foolish enough not to be taking a copy of this excellent journal each month!

I have been using computers for about three years and have owned a UK101, a Commodore Pet and am now the very satisfied owner of the finest micro on the market – a BBC Model B.

With all these computers I have used the same cassette deck to load and save programs, namely a JVC 9201LSB radio cassette recorder which has a DIN record/playback socket and is equipped with remote motor control.

In the three years I have been using it I have never failed to load or save a program first time, nor has it ever devoured one of my precious programs or corrupted it. You can therefore understand my amazement at the problems people seem to have with cassettes.

It could be said that I am just lucky to have experienced no trouble but it is more likely because of my understanding of tape recorders, being an audio engineer by trade.

I intend in this article to reveal to you the secrets of my success and to give some details on choosing a cassette deck that should operate correctly and reliably with the BBC Micro.

You should also refer to the "Cassette Capers" articles in previous issues as there are important points there which I have not repeated here.

The question of tape deck compatibility with the BBC computer is a rather complex subject because there are so many factors to be taken into consideration. I have tried to keep things as simple as possible, and what follows should ensure that you will be successful in choosing the right machine.

First, don't consider any machine which would mean using the output from the earpiece socket to load programs. The output impedance is wrong, the signal will contain too much noise and distortion and, most importantly, the output level will be high enough to blow the cassette interface in your computer.

Look for a unit which has a five-pin DIN socket and possibly remote motor control capability too. The types of connection are discussed quite adequately on pages 12 and 13 of the user manual.

What the user manual does fail to give, however, is the input/output levels and impedances for a tape deck to match the computer cassette interface

Loading problems?

I never have them – and this is why

correctly. They are given in the panel on this page.

You probably won't find a cassette deck that has figures that match these exactly but they should be as close as possible. With the output level you have quite a large margin to play with and should present little problem. An audio dealer of any worth should be able to advise you if you give him these figures.

When choosing a deck that fulfils the above specification, don't just go for the cheapest machine. The extra expense will be worth it as the signal quality will be better, the tape transport of higher quality (very important) and hopefully it should be more reliable with greater longevity.

It is quite in order to use a stereo machine such as one of the large radio cassette portables which are so popular these days. They should be switched into mono mode if possible when used with your computer so that both channels are connected together.

You should try to obtain a machine whose output at the DIN socket is independent of the volume control, that is, a fixed level corresponding to those given earlier. This means that you will not have to fiddle around getting the output right each time and you will also be able to turn off the ghastly row that emits from the loudspeaker during a load or save.

Those machines with manual recording levels instead of automatic are advantageous insofar as they permit you to check whether enough signal is being put onto the tape so you can adjust it accordingly. However, you may find on playback the level has dropped, which is a good indication that the tape you are using is of poor quality or that the heads are dirty. This leads me nicely on to the next topic.

Machine cleanliness (that is, the tape transport) is of paramount importance if your load or save will have any chance of being successful. I clean the heads (record/playback and erase) along with the tape guides, rubber pinch roller and capstan once a fortnight. This is done by using cotton wool buds and head cleaning fluid, not those silly head cleaning tapes which are an ineffective and lazy way.

In addition, I use an electronic head demagnetiser every two months. This is the one manufactured by TDK and looks like an ordinary cassette. All you do is pop it into the cassette compartment and then press "play" for a few seconds. They cost about £10 from better audio dealers and can obviously be used to good effect on your hi-fi system and your car player, too.

Input impedance – *Greater than 150k ohms*
Output level – *20mv to 5v peak to peak (14v to 3.5v rms)*
Output impedance – *Less than 200 ohms*
Input level – *65mv peak to peak (46mv rms)*

While we are on the subject of care of the tape transport it is important to mention remote motor control. It is now common to have this feature on cassette decks and it can cause problems without you realising it.

When under computer control via the remote switch, the motor on the deck is switched off automatically after a load or save. Unfortunately, on most decks, except the very expensive ones, this leaves the soft rubber pinch roller in contact with the metal capstan. The effect of this over protracted periods is to cause deformation of the rubber roller which will lead to uneven tape feed and irregular tape speed.

Furthermore, the tape is held between the roller and capstan causing a crease which can lead to signal dropout when you next use this section. The answer is: Don't leave the deck in play or record mode with the motor off for long periods.

When it comes to the cassettes themselves this is where I suspect the root of a great many people's problems lie. Quite simply, the majority of so called computer cassettes are just rubbish. The only ones I have found any good are the expensive ones marketed by a national chain at well over £1 each.

The alternative is to buy TDK DC45 tapes (no, I don't work for TDK!) which are 22 minutes a side and cost about 60p each from discount tape retailers. If you find these too long you can cut and splice them, as I do.

Laborious? Maybe – but reliable, definitely! If you doubt my words on this subject do two things. First, take one of the computer tapes you now use and gently pull a small length of tape from inside the cassette using a pencil. Note how thin the tape is, then look at the tape against the light. Odds are that the magnetic coating is so thin that you can see right through it. Compare that with a good quality audio tape.

Second, having carefully spooled the tape back inside the cassette, put it on your hi-fi system and record some music on it. The results should be enough to convince you when compared with good audio tape.

A tip to remember when saving a program on tape is always to wind the cassette forward past the transparent

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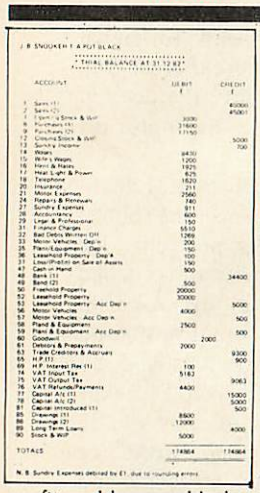

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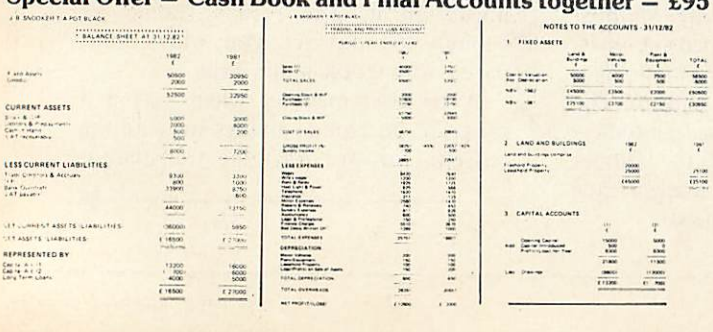

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6	INCOME		
7	Sales	11786	10944
8		———	———
9			
10	REVENUE EXPENDITURE		
11	Purchases	500	500
12	Advertising	500	1000
13	Director's salary	1596	1596
14	Salaries	2216	2216
15	Rent		
16	Telephone		300
17	Insurance		200
18	Printing, stationary		400
19	Repairs & renewals		
20	Hire of equipment	60	60
	COMMAND BCDEFGPRSTW'?		

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- In fact, anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

Program Availability Chart:-

	Database	Stock Control	Mailist	Invoices & Statements	Spread sheet Analysis	Cashbook Accounting	Word processor	Home Accounts	Commercial Accounts	Plot	Final Accounts
Sinclair Spectrum 16k or 48k	●	●	●			●		●	●	●	●
Dragon 32k or 64k	●	●	●	●	●			●	●	●	
VIC 20 (16k +)	●	●	●	●				●	●		
Sinclair ZX81 (16k +)	●										
Grundy Newbrain	●		●								
Sharp MZ80A	●	●	●	●				●	●		
Sharp MZ80K	●	●	●	●				●	●		
Sharp MZ80B	●	●	●	●				●	●		
BBC Micro model A or B 32k	●	●	●	●	●	●	●	●	●	●	●
Atari 400/800	●										
Torch	●	●	●	●	●	●	●	●	●	●	●
Epson HX-20	●	●	●								
Commodore 64	●		●					●			

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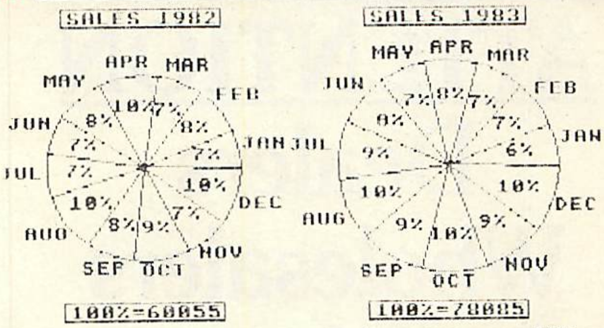

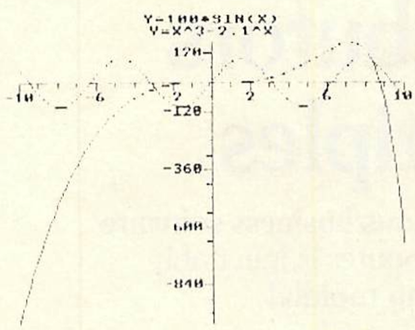

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From Page 31

leader by inserting a ballpoint pen in the take-up spool hub. This will ensure that your program is recorded on to the tape and not the leader! In addition, because there is a time delay during the save process before the computer starts sending data to the tape deck, the tape has further advanced past the initial section, which invariably has imperfections in it from the manufacturing process.

Contrary to popular belief your computer is more critical of your tape deck's performance for storing data than your ears are for its reproduction of music. This is hardly surprising when you consider the density of data being stored. At 1200 baud your recorder is loading or saving 120 characters per second on $1\frac{7}{8}$ inches of tape.

It doesn't take much to realise that the smallest imperfection in the tape, such as a crease or piece of missing oxide coating, will cause loss of information and subsequent loading problems. Likewise, variations in tape speed and tape feed will cause problems too. Cheap tapes are a false economy. If you want to be free from the dreaded "Bad Program", use good quality audio tapes.

A friend of mine had the odd intermittent problem loading and saving with his Beeb, despite using a good quality deck and adhering to all the precautions I have outlined already. We eventually traced his problem to mains interference from other electrical equipment in the house.

This was resolved by using a QED mains interference suppressor, which is available from the specialist audio retailer. Both the computer and the cassette deck are plugged in to this to make it effective.

During our fight to cure his problem we managed to retrieve some of the programs corrupted by mains interference during saving by using the following simple procedure. I can't guarantee it will work all the time but it's certainly worth trying.

If you save and then try to reload a program and find it is corrupted, do a hard reset on the computer, rewind the tape to the beginning and type *OPT 2,0 (see page 398 of the useless manual, sorry, user manual) and then press Return. Then type LOAD (don't type CHAIN) followed by the filename, start the tape and press Return.

The computer will now ignore all cassette errors during loading, though it will issue error messages which you, like the computer, should ignore. The program should hopefully now load successfully and the computer issue its normal end of file bleep.

Don't try to run the program! Instead, list it and you should find most of it intact. At least you will get some, if not all, of it back and can compare it with your original listing to correct errors. Note, however, that if block zero of your program is missing you won't get it to load at all as the operating system looks for this to initiate loading. This may happen if you have the 0.1 OS, in which case try using the cassette bugs fix published in the March issue of *Micro User*.

Well, I hope the ideas I have put forward will enable you to achieve the same success I have with cassette loading. There is no reason why not. Just pay particular attention to keeping your deck transport clean and use good tape.

What our Technical Editor says

WHILE I would heartily agree with most of what Peter Rochford has written, I must differ about his stated requirements for the input/output specifications of a tape recorder suitable for the BBC computer.

His specification will certainly work with the computer, but do not be misled into thinking that this is the minimum specification in respect of the BBC Micro.

From experiments I have carried out I have found that the BBC Micro requires the tape recorder to have input impedance greater than 10k with a sensitivity of 100 mV PTP and output impedance less than 1k with a signal of 2V PTP. It is plain that most domestic recorders will meet this spec., so why will some not work?

This can be for many reasons. For instance, the quality of the tape transport mechanism is quite low on the cheaper machines. This can cause tape grab as the tape does not move smoothly through the machine.

Also the speed of the mechanism must be in theory ± 4.5% of true speed. As this is the limit, look for a spec. of ±2% or better.

The frequency response of the recorder should be better than 2dbs at the two spot frequencies of 1200Hz and 2400Hz. This is a figure that is not normally known (even by the manufacturers), let alone quoted.

There is another point that can cause an otherwise excellent recorder to fail to work on a computer and that is the question of phase shift. There must be a minimum phase shift between the two frequencies (1200Hz and 2400Hz) that are used on the BBC Micro. If there is some shift, it will introduce distortions into the signal which can cause it not to work.

As the human ear cannot detect the phase in a sound this is something that is often ignored in the design and is just left to chance. This is quite difficult to measure on a tape recorder and you will have to test it by seeing if it works on your computer.

Perhaps this explains why seemingly identical recorders will give differing results.

This should not happen with a recorder that has been especially designed for recording computer data.

Finally I would like to disagree with Mr Rochfords' comments on the desirability of a fixed volume level out of the DIN socket. In some recorders this is not sufficiently strong to operate the BBC Micro.

However, assuming that it is, there would also be no way to compensate for a tape recorded at a lower saturation, or a slightly different head alignment. This can happen when you are playing a tape not recorded on your own machine.

Mike Cook

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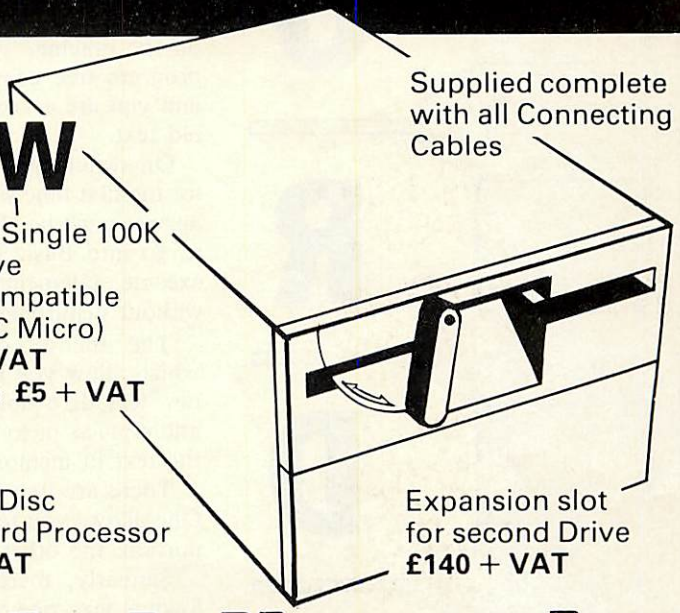

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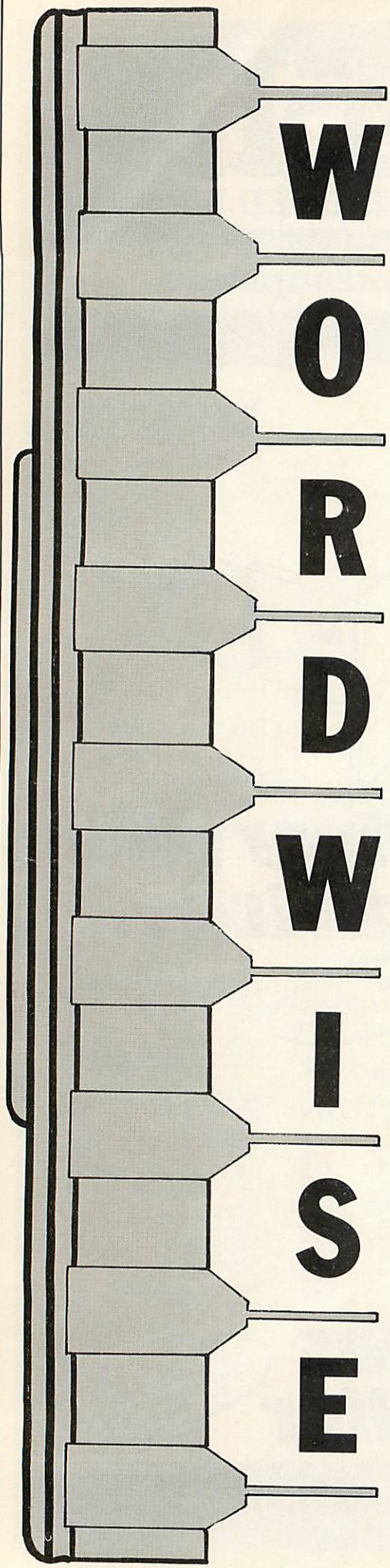

WORDWISE is a word processing program on a chip. It can be fitted into the rightmost ROM socket in which case you will go into Wordwise on switching on, or into the socket to the left of the Basic ROM, in which case you enter Basic as usual.

When in use it will take up the 16k allocated to Basic, which has the advantage of leaving the user 32k (less display memory – 1k in teletext mode – and the 3.5k used by the MOS) for text storage.

It will only run with OS1.0 or higher and though it will run on a model A there will be a lot less space for the text, which will have to be transferred on tape to a model B for printing.

The program operates in two modes, menu mode (on switching on) and edit mode.

To get into Wordwise after switching on the machine you type "*W.". The program title comes up on the screen and you are asked if memory contains old text.

On switching on, or using Wordwise for the first time since switching on, the answer must be "No", but it is possible to go into Basic (using *BASIC) and execute statements in immediate mode without disturbing memory.

The menu contains eight items which allow you to save old text, load new text, do a global or selective search and replace, or to review, print or spool the text in memory.

There are two forms of saving text. One allows you to save only a marked portion, the other saving all the text.

Similarly, there are two forms of loading text, one replacing the contents of memory with the loaded text, the other inserting the new text at the cursor.

Search and replace will either replace every occurrence of a given string with another or, in the selective mode, will stop at every occurrence of the string and give you the option of replacing it, leaving it unchanged or (by pressing Return) of deleting it.

If you just want to find all occurrences of a particular string, you can use the selective replace with a null replacement string and press "N" every time.

The other menu items output the text in its formatted state. This may be to the printer – normally through the Centronics interface but this can be easily changed to the RS423 interface – to the filing system (Wordwise can be used with both cassette and disc filing systems) or to the screen.

Sending it to the filing system allows documents to be sent to people who do not have Wordwise.

Text sent to the screen can be previewed in its formatted state. If there is enough room then an 80 column display will be used, otherwise it will be displayed in 40 columns.

To send output to the RS423 interface the command *FX5,2 is used in menu mode. Since the program can communicate with a printer over both a Centronics and an RS423 link, there should be little difficulty in connecting it.

THE MENU

1. **Save entire text.**
2. **Load new text.**
3. **Save marked text.**
4. **Load text to cursor.**
5. **Search and Replace.**
6. **Print text.**
7. **Preview text.**
8. **Spool text.**

Pressing the Escape key will go from menu mode to edit mode or vice versa. Using the Escape key while in one of the menu operations will abort it and return you to the menu.

While in menu mode, any MOS command such as *CAT or a *FX command can be given. Wordwise is left by typing *BASIC in menu mode.

Edit mode is the one you actually write your text in. The cursor keys are used to move around the screen, and one disconcerting thing is that the cursor line remains in the middle of the screen while the lines move up or down around it. However this does mean that the 12 lines before and after the cursor line are always in view.

The cursor keys will move one character to the left or the right, or one line up or down. Pressing CTRL together with a cursor key will jump one word to left or right or 23 lines (one page) up or down.

Pressing Shift and a cursor key will move the cursor as far as it will go in that direction – to the beginning or end of the line, or to the beginning or end of the text – very neat and logical.

When typing in the text no Returns are necessary as a word which goes over the end of a line is (instantly) transferred to the beginning of the next line. If a Return is typed then a line break occurs and the words on the next line will not be used to fill the previous line. By this simple means paragraphs

CHRIS MARTIN reviews the word processing program that comes to you packed in a chip

and blank lines may be inserted into the text.

As lines are typed in, a status line at the top of the screen shows how many words the text contains as well as the number of characters remaining in memory.

In Edit mode Wordwise uses the function keys to provide a set of very useful editing commands. They also allow one to start and end embedded commands.

FUNCTION KEYS

- **f0** *Swap between Insert and Overwrite mode*
- **f1** *Start formatting command*
- **f2** *End formatting command*
- **f3** *Set marker (up to 2 can be set)*
- **f4** *Move to a given character*
- **f5** *Count words to a given character*
- **f6** *Delete to a given character*
- **f7** *Delete text between markers*
- **f8** *Move marked text, inserting it at the cursor*
- **f9** *Copy marked text, inserting it at the cursor*

Key 0 is used to change from Insert to Overwrite mode. On entry, the program is in Insert mode – all text entered pushes any text after it to the right to make room. In Overwrite mode the text remains where it is and the new characters overwrite the text already there.

Key 3 allows two markers to be set.

→

Command	Range	Default	Formatting commands
LMn	0 to 180	5	Set left margin
LLn	10 to 200	70	Set line length
INn	0 to LL-10	0	Set indent
TIn	0 to LL-10	0	Set temporary indent
CI	--	--	Cancel indent
PLn	10 to 200	66	Set number of lines per page
TSn	0 to 50	7	Set top margin
DH <text>	--	--	Define heading as <text>
HPn	0 to TS	3	Set heading position in top margin
BSn	0 to 50	7	Set bottom margin
DF <text>	--	--	Define footing
FPn	0 to BS	3	Set footing position in bottom margin
JO	--	ON	Justify text
NJ	--	OFF	No justification
LSn	1 to 50	1	Set line spacing (LS1 is single spacing)
SS	--	ON	Set single spacing
CEn	1 to 200	1	Center the next n lines
OCn",n3	0 to 255	--	Output control codes - as many codes can be sent as required
SPn	0 to 200	0	Leave n blank lines
CO	--	ON	Print text with no pages, headers, footers &c
EP	--	OFF	Print text with pages, headers, &c
BP	--	--	Start a new page
PNn	1 to 1999	1	Set page number
CPn	0 to PL	--	Start a new page unless at least n lines remain
DPn	0 to 255	96	Send code n for pound sign
PCc	! to z	ñ	Set pad character
DTn,n	0 to 200	10,20,...	Define tab stops (up to 9)
EM	--	OFF	Give "PAPER!" message at end of page
DM	--	ON	No "PAPER!" message
PP	1 to 9999	PN	Print page number
GF"filename"	--	--	Get file & dump it to printer

From Page 39

Text between them may be saved, printed, moved, copied or deleted.

Saving and printing are done by returning to Menu mode after setting the markers. Moving, copying and deleting are done using keys 7, 8 and 9 in Edit mode.

Move deletes the passage between the markers while inserting it at the cursor. Copy inserts the marked passage in the same way but doesn't delete it.

There are three other key functions:

Move To moves the cursor to the next occurrence of the character entered in response to the resulting query.

Word Count allows the count of words to be made for parts of the text only.

Delete To will delete text from the cursor position to the next occurrence of a given character.

One nice editing feature is CTRL-S, which will swap the case of the letter under the cursor from lower to upper case or the other way round. I like this – but then I have a predilection for CASE chanGES.

Formatting commands are entered by pressing f1 and ended by pressing f2. Multiple commands can be entered in an abbreviated mode where the f1 key for the following command acts as the f2 key for the previous one.

There are commands to set the left margin and the line length, the page length and the margins at the top and bottom of the page.

Headers and footers can be defined and these can include formatting commands in the string, though only a few commands like the "Print page number" command make any sense.

Indents can be set and, to allow the first line of a paragraph to be indented, a temporary indent which applies to the next line only can be defined.

Text may be justified – extra spaces are inserted in a line so that the right margin as well as the left is aligned – or not justified, with a ragged right margin.

Line spacing can be set to any number or single spaced, and lines can be centred.

There is a command to leave a variable number of lines blank which is useful if diagrams or tables are to be inserted later. There is another to force a new page if there are less than a given number of lines left on the current page.

This can be used to make sure that chapters, lists or paragraphs are not split awkwardly between pages.

A related command allows a file to be read in at any point in the text and dumped straight out to the printer – this might be a program listing or a piece of program output.

Another command (initially active) causes the printout to be made without headers, footers or page numbers as a rough draft mode. When it has been licked into shape, page mode can be enabled and the full formatting appreciated.

There are no commands to activate printer functions like underlining, super- or subscripting, double or condensed printing but the OC (output control codes) command will send an arbitrary string of characters – entered as decimal numbers – to the printer.

There is also a special command to define the code to be sent to the printer for a "£" character.

The BBC Micro sends code 96 for this character but the Epson printers (in the English character set) and Diablos print a "£" for code 35. The simple command DP35 will ensure that your pounds don't become devalued!

There is provision for a pad character (initially "¦" but this can be changed by another formatting command) which can be used to make sure that when text is justified extra spaces are not inserted where they are unwanted. The character appears in the text as "¦" but is printed as a space.

Finally, it is possible to get the program to stop at the end of a page, bleep and display "PAPER!" so that if single sheets are being used, there is time to put in the next sheet.

There are a number of other commands which you will find in the table on Page 39, but it is primarily the commands that I have discussed that will enable the reader to decide whether Wordwise is what he is looking for.

The manual also contains a section on hints and tips. Among other things this shows how Basic programs may be edited using Wordwise – this is both possible and easy.

The final section of the manual contains some technical details about the program and a list of all the formatting commands and the operations performed by the function and cursor keys.

The chip arrived with an example on cassette, a 30 page manual, a sheet containing the installation procedure and a function key label strip to slide under the plastic strip above the keys.

Installing the chip is easy if you have some experience. Previously I had none, and I managed to bend some of the legs. Thinking that any minute they would drop off and I would be left with

£45 of useless chip, I was sweating.

However a more experienced colleague came to my aid and coolly straightened the bent legs, aligned both sides with the holder and in it went with no further trouble.

Anybody without experience who is determined to insert their own chip would be well advised to read the article by Mike Cook in the March issue of *Micro User*.

Using Wordwise is made easier if you have a colour monitor, as the status line and the formatting code appear in colour. On a monochrome monitor they would appear as shades of grey which would be easy to overlook (Inland Revenue please note!).

The manual is well laid out and well printed, though it seems rather difficult to find the command you want. The list of commands in the back is printed in the order they appear in the text. It would perhaps have been better if they had been in alphabetical order.

Wordwise is easy to get started with since the text is neatly formatted with no need for special commands, just typing it in with Returns to separate paragraphs.

Once this has been done you can start setting up headers and footers, centering headings and so on.

It seems a very good program and worth the money.

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STRIKE LUCKY

By ANDREW PHILIPS

TENPINS is a simulation of the game of tenpin bowling. It uses Mode 7 graphics to ensure that the program can run on both models A and B.

The program is quite straightforward. The list of procedures should explain what's going on clearly enough to allow you to make your own modifications.

The game follows the normal rules of play, and incorporates the standard method of scoring.

It consists of ten FRAMES, each player bowling two balls in a frame (unless the first bowl is a strike).

If a player scores a STRIKE (all 10 pins down with the first bowl) a bonus of the next two balls is added to his score.

A SPARE (10 pins down with two bowls) gives a one-ball bonus.

A strike in the final (10th) frame gives a player two bonus balls (EXTRAS).

A spare gives one EXTRA.

To bowl a ball, a player must make three entries, as follows:

POSITION (0 to 9) ?

Enter the starting position of the ball. 0 is the left of the lane, 9 is the right.

SPEED (0 to 5) ?

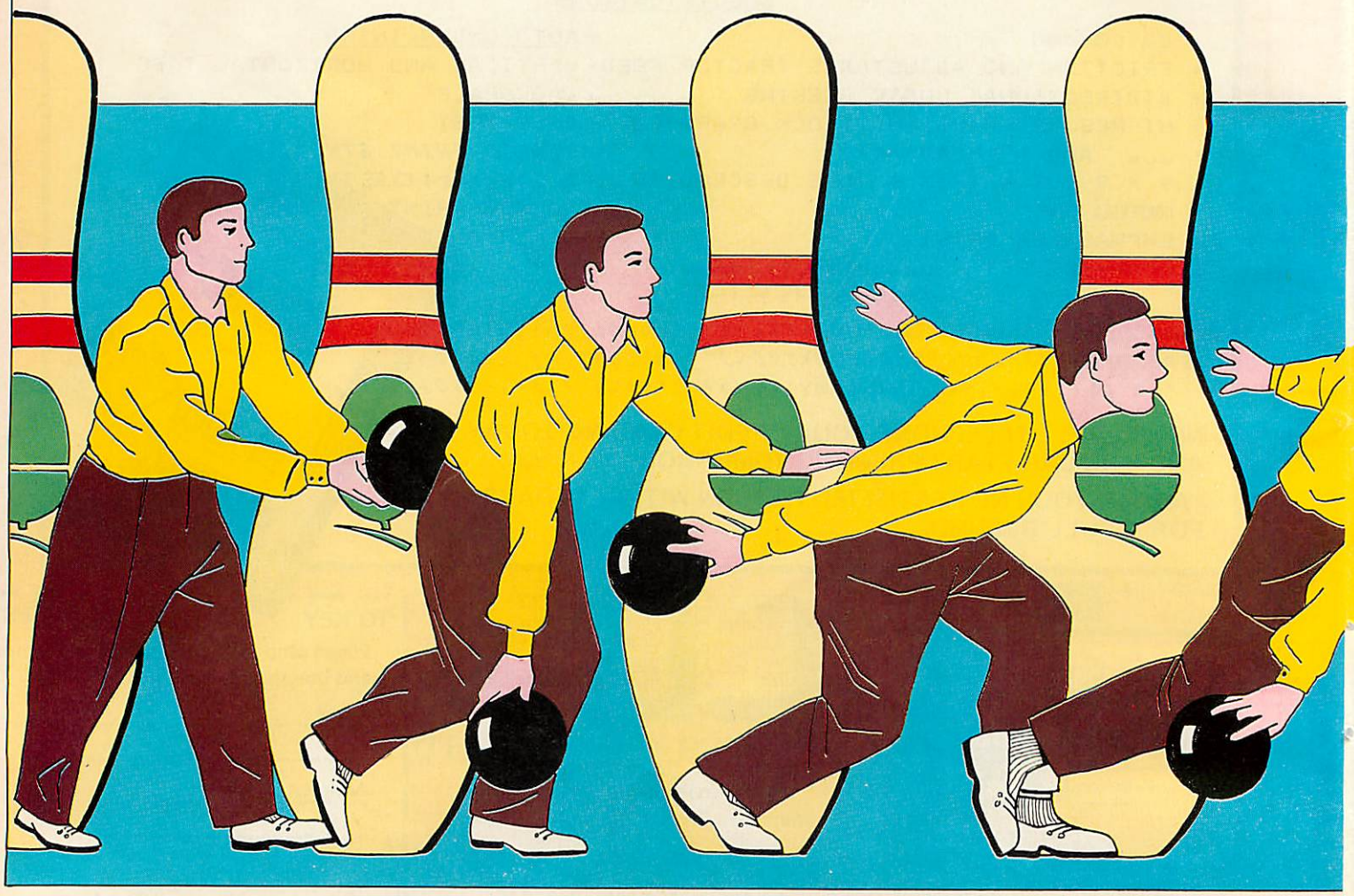
Enter the speed of the bowl. 0 is slowest, 5 is fastest.

BIAS (L or R) ?

Enter the direction in which the ball is to "swerve" – left or right.

The amount of "bias" is inversely proportional to the speed of the bowl. The slower the bowl, the greater the "swerve".

To make the game more interesting, the exact degree of bias is unpredictable.

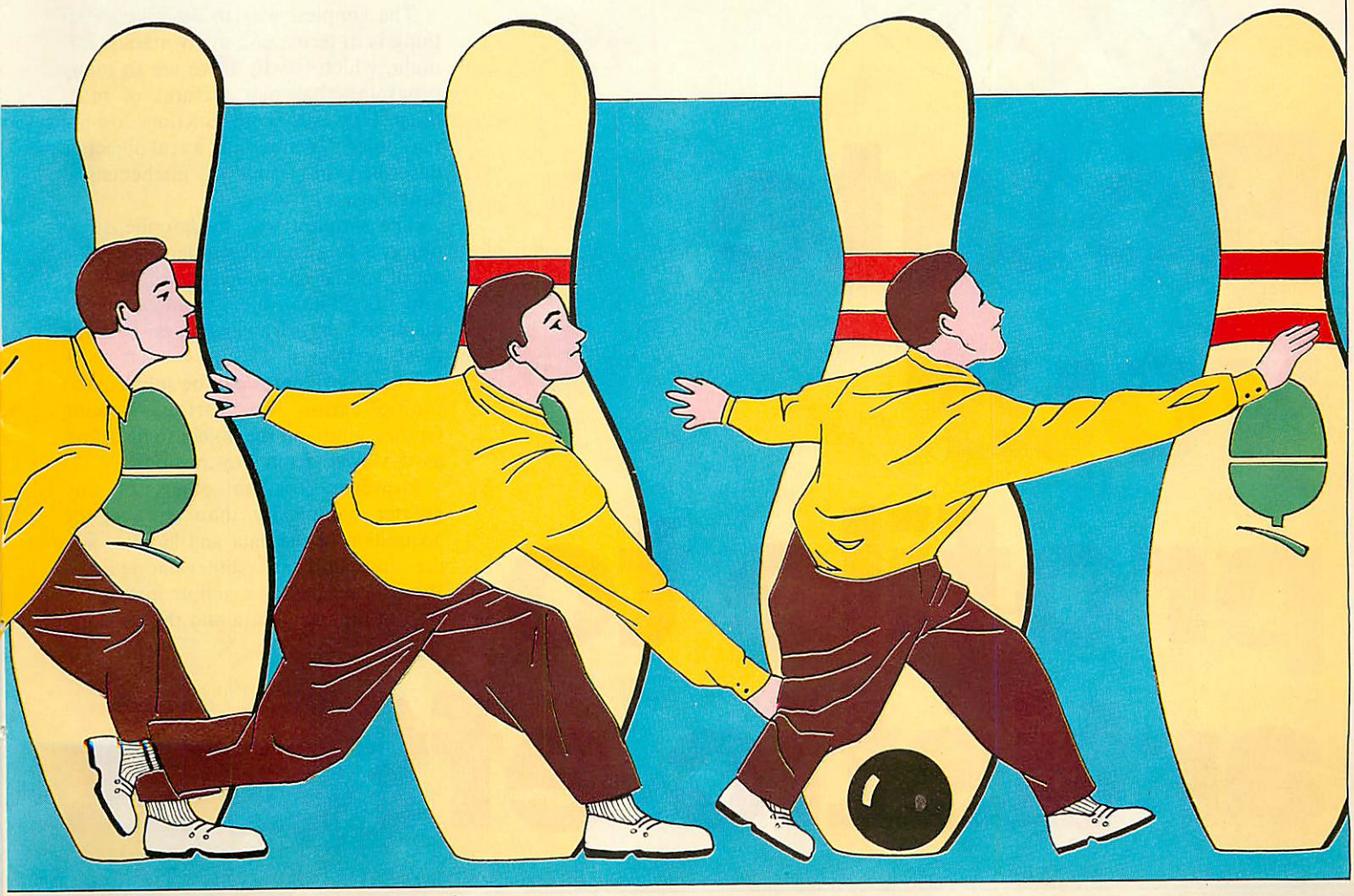


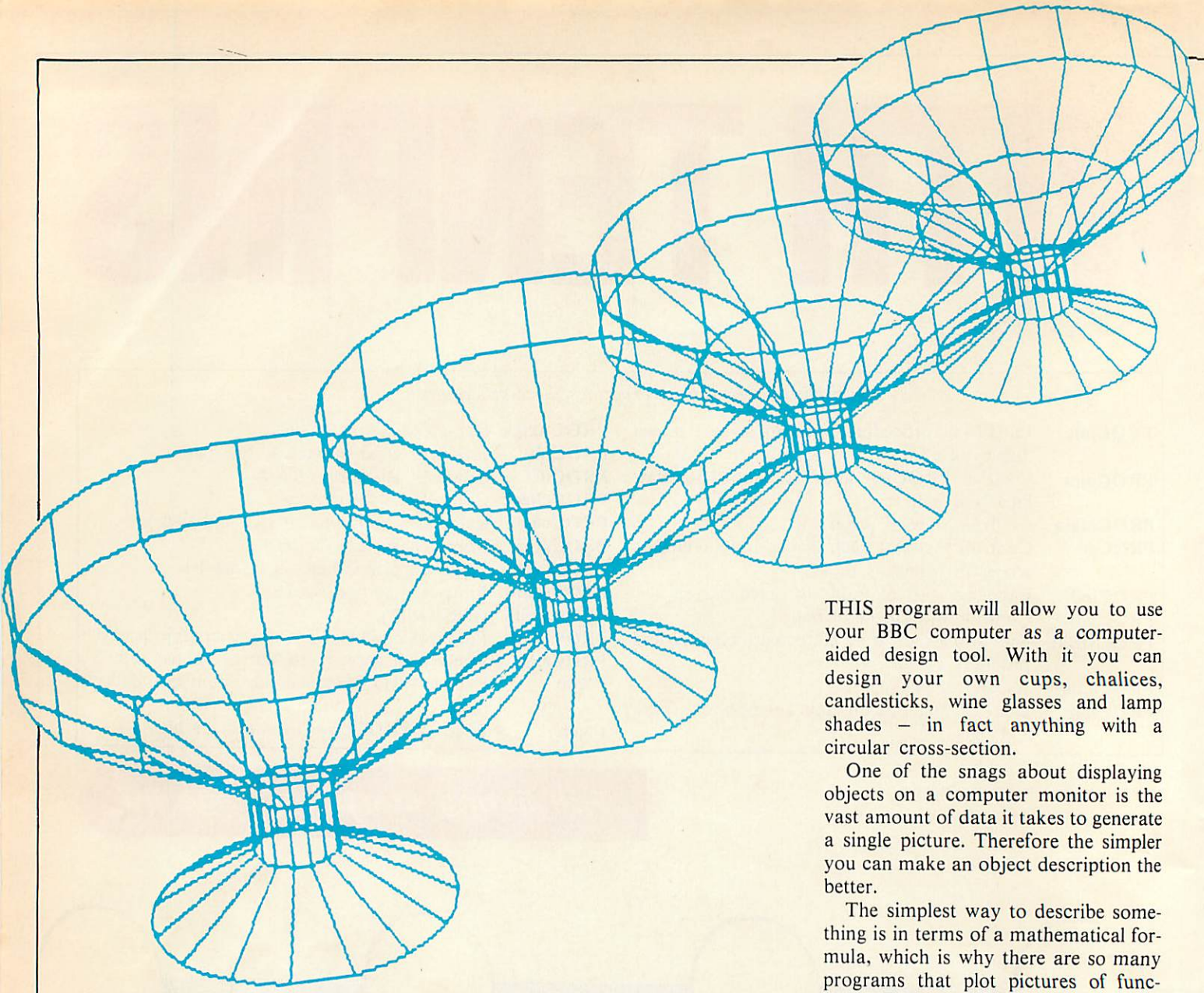
WITH TENPINS

The program structure incorporates these procedures:

PROCinit	Initialising procedure: sets up arrays, screen display, etc.
PROCplot	Used in PROCinit and PROCbowl to draw lines and ball.
PROCmain	Controls flow of program.
PROCgo	Controls logic for each player and increments scores in frames 1 to 10.
PROCind	Indicates start of frame for each player.
PROCbowl	Controls movement of ball.
PROCstrike	Sets strike indicator, increments counter and produces sound.
PROCspare	As above, for spare.
PROCinp	Does calculations on input for position, speed and bias.
PROCweigh	Controls amount of bias.
PROChit	Produces crash when ball hits pins.
PROCdef	Controls deflection of ball.
PROCcheck	Controls fall of pins.
PROCcalc	Calculates bonus for spares and strikes.
PROCpins	Prints characters for pins.
PROCextra	Logic for bonus balls in frame 10.
PROCscore	Prints scoreboard figures.
PROCwait	Gives delay.
PROCprint	Produces double height characters for display.
PROCend	Prints highscore, resets cursor control, etc.
FNtot	Used in PROCgo to calculate number of fallen pins.
FNch	Used in PROCbowl to check for hit.

Full listing starts on Page 99





Rotate your profile to artistic effect

THIS program will allow you to use your BBC computer as a computer-aided design tool. With it you can design your own cups, chalices, candlesticks, wine glasses and lamp shades – in fact anything with a circular cross-section.

One of the snags about displaying objects on a computer monitor is the vast amount of data it takes to generate a single picture. Therefore the simpler you can make an object description the better.

The simplest way to describe something is in terms of a mathematical formula, which is why there are so many programs that plot pictures of functions. However these functions are not real objects, neither can a real object be described in terms of mathematical functions.

The simplest way to describe a real object is to give each corner or vertex a set of spatial co-ordinates, usually X, Y and Z. The object can then be displayed by drawing lines between these vertices.

The co-ordinates can be subjected to multiplication by various scaling factors, enabling the object to be drawn as if viewed from any position.

However, for an object of any greater complexity than a cube, the acquisition of the data and its entry into the computer are somewhat tedious. What is needed is a simple interactive way of inputting data and then making

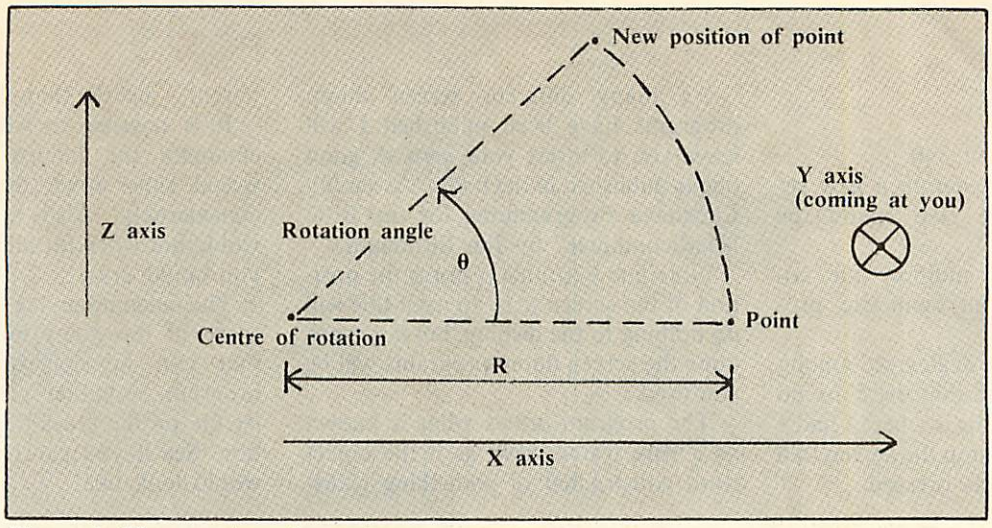


Figure I: The rotation of a point

the most of it.

After a sentence like the last it will come as no surprise for you to find that this program does just that!

If an object has a circular cross-section then it is only necessary to input the profile of the object and let the computer generate all the points needed to draw it.

Consider Figure I. You are looking down onto a point with the Y axis coming out of the paper at you.

If you rotate that point through some angle, Θ, it will have new X and Z co-ordinates but the same Y co-ordinate. The new values will be:

X=R*COS(Θ)
Z=R*SIN(Θ)

where R is the distance between the point and the centre of rotation.

If this is repeated for many different angles of rotation we can create a whole host of points from the one original value. This will then produce a circle composed of many points.

The co-ordinates of each point can in turn be multiplied by a transformation matrix – this just means set of numbers – to reveal the co-ordinates of that circle as viewed from any angle.

If this is repeated for a few different points we can generate a solid of rotation.

All that is needed then is a way of entering the original points. It is possible to draw the points that make up the profile on a piece of graph paper, read off the position of each and type it into the computer.

However, changing the profile until you have the right design is messy and repetitive and a computer thrives on repetitive tasks. A better way is to use the computer interactively to produce and edit the profile.

One technique of doing this is called "rubber banding". This is a technique by which the controlling points of a shape can be moved and the lines to and from them also move as if connected by a rubber band. In this way a shape can be generated and changed interactively until it is just right.

This program allows you to enter a profile using rubber banding techniques

By MIKE COOK

and then draws the isometric projection of the solid created by rotating that profile. The profile may then be edited and the new shape drawn.

The program first asks how many points you want to include to define the profile. Nineteen is the maximum number and is more than enough, I tend to use between three and seven.

Note that this is the only point in the program where you have to press the Return key.

The screen then shows a dotted line, which is to be the axis around which the points are rotated. On the left hand side is a line which is the initial profile.

To select a point just press the key corresponding to its number. For point numbers greater than nine, holding the shift key down adds ten to the value of the key pressed. For example, to select point 14 hold down the shift key while pressing four.

Providing you have selected a valid point you will see it flash. If this is not the point you want to move simply select another. Number 1 is the bottom point and the numbers increase as they move up the profile.

Having selected a point it may be moved by using the four cursor control keys. Holding the keys down makes them auto repeat and the point may be steered into place.

When you have the profile you want you can see the solid of rotation by typing the "D" for draw key. After you have studied it, typing any key brings you back to edit the profile.

You can type "N" to select a new number of points or to start again from the initial position. To exit the program hit the Escape key.

As the cursor keys have been used to edit the profile you must reset them to perform the normal editing function. This can be done by pressing function key 0.

For those of you who want to tinker with this program here are a few notes about how it is constructed:

Lines 10-290 comprise the instructions and setting up of initial values. The value RT in line 270 determines the number of points generated in the rotation. This is also half the number of vertical lines to be drawn. The given value is a good compromise between detail and speed of drawing. The value PR in line 280 gives the point of rotation.

Lines 300-380 initialise the points in the profile and draw it. The profile control points are stored in a two dimensional matrix P(A,B), where A is the point number and B is the axis, such that 0 = X axis, 1 =Y axis, 2 = Z axis.

Lines 390-980 allow the profile to be edited using the rubber banding technique.

Lines 660-950 draw the isometric projection of the solid, with lines 810-910 putting the vertical lines in every other point. You can change this by

→

From Page 45

altering lines 820 and 840.

Lines 960-1010 generate a new set of co-ordinates one step round the solid.

Lines 1020-1050 multiply the co-ordinates to give an isometric projection.

As a final note the eagle-eyed among you will have spotted that there are no lines 440 and 940. This is where I had a call to a routine to dump the screen to a printer when a P was pressed.

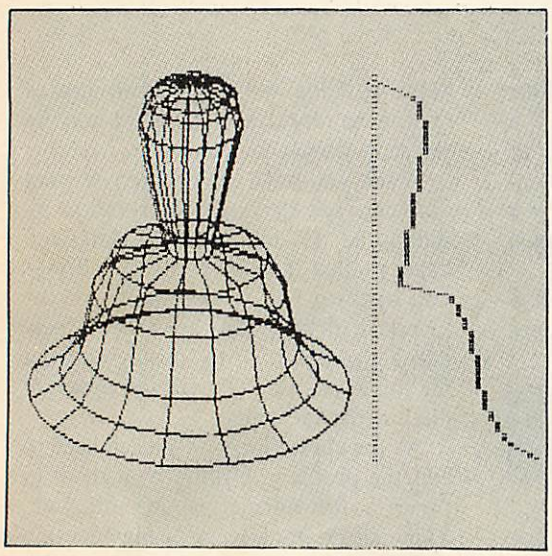
As many different screen dump programs have been published I will leave you to insert your own. A good one is published in the book "Assembly Language Programming for the BBC Microcomputer" by Ian Birnbaum.

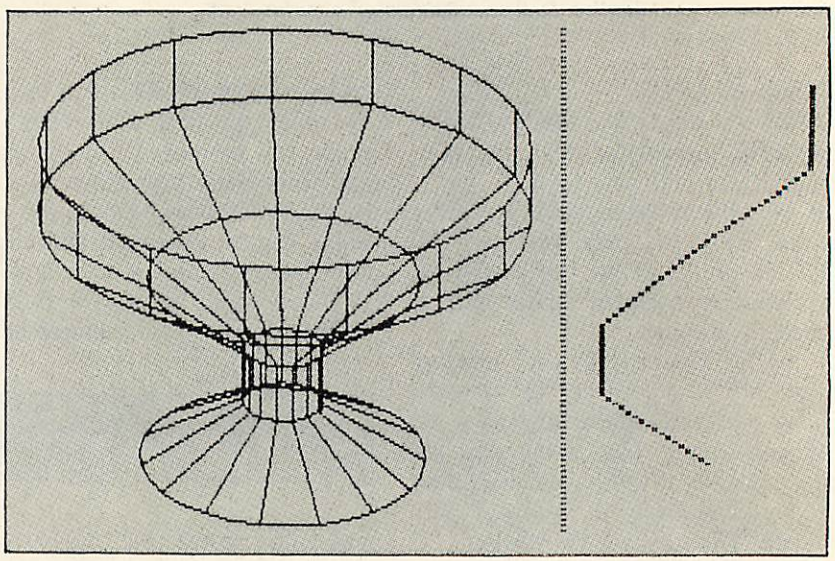
Note line 920: this restores the position of the screen axis. In itself this will do nothing to the display, but if it is not done the screen dump programs will be confused.

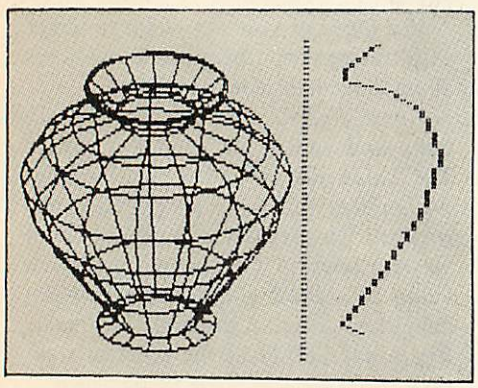
The program draws what is known as a wire frame view, as if the object were constructed of something transparent – just the thing for a wine glass.

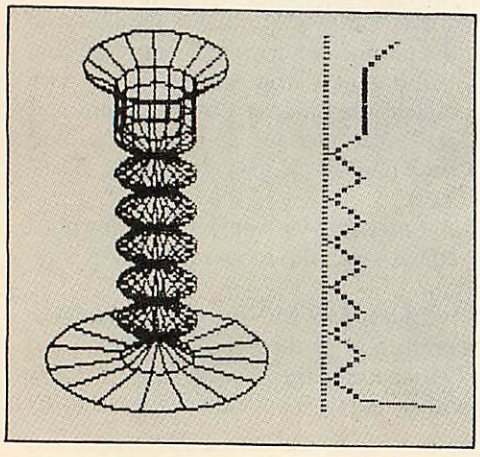
It is possible to write a routine to eliminate the hidden lines but this would slow down the drawing time considerably. Also a simple routine would not work for all possible profiles you could draw.

The accompanying diagrams show some of the many interesting shapes that can be constructed with this program. Note that it is also possible to let the profile cross the centre of rotation. See if you can predict what that would look like!









```
  5 REM YOUR CUP RUNNETH OVER By Mik
e Cook
  10 *KEY0 *FX4,0 |M
  20 DIM P(19,2)
  30 *FX4,1
  40 MODE7
  50 PRINT"SOLID OF ROTATION"
  60 PRINT:PRINT
  70 PRINT"THE ROTATION AXIS IS SHOWN
 DOTTED"
  80  PRINT:PRINT
  90 PRINT"1) FIRST DRAW THE PROFILE"
 100 PRINT
 110 PRINT"SELECT THE POINT YOU WANT"
 120 PRINT"TO MOVE BY TYPING IT'S NUM
BER"
 130 PRINT"HOLD DOWN SHIFT FOR NUMBER
S >9"
 140 PRINT
 150 PRINT"MOVE IT WITH THE CURSOR KE
YS"
 160 PRINT"CONTINUE UNTIL YOU HAVE DE
SIRED PROFILE"
 170 PRINT
 180 PRINT"THEN"
 190 PRINT"2) TYPE D TO DRAW THE SOLI
D OF ROTATION"
 200 PRINT"THEN ANY KEY TO EDIT PROFI
LE"
 210 PRINT
 220 PRINT"TYPING N WILL RETURN TO TH
IS PAGE"
 230 PRINT:PRINT
 240 INPUT"INPUT THE NUMBER OF POINTS
 TO USE",NT
 250 IF NT>19 THEN PRINT "LESS THAN 2
0 PLEASE":GOTO 240
 260 IF NT<2 THEN PRINT"TRY AGAIN":GO
TO 240
 270 RT=30
 280 PR=650
 290 MODE 2
 300 FOR N=1 TO NT
 310 P(N,0)=700
 320 P(N,1)=(600/NT)*N
 330 NEXT
 340 MOVE PR,0 : PLOT 21,PR,1027
 350 MOVE P(1,0),P(1,1)
 360 FOR N=2 TO NT
 370 DRAW P(N,0),P(N,1)
 380 NEXT
 390 K=GET
```

```
  400 N=K AND &F
  410 IF INKEY(-1) THEN N=N+10
  420 IF K=68 THEN MODE 0 :PROCDRAW:MO
DE 2:GOTO 340
  430 IF K=78 THEN GOTO 40
  450 IF N>NT OR N<1 THEN GOTO 390
  460 PLOT 70,P(N,0),P(N,1)
  470 MOVE P(N,0),P(N,1)
  480 REPEAT
  490 K=GET
  500 S=1
  510 PROCINVPLOT(7)
  520 IF K=&88 THEN P(N,0)=P(N,0)-4:S=
0
  530 IF K=&89 THEN P(N,0)=P(N,0)+4:S=
0
  540 IF K=&8A THEN P(N,1)=P(N,1)-2:S=
0
  550 IF K=&8B THEN P(N,1)=P(N,1)+2:S=
0
  560 PROCINVPLOT(5)
  570 UNTIL S=1
  580 GOTO 400
  590 DEFPROCINVPLOT(OP)
  600 IF N=1 THEN MOVE P(N,0),P(N,1):G
OTO 630
  610 MOVE P(N-1,0),P(N-1,1)
  620 PLOT OP,P(N,0),P(N,1)
  630 IF N=NT THEN GOTO 650
  640 PLOT OP,P(N+1,0),P(N+1,1)
  650 ENDPROC
  660 DEFPROCDRAW
  670 CLS
  680 VDU 29,640;200;
  690 C1=.707107:C2=.408248
  700 C3=.816597:C4=-C2
  710  TI=2*PI/RT
  720 FOR N=1 TO NT
  730 TH=-TI
  740 FOR R=1 TO RT+1
  750 TH=TH+TI
  760 PROCROTATE
  770 PROCTRANS
  780 IF R=1 THEN MOVE X,Y ELSE DRAW X
,Y
  790 NEXT R
  800 NEXT N
  810 REM PUT IN THE VERTICAL LINES
  820 TI=TI*2
  830 TH=-TI
  840 FOR R=1 TO RT+1 STEP 2
  850  TH=TH+TI
  860 FOR N=1 TO NT
  870 PROCROTATE
  880 PROCTRANS
  890 IF N=1 THEN MOVE X,Y ELSE DRAW X
,Y
  900 NEXT N
  910 NEXT R
  920 VDU 29,0;0;
  930 K=GET
  950 ENDPROC
  960 DEFPROCROTATE
  970 TM=P(N,0)-PR
  980 X=TM*COS(TH)
  990 Y=P(N,1)
 1000 Z=TM*SIN(TH)
 1010 ENDPROC
 1020 DEF PROCTRANS
 1030 Y=C2*X+C3*Y+C4*Z
 1040 X=C1*X+C1*Z
 1050 ENDPROC
```

They say the pen is mightier than the sword... and PRINT is pretty powerful, too!

I LOOKED up from my desk as the editor stumbled back from his lunch.

"You, " he cried, "still here?"

"Yes," I replied sarcastically. "I'm hoping to get into print sometime."

"Well now's your chance. Get into PRINT and write about it – and I want it yesterday."

He negotiated the door of his office (giving me an idea for a game where you have to guide an alcoholic editor through a set of desks). With a sigh I reached for my keyboard. PRINT . . .

By NIGEL PETERS

THE strange thing about the PRINT command is that it doesn't actually print anything. At least, it doesn't print anything on paper. All it does is to tell your micro to display on the TV screen whatever follows the PRINT statement.

For example, if you want to display the word "Hello" on the screen (which beginners' books seem to assume you do with sickening regularity) you type:

```
PRINT "Hello"
```

and press the Return key. The word Hello then appears on the screen and, presumably, some people think the micro's talking to them.

What you've done is to use the PRINT statement to tell the micro to "print" something on the screen. What actually appears on the screen depends on the "print list", the items that follow the PRINT statement.

In the above example you've followed your PRINT with "Hello" and you get a screen showing:

```
Hello
```

By putting the inverted commas around the word following PRINT, you've told the micro to show on the screen exactly what came between the inverted commas. Try a few more, e.g.:

```
PRINT"Literally what is in inverted commas"
```

or:

```
PRINT "Notice that the inverted commas themselves aren't printed."
```

and you'll get the idea. Whatever comes between the inverted commas after a PRINT statement is displayed on the screen – punctuation marks, spaces and all. (Don't forget to press Return to send the information into the micro.)

Having said that, beware using inverted commas in the middle of what you want to display as it plays havoc. When it reaches the second set of inverted commas the micro thinks that it has come to the end of what it has to print and confusion arises for you, and for the machine! Try this and see what happens:

```
PRINT "I said"Hello""
```

Fun isn't it? What happened is that the micro has come to the first set of inverted commas and has decided to print out everything until it comes to the next set. When it reaches these it assumes that it has done its job and all the rest of the line is a bit confusing to it. Is it a variable or what? The micro doesn't know and tells you so.

The way to get round this is just to use the apostrophe that you'll find on the same key as 7. This is accepted quite happily by the micro and looks neat. Try:

```
PRINT "I said 'Hello.'"
```

So now we can use the print statement to display whatever we want on the screen. We can also use it to do our sums.

Suppose that for some reason best known to you, your maths teachers and the authors of beginners' books you want to use the micro to add 2+2. All you do is enter:

```
PRINT 2+2
```

and press the Return key.

The micro will do the sum "in its head" and the answer will appear on the monitor. (In case you're wondering, it's 4.)

Obviously the example is trivial but the principle is the same for more difficult calculations: Now try:

```
PRINT 3+4/3
```

or maybe:

```
PRINT (3+4)/3
```

Both times the micro prints out the answer for you, and it will do so for much more complicated mathematical expressions. I leave it to you to do a few sums but can I point out that the micro follows the same rules you did at school – it does calculations from left to right in the order: brackets, division, multiplication, subtraction and addition.

Don't worry if you don't follow that last bit. You'll understand it when you need it.

You might notice that if you try to print out some variable name that doesn't exist yet, the micro doesn't like it and tells you so. Try:

```
PRINT Z
```

and see what you get. This is because you haven't set up the variable in an assignment statement like:

```
LET Z=3
```

or whatever. The variable has to exist somewhere in its memory for the micro to PRINT it to the screen. Having said that, you might notice that the micro will accept a number and display it quite happily, treating it almost as a string. For example,

```
PRINT 3
```

puts a figure three on the screen. That is, it displays literally what comes after the PRINT statement without needing the inverted commas.

If you've followed all this so far you are now able to use your micro to do things like:

```
PRINT "Hello Mum"
```

or:

```
PRINT (1*1)/1
```

but it's all a bit limited as we've been using only command mode. So everything we've told the micro to do

has been done immediately.

Is PRINT the same in the middle of a program? Yes it is but it can be much more powerful, and is one of the regular features of nearly all programs. Here is one stupid program:

```
10 PRINT "This is a silly program"
20 PRINT 2+2
30 PRINT "I told you it was silly"
```

Again, it's trivial but it shows that PRINT works in programs. And when a PRINT statement is combined with variables then it becomes a very powerful tool.

If you don't know what a variable is may I refer you to my editor's brilliant series of articles on beginners' Basic. (OK, so I'm crawling but I've got a wife and tabby to support.) For those who, wisely, prefer my epic words I'll give you a brief recap of what a variable is.

Remember those sums at school where you had to figure out what "X" stood for? All you knew was that it was some number or other. Well "X" was a numeric variable, a name used for the time being until you could figure out what number it stood for.

In BBC Basic you have two types of variables – numeric variables which, as you might guess, stand for numbers, and string variables.

You've already met a string when we used PRINT to display Hello on the screen. A string is just a collecton of letters, spaces and punctuation marks that can be treated in one lump by the micro. We tend to bundle up the whole lot between quotes.

Now suppose you had a string that you wanted printed on the screen. Something like: "You are a brilliant programmer". Instead of having to write this into your program every time we wanted to feel smug, wouldn't it be handy if we could just refer to it by a shorter "label"? Well such a label is a string variable. You can tell string variables because they all have names ending in $.

Now we can use the PRINT statement with these variable names to display items from our programs. Even if we don't know what they'll be when we write our program, we can give them a variable name and tell the micro to print them out when it's figured out what they are.

Take the following program which asks for a number and then doubles it:

```
10 LET A$="PLEASE ENTER A NUMBER"
20 LET B$="THIS IS DOUBLE YOUR NUMBER"
30 PRINT A$
40 INPUT X
50 LET Y=2*X
60 PRINT B$
70 PRINT Y
```

As you can see, we've used both string and numeric variables, and the micro has printed on the screen not the variable itself but whatever it was labelling, in full. You might notice that we could get rid of line 50 and get the same result by doing the calculation in the last line, such as:

```
70 PRINT 2*A
```

Try it for yourself. Set up some variables and use PRINT to call them to the screen by their variable names. "Playing" on your micro is the best way to learn.

Also, you might want to test your powers of discrimination by figuring out the difference between:

```
PRINT 2+2
```

and:

```
PRINT "2+2"
```

If you want a hint about the last, try:

```
PRINT "Two plus two"
```

You've probably already noticed that the micro treats the different types of variables in different ways.

If you enter:

```
PRINT"Hello,again"
```

it appears on the left of the screen. Now if you print out a number, like this:

```
PRINT 2*2
```

the answer appears slightly indented from the edge of the screen.

The explanation is that the micro divides the screen into a number of separate "fields" of fixed length. When you switch on the machine the field lengths are fixed at the default value of 10 characters. (This can be changed but for the moment we'll stick to the default value.)

Mode 7, which is the mode you are in when you switch on, is a 40 character mode. This means the screen can hold 40 characters on one line.

If you accept that the micro divides the screen into fields each of which is 10 characters in length, then in Mode 7 you have four of these fields. Again in an 80 character mode, dividing by the field length of 10 gives you eight fields.

It's these fields that cause the difference in the way variables are printed on the screen. With strings what happens is that the first character of the string is displayed in the left-most character of the field. The next character is in the next field space and so on from left to right.

On the other hand, numbers are printed with their last figure on the last character of that field. The following simple program should show what I mean.

```
10 PRINT 0123456789
20 PRINT 1
30 PRINT "A"
40 PRINT 12
50 PRINT "AB"
60 PRINT 123
70 PRINT "ABC"
```

As you can see, strings and numerics use the fields in different ways. Try expanding the program until your strings and numbers fill the whole 10 characters of the field. What happens when you spill over? Again try it and see.

With strings, the micro just spills over into the next field. With numbers, it does something slightly different which I'll explain when I unravel how to change the field lengths.

Maybe you'll have noticed that the example program used only the first of the screen fields. How do you get to print things in the other fields?

The answer is that you use punctuation marks in the print line (the things that follow the PRINT statement). Using these you can PRINT out several items in a print line, using only one PRINT statement and deciding in which field they appear by your choice of punctuation marks.

The first "punctuation mark" isn't really a punctuation mark at all. It's a space. Suppose you leave spaces between some strings you want to display, such as:

```
PRINT "Hello" "yet" "again"
```

and you get:

```
Helloyetagain
```

on the screen. The micro ignores the spaces and prints them all one after the other. To make this more understandable you must put the spaces that you want between the words on the screen inside the inverted commas that define the strings that you want printed, like:

```
PRINT "Hello " "yet" " again"
```

When you put spaces between numbers the micro prints them in different fields. Try:

```
PRINT 1 2 3
```

if you don't believe me. You get:

```
1          2          3
```

The comma works slightly differently.

```
PRINT "Hello","yet","again"
```

produces:

```
Hello      yet        again
```

→

From Page 49

because the comma tells the micro to display the next item in the print list in the next unused field. This may be on the next line, such as:

```
PRINT "a","b","c","d","e"
```

With numbers, the comma has the same effect as shown by:

```
PRINT 1,2,3
```

which gives:

```
1          2          3
```

Incidentally, you might notice that this gives the same effect as using spaces.

The semi-colon has the effect of joining the item after it to the item before, effectively overiding the effects of the fields. With numbers you get a command like:

```
PRINT 1;2;3
```

returning:

```
123
```

The micro has printed the first figure normally in the tenth column of the field and then, because of the semi-colons, has joined on the other two figures. As you might guess this can be the cause of confusion at times (as can two fields of figures running into each other on the screen).

With strings, the semi-colon works just like spaces, joining them together.

```
PRINT "Hello ";"yet";" again"
```

gives:

```
Hello yet again
```

(You'll notice that I put the spaces I wanted between the words in the strings.)

Finally we come to the apostrophe which, when put between items in a print line, forces the micro to print the next item on a new line.

```
PRINT 1'2'3
```

thus gives:

```
1
2
3
```

while:

```
PRINT "Hello"'"yet"'"again"
```

displays:

```
Hello
yet
again
```

on the screen.

The fun really starts when you get to mix the punctuation and the different types of print item up in the same print lines.

Try it yourself. Can you make the micro print in the centre of the screen?

```
The answer is 23
```

It's not hard. It just takes a little thought.

It might help if I told you that just using the PRINT command by itself makes the micro skip to the beginning of the next line.

If you clear your screen (CLS and the Return key) and enter:

```
PRINT
PRINT
PRINT "Hello"
```

you'll see what I mean.

But using PRINT statements with punctuation marks is the long way of doing it. I'll tell you an easier way doing it in another article when I'll also be describing the limitations of the print fields and how you can change them.

As it is, I haven't the time. I've got to help the editor find his way through these desks so he can go home. I wonder if there is a game in that?

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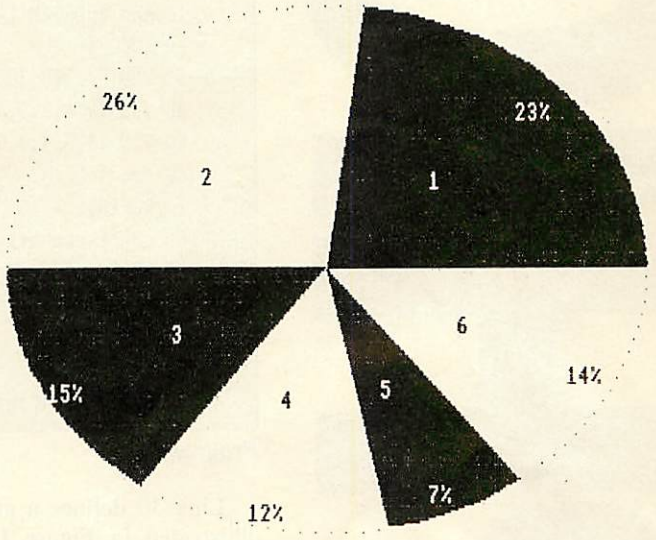

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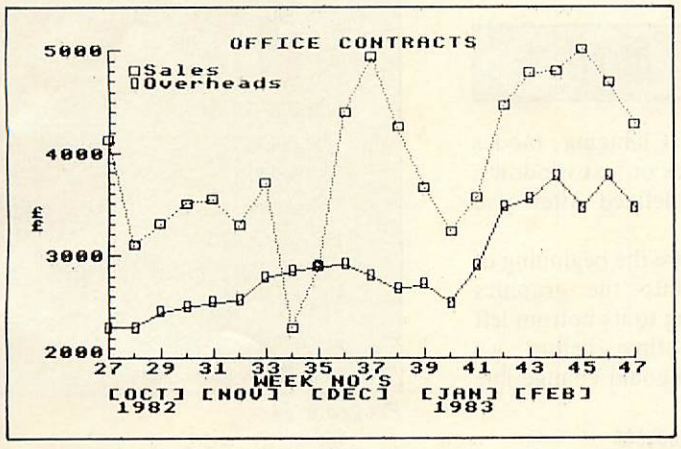

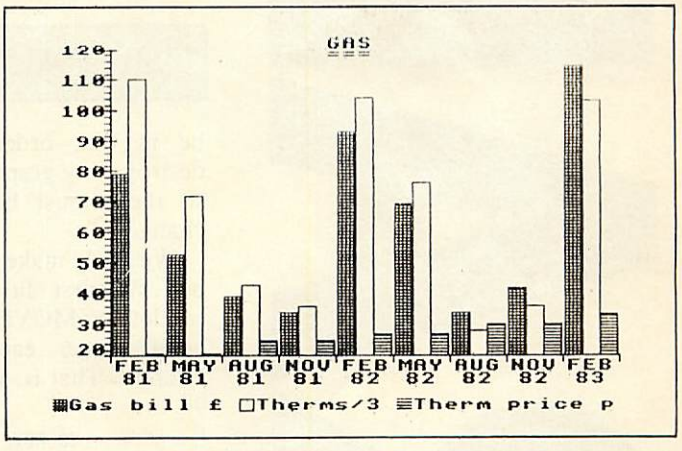

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The examples shown are reduced samples of EASIPLOT graphs with axis labels removed.

GRAPHICS

By PAUL JONES

WE saw in the June *Micro User* that you can define graphics windows by the use of VDU 24. However, when you define a window the graphics co-ordinate system does not change in line with this new window.

What this means is that (0,0), the point at the bottom of the graphics screen at switch on, doesn't automatically move to the bottom left hand corner of the window. This can lead to graphics effects being chopped off, as Program I demonstrates.

```
10 REM PROGRAM I
20 MODE 5
30 VDU 24,200;300;1000;800;
40 VDU 19,0,5,0,0,0
50 VDU 19,3,4,0,0,0
60 count=0
70 REPEAT
80 count=count+1
90 MOVE 0,0
100 x=RND(1279):y=RND(1023)
110 GCOL0,RND(3)
120 DRAWx,y
130 UNTIL count>99
```

Program I

Line 30 defines a graphics window, illustrated in Figure I. Only the graphics within this window are displayed. To see the full sunburst effect of the program try leaving out line 30.

Incidentally, line 20 and 30 have to be in that order. Changing modes destroys any graphics or text windows, so these must be defined after you change.

We could make sure the beginning of our sunburst fits into the graphics window by MOVEing to its bottom left hand corner each time before we DRAW. That is, we could change line 90 to:

```
90 MOVE 200,300
```

There is a neater way. Simply tell the micro that, from now on, it is to consider the point (0,0) – called the origin – to be at the bottom left of the graphics display.

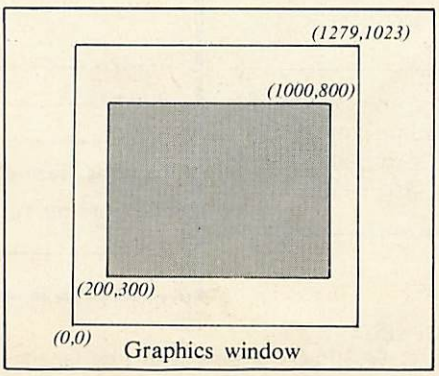


Figure I

We do this with the VDU 29 command. This allows us to place the origin at any point on the display. For instance:

```
VDU 29,640;512;
```

places the origin at the centre of the screen. This means that from now on (0,0) will refer to the middle of the screen.

Try:

```
MODE 5
VDU 29,640;512;
MOVE 0,0
DRAW 200,200
DRAW 200,0
DRAW 0,0
```

to prove that, as far as the micro is concerned, (0,0) has been moved to the centre of the screen.

Notice how we use the command to move the origin:

- VDU 29 followed by a comma
- the X co-ordinate followed by a semicolon
- the Y co-ordinate follwed by another semicolon.

Make sure you get your commas and semicolons in the right places!

In Program II line 40 ensures that the origin is moved to (200,300), which is at the bottom left hand corner of the graphics window defined in line 30.

```
10 REM PROGRAM II
20 MODE 5
30 VDU 24,200;300;1000;800;
40 VDU 29,200;300;
50 VDU 19,0,5,0,0,0
60 VDU 19,3,4,0,0,0
70 count=0
80 REPEAT
90 count=count+1
100 MOVE 0,0
110 x=RND(1279):y=RND(1023)
120 GCOL0,RND(3)
130 DRAWx,y
140 UNTIL count>99
```

Program II

This ensures that the sunburst starts at the bottom of the window. The MOVE (0,0) of line 100 makes certain that the DRAW of line 120 starts from there.

Moving the origin in this way is more formally known as "redefining the graphics origin". You can use this idea of redefining the origin without using a graphics window – though you often do, since they work quite nicely together. Look at Program III.

Line 30 moves the origin to the centre of the screen. Although we haven't defined a window here, you

might think that we are restricted to the top right hand corner of the screen because of the position of the origin.

We can use the rest of the screen, though, if we use negative co-ordinates. These involve using numbers smaller

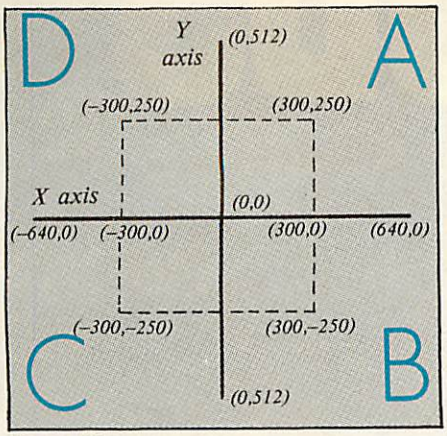


Figure II

than 0, that is, numbers with a minus ('–') sign in front of them.

So far we have just used positive co-ordinates, which are numbers bigger than or equal to zero. Figure II illustrates the idea.

If both co-ordinates are positive, the point will be in region A. If the X co-ordinate is positive and the Y co-ordinate negative, it is in region B.

If both co-ordinates are negative the point is in region C, while if the X is negative and the Y positive it will be in region D.

Notice that as you go left along the X axis from the origin the figure following the minus sign increases. That is, –300 is nearer to the origin than –600.

Similarly, as you move down the Y axis from the origin, –250 is nearer to the origin than –500.

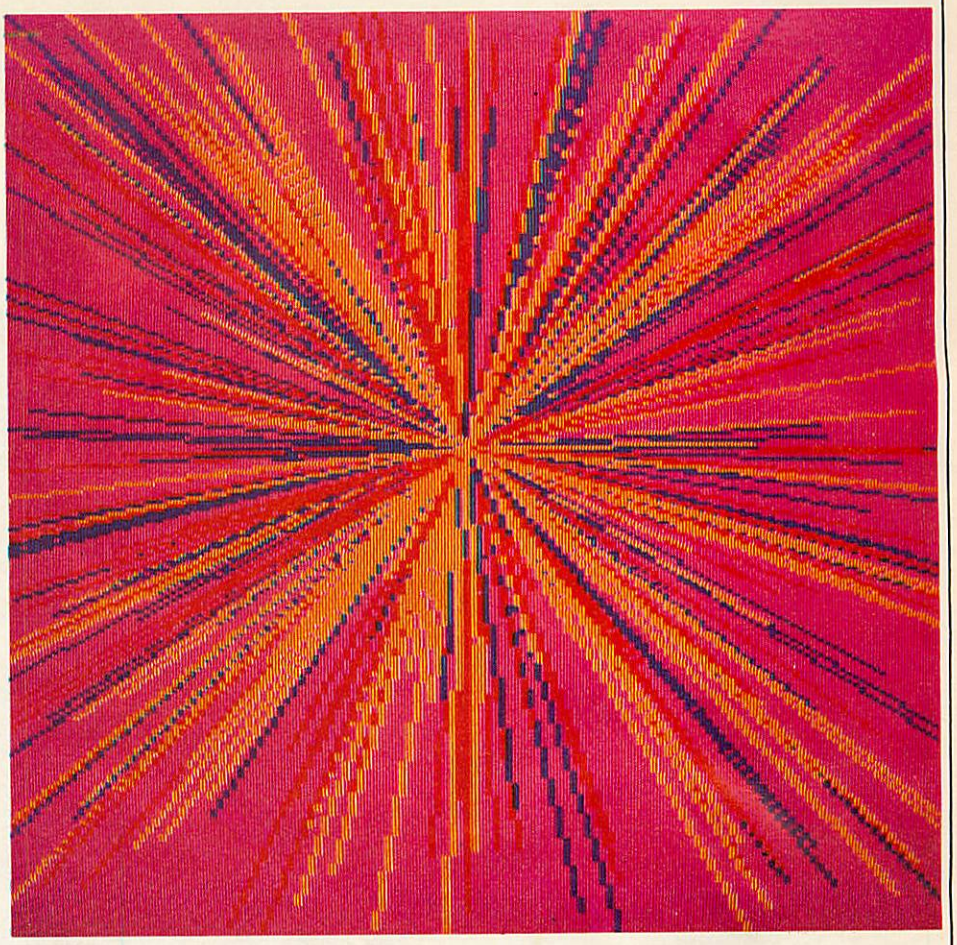
Try running program III with the following versions of line 100:

```
100 x=RND(640):y=-RND(512)
100 x=-RND(640):y=-RND(512)
100 x=-RND(640):y=RND(512)
```

Each version will draw our sunburst at different corners of the screen.

```
 10 REM PROGRAM III
 20 MODE 5
 30 VDU 29,640;512;
 40 VDU 19,0,5,0,0,0
 50 VDU 19,3,4,0,0,0
 60 count=0
 70 REPEAT
 80 count=count+1
 90 MOVE 0,0
100 x=RND(640):y=RND(512)
110 GCOL0,RND(3)
120 DRAWx,y
130 UNTIL count>99
```

Program III



Program IV uses the idea of negative co-ordinates to produce a full sunburst effect.

Program V uses a procedure, PROCburst, to give the sunburst effect. PROCburst is defined to allow us to choose the position of the origin (xpos,ypos) and the maximum size of line.

Variables x and y are then chosen and used in the four combinations of negative and positive (lines 130 to 170). This gives the sunburst – this time of one colour – a pleasing symmetry.

The procedure is called three times. The value of xpos is determined by the variable parameter, as is the maximum line length.

The value of ypos is actually fixed at 512. If you like, you can replace the 512 in line 70 with 512/2^ count, which moves each successive sunburst down the screen.

```
 10 REM PROGRAM IV
 20 MODE 5
 30 VDU 29,640;512;
 40 VDU 19,0,5,0,0,0
 50 VDU 19,3,4,0,0,0
 60 count=0
 70 REPEAT
 80 count=count+1
 90 GCOL0,RND(3)
100 x=RND(640):y=RND(512)
110 MOVE 0,0:DRAW x,y
120 x=RND(640):y=-RND(512)
130 MOVE 0,0:DRAW x,y
140 x=-RND(640):y=-RND(512)
150 MOVE 0,0:DRAW x,y
160 x=-RND(640):y=RND(512)
170 MOVE 0,0:DRAW x,y
180 UNTIL count>99
```

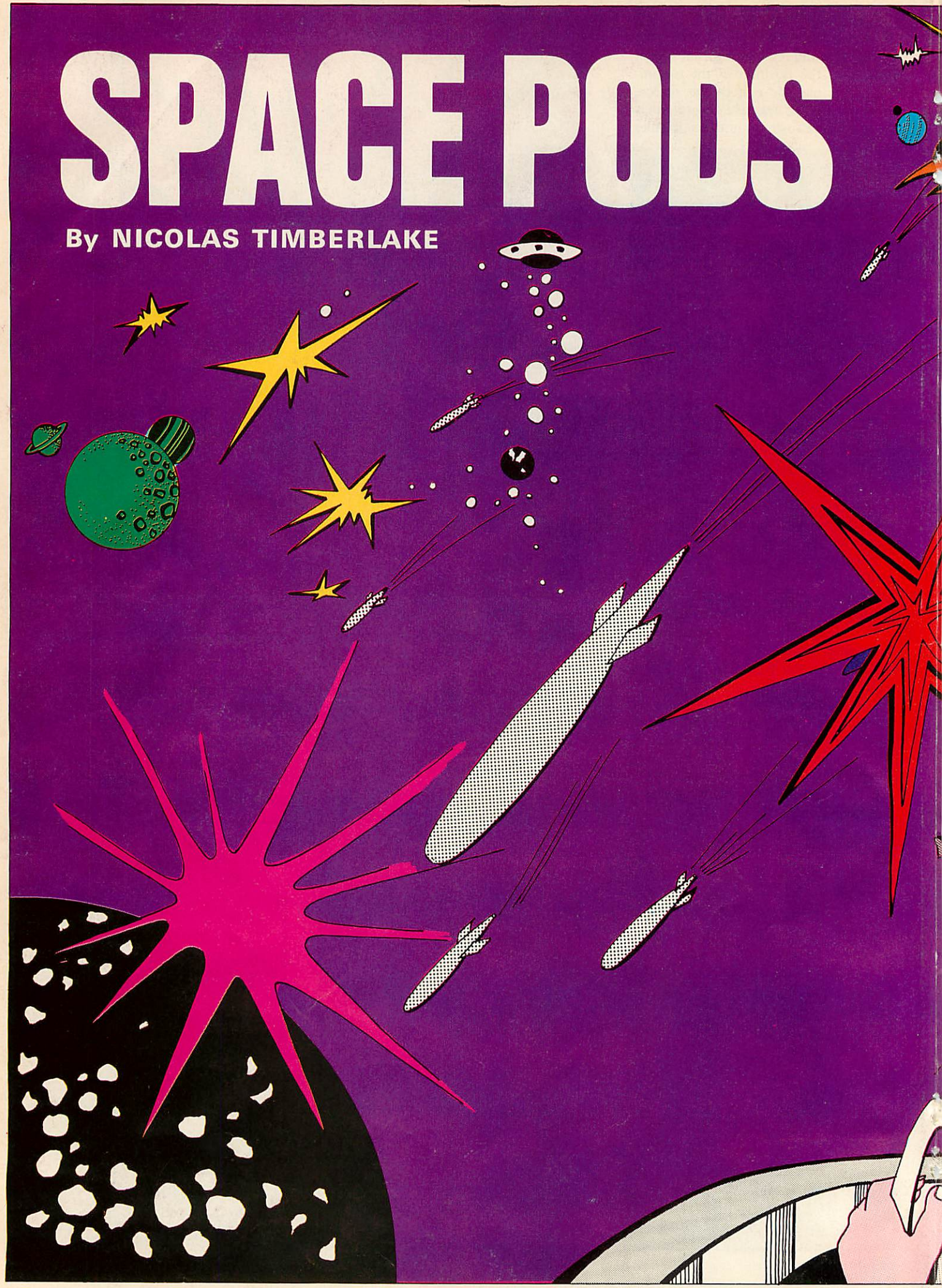
Program IV

```
 10 REM PROGRAM V
 20 MODE 5
 30 VDU 19,0,5,0,0,0:VDU 19,3,4,0,0,
0
 40 FOR count= 0 TO 2
 50 parameter=1100/(2^count)
 60 GCOL0,count+1
 70 PROCburst(parameter,512,paramete
r)
 80 NEXT count
 90 END
100 DEFPROCburst(xpos,ypos,size)
110 VDU 29,xpos;ypos;
120 FOR loop=0 TO 50
130 x=RND(size):y=RND(size)
140 MOVE 0,0:DRAW x,y
150 MOVE 0,0:DRAW x,-y
160 MOVE 0,0:DRAW -x,-y
170 MOVE 0,0:DRAW -x,y
180 NEXT loop
190 ENDPROC
```

Program V

SPACE PODS

By NICOLAS TIMBERLAKE



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How long will you be able to survive?

Space Pods listing starts on Page 104

BITS & BYTES

Consider

MIKE BIBBY continues his explanation of the fundamentals of the BBC Micro workings

As we have mentioned in previous articles, the BBC Micro – and all other machines based on the 6502 microprocessor – handles its binary numbers in groups of eight bits at a time. Such a group of eight is called a byte.

However, while handling eight bits at a time is satisfactory from the machine's point of view, from the human side of things it's rather difficult to manage. Those 1s and 0s are far too prone to error. Look at Table I for instance. It contains an error – can you find it?

It's all too easy to slip up when handling binary numbers – a single 1 in the wrong place and all is lost! To make things easier to deal with, when I am copying out binary numbers I put a wavy line between bits 3 and 4 to split the byte into two equal groups of four.

For example, if I were copying

% 10001111(= 1 4 3)

I would write

% 1000⌇1111

Actually, splitting the byte into two groups of four bits is standard practice – each group of four bits is called a "nibble", would you believe.

It's not too hard to see that the biggest number you can represent in a nibble is 15, and the smallest is 0,

%1111 and **% 0000**

respectively. After all, you've only got four bits to play with!

So we can split up our byte into two nibbles of four bits each. Now when we split up a binary number in this manner we call the "left-hand" nibble the most significant nibble (MSN) and the "right hand nibble" the least significant nibble (LSN).

We have already created one new number system – the binary system. Let's design another one that combines the advantages of the denary system with those of the binary. That is, it will be easy to read and write, yet will still allow us to perceive the binary manner in which the machine handles things.

The system we want is called hexadecimal. This consists of using our standard digits 0 to 9 for the number zero to nine respectively, and the letter A to F for the numbers 10 to 15. In this way it allows us to code the numbers available in a nibble (that is, 0 to 15) with just one digit. This digit will be in the range 0 to 9 or A to F.

It may take a while to adjust to the idea of using letters of the alphabet for numbers, but it soon becomes second nature. You just have to get used to counting

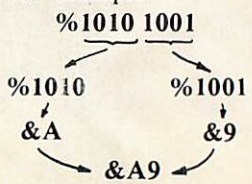
1,2,3,4,5,6,7,8,9,A,B,C,D,E,F

Remember, there are B people in a cricket team, D in a rugby league team and F in a rugby union team. There are C months in a year, and E days in a fortnight.

Now just as we prefix all our binary numbers with %, we prefix our hexadecimal numbers with &, to avoid confusion. So &F means 15, while &9 means 9.

Studying Table II will really pay dividends – I suggest you practise writing down bit patterns of nibbles and their hexadecimal equivalents until it becomes second nature.

Given that we can encode a nibble in one hexadecimal digit, and that a byte consists of two nibbles, it should readily be apparent that we can encode a byte as two hexadecimal digits side by side, for example:

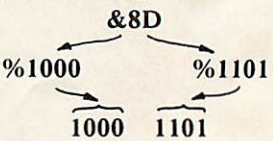


That is:

%10101001 = &A9 = 169

You just split the byte up into two nibbles – a left hand and a right hand nibble, encode each as a hexadecimal number, then put the two side by side.

You can go from hexadecimal to binary just as easily:



That is:

&8D = % 10001101 = 141

Although you have probably never thought of it in these terms, you are well aware that the value a digit represents depends on the column it is in. The number 230 is not as large as 320, though both numbers contain the same digits.

In hexadecimal coding too the column a digit is in is important. For example, &10 is far greater than &01. In binary each column is worth twice the preceding one. In denary, our usual number system, each column is worth 10 times the preceding one. In hexadecimal, each column is worth 16

the significance of nibbles...

times the preceding one.

Believe or not, the columns in a four digit hexadecimal number, from greatest to least, are worth:
4096, 256, 16 and **1** respectively.

This means that:

& 1101 = 4096 + 256 + 1 = 4353

For the moment let's concentrate on the two digit, that is, two column, hexadecimal number, as these are all we need to store our bytes in. In this case the left-hand column is the "sixteens" column, the right hand the units column.

So:

```
  16 1
& 2 1 =  2*16+1 = 33
  16 1
& 2 D =  2*16+13 = 45
  16 1
& 8 0 =  8*16+0 = 128
  16 1
& C 0 = 12*16+0 = 192
```

To translate a two digit hexadecimal number into denary simply multiply the number in the left-hand column by 16 and add it to the number in the right-hand column – remembering to translate A to F if necessary.

The second column has the value 16 since the first column can only handle numbers up to 15 (&F) – the largest you can fit into a nibble (%1111). After 15, you *have* to use a second column for 16, that is &10.

Just as in denary, we "carry" at 10 since the largest value our columns can handle is 9, so in hexadecimal we carry at 16, since the largest value our columns can handle is 15 (&F).

```
%10111011 = 187
%10101101 = 173
%10001111 = 151
%11110110 = 246
```

Table I

It is the fact that we carry at 16 that gives this number system its name "hexadecimal" – here "hex" stands for 6, "decimal" for ten. "Hexadecimal" = 6 + 10 = 16.

Given a second column, &10, as we have seen is 16, 17 will be &11, while &12 is 18 and so on until we reach 31, which is &1F.

We have then run out of legal digits for the units column, so if we want to go on to 32 we had better give ourselves another 16, and set the units column back to zero, that is &20.

Another way of looking at the second column is that it comes from the most significant nibble. To turn the least significant nibble into the most significant nibble, we have to shift it over to the left four times.

If you cast your mind back to last month, this is equivalent to multiplying it by two four times in succession, that is 2×2×2×2=16. This is why a hexadecimal digit representing the most significant nibble is 16 times larger than the same digit representing the least significant nibble.

The largest number you can store in a two-digit hexadecimal number is &FF = 15×16+15=255. This is, of course, the same as the largest number we could store in a binary byte – we often refer to a two digit hexadecimal number simply as a byte.

To obtain the hexadecimal equivalent of a positive interger (whole number) less than 256, we divide it by 16. The quotient is the left hand digit, the remainder the right hand, translating into A to F where necessary.

For example:

174÷16=10 r 14

That is:

& A r & E

Hence **174=& AE**

Fortunately we don't have to go to such lengths, the BBC Micro allows us to simply print out the hexadecimal equivalent of decimal numbers and vice versa.

For instance:

P. &BC will give

192

while **P.~141** will give

&8D

(Notice that ~ in Mode 7 appears as ÷. Don't worry, it still works.)

Decimal	*Binary*	*Hexadecimal*
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

Table II

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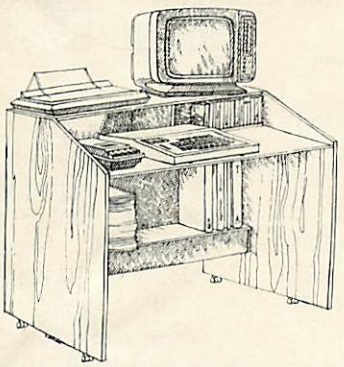

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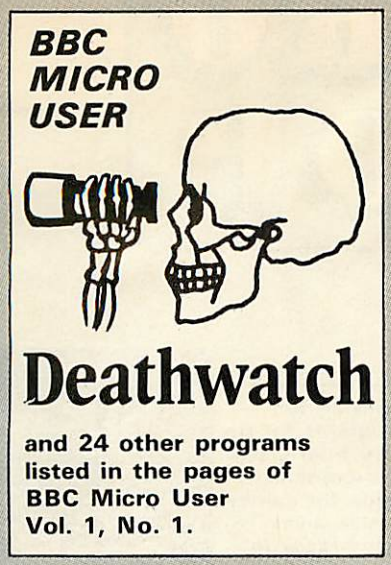

March Issue

DEATHWATCH, a superb arcade game that challenges you to use your skill to fight off enemy battleships, tanks and helicopters; **BINGO,** illustrating clever uses of the randomise function; **BUBBLESORT** routines; **TESTS** for function keys in machine code routines; a useful **CASSETTE BUGS FIX** for users with OS 0.1 . . and many **COLOUR** and **GRAPHICS ROUTINES** to help you create a kaleidoscope of screen designs which you can incorporate into your own programs.

April Issue

KING KONG, a fast moving game in which you pilot a helicopter to rescue girls perched on the Empire State Building before killing Kong; **GRAPHICS,** a suite of colourful demonstration programs; **NIM,** a structural game of strategy; **TOKENS,** first steps in unravelling the Basic ROM; **HOROSCOPES,** a fun program with useful error-trapping routines; **FORMATTER,** an essential disc utility; **DISASSEM,** a full machine code disassembler; **HEAT & LIGHT,** two measuring and plotting programs.

May Issue

AIR STRIKE, a fast and furious arcade game; Test your mental powers with **PELMANISM;** 25 **ANAGRAMS** for you to solve; **CHARACTER,** to generate vertical and inverted text; **TELETEXT,** animation in Mode 7 really brings the screen to life; **LAB,** a trio of programs to interface laboratory equipment; 10 programs to investigate the **OSBYTE** routine; **BEEB,** two joystick exercises; plus more **COLOUR** and **GRAPHICS** routines.

June Issue

SPACE PILOT, lost in space with dwindling fuel supplies, you must fight off repeated attacks from alien life forms. To replenish fuel, you have to perform a tricky docking manoeuvre, while to repair the inevitable damage you must land on a mountanous planet. **NOMISM,** you are a nomadic herdsman desperately trying to eke out a living on the plains of Africa. Can you survive drought, tsetse fly and other hazards? **PLUS** other listings from the June issue.

July Issue

TENPIN. A highly entertaining simulation of Tenpin Bowling. **SPACEPODS.** Try to beat alien hordes. **CUP.** Exciting techniques to bring 3D graphics to the BBC Micro. **SCRSAVE** and **CSRLOAD.** Two programs to allow you to save and load screens to tape or disc. **TEST** and **STEADY.** A pair of programs to accompany the Beeb Body Building Course. **BREAKFIX.** Don't let the Break key destroy all your precious variables! **FORMAT.** Creates neater listings.

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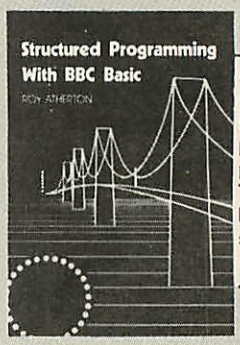

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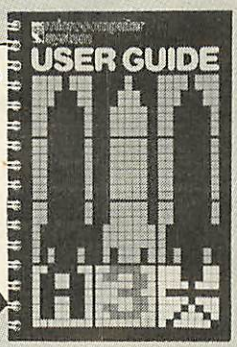

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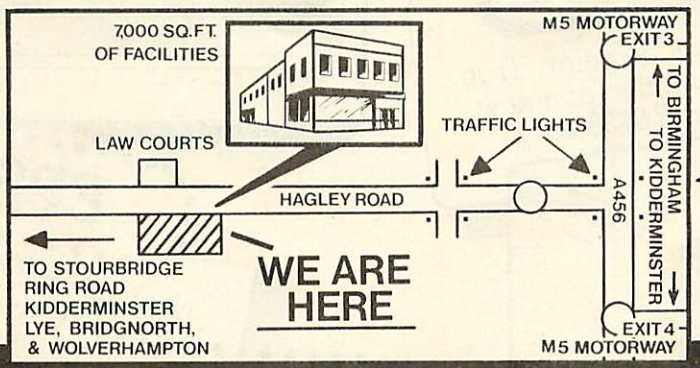

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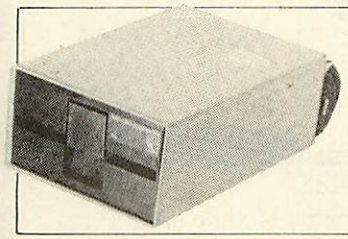

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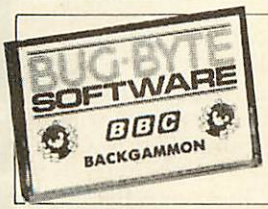

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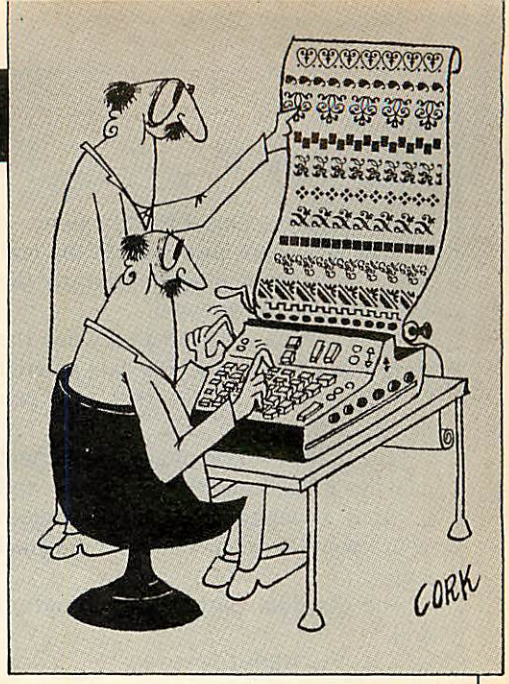

By JOHN LORD

WHEN debugging or editing programs it is useful to be able to escape from the program to make adjustments and then to jump back in without entering all the data again.

When you alter the basic program you may overwrite the variable storage locations. To prevent this happening make the first line of your program:

```
0  LOMEM=TOP + &400
```

This line creates a gap of about 1000 bytes between the end of the basic program TOP and the start of the variable storage area LOMEM.

Then program key 8 with:

```
*KEY8 ?&480=?&2:?&481=?&3:
 ?&4FF=&D:M=&480:£$=
 $M:M=&D00:$M=£$:M
```

Looking at it line by line:

```
?&480=?&2:?&481=?&3
```

stores Vartop, the top of the variable storage area.

```
?&4FF=&D:M=&480:£$=$M
```

positions &D so that the string indirection operator can be used to move the variables map.

```
M=&D00:$M=£$:M
```

moves the variable map to a safe place &D00.

Pressing ESCAPE followed by f8 enables editing to be carried out.

Key 9 is programmed to return the variable map and Vartop.

```
*KEY9 M=&D00:£$=$M:M=&480:$M=
 £$:?2=?&480:?3=?&481:M
```

Typing RUN (Return) will restart the program, but you will have to work through the program to the point at which you escaped because RUN clears the variable map.

A better way when you have completed the alterations is to press f9 and type GOTO ERL then Return. Escape is classed as an error and has the code 17.

This technique enables you to rejoin your program at the error line. Unfortunately if you left the program in the middle of a procedure or a loop, joining the program in this way leads to a no PROC error message when the ENDPROC is encountered.

The only way which always works is to GOTO some suitable line before the start of the loop.

The only other requirement is to dimension your arrays early in the program so that you do not try to dimension the array twice.

FIXING THE BREAK KEY

EQUALLY important is protecting data which has already been entered from accidental pressing of the Break key. Nothing is more frustrating than to have spent a long time entering information and to lose that data.

When Break is pressed all reference to the variable storage is deleted but the values which are stored are not altered in any way.

If the position in the program, the variables map and Vartop are stored then all is not lost. With the routines in Program I, each time data is entered, the variable map, Vartop and the next line number are stored where they will not be changed if Break is pressed.

The time taken to perform each update is negligible compared to the time spent in inputting data.

If Break is pressed the operation OLD is performed, the variable map and Vartop are renewed and the program continues at the line following the last data input.

```
 10  REM BREAK FIX AND REPEAT..LOOP
 20  REM (C) J.F.LORD APRIL 1983
 30  REM RETAINS DATA AND POSITION
 40  REM WHEN THE BREAK KEY IS PRESSED
100  LOMEM=TOP+&100
110  ?&70=?&0B:?&71=?&0C:
     PROCstorenextline
120  REPEAT
130  A$=GET$
140  PRINTA$;
150  line$=line$+A$
160  PROCmapoff
170  UNTIL A$=CHR$(13)
180  PRINT CHR$(&0A)
190  PRINTline$
200  END
210  DEF PROCstorenextline
220  *KEY10 OLD M PROCnextline M
230  LOCAL op,LL%
240  op=(256*?&71+?&70)
250  LL%=?op:?&70=?(op+LL%-2):
     ?&71=?(op+LL%-1)
260  ENDPROC
270  DEF PROCnextline
280  M=&D00:£$=$M:M=&480:$M=£$:
     ?2=?&480:?3=?&481
290  PRINTline$;
300  Nextline%=(256*?&70+?&71)
310  GOTO Nextline%
320  ENDPROC
330  DEF PROCmapoff
340  M=&480:?&480=?&2:?&481=?&3:
     ?&4FF=&D:M=&480:£$=$M:
     M=&D00:$M=£$
350  ENDPROC
```

Program I is a simplified version of the input stage of a text handling program. The only effect of pressing Break is to clear the screen, print the

→

From Page 67

usual messages plus PROCnextline.

This procedure prints line$, the text which had been entered prior to the Break key being pressed.

Input of text is terminated when the Return key is pressed. The data entered is then printed out so that you can easily compare the two.

One of the programmable keys could call the procedure PROCnextline and be used as an excellent way to rejoin your program when you have finished editing.

The essential parts of the program are:

```
100 LOMEM=TOP+&100

110 ?&70=?&0B:?&71=?&0C

    :PROCstorenextline
```

Line 110 stores the current position in the basic text in locations &70 and &71.

PROCstorenextline calculates and then stores the next line number in the program.

op is the position in memory of the beginning of the current line.

PROCmapoff has the same effect as key 8 in the program editing routine in that it moves the memory map to &D00 and also saves Vartop.

It is important that this procedure is called after each data entry. If not, then all the variables may not have been declared when the break key is pressed. Then data could be lost and need to be re-entered.

PROCnextline put the variables map back in position, restores the pointer to the top of the variables and then goes to the next line.

Saving works of art

IF you have created stunning artwork on the BBC Micro and want a permanent record, then the simple routines below will load and save a screen onto tape.

```
10 REM LOAD SCREEN
20 VDU 21
30 *LOAD SCREEN
40 VDU 6


960 REM SAVE SCREEN
970 VDU 21
980 *SAVE SCREEN SSSS VVVV
990 VDU 6
```

Where SSSS, the start address, is the value of HIMEM in hex (given by PRINT HIMEM).

For the different modes, the value of SSSS is given by:

MODE	MODEL B	MODEL A
0, 1, 2	3000	–
3	4000	–
4, 5	5800	1800
6	6000	2000
7	7C00	3C00

3C00 For a Model A replace VVVV by 4000, and on a Model B by 8000.

The screen saving routine should be placed in the basic program to run once the screen has been completed.

The program will pause at line 980 until the return key is pressed, so allowing the tape to be positioned before recording starts.

VDU 21 and VDU 6 disable then enable the VDU drivers so that the message "RECORD THEN RETURN" and the file name are not printed on the screen, and subsequently dumped to tape. **Anthony Robinson**

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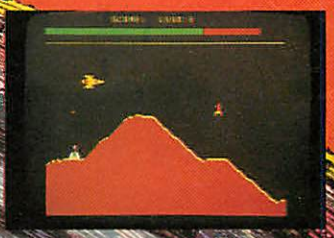

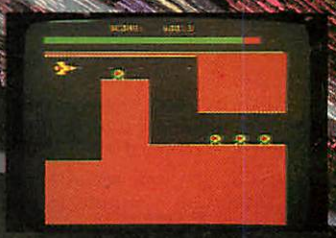

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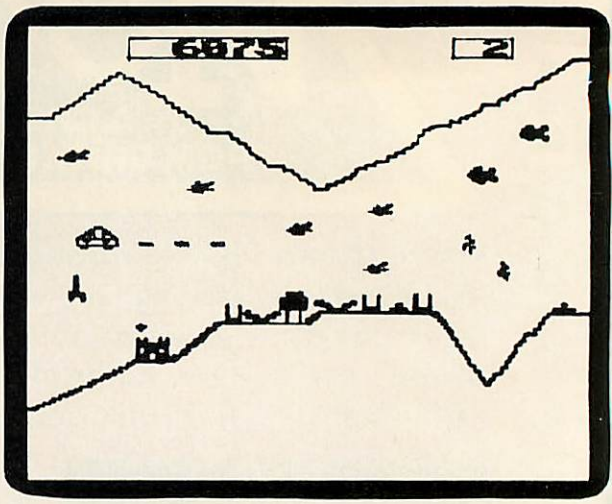

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The game starts fairly easy, then gets harder and harder, with of course the ground and 'top' moving all the time–and completely random, with no two games ever the same. As the game progresses so more and more is 'thrown' at you.

Keyboard or joystick operation giving infinite control of the bomber, the bombs and firing. Top score table and extra 'lives'.

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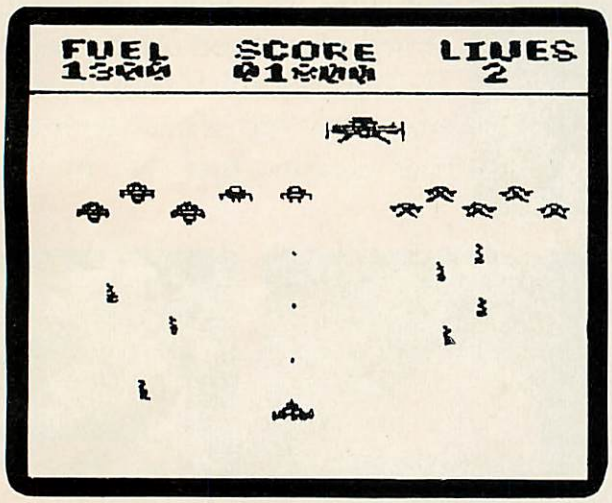

COSMIC FIGHTER

As Kansas reigned supreme with its TRS-80 Arcade games in Britain, Big Five Software were our counterpart in the States, with their 'flagship' being the famous Cosmic Fighter.

This fast-action multi-screen game has been brought to the BBC Micro by Kansas programmer Wal Mansell.

Four entirely different 'screens' with four different types of Alien, each with its own brand of attack, and all of them relentlessley homing down on your base. Four games in one in fact!

Move your base to fire whilst dodging their bombs, but as soon as you wipe out one lot, another type appears–and all of them hell-bent on your destruction!

Then comes your Mother Ship, so home onto her to re-fuel, but get it exactly right... Then it all starts again–with a difference–you have to hit each Alien twice to destruct!

Colour, sound, keyboard or joystick control, with of course the usual Kansas top score table. An all-time great.

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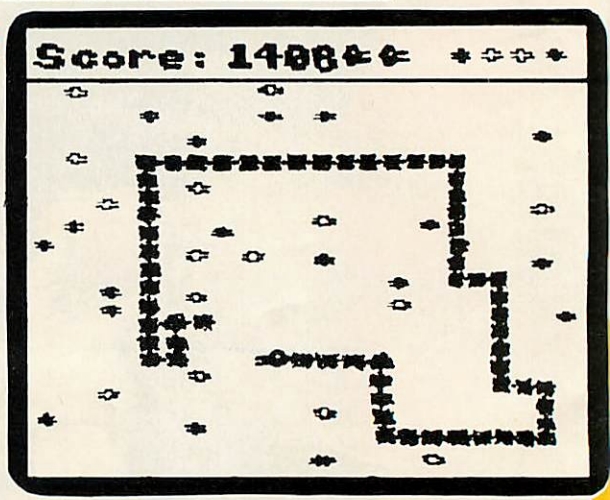
SNAKE



You have control in all directions of the Snake to devour the mushrooms. It's a real snake, not just a line, pulsating along and growing longer and longer as each mushroom is devoured.

Just like the arcade game, you can actually increase speed to try and clear a screen in less than a minute to earn yourself a bonus. But don't devour the toadstools!

Then it gets harder. And harder. And harder. For as each screen is cleared the next one becomes more difficult. Not only does the speed automatically increase but you get a split screen. And if you manage that, a totally unheard of, double split screen!

Colour, sound, keyboard or joystick operation and of course the Kansas top score table.

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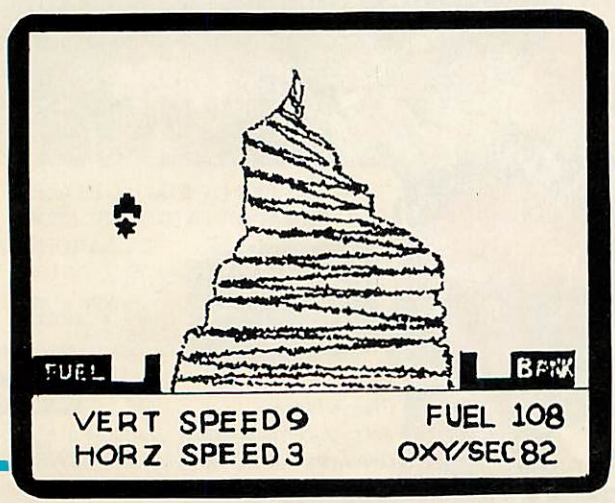

SPACE CAB

Slow the pace right down now, to a thinking mans' game. Ferry passengers over the random mountain, choosing the number, the amount of fuel and liquid oxygen to get you there and back. It's totally logical–the more passengers you carry the more fuel and oxygen you'll need. There's a purpose too, for you have to earn enough to pay off the mortgage on the craft or it's re-posessed!

Not too easy to play as control must be spot-on or you can run out of fuel, starve the passengers of oxygen or crash!

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Experience has taught us that not only do any two people never need the same in a data file, but even one person wants it to be capable of many things. We think that the Kansas Data File fulfills this need, and will be recognised as the standard.

It's main appeal must be its sheer versatility. **You** can **define** not only the **length** of any field, but the actual **number of fields**--up to 20! So you can make it an ordinary name and address file, or anything extraordinary that you might wish. And all permanently saved to tape...

The number of files available depends entirely on the length of the file. Up to 1947 with a single field.

Here are the facilities of Data File:

Create File Define any number of fields up to 20. Define length of each field up to 255 characters. Name each field as required. Computer automatically uses maximum memory.

Insert Simply type in pressing Return for next field.

Search Data File has a most unique Search facility, for it will search **any** defined field throughout the whole file, but not only this, it can be asked to search for the item at the start of the field or in fact anywhere in that field, making it a very powerful facility indeed.

Edit Couldn't be simpler--just use the cursor keys.

Jump A very handy feature, allowing you to jump to any particular file you require.

Sort Not just the normal first field sort, but one which allows you to define the sort field.

Status Not found in normal data files, this is useful for it tells you the file name, when updated, files used, and most important how many files free.

Print A most important facility, allows the printing of the files, as required.

Delete Delates unwanted files, and at the same time the remaining records will be closed up.

Save Allows you to save the entire file to cassette. This can be loaded at the start when Data File is run.

To facilitate the ease of operation, all the above functions are on the red function keys, so needing just a single key stroke to bring into operation.

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PERSONAL ACCOUNTS

Another exclusive Kansas program, designed for the micro user to keep an accurate check on all accounts.

This program is not limited to personal cash accounts, but can also be used in conjuction with a cheque account or even to keeping a credit card account in order. In fact there is little limit to its use, where the transaction of money is concerned.

As it creates its own files to tape, it can be used for a multitude of purposes, each having its own file and thus being loaded to handle transactions.

It can hold 500 transaction entries!

A great asset of the program is that it can be customised by altering any of the 32 items, with in fact 10 already set aside for this purpose, with the others too being simple to change.

Each entry has its own number, together with amount, date and item, with all details and current balance shown after each entry. This makes it very straightforward to add either payments or deposits to the file.

There is also a list facility, even allowing the scrolling through the entire file.

Facility is also provided for alteration of any entry, with automatic update of the current balance. The balance itself can be altered, which is useful when using as a credit card account, as a monthly payment is made.

There is a clever little routine which allows you to estimate the effect any particular payment may have on your account, so you can see if you can really afford it or not!

A status section lets you see the current balance, file name, when updated, transactions on file and spare entries.

Personal Accounts is very friendly in use, with messages should you do something wrong, such as using the same transaction number twice.

Files can be saved to cassette, and you have the choice of either loading in a saved file or creating a new one, when the program is run.

Use is made of colour, with the obvious showing of deposits or payments.

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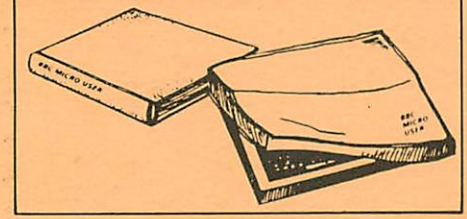

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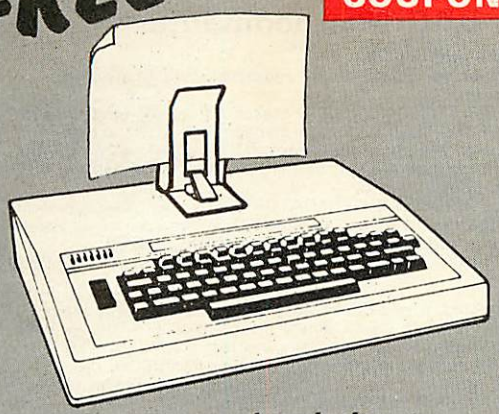

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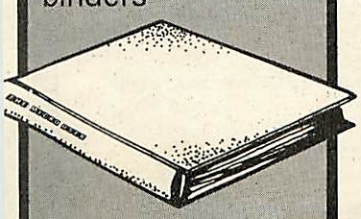

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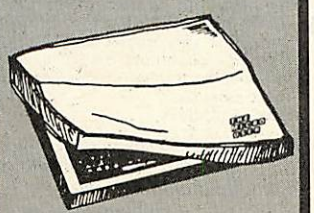

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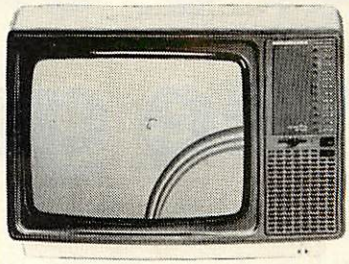

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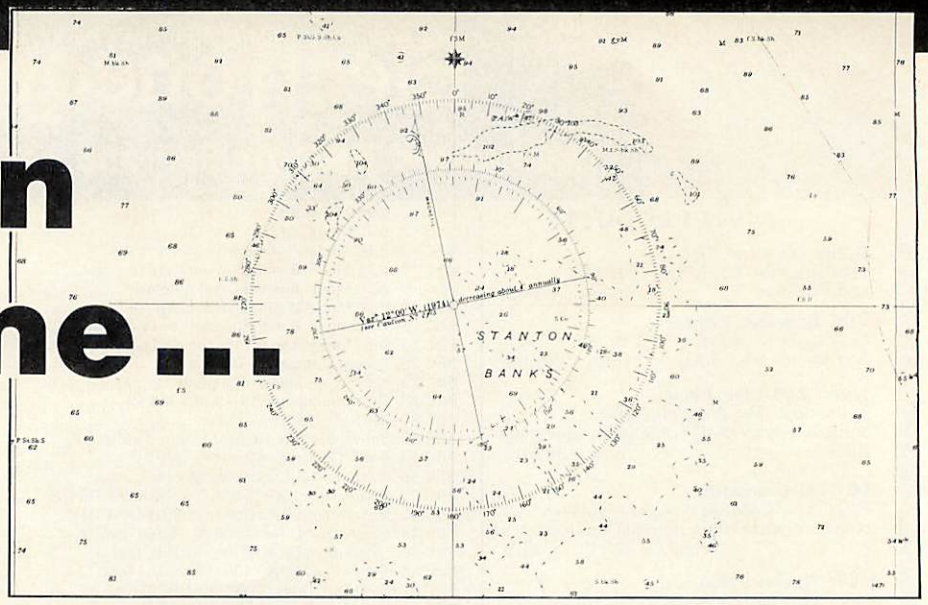

Slick (BP Educational Service)

SLICK is an interactive computer simulation based on the conservation game of the same name. It is designed to enable students of various ages and abilities to investigate the methods of dealing with oil pollution around the fictional coastal town of Inverlochen.

For advanced students it could form the basis of an examination into decision making in the modern world, or an introduction to logical thinking.

For top juniors it could be the centrepiece of a project on oil and pollution, giving an introduction to simple map reading.

Initially a map appears with the title of the program. Then the map reappears together with a key of the various features. The whole of the graphics are produced in Mode 7 (teletext mode) and are excellent.

This is followed by a brief introduction and details of the methods available to combat an oil spillage from a tanker, such as booms and dispersants, with different costs for each. Further details are provided on data sheets which can be copied for class use.

A total of £5,000 can be allocated between the methods. The pupil is then presented with a 100 tonne oil spillage which has to be dealt with.

The initial map co-ordinates of the slick are given on the screen, together with windspeed and direction. The student has to estimate the new position of the oil slick before any other choices can be made.

If the estimate is correct, then various options are open depending upon the methods of dispersal chosen. For example, a tug may be loaded with dispersant units, or booms may be moved to protect sections of the coast.

There are various conditions attached to the options. For example, only two dispersant units can be loaded at a time before the next slick position has to be estimated.

To make things a little more difficult, a clock is displayed on the screen and unless moves are made within a certain time limit the message "Time-up" is given.

The slick moves slowly towards the coastline and each method takes a certain time to implement (times are given in the data sheets).

It is impossible to deal with all of the oil and eventually the message "Oil Ashore" is displayed, followed by a detailed breakdown of the score achieved.

After discussion of the score the pupils can then select from the menu one of several options and repeat the game, leave the program, or make a copy of the program.

The program is supplied on tape with copies at 1200 and 300 baud. A teachers' guide and copies of the briefing sheet, data sheets and map are also provided.

All written materials and the program may be copied for use by a class of students and a sheet of program notes is also provided with instructions on how to use the program with a Model A machine or with a disc based system. **Mike Shaw**

Music Synthesiser (Bug Byte)

Budding

"YOU are well advised to read the BBC section on envelope before using the Music Synthesiser," states the opening section of documentation – and very good advice it is too.

Unless the user has a very good knowledge of music and, in particular the SOUND and ENVELOPE commands in BBC Basic, it is unlikely that he will be rapidly producing long musical pieces scored for three instruments.

He is not helped by rather poor, and sometimes unclear, screen prompts (for example Silent Inst'mt Rep number or note) which could be somewhat improved.

In several places the command displays are rather confusing because CLS is not always used before overprinting with new information at the top of the screen.

The written documentation is also rather poor. I found that I had to read and reread some sections several times while running the program in order to try and clarify the instructions. Particularly difficult to follow is the section on "Inserting and editing notes and directives" (2b) and the description of Sections (2d)(3b).

The program uses a Mode 7 text display with good use of colour and is on the whole quite well protected against incorrect keyboard input (generally the input line is overprinted and the user is warned with a gentle beep).

In a typical first run, the user would enter the Edit Envelope mode and define some instruments. Up to 16 can be defined with OS 1.2, although obviously only four can be used at any one time. In Edit Envelope mode several options are available on the soft

Missiles, meteorites and small green aliens

Rocket Raid (Acornsoft)

THIS is an amazingly addictive arcade game which can be played with a joystick or keyboard. The keyboard version though can make the game even more frustrating, and doesn't really do it full justice.

The aim is to fly your rocket ship through five different landscapes, each of which has its own hazards designed to make things as difficult as possible for you.

The first scenario is a lurid purple mountainous terrain containing fuel tanks which you must destroy to maintain your supplies, servicing units – which don't fight back fortunately – and ground sited missiles which zoom up at you with fatal consequences unless you can dodge or shoot them.

Despite all this, the first stage is designed to lull you into a false sense of security, because next comes the Cavern.

It wouldn't be too bad if you just had to navigate through it without crashing into overhangs and outcrops, but unfortunately the Cavern is inhabited by small green aliens called Phizzers which are remarkably adept at smashing into you.

You can shoot them, but don't forget about the narrow section at the end of the Cavern!

If you do manage to get through the Cavern don't relax, because next come the Meteorites. You can't destroy these, so you just have to dodge them while trying desperately to bomb the fuel tanks below you.

Fortunately, this section is not too bad and you'll soon get through to the Skyscrapers. Once again there are ground missiles here, so you have to fly above and between these as they take off, until eventually, if you're lucky, you reach the Maze.

This is the most difficult section of all. After many hours of trying I still haven't got far into it, but no doubt after a few more weeks of playing through the night its secrets will be revealed.

Each game gives you three ships, and you can earn more if you score enough points. Unfortunately each time you get destroyed you go right back to the beginning of the section you were in.

This is quite heartbreaking when after many attempts you are almost at the end of the Cavern!

Conclusion: This is a superb game. The sound effects are of an excellent quality, and the joystick control allows you to shoot bullets and drop bombs with a single button, which gives you a small advantage over the terrors of the enemy's many different methods of attack – even if you never quite manage to completely overcome them.

Jane Jackson

Bachs beware

keys as each envelope is being defined – the envelopes can be named (f3) and listed (with command DISPLAY), represented graphically (f2) and heard as music (f0) or noise (f4) with a present frequency (f5).

Once the envelopes are set, the user can enter Edit Channel mode. Rather tediously he then has to enter notes (or directives such as 'R' for repeat a section) in sequence, channel by channel.

Conventional music notation is used to enter the notes, example C♯4 – 'C' sharp, 4th octave, where the octaves "wrap round". That is A (octave 4) follows G (octave 3).

Finally in Play Mode, the entire piece can be played through from note 1, or sections (previously defined, for example as section 1 – notes 1 to 32; section 2 – notes 33 to 64) can be played in any sequence.

This is useful of course for playing a tune whose structure is, say verse, chorus, verse, chorus, chorus repeat.

Unfortunately if your composed piece doesn't contain many notes, there is quite a long pause after they have been played while the program examines the rest of an empty array. However I found that pressing Return at this point quickly returns control to the main menu ready to continue editing.

A very useful feature of Music Synthesiser is the option of saving a file containing the instrument envelopes and channel notes which you have defined.

In conclusion, quite a useful program, but not recommended for the beginner. It could easily be improved by increasing user friendliness, tidying up the screen display and reducing the number of key presses required, for example by increased use of GET or INKEY. It would also have been useful to have included an example music data file.

The rather high price of the package is in my view justified only by the inclusion of the delightful Auto-Composer program. A few inputs to define parameters such as tempo and rhythm, choose between two and six musical chords and give a weighting to each, and away goes the computer composing ad infinitum.

Far from being random and discordant, some of the pieces it produces are quite intelligent. A musician with a knowledge of chord structures would have a whale of a time with this one. Pity about the spelling though – cord, syncapation and sink!

N.R.M. Smith

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Part five of MIKE BIBBY'S introduction to programming

THERE is an assortment of new ideas this month, which should greatly increase the scope of our programs.

Firstly, if you cast your mind back to last month, we saw that the INPUT statement enables the BBC Micro to ask for information when a program is running.

When the micro encounters a line such as:

```
10 INPUT name$
```

it halts the program, puts a prompt ('?') on the screen and waits for a response. You then type in what you wish name$ to be and press Return, when the program continues with the new value of name$.

We also saw that it is sensible to print a message on the screen before INPUT to indicate the kind of response required.

Last month we used techniques such as:

```
10 PRINT "How old are you";
20 INPUT age
```

Actually we can incorporate such messages in the INPUT statement, as in the following:

```
10 INPUT"How old are you",age
```

Look carefully how it is done:

- ☐ You insert the message between INPUT and the variable.
- ☐ The message is in quotes.
- ☐ There is a comma between the final quotes and the variable.

Using this technique, last month's multiplication program would become:

```
10 REM *** PROGRAM I ***
20 MODE 6
30 INPUT "First Number",first
40 INPUT "Second Number",second
50 PRINT;first " multiplied by ";se
   cond " is "; first * second
```

Program I

And now for something completely different! You should remember programs such as:

```
10 PRINT "HELLO"
20 GOTO 10
```

This type of program, which endlessly repeats itself, is called an unconditional loop. As we learned, it is not a particularly useful thing to do in a program, and we'll see how to do something about it this month.

Firstly, though, let's look at another way of obtaining an endless loop:

```
10 REPEAT
20 PRINT "HELLO"
30 UNTIL FALSE
```

If you run it, you'll see that it gives exactly the same output as the previous example, repeatedly printing out HELLO until you press escape.

This sort of loop is known as a REPEAT . . . UNTIL loop. All the lines between the REPEAT and the UNTIL are repeated until a certain state in the program, known as the condition, is reached.

For instance, here is a 'program' to read a book:

```
REPEAT
 read next page
UNTIL no more pages
```

In this case the finishing condition is 'no more pages'.

Now the last program we ran simply said UNTIL FALSE, so the condition the loop was testing for, to see if it was finished, was FALSE.

Exactly what this means we'll ignore for the moment. Suffice it to say that, since we haven't given the micro anything that could possibly be FALSE, it isn't likely to find anything to meet the finishing condition, so it will keep on repeating indefinitely.

It isn't so much an unconditional loop as a loop with an impossible condition.

Program II uses a REPEAT . . . UNTIL loop with a condition: lines 40 and 50 are to be repeated until A$="YES".

```
10 REM *** PROG II ***
20 MODE 6
30 REPEAT
40 PRINT "This is a REPEAT... UNTIL
loop"
50 INPUT "Do you wish to finish",A$
60 UNTIL A$="YES"
70 PRINT"Then I quit!"
```

Program II

The effect of this is that the program keeps on printing out its message (line 40), then asks whether you wish to finish (line 50). Any reply to the question other than YES will cause the loop to be repeated.

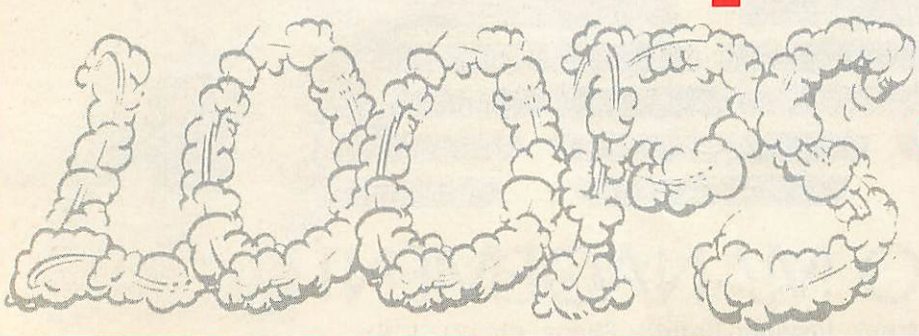
If, however, you answer YES, the loop's condition, which was UNTIL A$="YES", is fulfilled and the program is able to continue past to line 70.

Before we continue with REPEAT . . UNTIL loops look at Program III. There's nothing here that should prove too difficult. Let's examine line 50 in detail:

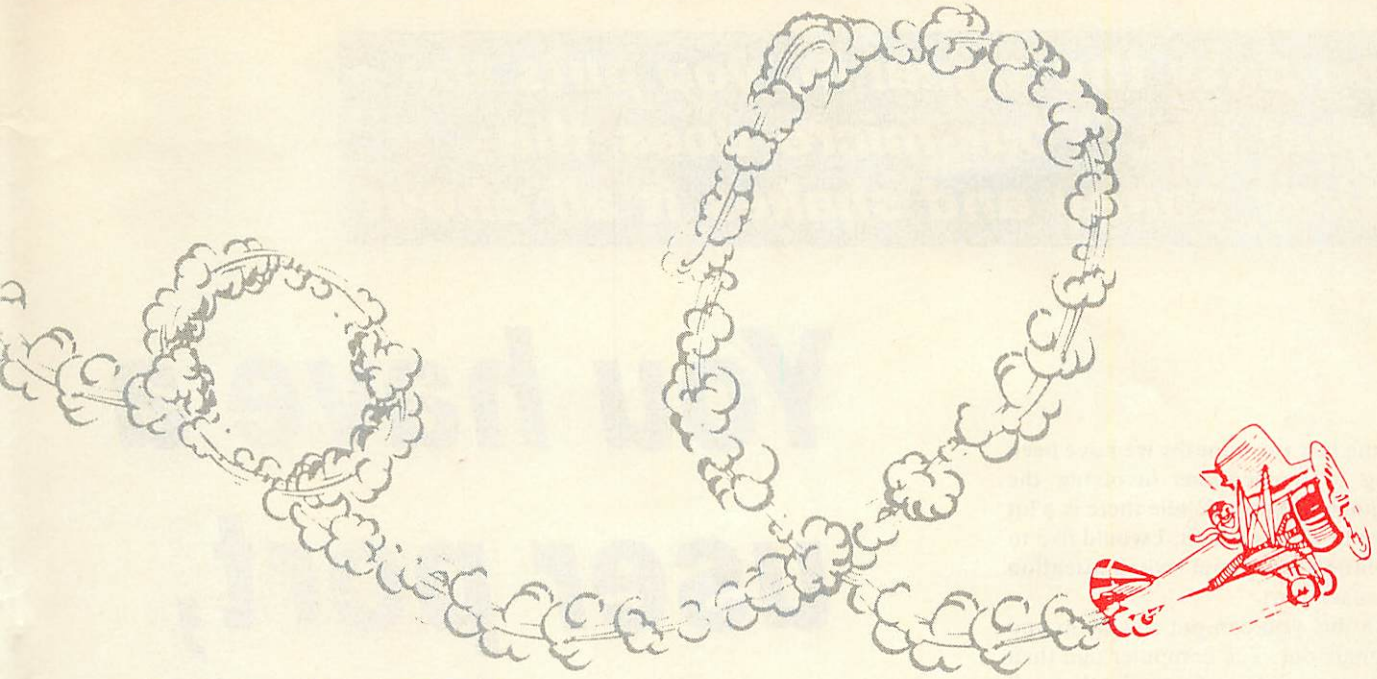
```
50 new_number=number + 1
```

When the computer reaches this line, it takes the value of the number, adds

Now let's put some



to work



one to it, and stores the result under the label new_number. That is, line 50 ensures that new_number is one higher than number.

Notice that the computer does the sum that appears on the right of the '=', then stores the result in the variable appearing on the left.

If you try Program IV, you'll see that it is based on Program III.

Can you see what's happening in line 50? Remember, we do what is on the right of the '=', then store the result in the variable on the left. So when the micro encounters:

```
50 number=number+1
```

it takes the value labelled by number, adds one to that value, then stores the result back in the variable number. In other words, line 50 increases the value of number by one.

Had line 50 read:

```
50 number=number+2
```

the value stored in number would have been incremented by two. Try it!

Now, let's get something clear: Mathematically,

```
number=number+1
```

does not make sense. How can a number be equal to itself plus one? It's like writing:

```
5=5+1
```

However, we are not using the '=' as an equals sign. We are using it to signify assignment – that is, we're using it to pin a label (or variable) onto something. When we write:

```
new_number=number +1
```

we are telling the computer to do the job on the right, that is, to add one to the value labelled by number, then to label the result of that number with the label on the left of '='.

The only reason that:

```
number=number+ 1
```

might seem confusing is that we are labelling the result of the calculation on the right with a label that's already been mentioned in that calculation.

That doesn't worry the micro, though. It's used to re-using the same label. That's why they're called variables – they keep varying!

Have a look at Program V. Line 50 is identical to that of Program IV. That is, it increases the value of the variable number by one.

However, the variable is part of a REPEAT . . . UNTIL loop. Hence no sooner has it incremented number (line 50), than it is printed out again (line 40), incremented again (line 50), printed (line 40) and so on.

The effect is that line 40 prints out a steadily increasing sequence of numbers.

This might be rather hard to see, since the screen will be scrolling rather quickly. To get round this I suggest that you add the following two lines:

```
25 VDU 14
65 VDU 15
```

These lines introduce the VDU drivers, a rather complex topic that we shall, for the moment, only touch on lightly.

The effect of VDU 14 in line 25 is to put the micro into paged mode. This means that rather than allowing the unrestricted scrolling of the screen, information is presented in screenfuls at a time, which remain on the screen until Shift is pressed, when the next screenful is delivered, and so on.

VDU 15 on line 65 simply ends the paged mode and returns you to normal scrolling.

Can you alter line 50 in Program V so that number goes up in 2s, 4s or 10s? Could you, by altering lines 30 and 50, get the program to start at 1000 and count down in ones?

We can actually get the program to stop at a given number by altering the loop condition in the UNTIL statement. In Program V, try altering line 60 to:

```
60 UNTIL number=24
```

Is the final number printed on the screen 24 or not? If not, can you see why, and can you alter the program so 24 is the final number printed out?

```
10 REM *** PROG III ***
20 MODE 6
30 number=0
40 PRINT "number is ";number
50 new_number=number + 1
60 PRINT "new_number is ";new_number
```

Program III

```
10 REM *** PROG IV ***
20 MODE 6
30 number=0
40 PRINT "number is ";number
50 number=number + 1
60 PRINT "number is now ";number
```

Program IV

```
10 REM *** PROG V ***
20 MODE 6
30 number=0
35 REPEAT
40 PRINT "number is ";number
50 number=number + 1
60 UNTIL FALSE
```

Program V

You puts the signal in, you puts the signal out. Your micro does the hokey cokey and shakes it all about

You have a user port, so use it!

By MIKE COOK

FOR the last two months we have been looking at applications involving the analogue input port. While there is a lot more to be done using it, I would like to add a little variety and switch attention to the user port.

With this you can put signals in and put signals out. The computer can then do the hokey-cokey and shake them all about.

With a digital port you can monitor switches and control devices, which will add another dimension to your computer.

The user port is one side of the 6522 VIA (Versatile Interface Adapter). It is in fact the B side, the A side being used to drive the printer.

The VIA is a quite remarkable device, capable of being used in many different modes. The B side consists of eight input/output lines and two control lines.

To those of you not familiar with computer electronics, it may be a little puzzling why I said input/output. Surely a connection must be either an input or an output? Normally, with logic circuits, I would agree with you. But with the VIA – and other specialised computer I/O devices – each data connection is capable of being either an input or an output. It can, however, only be one of these at any one time.

How does it do this trick? Well, the VIA is memory mapped into the address space of the microprocessor. That is to say, it appears as 16 consecutive memory locations, from &FE60 to &FE6F.

So at those addresses instead of there being normal memory there are the internal registers of the VIA.

Each register, and so each address, in this range controls some part of the behaviour of the VIA, and one of the registers determines whether a bit is an input or an output.

Fortunately you don't have to understand them all to be able to operate the user port. It will help, however, to have a little knowledge of binary and hexadecimal.

If these are unfamiliar, I suggest you read Bits and Bytes on Page 60, which should make it clearer.

The registers in the VIA affect the way it operates. At address location &FE60 is the data register for the B side of the VIA, and any input or output is channelled through this address. That is, any data transfer to the user port just needs to use that address to access the outside world.

As I said before, each bit can be either an input or an output, as dictated by the eight bits in the Data Direction Register (DDR) for the B side (or port B).

The DDR is at address &FE62 and each bit in that register determines whether the corresponding bit in the Data Register, and hence the user port connection, is an input or an output. If bit 5 in the DDR is a one, then bit 5 in the Data Register will be an output.

Similarly, if bit 6 in the DDR is a zero, then bit 6 in the Data Register will be an input. In this way we can have any combination of inputs and outputs distributed over the eight bits.

As the number stored in address location &FE62 affects the configuration of each bit in the user port, you will see that it is very useful to express the number in hex.

To read or write to the user port we must read or write to the memory location &FE60. We can access this register in two ways – firstly by using the indirection operator "?", and secondly by an OSBYTE call.

The second method has the advantage of working when using the second processor and is recommended by Acorn. However, it has two disadvantages, first it is slower and second it only works with operating system 1.0 or later.

When considering which to use I asked myself, "How many people have a second processor anyway?" and, "If Acorn were that serious about OSBYTE calls why didn't they implement them from the first operating system?"

So in all my examples for the time being I will use the direct method, which is both quicker and easier to write. If you do want to convert the examples to run on the second processor then it is very easy and many articles have already appeared on how to do it. *(Note: Many more articles than second processors!)*

Having seen how to access the VIA from software we need physically to access the pins of the VIA. These are brought out to a 20 way IDC header, under the case.

The easiest way to access them is to use a 20 way socket (known as an insulation displacement connector)

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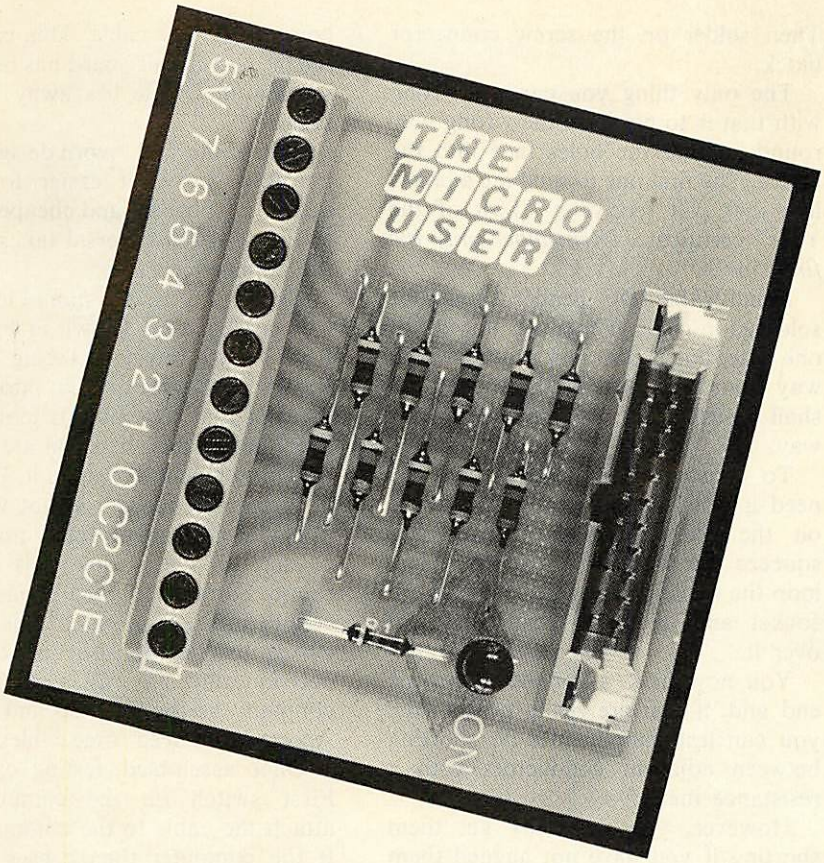


attached to a ribbon cable.

The cable is threaded through and then the whole assembly is squeezed in a vice. The sharp prongs in the socket cut through the insulation and grip the wires, thus making 20 joints at a stroke.

This is something that newcomers find hard to believe, but they really are as good and solid as if they had been soldered.

The other ends can be separated, stripped and soldered onto the external circuits.

However, I have found that while it is easy to say (and in my opinion to do) many people have difficulty in doing this neatly and in a way that does not short out any connections. Also, for every circuit a new socket and length of ribbon cable has to be used.

Ribbon cable is expensive, and as all the connections are not always needed there is some waste that leads to an untidy job.

I pondered long over this dilemma and came up with the idea of a ribbon cable with a socket on each end connecting to a small printed circuit board that makes a transition to screw connections.

This has the advantage of being easy to connect to external circuits, and if you wanted to leave it connected permanently to one circuit you could just obtain extra printed circuit boards and use the same ribbon connector.

In addition, the printed circuit board can label each user port connection so there is no danger of them getting mixed up. So I have designed a printed circuit board to do the job. Details of how to buy it are on the next page. Two packs are available:

The circuit for the printed circuit board is shown in Figure I. It is included for those of you who would like to make it up from your own components. As you can see, it is not very complicated as it is basically just a transition from one type of connector to another.

There is an LED to indicate that it is connected up correctly and that the power is on. Also on each signal line there is a resistor going to the +5 volt line. This is known as a pull-up resistor, and is needed when a line is used as an input.

If some active device is feeding the

→

Body Build Pack No. 1 **consists of a printed circuit board, IDC header, screw terminal block, 11 resistors and an LED. Price £9.95, including VAT.**

Body Build Pack No. 2 **consists of two 20 way IDC sockets and 2ft of ribbon cable. Price £9.95, including VAT.**

You need both packs to start with, but then if you want to do more work you need only buy another Pack No. 1, as you can use the same ribbon cable connector.

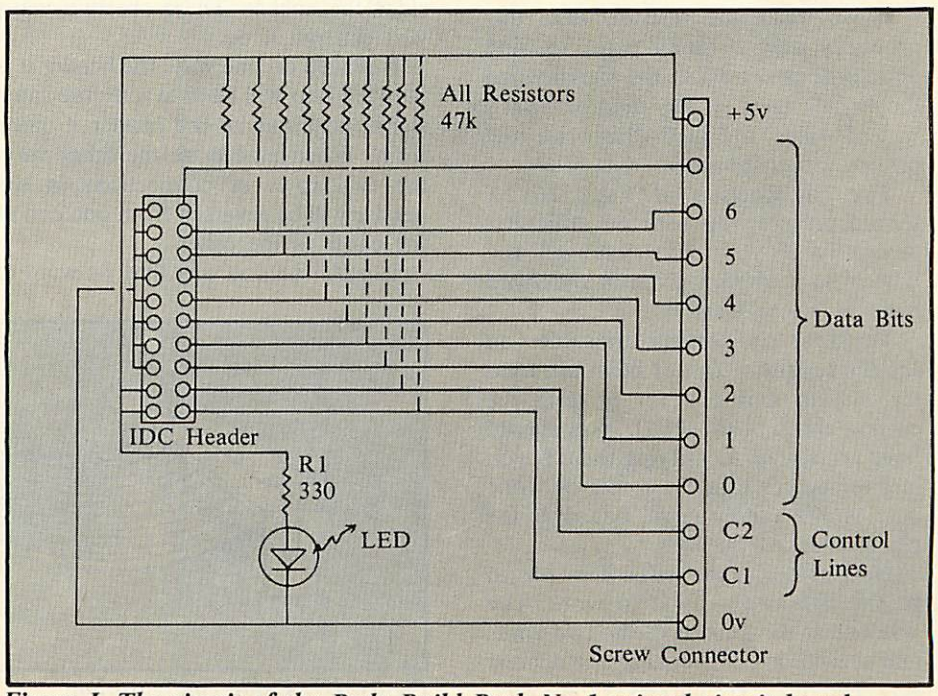


Figure I. The circuit of the Body Build Pack No 1 printed circuit board

From Page 83

input then a pull-up resistor is not needed as the appropriate voltage levels are generated by the device.

However, if a passive device, such as a contact closure in a switch, is feeding an input, it cannot generate any voltage to drive that input. In this case *(see Figure II)*, when the switch is open circuit the pull-up resistor supplies enough current to produce a logic one on the input.

When the switch is closed, the input is connected to earth (0 volts line) and so a logic zero is produced on the input.

As only a very small current is needed, the resistor value can be quite high and its exact value is not critical. When the line is used as an output the pull-up is added to the load the output has to drive.

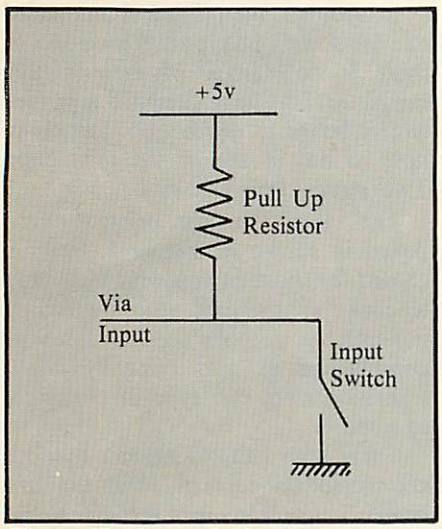


Figure II. A switched input

If we make the resistor large this produces only a small extra loading and so does not affect the signal when the line is used as an output. That's why I have included them on the printed circuit board.

The construction of Pack No. 1 should present you with no difficulty, especially if you have followed my advice on soldering given in the April issue of Micro User.

The first components to solder on are the resistors. Ten of them are used for pull-up and one for limiting the current through the LED. You should have no trouble identifying them if you just remember that R1 is the odd one out. Mount them on the board at the places marked by lines.

Next solder in the LED. This has to be the right way round to work. The +ve end is the longest of the two wires and should be connected to the nearest R1. The hole is marked + anyway. Then solder on the screw connector block.

The only thing you can get wrong with that is to put it on the wrong way round so that the holes face into the board. The first one to send me a board like that will receive a "Twit of the Year" certificate. *(Remember only the first one!)*

Finally, the IDC header should be soldered in place. There is a slot out of one side, but it does not matter which way round this goes as the sockets we shall be using are not polarised in this way.

To construct Pack No. 2 you will need a vice. Carefully align the cable on the grooves of the socket and squeeze the two parts together. Then loop the cable back over the top of the socket and clip the strain-relief clip over it.

You now have a connector on one end and, if you are really pessimistic, you can test that there is no shorting between adjacent conductors with a resistance meter.

However, you will only get them shorting if you have not aligned them properly in the first place. Officially there is no going back once you have made the connection, although I have on occasions successfully removed a socket and replaced it.

But be warned, there are no guarantees that you will be able to do this as, if you are not careful, the socket connectors will pull out with the cable. They can be pushed back if they have not been lost or suffered damage.

Now with a connector on one end you are all set to connect up the other end, but pause for a second and consider the socket. There are two ways you can put it on.

If placed on one way, the header it is plugged into will have exactly the same signal positions as the header it came from. When placed on the other way, the two rows of connections in the header will be reversed from one end of the cable to the other.

It is this second way that we want to connect up our cable. This is because the printed circuit board has been made so that the cable lies away from the board.

Due to the way Acorn designed their board it makes it easier for me to design my board – and cheaper for you to buy – if this reversal takes place in the connecting cable.

The way the cable should look when it is completed is shown in Figure III. Both sockets must be facing the same way – remember to take into account the fact that the cable is looped back over the socket when you are deciding which way round to align it. If you get it wrong the board will not work.

If you are using a ready-made cable be sure to check that it is this way round. Some people may consider that connecting up a cable this way is wrong, but I emphasise it is a deliberate decision and anyway I am in good company as the TRS-80 and even the Acorn Atom need some cables like this.

Once assembled, testing can begin. First switch on the computer and attach the cable to the computer only. If the computer then ceases to work you have a short in the cable, otherwise proceed to the next stage and connect up the printed circuit board.

Remember that the cable should lie away from the board, not over the components. The LED should then light. If not, then it could be soldered in the wrong way round or you could have some other problem.

If the computer crashes (stops working) then you might have the cable connected the wrong way round (see Figure III) or there could be a solder splash shorting out the pins on the IDC header. Check this very closely.

Do not worry about the computer crashing – there is very little danger of doing any permanant damage if you switch it off as soon as you notice it.

Assuming that the LED is on and the computer is still working, connect a wire to the 0v screw connector and run the program in Listing I. This will test out all the data inputs and should show

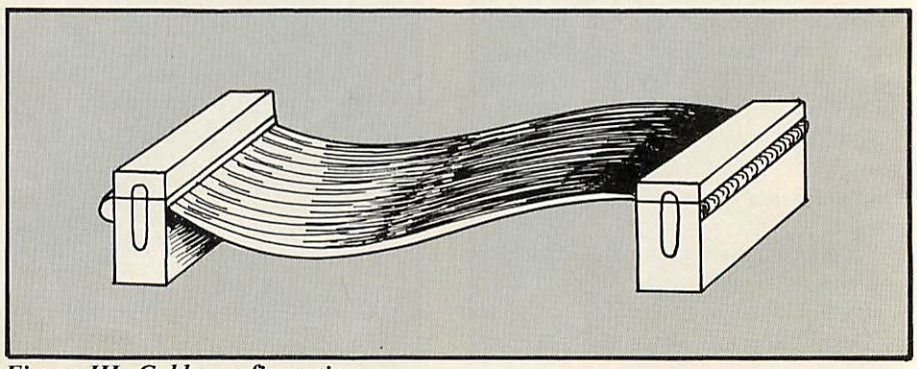


Figure III. Cable configuration

```
 10 MODE 7
 20  PRINT TAB(5,3),"BODY BUILD No.1
CIRCUIT TEST"
 30 PRINT TAB(12,7),"INPUT &FE60"
 40 PRINT TAB(10,9),"7 6 5 4 3 2 1 0"
 50 ?&FE62=0
 60 P%=?&FE60
 70 PRINT TAB(10,11);
 80 A%=128
 90 REPEAT
100 IF (A% AND P%) THEN PRINT "1 ";
ELSE PRINT "0 ";
110 A%=A% DIV 2
120 UNTIL A%=0
130 GOTO 60
```

Listing I

that all the bits are at logic one.

Move the other end of the 0v wire and touch each of the data inputs 0 to 7 in turn. As you do, you should see each bit on the display immediately go to zero and then back to one when the wire is removed.

If more than one bit changes then again check for solder splashes on the board.

For those of you who have not used a computer input port before, the following explanation might help you to understand how one is driven.

Line 50 sets up all the data lines to be inputs. The computer powers up in this state but it does no harm to include the line.

Line 60 inputs the value on the data lines at that time into a variable P% so that the bits making up P% will be identical to the logic state of the inputs.

We then proceed to display this bit pattern. To do this we take a variable A% and use it as a mask to test P% with.

The mask is first set to 128 (a one in bit 7 and zero in all the other bits) and then AND it with P%. If bit 7 of P% is a one then the result will be none zero and hence true so a "1" will be printed on the display. Otherwise a "0" will be printed.

For a more detailed explanation of the AND operation see the User Guide.

Having tested bit 7, we want to test bit 6, and so we must put a one in bit 6 of the mask. As the mask already contains a one in bit seven we can shift it down using line 110.

In this way we test each bit until the mask reaches zero, indicating that we have tested all the bits. The program then loops round to get a new bit pattern from the user port.

Now that we have a working input port there are a great many devices and switches that can be wired up to it. However, as the saying "All work and no play" is there to testify, I think it is time we took a little light relief as it has been rather heavy going so far.

While not giving away my age (I just have a good memory), I wonder how many of you will remember "Sunday Night at the London Palladium" and in particular the game they had in the section "Beat the Clock"? No, not the one that I still use when someone asks me to do something unpleasant, namely "Arrange these words in a well known phrase or saying – knotted get".

It was a game where contestants had to manoeuvre a loop along a twisted wire without touching the sides. Using the user port we can make a very good simulation of this game. I call it Steady Hands (but then I never did have much imagination!).

All you need is an old wire coat hanger and a block of wood. As old coat hangers tend to be a little tarnished it is advisable to clean them with a little emery paper or steel wool so that they make good electrical contact.

Snip off some of the hanger to form a loop about threequarters of an inch in diameter with a small handle. Also cut two end stops about two inches long from the length of hanger.

Bend the coat hanger into whatever shape you like and clip it into two holes at each end of the block of wood (see Figure IV).

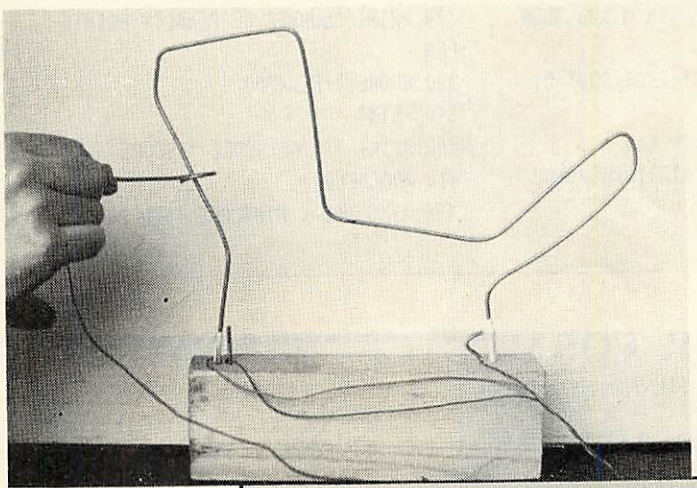
Take the two end stops and mount them at each end of the wire. Either paint the ends of the wire or wrap them with insulation tape so that when the loop is at the ends it connects only with the end stops and not with the main wire.

The program in Listing II will then drive the game, but you will find it is not quite as easy to do as it sounds. I have designed it so that it bleeps when the loop touches the side and some penalty points are added onto your time.

Also a record is kept of the best time and who made it so it would be suitable for running at fund-raising functions and suchlike.

Line 40 sets up P% as the address of the input port, as using a variable rather than a constant is slightly faster. Also line 70 turns off the analogue-to-digital converter to speed things up.

Lines 290 to 320 time your run and also determine the number of penalty points you clock up. In this version each point costs two seconds, but it can



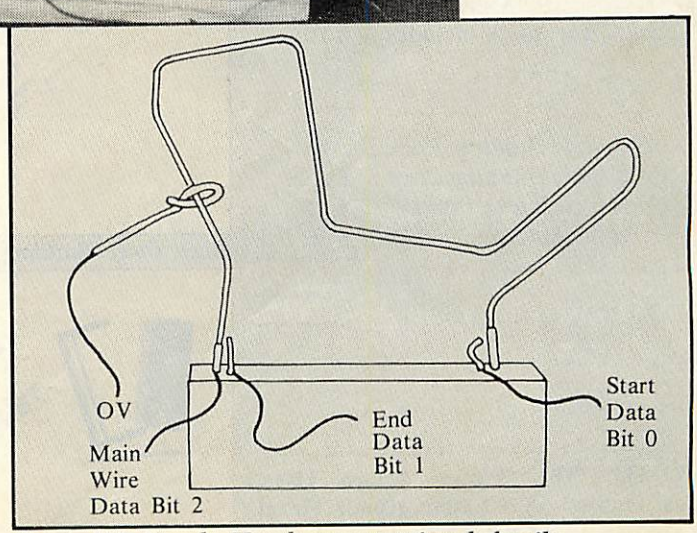


Figure IV. Steady Hands constructional details

From Page 85

be changed by altering line 380.

You might like to change the game so that if you touch the side you have to go back to the start again!

I know of some teachers who are adapting the game for handicapped children by introducing a warning sound and a delay before any penalty points are incurred. This extra feedback helps them to improve their hand-eye co-ordination.

One interesting aspect of running this game is that there is no need to make any keyboard input, apart from entering the name of the best scorer if one is made.

This gives the game a totally different feel from normal computer games and people have told me that they "get on with it much better" as a result.

In addition, if you are running the game at a function the computer can be hidden out of sight, where no spotty little Herbert can get at the Break key.

Well that's just one application of the user port. There are many more to come in future issues of Micro User, so the connector board would be a good investment whether you are interested in this game or not.

● **Next month we will see how the user port can be used as an output as we exercise our muscles to control the world – or at least eight bits of it.**

```
 10 REM THE MICRO USERS - MIKE COOK
 20 REM JULY 1983 ISSUE
 30 MODE 7
 40 P%=&FE60
 50 ?&FE62=0
 60 S=0
 70 *FX16,0
 80 NCHAMP$=""
 90 MINSCORE=99999999
100 CLS
110 PRINT TAB(12,3),"STEADY HANDS"
120 PRINT CHR$(134);"SEE BEEB BODY B
ULDING COURSE No.5"
130 IF S=0 THEN S=1:PRINT TAB(0,11):
GOTO 440
140 IF NCHAMP$="" THEN 180
150 PRINT:PRINT CHR$(131);"TODAYS CH
AMPION IS ";CHR$(136);NCHAMP$
160 PRINT CHR$(131);"WITH A LOW SCOR
E OF ";MINSCORE
170 PRINT TAB(0,11),STRING$(60," ")
180 PROCDELAY
190 IF (?P% AND 1) THEN 460
200 PRINT TAB(1,11),"START WHEN YOU
ARE READY"
210 REPEAT
220 L%=?P% AND 1
230 UNTIL L%
240 PRINT TAB(0,11),STRING$(60," ")
250 TIME=0
260 PRINT TAB(0,11),CHR$(130);"YOUR
OFF"
270 SOUND 1,-15,45,1
280 PEN=0
290 REPEAT
300 L%=?P% AND 6
310 IF L%=2 THEN SOUND 1,-15,100,1 :
PEN=PEN+1
320 UNTIL L%=4
330 T=TIME
340 PRINT TAB(0,11),"THATS IT YOUR S
CORE IS :-"
350 PRINT
360 PRINT "TIME ";T/100;" SECONDS"
370 PRINT "NUMBER OF PENALTY POINTS
";PEN
380 SCORE=T+PEN*200
390 PRINT
400 PRINT "TOTAL SCORE ";SCORE
410 PROCDELAY
420 IF SCORE < MINSCORE THEN PROCCHA
MP
430 PRINT
440 PRINT"MOVE LOOP BACK TO START AG
AIN"
450 PRINT"AND THEN RELEASE IT"
460 REPEAT
470 L%=?P% AND 1
480 UNTIL L%=0
490 GOTO 100
500 DEF PROCDELAY
510 TIME=0
520 REPEAT
530 UNTIL TIME > 70
540 ENDPROC
550 DEF PROCCHAMP
560 PRINT
570 PRINT CHR$(129);"CONGRATULATIONS
"
580 PRINT"THAT IS THE BEST SCORE TO
DAY"
590 PRINT"PLEASE LET ME KNOW WHO YOU
ARE"
600  INPUT"TYPE IN YOUR NAME ",NCHAM
P$
610 MINSCORE=SCORE
620 ENDPROC
```

Listing II

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ORDER FORM ON PAGE 73

FORMAT YOUR PROGRAM LISTINGS

JIM NOTMAN shows you how

THE need for this program arose while I was trying to decipher some program listings which I hadn't looked at for some time. Even with the LIST option on, long program "lines" often break up keywords and wrap over onto the next line below the line numbers, making the listing look very untidy and difficult to follow.

The program following is an attempt to tidy up these listings.

It will:

- Divide up multi-statement lines.
- Not split keywords.
- Insert spaces after keywords unless this alters the meaning of the statement, for example, after FN there must be no space before the function name.
- Indent statements if the line overflows onto the next.
- Page a printer and write a heading.
- Work with Basic programs saved on both disc and cassette filing systems.

Select the file system required before typing RUN.

At the moment the program is set for a maximum width of 38 characters so that it will work in Mode 7. With standard computer printer paper this leaves a margin on the right which is very useful for documenting your program.

You can remind yourself what you did without having to use too many REMs.

Before examining the program we'll have a brief look at how Basic is stored in memory.

The first byte of a line is always &D.

The second and third bytes hold the line number in binary format. If the second is &FF this shows that this is the end of the program.

The fourth byte is the offset value to the start of the text on the next line.

The line statements follow:

The Basic keywords are represented in the form of tokens, all of which have a value more than 127. Teletext allows characters to have a value more than 127, but these must be enclosed by quotes, otherwise they will be misinterpreted by Basic.

Numbers (for example after GOTO) which occur within a line are stored in a complicated form in three bytes preceded by the token &8D.

The information giving the line number, which could have been stored as a two byte integer, is stored in three bytes instead.

Bit 6 of each of these bytes is set. One reason for this is to prevent Ascii control characters from appearing within a line.

Also, since the line numbers are always the same length, RENUMBERing is made easier *(see Figure I)*.

The other characters will have Ascii values 32 to 126, representing variables and expressions.

Bit values of the three byte line number

Bit	7	6	5	4	3	2	1	0
Byte 1	0	Always set	128	NOT 64	0	NOT 16384	0	0
Byte 2	0	Always set	32	16	8	4	2	1
Byte 3	0	Always set	8192	4096	2048	1024	512	256

Figure I

LOOKING AT THE LISTING

C% = Character to be decoded.
L% = Last character printed.
S% = File system in use, set in line 420.
O% = Offset to beginning of statements of next line number.
R% = Repeat loop counter.
MAX = Maximum number of columns on the screen. It's best not to come right to the edge of the screen as extra line feeds may be inserted by the operating system.
P = Printer control.
FILE$ = File name.
D%,D$ = Disc drive number.

PROGRAM MAP

10-140 Set up parameters and open file. Select printer.
170 Check first byte. With a Basic file this will be character 13.
180-230 The next two bytes give the line number in binary form.
240-250 The next byte is the offset to the statements of the next line.
260-370 The main body of the program, which decodes the line statements.
290 If the token is &8D then decode the line number.
300 Check to see if the character is

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From Page 93

an Ascii control one. If so, print an error message.

310 If byte is 58 (a colon) then go to next line.

320 If byte is 34 (quotes) go to quotes procedure.

330 If byte is &80 or more it is a token, otherwise it is a printing character.

340-350 Update line count and check to see if the line end has been reached.

370 See if end of file has been reached.

380-400 Close file. Option of looking at another file.

370 The (GET AND &F) makes the program respond to both upper and lower case "y".

400-500 PROCinit.

420 Save space for token table, and locations for working out line numbers in line statements.

440 D$ used by the disc system, defined as a null so that this program may be used with the tape system as well. MAX is the maximum number of characters on a line.

450 This is the way the computer works out which filing is active when the program is RUN with a CALL to OSARGS. S%=1 with 1200 baud TAPE, S%=2 with 300 baud TAPE, S%=4 with disc system.

470-490 These lines will set up the printer output for RS423, 150 baud and give line feeds. Replace these with your printer setup routine if required.

510-630 The routine that decodes the rather complicated manipulation of a line number held in text.

640-690 Compiles an array holding the keywords by looking at the keyword table in Basic.

670 Most of the keywords have a space added to them except those which end with a '(' or those where a space is not allowed, for example after PROC.

700-760 Prints out tokens after checking line position, or THEN or ELSE, when it goes onto the next line first.

710 Will not print out a token if less than eight spaces left so as not to break the longest keyword.

770-840 Outputs a character after checking line position and the last character output.

850-960 Outputs characters within quotes after checking line length, but does not add or remove spaces.

950 A "letout", just in case you forgot to close quotes at the end of the line.

970-1020 Moves onto the next line, but not if it has just moved to a new line. Indents margin if the program line is not complete.

1030-1060 Used to page the printer. Prints 60 lines including heading. Scrolls down six lines between pages.

THE advent of BBC Basic II has caused some changes in Basic locations. If you wish to run this program under Basic II you must make two alterations.

In line 650, A% = &806D should be replaced by A% = &8071

Similarly in line 660, UNTIL A% > & 8358 should be replaced by UNTIL A% > & 835B

Remember also that the program is set up for a serial printer. The lines you need to alter for a parallel printer are given in the text.

Formatter listing

```
10 REM Jim Notman 1983
20 MODE 7
30 PRINT ''"FORMATTER FOR PRINTER
   LISTINGS"
40 PRINT ''"Initialising...."
50 PROCinit
60 CLOSE #0
70 IF S%=4
   THEN REPEAT
   :INPUT '"Drive # ",D%
   :UNTIL D%>=0AND D%<=1
   :D$=":"+STR$ (D%)+"."
80 IF S%<3
   THEN PRINT ''"Put the program
    tape into the cassette"''"unit."
90 INPUT '"File name ",FILE$
100 IF S%<3
   THEN PRINT ''"(after rewinding
    your tape)"''"PRESS PLAY"
110 Z=OPENUP (D$+FILE$)
120 IF Z=0
   THEN PRINT '"FILE NOT FOUND"
   :GOTO 60
130 PRINT ''"Printer (Y/N) ";
   :P=GET AND &DF
   :IF P<>89 AND P<>78
   THEN 130
140 IF P=89
   THEN VDU 2,15
   :PRINT TAB(10)FILE$;TAB(MAX-8)
   "Page ";page'
   ELSE VDU 3,14
   :PRINT ''
150 REPEAT
160 C%=BGET #Z
170 IF C%<>13
   THEN VDU 3,7
   :PRINT '"NOT A BASIC PROGRAM"
   :CLOSE #0
   :STOP
180 C%=BGET #Z
190 IF C%=255
   THEN 380
200 N%=C%*256
210 C%=BGET #Z
220 N%=N%+C%
230 PRINT TAB(5-LEN (STR$ (N%)));N%;
   " ";
240 C%=BGET #Z
250 O%=C%-4
   :R%=0
   :L%=32
260 REPEAT
270 C%=BGET #Z
280 IF COUNT <6
   THEN PRINT TAB(6);
290 IF C%=&8D
   THEN PROCtextnumber
   :GOTO 340
300 IF C%<32
   THEN VDU 7
   :PRINT ''"?ERROR (ascii in text)"
   :CLOSE #0
   :STOP
310 IF C%=58
   THEN PROCnextline
320 IF C%=34
   THEN PROCquotes
   :GOTO 340
330 IF C%<127
   THEN PROCchar(C%)
   ELSE PROCtoken(C%)
340 R%=R%+1
350 UNTIL R%=O%
360 IF P=89
   THEN line=line+1
   :IF line>=60
   THEN PROCpage
370 UNTIL EOF #Z
380 CLOSE #0
390 VDU 13,3
   :PRINT ''"End of program file."
400 PRINT '"Format another program
    (Y/N)?";
   :IF (GET AND &DF)=89
```

Formatter listing

From Page 95

```
    THEN VDU 12
    :line=1
    :page=1
    :GOTO 60
    ELSE VDU 7,12
    :END
410 DEF PROCinit
420 DIM T$(128),E 3
430 PROCtable
440 D$=""
    :MAX=38
450 A%=0
    :Y%=0
    :S%=USR (&FFDA) AND &F
460 line=1
    :page=1
470 *FX8,2
480 *FX5,2
490 *FX6,0
500 ENDPROC
510 DEF PROCtextnumber
520 IF COUNT >(MAX-5)
    THEN PROCnextline
530 !E=0
540 C%=BGET #Z
550 IF (C% AND &20)<>0
    THEN !E=&80
560 IF (C% AND &10)=0
    THEN !E=!E OR &40
570 IF (C% AND 4)=0
    THEN E?1=&40
580 C%=BGET #Z AND &3F
590 ?E=?E OR C%
600 C%=BGET #Z AND &3F
610 E?1=E?1 OR C%
620 PRINT ;!E;" ";
    :R%=R%+3
    :L%=32
630 ENDPROC
640 DEF PROCtable
650 W$=STRING$(10," ")
    :A%=&806D
    :REPEAT
    :W$=""
    :REPEAT
    :W$=W$+CHR$ (?A%)
    :A%=A%+1
    :UNTIL ?A%>&7F
660 T$(?A%-&80)=W$
    :A%=A%+2
    :UNTIL A%>&8358
670 FOR I%=0TO 127
    :IF NOT (I%=114OR I%=36 OR
    RIGHT$(T$(I%),1)="(")
    THEN T$(I%)=T$(I%)+" "
680 NEXT
690 ENDPROC
700 DEF PROCtoken(C%)
710 IF COUNT >MAX-8
    THEN PROCnextline
720 IF C%=140OR C%=139
    THEN PROCnextline
730 IF COUNT <6
    THEN PRINT TAB(6);
740 PRINT T$(C%-&80);
750 IF RIGHT$(T$(C%-&80),1)=" "
    THEN L%=32
760 ENDPROC
770 DEF PROCchar(C%)
780 IF COUNT >MAX
    THEN PROCnextline
790 IF (COUNT >(MAX-5)AND C%=32)
    THEN PROCnextline
800 IF (C%=32 AND L%=32)
    THEN ENDPROC
810 IF COUNT <6
    THEN PRINT TAB(6);
820 PRINT CHR$ (C%);
830 L%=C%
840 ENDPROC
850 DEF PROCquotes
860 IF COUNT >MAX-5
    THEN PROCnextline
870 PRINT CHR$ 34;
880 REPEAT
890 C%=BGET #Z
900 IF COUNT <6
    THEN PRINT TAB(6);
910 IF COUNT >MAX-5 AND C%=32
    THEN PROCnextline
920 IF COUNT >MAX
    THEN PROCnextline
930 PRINT CHR$ (C%);
940 R%=R%+1
950 UNTIL C%=34 OR R%=0%
960 ENDPROC
970 DEF PROCnextline
980 IF COUNT =6
    THEN ENDPROC
990 IF R%>0%-2
    THEN ENDPROC
1000 PRINT 'TAB(6);
1010 L%=32
    :IF P=89
    THEN line=line+1
    :IF line>=60
    THEN PROCpage
1020 ENDPROC
1030 DEF PROCpage
1040 line=1
    :page=page+1
1050 PRINT '''''''TAB(10)FILE$;
    TAB(MAX-8)"Page  ";page'
1060 ENDPROC
```

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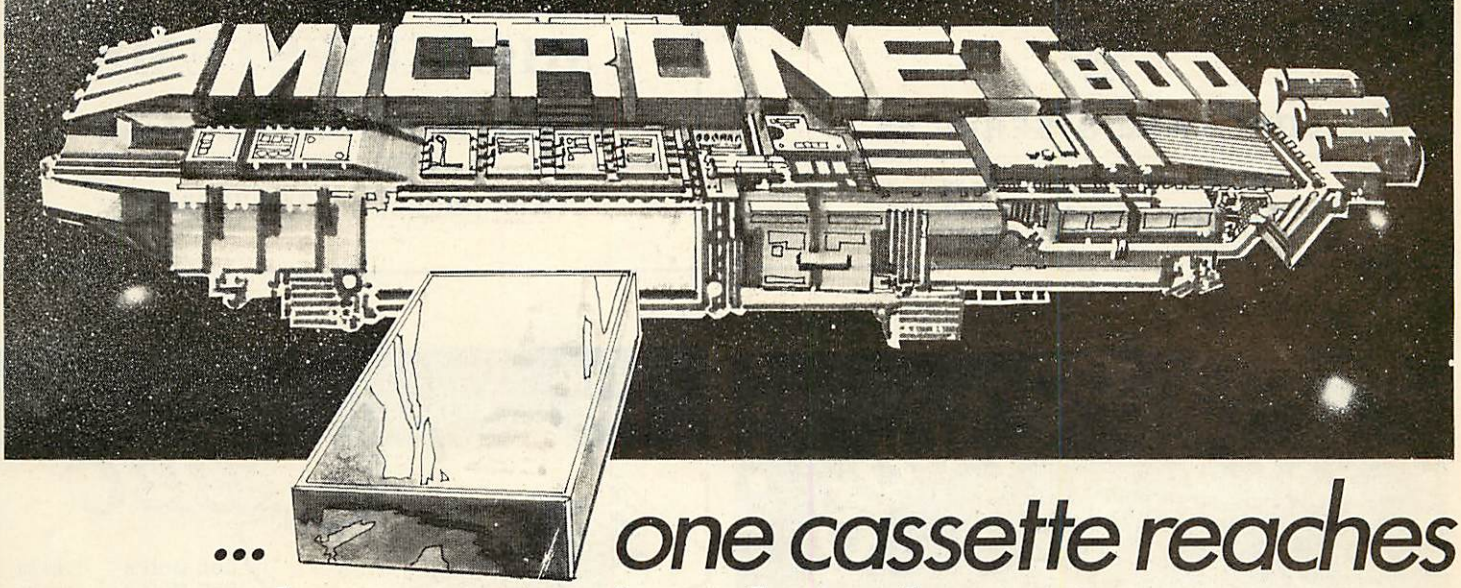

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Tenpins listing

From Page 43

This listing was produced by a Jim Notman formatter, which breaks one program line over several lines of listing. When entering a line don't press Return till you come to the next line number. Full details of the formatter are given in the article on Page 93.

```
 5 REM
   :"TENPINS" A.Phillips (3/83)
10 ON ERROR RUN
20 MODE 7
30 PROCinit
40 PROCmain
50 PROCend
60 MODE 7
70 END
80 DEF PROCinit
90 VDU 23;8202;0;0;0;
100 *FX11,0
110 *FX4,1
120 DIM S% 7
130 DIM BALL1%(1),BALL2%(1),CSTR%(1),
    OSTR%(1),SPR%(1),B%(1),NSTR%(1),N
    SPR%(1),SCORE%(1),M%(10)
140 F%=0
150 !S%=&08040201
160 S%!4=&4010
170 ENVELOPE 1,1,10,20,-30,10,5,15,12
    7,-2,0,-1,127,100
180 ENVELOPE 2,3,0,0,0,0,0,0,127,-10,
    -5,-2,120,120
190 ENVELOPE 3,5,16,12,8,2,1,1,10,-10
    ,0,-10,200,100
200 ENVELOPE 4,5,0,0,0,6,3,3,127,-5,-
    5,-5,120,60
210 FOR I%=0TO 23
    :PRINT TAB(0,I%)CHR$ 148;
    CHR$ 157
    :PRINT TAB(11,I%)CHR$ 156
    :PRINT TAB(29,I%)CHR$ 148;
    CHR$ 157
    :NEXT
220 FOR I%=0TO 23
    :PRINT TAB(10,I%);CHR$ 151
    :NEXT
230 FOR I%=3TO 74
    :PROCplot(28,I%)
    :PROCplot(50,I%)
    :NEXT
240 FOR I%=1TO 8
    :READ X%,Y%,L$
    :PRINT TAB(X%,Y%)CHR$ 131;L$
    :NEXT
250 PROCprint(1,21,130,"PLY 1")
260 PROCprint(30,21,130," PLY 2")
270 FOR P%=0TO 1
    :PROCscore
    :NEXT P%
280 FOR I%=1TO 10
    :READ M%(I%)
    :NEXT I%
290 ENDPROC
300 DEF PROCplot(X%,Y%)
310 LOCAL C%,A%
320 VDU 31,X% DIV 2+1,24-Y% DIV 3
330 C%=S%?((X% AND 1)+(2-Y%MOD 3)*2)
340 A%=135
350 VDU (USR &FFF4 AND &FF00)
    DIV 256 OR C% OR 128
360 ENDPROC
370 DEF PROCmain
380 FOR F%=1TO 10
390 FOR P%=0TO 1
400 PROCpins
410 PROCscore
420 PROCgo
430 PROCscore
440 PROCwait(300)
450 PROCpins
460 NEXT P%
470 NEXT F%
480 FOR P%=0TO 1
490 IF CSTR%(P%)=B%(P%) OR SPR%(P%)=B
    %(P%) PROCextra
500 NEXT P%
510 ENDPROC
520 DEF PROCgo
530 PROCind
540 IF BALL1%(P%)=10
    THEN BALL2%(P%)=10
550 BALL1%(P%)=0
    :PROCbowl
560 BALL1%(P%)=FNtot
570 IF BALL1%(P%)=10 PROCcalc
    :PROCstrike
    :GOTO 630
580 PROCcalc
590 PROCbowl
600 BALL2%(P%)=FNtot-BALL1%(P%)
610 IF Tot%=10 PROCspare
620 PROCcalc
630 SCORE%(P%)=SCORE%(P%)+Tot%
640 ENDPROC
650 DEF PROCind
660 SOUND 1,3,100,25
670 IF P%=0
    THEN PRINT TAB(3,19)CHR$ 136;
    CHR$ 147;CHR$ 57;CHR$ 137
    TAB(34,19)CHR$ 148;CHR$ 255
    ELSE PRINT TAB(4,19)CHR$ 148;
    CHR$ 255TAB(33,19)CHR$ 136;
    CHR$ 147;CHR$ 102
680 ENDPROC
690 DEF PROCbowl
700 B%(P%)=B%(P%)+1
710 R=RND (-TIME )
    :CR%=TRUE
    :HT%=FALSE
720 PROCinp
730 PRINT TAB(8,24)CHR$ 129;"PRESS
     SPACE BAR TO BOWL";
740 REPEAT
    :G%=GET
    :UNTIL G%=32
    :PRINT TAB(8,24)SPC (24);
750 FOR Y%=2TO 74
760 PROCweigh
770 IF HT%
    THEN PROCdef
780 IF X%<=29
    THEN X%=26
    :GOTO 810
790 IF X%>=49
    THEN X%=52
    :GOTO 810
800 IF FNch(X% DIV 2+1,24-Y%
    DIV 3)="^" PROChit
810 PROCplot(X%,Y%)
820 FOR T%=1TO D%
    :NEXT
830 VDU 127
    :NEXT
840 PROCcheck
850 IF FNtot=BALL1%(P%) AND BALL1%(P%
    )<>10
    THEN SOUND 1,2,20,10
    :SOUND 1,2,5,20
860 ENDPROC
870 DEF PROCstrike
880 OSTR%(P%)=CSTR%(P%)
    :CSTR%(P%)=B%(P%)
```

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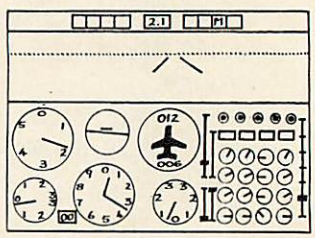

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Tenpins listing

From Page 99

```
890 SOUND 1,1,85,20
900 PRINT TAB(16,2)CHR$ 136;CHR$ 134;
    "STRIKE";CHR$ 137;CHR$ 151
910 NSTR%(P%)=NSTR%(P%)+1
920 ENDPROC
930 DEF PROCspare
940 SOUND 1,2,149,5
    :SOUND 1,2,165,5
    :SOUND 1,2,129,5
    :SOUND 1,2,165,5
950 PRINT TAB(16,2)CHR$ 136;CHR$ 130;
    "SPARE";CHR$ 137;CHR$ 151
960 SPR%(P%)=B%(P%)
970 NSPR%(P%)=NSPR%(P%)+1
980 ENDPROC
990 DEF PROCinp
1000 *FX15,1
1010 PRINT TAB(12,24)CHR$ 131;"Positio
     n ? (0-9)";
     :REPEAT
     :Pos%=GET
     :UNTIL Pos%>47 AND Pos%<58
1020 PRINT TAB(13,24)" Speed ? (0-5)
       ";
     :REPEAT
     :V%=GET
     :UNTIL V%>47 AND V%<54
1030 PRINT TAB(13,24)"Bias ? (L or
      R)";
     :REPEAT
     :SP%=GET AND 223
     :UNTIL SP%=76 OR SP%=82
1040 X%=30+(Pos%-48)*2
1050 Mod%=(V%-47)*(RND (2)*5)
1060 D%=(10-(V%-48))*25
1070 ENDPROC
1080 DEF PROCweigh
1090 IF SP%=76
     THEN X%=X%+((TIME MOD Mod%=0)
     OR (RND (7+V%)=4))
     :ENDPROC
1100 X%=X%+ABS ((TIME MOD Mod%=0)
     OR (RND (7+V%)=4))
     :ENDPROC
1110 DEF PROChit
1120 IF CR%
     THEN SOUND 0,4,6,3
     :SOUND 0,4,5,10
     :CR%=FALSE
1130 HT%=TRUE
1140 ENDPROC
1150 DEF PROCdef
1160 R=RND (3)
1170 IF R=1
     THEN X%=X%+2
1180 IF R=3
     THEN X%=X%-2
1190 HT%=FALSE
1200 ENDPROC
1210 DEF PROCcheck
1220 LOCAL G%
1230 IF RND (3)=3 AND BALL1%(P%)=0
     AND ?(HIMEM +&8C)=32
     THEN FOR I%=1TO 10
     :M%(I%)?HIMEM =32
     :NEXT
     :ENDPROC
1240 IF FNtot=BALL1%(P%) OR RND (2)=1
     ENDPROC
1250 IF BALL1%(P%)=0
     THEN G%=9
     ELSE G%=10
1260 FOR I%=G%TO 5 STEP -1
1270 IF M%(I%)?HIMEM =32
     THEN ?(HIMEM +M%(I%)-&27)=32
     :?(HIMEM +M%(I%)-&29)=32
1280 NEXT I%
1290 ENDPROC
1300 DEF PROCcalc
1310 IF B%(P%)<3 ENDPROC
1320 IF SPR%(P%)=B%(P%)-1
     THEN SCORE%(P%)=SCORE%(P%)+BALL1%
     (P%)
     :ENDPROC
1330 IF OSTR%(P%)=B%(P%)-2 OR CSTR%(P%
     )=B%(P%)-2
     THEN SCORE%(P%)=SCORE%(P%)+BALL1%
     (P%)+BALL2%(P%)
1340 ENDPROC
1350 DEF PROCpins
1360 PRINT TAB(16,2)SPC (9)
1370 RESTORE 1970
1380 FOR I%=1TO 10
1390 READ A,B
1400 PRINT TAB(A,B)"^"
1410 NEXT I%
1420 ENDPROC
1430 DEF PROCextra
1440 LOCAL N%
1450 BALL1%(P%)=0
1460 IF P%=0
     THEN PRINT TAB(2,1)CHR$ 133;
     "EXTRA"
     ELSE PRINT TAB(2,1)CHR$ 148;
     SPC (5)TAB(32,1)CHR$ 133;"EXTRA"
1470 PROCind
1480 IF SPR%(P%)=B%(P%)
     THEN N%=1
     ELSE N%=2
1490 FOR W%=1TO N%
1500 PROCbowl
1510 IF W%=2 GOTO 1540
1520 BALL1%(P%)=FNtot
     :IF BALL1%(P%)=10 PROCstrike
     :PROCwait(300)
     :PROCpins
1530 GOTO 1570
1540 IF BALL1%(P%)=10
     THEN BALL2%(P%)=FNtot
     ELSE BALL2%(P%)=FNtot-BALL1%(P%)
1550 IF BALL2%(P%)=10 PROCstrike
     :GOTO 1570
1560 IF Tot%=10 PROCspare
1570 PROCcalc
     :PROCscore
1580 NEXT W%
1590 PROCwait(300)
     :PROCpins
1600 ENDPROC
1610 DEF PROCscore
1620 IF P%=0
     THEN X%=3
     ELSE X%=33
1630 IF F%>10
     THEN F%=10
1640 F$=STR$ (F%)
     :PROCprint(X%+(F%>9),4,133,F$)
1650 F$=STR$ (NSTR%(P%))
1660 PROCprint(X%+(NSTR%(P%)>9),8,134,
     F$)
1670 F$=STR$ (NSPR%(P%))
1680 PROCprint(X%+(NSPR%(P%)>9),12,134
     ,F$)
1690 F$=STR$ (SCORE%(P%))
1700 PROCprint(X%+(SCORE%(P%)>9),16,12
     9,F$)
1710 ENDPROC
1720 DEF PROCwait(W%)
1730 LOCAL T%
1740 T%=TIME
     :REPEAT UNTIL TIME =T%+W%
1750 ENDPROC
1760 DEF PROCprint(X,Y,C,L$)
1770 PRINT TAB(X,Y)CHR$ 141;CHR$ C;L$
1780 PRINT TAB(X,Y+1)CHR$ 141;
     CHR$ C;L$
1790 ENDPROC
1800 DEF FNtot
1810 Tot%=0
1820 FOR H%=1TO 10
1830 IF M%(H%)?HIMEM =32
     THEN Tot%=Tot%+1
```

→

Tenpins listing

From Page 101

```
1840 NEXT H%
1850 =Tot%
1860 DEF FNch(X,Y)
1870 LOCAL A%,OX,OY,C
1880 OX=POS
     :OY=VPOS
1890 VDU 31,X,Y
1900 A%=135
     :C=USR (&FFF4)
1910 C=C AND &FFFF
1920 C=C DIV &100
1930 VDU 31,OX,OY
1940 =CHR$ (C)
1950 DATA 3,3,FRM,33,3,FRM,3,7,STK,33,
     7,STK,3,11,SPR,33,11,SPR,3,15,SCR
     ,33,15,SCR
1960 DATA &11,&13,&15,&17,&3A,&3C,&3E,
     &63,&65,&8C
1970 DATA 17,0,19,0,21,0,23,0,18,1,20,
     1,22,1,19,2,21,2,20,3
1980 DATA 101,101,101,117,101,101,101,
     81,101,117,129,117,101
1990 DEF PROCend
2000 IF SCORE%(0)=SCORE%(1)
     THEN F$="  Drawn game "
     :GOTO 2020
2010 IF SCORE%(0)>SCORE%(1)
     THEN F$="Player 1 wins"
     ELSE F$="Player 2 wins"
2020 PROCprint(12,4,131,F$)
2030 FOR I%=1TO 13
     :READ P%
     :SOUND 1,-10,P%,2
     :SOUND 2,-10,P%+48,3
     :SOUND 1,0,0,1
     :NEXT I%
2040 PROCprint(9,21,129,"ANOTHER GAME
      (Y/N) ?")
2050 REPEAT
     :G%=GET AND 223
     :UNTIL G%=89 OR G%=78
2060 VDU 12
2070 PROCprint(7,5,131,"**************
     **********")
2080 FOR I%=7TO 15 STEP 2
     :PROCprint(7,I%,131,"*")
     :PROCprint(30,I%,131,"*")
     :NEXT I%
2090 PROCprint(7,17,131,"**************
     ***********")
2100 FOR P%=0TO 1
     :IF SCORE%(P%)>Q%
     THEN Q%=SCORE%(P%)
2110 NEXT P%
2120 F$=STR$ (Q%)
2130 PROCprint(10,11,129,"HIGH SCORE
      = ")
     :PROCprint(25,11,132,F$)
2140 PROCwait(600)
2150 IF G%=89
     THEN RUN
2160 *FX4,0
2170 *FX12,0
2180 ENDPROC
```

DISC USERS

– IF YOU USE DISCS YOU NEED "THE KEY"

A suite of disc utility programs:

1. FORM 40 – Format 40 track discs.
2. FORM 80 – Format 80 track discs.
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This is the sort of utility that should be provided with every disc drive sold as it becomes indispensible once used. At a price of £12.95 "THE KEY" represents very good value when compared with the many formatting programs being sold for around £10.00

THE KEY – £12.95 (state 40 or 80 track discs)

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This program allows most of the popular machine-code and Basic programs on cassette to be uploaded onto disc and run. The program is very user friendly and almost does away with the need for human intervention. It is presented in such a way that the user does not need to know what is going on, he simply inserts the tape and presses a few buttons when prompted. The programs will be presented in a menu, which is created by the utility, and will auto-boot, just leaving the user to select the required program. Many types of program can be handled with this utility and it is particularly suited to programs that load in several stages or sections. The disc will allow approximately 8-10 programs of similar length to the Acornsoft arcade game to be stored. If additional program space is required, a further disc must be purchased.

REPLICA £9.95

(state 40 or 80 track)

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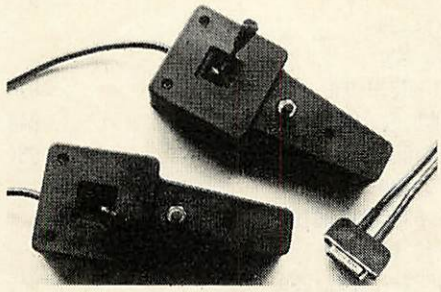

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Space pod listing

From Page 59

```
10 REM *****************
20 REM * SPACE PODS *
30 REM *FOR BBC MODELB*
40 REM *****************
50 MODE 7
   :PRINT TAB(10,6);CHR$ 141;
   CHR$ 130"SPACE PODS !";TAB(10,7);
   CHR$ 141;CHR$ 130;"SPACE PODS
    !"
60 PRINT TAB(9,9);CHR$ 131"By N.Timb
   erlake"
70 PRINT TAB(3,16);CHR$ 129"Do you
    want instructions(Y/N)?";
   :G$=GET$
   :IF G$="Y"
   THEN PROCINSTRUCTIONS
80 MODE 2
90 ENVELOPE 1,1,-1,0,0,2,0,0,126,0,0
   , -10,126,126
100 SCORE%=0
   :T=20
110 DEF FNpoint(X,Y)=POINT((64*X+32),
   (32*(31-Y)+16))
120 VDU 23,231,255,126,126,126,126,12
   6,126,255
   :B$=CHR$ 231+CHR$ 231+CHR$ 231+
   CHR$ 231
130 VDU 23,233,129,66,60,66,66,60,36,
   102
140 VDU 23,232,252,252,0,0,0,0,252,252
150 COLOUR 129
   :COLOUR 6
   :CLS
160 VDU 23;8202;0;0;0;
170 VDU 23,230,255,255,255,255,255,25
   5,255,255
180 VDU 23,240,0,0,255,0,0,255,0,0
190 VDU 23;8202;0;0;0
200 A=-1
210 A=A+1
220 IF A=4
   THEN A=16
230 IF A>19
   THEN GOTO 280
240 FOR B=0 TO 29
250 PRINT TAB(A,B);CHR$ 230
260 NEXT B
270 GOTO 210
280 B=24
290 B=B+1
300 IF B>29
   THEN GOTO 350
310 FOR A=0 TO 19
320 PRINT TAB(A,B);CHR$ 230
330 NEXT A
340 GOTO 290
350 COLOUR 0
360 PRINT TAB(7,28);B$
370 COLOUR 0
380 PRINT TAB(4,8)CHR$ 232
390 PRINT TAB(4,16)CHR$ 232
400 X=RND (11)+4
410 Y=-1
420 G$=INKEY$ (0)
430 IF G$="W" OR G$="X"
   THEN GOTO 530
440 Y=Y+1
450 IF Y>29
   THEN PRINT TAB(X,Y-1)CHR$ 32
   :GOTO 400
460 IF FNpoint(X,Y)=6
   THEN PRINT TAB(X,Y-1)CHR$ 32
   :PRINT TAB(X,Y)CHR$ 32
   :GOTO 400
470 IF Y<>0
   THEN PRINT TAB(X,Y-1)CHR$ 32
480 PRINT TAB(X,Y);CHR$ 233
490 IF Y=28 AND X>6 AND X<11
   THEN PROCEND
500 IF SCORE%>2000
   THEN T=0
510 FOR VB=1 TO T
   :NEXT VB
520 GOTO 420
530 REM WHICH ONE
540 SOUND 0,1,100,1
550 PROCTOP
560 GOTO 420
570 DEF PROCEXPLOSION
580 SOUND 1,1,100,1
590 SCORE%=SCORE%+250
   :PRINT TAB(2,30);"SCORE:";SCORE%
600 Y=0
   :X=RND (11)+4
   :ENDPROC
610 DEF PROCTOP
620 COLOUR 0
630 IF G$="W"
   THEN FY=8
   ELSE FY=16
640 FOR FX=5TO 15
650 PRINT TAB(FX,FY)CHR$ 240
660 IF FX=X AND FY=Y
   THEN PROCEXPLOSION
670 NEXT FX
680 PRINT TAB(5,FY)"          "
690 ENDPROC
700 DEF PROCEND
710 RESTORE
720 READ P%
730 FOR A=1 TO 200
   :NEXT
740 IF P%=256
   THEN PRINT TAB(4,14)"YOU ARE
    DEAD"
750 IF P%=256
   THEN PRINT TAB(4,16)"ANOTHER
   GO";
   :INPUT G$
760 IF G$="Y"
   THEN GOTO 90
770 IF G$="N"
   THEN CLS
   :END
780 IF G$<>"Y" AND G$<>"N" AND P%=256
   THEN PRINT TAB(4,16)"
        "
   :GOTO 750
790 IF P%=257
   THEN FOR A=1 TO 200
   :NEXT
800 IF P%<256
   THEN SOUND 3,-15,P%,1
810 GOTO 720
820 DATA 81,69,53,69,81,257,69,257,61
   ,73,49,61,73,257,61,257,81,69,53,
   69,81,257,69,257,33,41,49,53,256
830 DEF PROCINSTRUCTIONS
840 CLS
850 PRINT TAB(10,3);CHR$ 141;
   CHR$ 130;"SPACE PODS !";TAB(10,4)
   ;CHR$ 141;CHR$ 130;"SPACE PODS
    !"
860 PRINT TAB(3,8);"The object of
    the game is to stop thespace
    pods landing and eating their
    way to your base.To stop them
    you have to  shoot them down
    with your laser guns.You have
    two laser guns which can be
    fired by pressing ";
870 PRINT "either 'W' or 'X'.Every
    time you hit a space pod,you
    will get 260  points."
880 PRINT TAB(3,20);CHR$ 133"Press
    any key to continue";
   :G$=GET$
   :ENDPROC
```

MICROMAIL

Shedding light on *LINE and *CODE

*IN his article on operating system routines Paul Beverley poses the question "Does anybody know what *LINE and *CODE do?" (BBC Micro User No 3 Page 46.) I think I can shed some light on the matter.*

Both of these calls indirect through USERV (location &0200) and since USERV is initialised to point at the "Bad Command" message, all they will do is print "Bad Command".

The story doesn't end here though, since this can be used to our advantage.

*If the user has a machine code routine placed somewhere in RAM all he needs to do is place the address of that routine in locations &0200 and &0201 and the command *LINE will call his routine. This is because *LINE does nothing but JMP (&0200).*

**CODE however is slightly more complicated, and can take two optional parameters which are placed in the X and Y registers before indirection. Thus*

***CODE 12, 54**

*will place 12 in the X register and 54 in the Y register. This can be used to good effect, but be warned that *CODE does seem to perform other operations before indirection – the one I have noticed is that it cancels the effect of the Escape key on the Escape flag.*

I hope this information has been helpful, but be warned that although these calls can be used to eliminate the necessity of remembering a start address of a routine they will probably only work like this in OS 1.2.

They may well do something more useful in future operating systems. – **N.J. Parker, Leatherhead.**

Explanation please

CONGRATULATIONS on your start. You qualify for the "yellow jersey"!

Regarding Jim Notman's 6502 disassembler in Basic, this is an impressive program with, I imagine, vast potential for use by the learner.

But where are the explanations on how and when to use the program?

There must be more to it than just seeing the mnemonics of the program itself, plus those of programmed red keys!

How do you use it to probe instructions and error messages in the operating system?

Incidentally, when "memory dumping" various addresses, I was intrigued to find odd (random?) characters at isolated addresses. This applied after several separate cold starts.

Where do they come from? I thought all characters in RAM disappeared on switch-off!

I feel sure the majority of your readers must be as puzzled as I am, and I hope you can find space to educate us on this particular topic. – **Ernest Cummins, Blackburn.**

● Thanks for the jersey. With all this praise, I doubt I'll get it over my head!

The disassembler was published basically as a tool for exploring the ROM. We felt that people who were into that sort of thing would already know what a disassembler was.

We will, however, be using the disassembler to probe various bits of the ROM to illustrate our machine code course for beginners, and we will have to publish details of its workings there.

I'm afraid that we can't comment on the "phantom characters" without knowing which bit of RAM you were looking at. The micro does use certain areas of its memory as "scratch pads" though, and even when you've just switched on there's a machine code program – called a bootstrap – that the machine goes through.

Upgrade SOS

AFTER careful study of the Beeb Body Building Course and inspecting the inside I decided it would not be too difficult to carry out this part of the upgrade. The chips could not be obtained locally so were obtained by mail order.

Doing everything with extreme care and step by step the chips were inserted without difficulty.

Unfortunately it did not work, the screen was blank and a continuous note was heard from the speaker. When the link S25 is returned to the original position it still works perfectly as 16k.

I now have a problem and phoned the local official Acorn dealer to seek advice. His response was and I quote, "If you didn't buy the chips from us you can't expect any help."

If this is Acorn's official attitude then you would do well to warn your readers who may be contemplating following your advice to save money by DIY upgrades.

It could be an expensive and humiliating experience to get the computer working again should there be a defect which cannot be identified.

If you recognise the symptoms perhaps you would offer advice.

Congratulations on a well produced and presented magazine. I look forward to future editions with interest. – **John Hartley, Kidderminster.**

● Mike Cook says he's encountered similar problems and they are usually caused by one of three, easily rectified errors:

☐ One or more of the memory chips may have been put in the wrong way round.

☐ One of the legs of a RAM chip might just be out of its socket. Look carefully for this, it's easy to miss.

☐ If the above doesn't work, then some of your new RAM chips are faulty.

The response from your official Acorn dealer seems par for the course.

Down loader doldrums

IT is refreshing to read a magazine on micros without incurring a feeling of inadequacy! As a newcomer to the BBC Micro I welcome your publication and have taken out an annual subscription.

May I request, however, that you remember the beginner when giving out instructions on how to do things. There is nothing more offputting than reading a set of instructions that the writer obviously understands, but you don't.

Now to my problem. I have a Model B with disc interface and 1.2 OS and purchased your first cassette of programs, some of which didn't run. I followed the instructions you gave in the April isue for setting up one of the function keys as a downloader and tried to load programs like Deathwatch.

After pressing the function key there would be a short pause followed by the message

BAD PROGRAM.

What have I done wrong? I

→

MICROMAIL

From Page 105

have checked my copy of your program and can find no obvious (to me) mistake. I have still not been able to use Deathwatch after many attempts.

As a suggestion for the future, could we have a review of various word processing ROMs available. I am sure you must have a fund of helpful information that would be of interest to prospective purchasers.

Would it also be possible for you to supply programs both on cassette and disc?

Many thanks to your useful contribution to my education. Keep up the good work. – **N. Diaz, Heversham, Cumbria.**

● I have tried, without success, to recreate your problem. Let's go through exactly what downloading is.

As you know when in operation the disc interface uses part of the RAM. With many programs, particularly those using the "memory eating" modes, you can LOAD them but, when you RUN them, as soon as the program tries to enter the hi-res modes it runs out of space.

The space the disc interface uses is at the bottom of RAM, taking up part of the memory that would normally be available for programs.

However, once we have loaded the program from disc there is no need to waste this space. We can copy our program down from where it has been loaded to a new position at the very bottom of RAM, overwriting the memory that the disc system takes up.

The program now has available to it as much memory as if it had been typed in or loaded from tape.

Moving the program down in memory like this is known as downloading. It only takes a small program to do this. I attach my downloader, called MOVER, to a function key.

When I want to download a program I first CHAIN "MOVER" to set up the function key. Nothing spectacular happens and I do not, at this stage, press the function key – after all, I haven't got the program I wish to download in the micro yet.

I then LOAD the program I want and follow that by pressing the function key. This brings the downloader into operation.

After a short pause, the cursor returns, showing that downloading is complete and I can now RUN the program.

Incidentally, we've come up with a rather unusual problem in our downloading: The DFS insists on altering just one byte of a downloaded program.

You can get away with running the program once, but the next time that altered byte will crash the program unless you're lucky. To get round this, at the beginning of the downloader I've added *TAPE to negate the influence of the DFS. Figure I contains the new version.

```
   1 *KEY 0 *TAPE |M FO
R LOCATION%=PAGE TO TOP:
?(LOCATION%-2816)=?LOCATI
ON%: NEXT:PAGE=&E00 |M OL
D |M
```

Figure I

Paddle landing

AFTER successfully building the games paddle as described in the March issue of your fantastic magazine (grovel, grovel), I decided to convert the Lunar Lander game on page 177 of the User Guide for use with a paddle.

It is, in fact, very easily done, changing lines 180 and 190 to 180 burn = INT (ADVAL (1)/ 242)

190 IF burn < 5 THEN burnrate%= 0
ELSE burnrate%= burn

As the spindle is turned to the right the burn will go up and vice versa. – **I. Mabbott, Prescot.**

Second thoughts

HAVING read in Micromail R.Y. McNulty's letter on investing in a disc drive and having read that the interface takes up a large amount of memory, I began to think about the 6502 second processor and came up with some queries:

☐ *Do you need to tell the computer to use the second processor?*

☐ *If you had a program that used more memory than the computer had on board, would the second processor automatically come on-line, or is it constantly on-line?*

☐ *Do commercial programs need to have their memory locations changed when the second processor is attached, as in the VIC 20?*

☐ *Finally, does the second processor double the speed of any operation?*

Thanks for a great mag. Keep up the good work – **Ian Brunt, Newcastle, Staffs.**

Bouncing marsupial is safely snared

I'M sitting here at 1am, playing with my Beeb (Mk XXIV ?), feeling very pleased with myself for "cracking" your Kangaroo (a la Mode 7) in the May issue of Micro User.

Obviously you also have a typewriter (wordprocessor?) that makes spelling mistakes. Your clever little prog had a little bug-ette, which had me scratching my cranium.

Mind you, it did have me tearing apart your program to see what the hell you were doing. It taught me quite a lot.

However, my clever little Beeb was not impressed. In great expectation I banged-in RUN and got the following curt reply: Bad hex at line 470.

So I replied with a L.470 and began to study the line. Apparently it had something to do with the EVAL("&" etc.) portion.

After pleading with my little friend to stop mucking about – all to no avail – I hit upon a brilliant idea (well, for me anyway). I politely asked for a PRINT ASC("&").

Guess what I got for a reply – 38, you berk.

Timorously I substituted "&3B" (yes, I make mistakes as well) and discovered a RUDE Kangaroo!

Anyway, I now have a good version of your bouncing marsupial safely residing between 055 and 060 on my cassette recorder.

Actually, I thought I'd discovered a couple more faux pas. But only one was.

You forgot to insert the colon between VDU 26,12 and GOTO 180, on line 310. I subsequently tried it (for a laugh) and got "No such variable at Line 310" – I'm amused easily, you see.

The other discovery I thought I'd made was at line 300. Being of a tidy mind (if nothing else) I wondered why you had departed from the norm and left out the comma in between REPEAT and AN$. That should have caused the REPEAT to be printed with a question mark.

So daringly I tried it. Yoiks! Every time REPEAT was printed I got a "strange" character beside it.

Looking on page 488 of the User Guide I discovered that it looked like graphics character 63.

It took me a little while to work that one out.

Page 497 charged to my rescue. The Ascii code for a "?" is 3F – or 63, to us mortals! Oh, very clever.

Anyway, I enjoy your mag, so keep it up. One of these days I'll finish my prog to reproduce, full screen size, that little BBC Micro "vulture" that adorns my machine.

The only problem is that every month you chaps publish another copy of Micro User and interrupt me! – **R. Poynter, Surbiton.**

● Thanks for an interesting letter. You don't need to tell the computer to use the second processor – as soon as power to the unit is on it informs the BBC Micro of the fact. From then on the second processor is constantly on line. As for commercial programs having their memory locations changed, they only need to if they have broken the Acorn rules about directly accessing ROM routines and I/O ports.

The second processor is clocked at one and a half times the rate of the BBC Micro, and so handles its Basic at a faster rate than normal. The display is, of course, handled at the normal rate by the original processor. There is still a time-saving element though, since the Tube acts as a buffer, allowing the second processor to rid itself of those time-wasting I/O operations quickly.

Preserving a picture

COULD you please help me. I am desperately trying to find out how to SAVE a screen (picture) for recalling at a later date without saving the lines which draw it.

I have looked in every book on the Beeb I could get my hands on without much success – **B. Partington, Salford.**

● Your wish is our command. This month's Programmers' Workshop contains just such a routine.

That dirty word

I HAVE been microcomputing now for about a month and in that time nearly everything that I have read about my Beeb B, including your magazine, treats GOTO as a dirty four letter word. Any fool knows that it is really two words.

From the start I tried to avoid using it, instead using REPEAT . . . UNTIL and FOR . . . NEXT loops, but all the micro would return was "Too many Repeats" or "Too many Fors".

I called the damned thing a stupid microbrained idiot but it quite unemotionally returned "No such variable." I told it to GOTO hell but the same message returned.

Rather than throw £400 worth of electronic grey matter out of the window I persevered with the mammoth 500 page manual and eventually got my loops working. So I tried procedures. "No Proc" is what I got back. I tried using Data. "Out of Data" it said.

Back to the manual, and to my surprise it actually recommended the use of "On Error GOTO n".

I am now programming quite happily, and with a little help from your magazine have taught my two-bit, sorry, 32k servant to be more friendly.

The other day it concluded a program by telling me to "Have a nice day" (in double height letters and in colour), and it even played me a short jingle in three part harmony to brighten my outlook.

Please accept £12 for a year's subscription to The Micro User, and forgive me for the moment for thinking that GOTO is a lot less bovver. – **Adrian Drover, Glasgow.**

● Well, Adrian, we warned you about using GOTO – be it on your own head if the structuralist boot boys pay you a visit.

The NEW look

YOUR excellent magazine is packed full of information, but please could you include a Hints and Tips page? I include some suggestions:

☐ *How do you include NEW in a line?*

☐ *When using VDU5 to position characters on a specific grid how do you rub out the character? I use a space to do this, but this does not work as you can superimpose characters.*

☐ *When you have characters on the screen which you do not want to disappear how do you draw a circle or another large shape in the background colour and then change it to the foreground colour? When I do this I accidentally change the background colour to the foreground colour.*

☐ *Is it possible to scroll other ways other than upwards in Basic?* – **Peter Caswell, Wolverhampton.**

● If you look at the competition winner's listing in this issue you will see a "self-destruct" routine which uses NEW from within a program in a rather crafty way.

Rubbing out characters with VDU 5 depends on using the GCOL options other than GCOL0. This is a complicated topic which we will cover in our graphics series.

I'm not quite sure I know what your problem is with the circle. I think you'll be able to solve it by switching colours with the VDU 19 statement.

You can scroll in different directions by careful manipulation of the 6845's registers, a topic we shall be covering in future issues.

Chance for tyros

MANY thanks for an excellent magazine. I have already learnt a great deal in just three issues.

However, as a competition fan I have been greatly disappointed by your competitions so far.

Excellent prizes but no chance of being among the winners if like me you are a BBC learner.

So how about a bit more variety, spread the prize money a little more widely, and give us all a chance. – **D. Rayner, Tonbridge.**

● Nobody can say that we aren't open to suggestions! If you look at this month's competition, Mr Rayner, you'll see your crossword there. Unfortunately, you won't be able to enter, will you?

Something for the teenies

I'M quite pleased with your publication but I'm disappointed with some of your reviews.

Good reviews of hardware and software are one of the most important things you can provide, but not all of yours are up to standard.

You gave Grafkey, from Clares, a half page review in your second issue, but the hard facts could have been contained in about two sentences.

I wanted to see a list of all its key features, comments as to its speed, information as to how easy it is to use the pictures drawn by it in my own programs (particularly with the disc version for the increasing number of us who have them), and any noticeable drawbacks.

It would also be nice if the review contained information about possible future upgrades – for instance, does Clares plan to make upgrades available so that pictures can be manipulated?

I think that particularly when you are reviewing non-games programs this sort of detailed information is required for the review to serve its purpose – to tell me whether or not a particular product will meet my needs and is worthwhile purchasing.

Keep up the good work, though – I look forward to your next issue and particularly to the Manchester Show. – **Douglas Weller, Birmingham.**

P.S. How about reviews and listings of programs for the very young ?

● Getting the balance of reviews right is far from easy: Should we cover one in detail or several more generally?

While I disagree with you about the Clares review, I agree that utilities, word processors and the like need a deeper level of review than games.

You'll be glad to hear that we have some programs for the very young well on the way to completion. My children are testing them at present, and we'll publish them as soon as I can get them off the micro!

MICROMAIL

Joystick movement

I HAVE constructed the joystick project as per The Beeb Body Building Course, (May issue).

I used the Radio Spares assembly, and although it works I find that I have to adjust it for every different game and on Rocket Raider I can't get sufficient movement on it at all.

Is there any cure for this? – **Richard Taylor, Fishal.**

● When I wrote the article the only game supporting joysticks was Snapper, and there was just about enough movement available on the joystick for this.

The only cure is to arrange that the "hot" end of the joystick be taken to a higher voltage than the 5 volts recommended in the article.

Unfortunately the A/D socket has only a maximum of 5 volts available. The simplest solution would seem to be to boost this voltage by connecting one or two batteries in series with the 5 volt supply (see diagram).

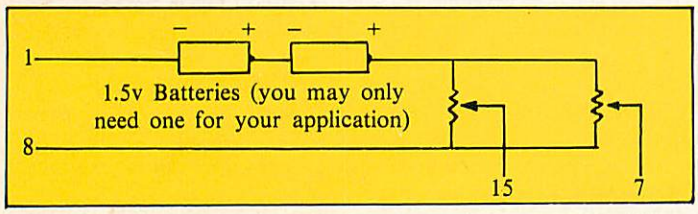
Due to the mechanical restrictions of the Radio Spares joystick, you will never be able to apply more than the absolute maximum of 5.3 volts to the A/D input.

However you should be careful during adjustment never to exceed this. If you do, you may damage the A/D converter and a new one will cost you £5.

With the extra voltage it is possible to cover the full range with the restricted movement of this type of joystick.

Remember to disconnect the joystick before turning the computer off as the battery would try to power your computer with a reverse voltage.

While probably not doing any harm, it does neither the computer nor the battery any good. Best of luck through the maze at the end of Rocket Raider – **Mike Cook.**



Planning ahead

AS new owners of a BBC Micro we are pleased with your new magazine, and have taken out a subscription.

I would like to offer the following suggestions for future contents:

● *A children's page, to include very simple and clearly presented programs which younger children and teenagers can type and run themselves – with, possibly, things to do based on the program.*

● *A cumulative index about every six months.*

● *Designs for a trolley on which to keep the computer, leads, etc., which is suitable for use with an ordinary chair, not necessarily to accommodate a TV as well, for making in readily available DIY materials!*

● *Programs available commercially, to be "consumer tested" by various age groups, including children and non-experts, for reviews.*

● *Reports on various brands of TV (including rental) as to compatability with micro – we have had quite a lot of trouble with this problem.*

Mrs J.M. Summersgill, Troon.

● A children's page is under consideration, but I'm a bit wary. Most of the children I know seem to spend 10 minutes playing with the micro then start to reel out programs far beyond anything I can imagine.

An index is a nice idea, as is the trolley. In fact my wife wishes to make a special plea for some DIY-inclined reader to design a workstation or desk for my disc-based system. The TV compatability problem is a new one to me. Are any other readers experiencing difficulties in this area?

And finally, with tongue firmly in cheek . . .

Missive from a faint-hearted micro user

Dear Trev,

Sorry I've not written for so long, but I've spent most of my spare time and all of my nervous energy looking for a cassette player that my Beeb will actually talk to. The one I have at home won't work, and neither will my neighbour's.

The damn thing is a snob. Apparently it won't hold a conversation with anything costing less than £20.

Mind you, I wouldn't mind paying twice that if I could find one that would work and initiate me into the mysteries of the "Welcome" cassette I found in the box during my fruitless search for the cassette leads. Of course, there's no advice in the manual about which cassette player will work with the Beeb – for £400 what else can you expect?

Ignoring Andrea's obvious delight at my predicament I began ringing round the computer shops for advice. Central Processors did give me the details of a model that would work, a Frodsham GP02.

"Where can I get it?" I asked

"You can't, they don't make it any more," came the reply.

"Well, do you know of any others that work with the Beeb?"

"No, but we've sold 40 micros this week and someone is bound to find a compatible model and let us know. Ring in a week's time."

He obviously didn't know A. There was no way I could sit around with £400 of underutilised microprocessor enduring her scorn.

So I began a fruitless search of the shops of the city, the enquiries going something like this: "Er, excuse me, have you got a cassette recorder?" I would ask.

"Certainly sir," and they would produce a two-storey ghetto blaster.

"No, I mean just a cassette player, no radio."

"No, sorry, all sold out. People keep buying them," the last said in a vaguely embittered tone. "Kids buy them for those computer things."

"Oh well, I don't suppose you know of a make that will work with the Beeb?"

"Yes, that'll be the Frodsham GP02, but you can't get them now, we've sold out and they don't make them any more."

"Why not?"

"There's a recession on."

Maybe Frodsham's didn't like to be the odd one out, a firm with a product that sold!

So my lonely search goes on. Why won't anyone print a list of compatible cassette players, and why do people stop making them when it's found they work with the Beeb? Is it some form of plot by a multinational computer firm to smother the British micro industry? In my more paranoid moments I imagine A going round buying up the last stocks of Frodsham GP02s just to frustrate me.

That's all for now, must resume the hunt!

Cheers, Bob.

P.S. Good news! Central Processors have told me the address of a man who's been electrocuted by trying to interface his Beeb with an electricity sub-station. I'm off to make his widow an offer for his Frodsham GP02.

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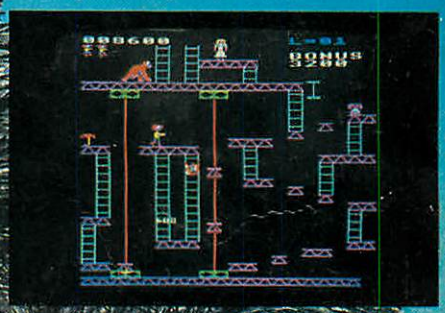

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