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SEPTEMBER 1983 BRITAIN'S BIGGEST-SELLING HOME COMPUTER MAGAZINE Vol. 3 No. 9

ADVENTURE SPECIAL:

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how to write your own

Reviews:

Sinclair Microdrive
Electron

BBC Sprites

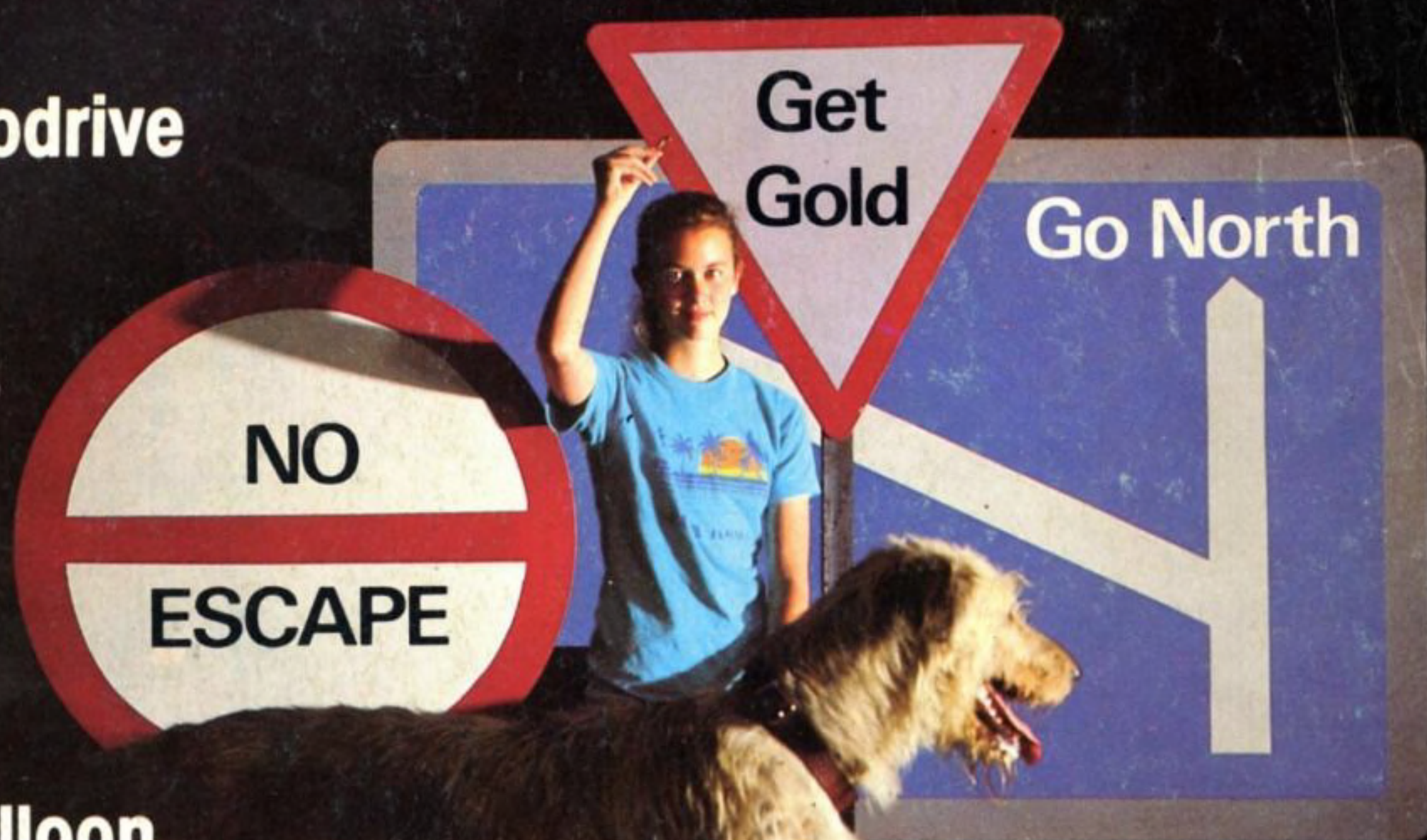
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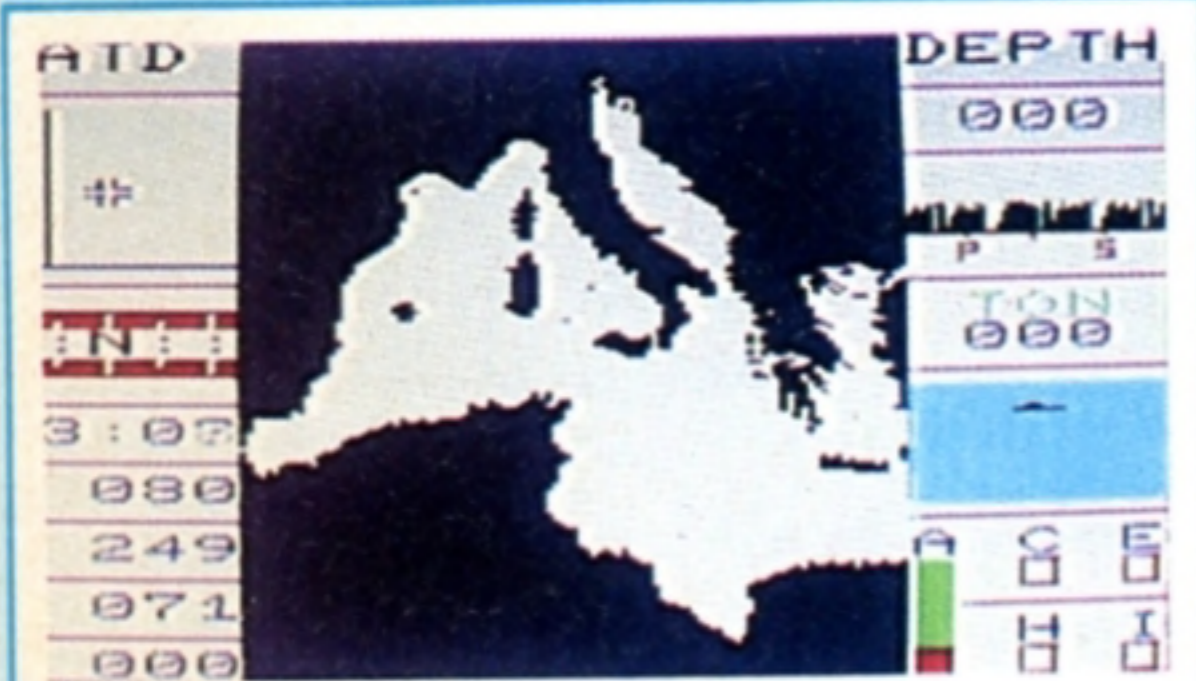
**spectrum
games**

by name

YOUR COMPUTER

Contents

SEPTEMBER 1983



Software Shortlist: page 51



Microdrive review: page 52.



Electron review: page 56.



Above: Balloon Hopper: page 76
Below: Adventure games reviewed:



Cover photograph by Stephen Oliver

- 38 EDITORIAL AND YOUR LETTERS:** A software nobbler speaks out; Schizoids versus Galaxians; more food for the Dragon. Is Microdrive the shape of the future?
- 40 NEWS:** More new machines, more price cuts for the old ones; a voice for the Dragon; Spectrum Fifth language extension and Interface Two; a micro for baby.
- 45 FIRST BYTES:** Our regular feature for new users looks at CP/M and flowcharts.
- 49 COMPUTER CLUB:** Meirion Jones visits Cardiff ZX Club.
- 51 SOFTWARE SHORTLIST:** From subs to orcs; a roundup of the latest software releases now available.
- 52 MICRODRIVE:** Kathleen Peel has seen the future and it works. But for how much and for how long?
- 56 ACORN ELECTRON:** The latest addition to the BBC stable — 32K for £199. Neil Cryer takes a canter across the keyboard.
- 60 COMMODORE CBM-64 — SOFTWARE SURVEY:** Shell-shocked Paul Bond is drafted back into the Space Patrol.
- 63 ADVENTURE GAMES — HOW TO WRITE ONE:** John Ransley initiates you into the dark rites of micro myth-making.
- 68 ADVENTURE GAMES — SURVEY:** Go west, young man. Pete Conners goes on several quests.
- 70 ADVENTURE GAMES — HOW TO SOLVE THEM:** If trolls are your *bêtes noires* and magic rings the bane of your life, Ron Hubbard has a word for the wise.
- 76 SPECTRUM BALLOONS:** Up, up and away with Andrew Foord in his beautiful balloons game for the Spectrum. Our tribute to the Montgolfiers.
- 78 BBC BARRICADES:** Shingo Sugiura's two-handed wall game.
- 83 SPECTRUM TRACER:** Gary Rees helps you to debug.
- 87 ORIC FROGGER:** Hop over to your Oric and key in this classic game of amphibian jaywalking adapted by Brian Lewis.
- 90 VIC GOLF:** Vikki Allsop and the Nolan brothers go a couple of rounds on courses for both expanded and unexpanded Vic-20s.
- 94 CBM-64 MUSIC:** Stephen Watson coaxes sounds from the Commodore.
- 97 BBC SPRITES:** Chris Melville looks at the creation of sprites.
- 106 DRAGON PUZZLE:** A version of a children's sliding-tile puzzle game, created for the Dragon by Margaret Norman.
- 113 VIC RESOLUTION:** That obscure object of desire, high-res graphics for the expanded Vic-20 is put into sharp focus by Adam Burbidge.
- 119 ZX-81 COMPILER:** David Threlfall guns: the motor on his ZX GT for the third time and explains some of the shortcomings and remedies in the design.
- 124 ZX-81 SEA MINES:** batten down the hatches, we're off to sea once more with Grant Passmore guiding us through the deadly minefield.
- 126 DRAGON MACHINE CODE:** John Nash takes an incisive look at the possibilities offered by directly addressing the 6809E.
- 133 MODEMS:** Imposing digital signals from the computer on to a carrier signal is the name of the game. John Dawson looks at different approaches.
- 141 6502 MACHINE CODE:** Darryl Mattocks continues his series.
- 149 RESPONSE FRAME:** Tim Hartnell answers your questions.
- 151 SOFTWARE FILE:** 10 pages crammed full of tips, games and serious applications for the ZX-81, Lynx, Spectrum and Dragon.
- WIN AQUARIUS** See card Page 35.
- 181 COMPETITION CORNER:** New puzzle, Electron winner.



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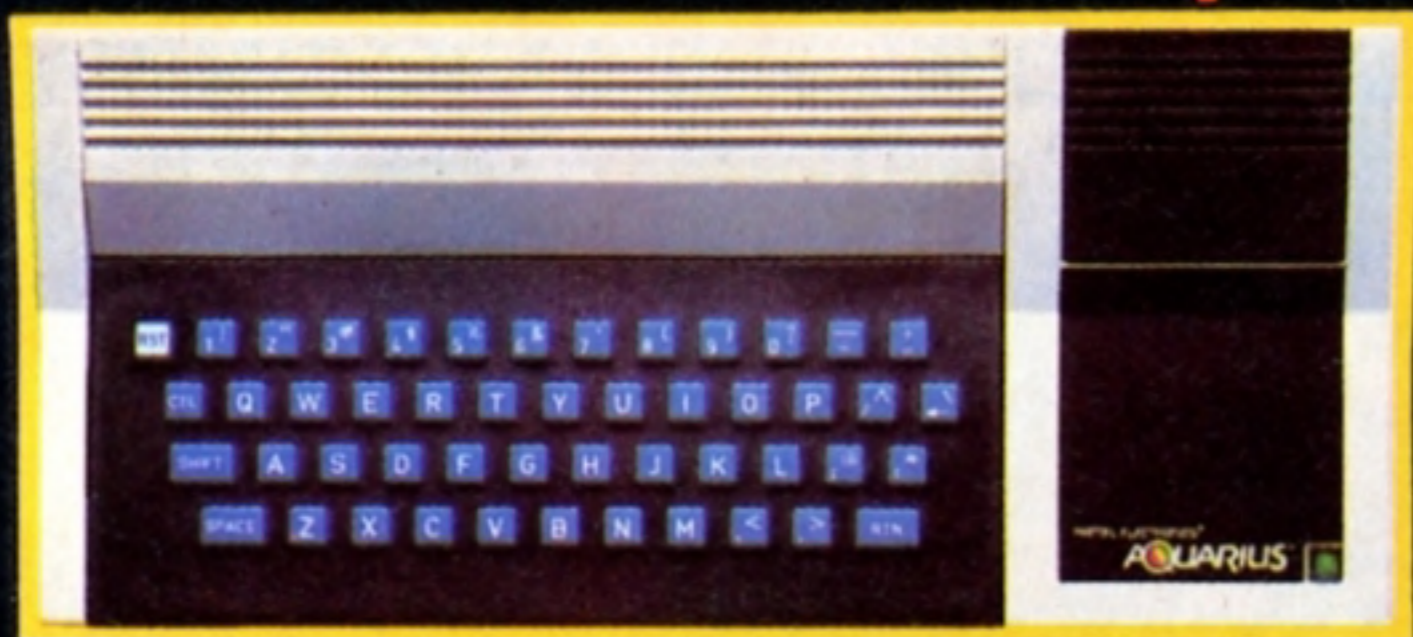
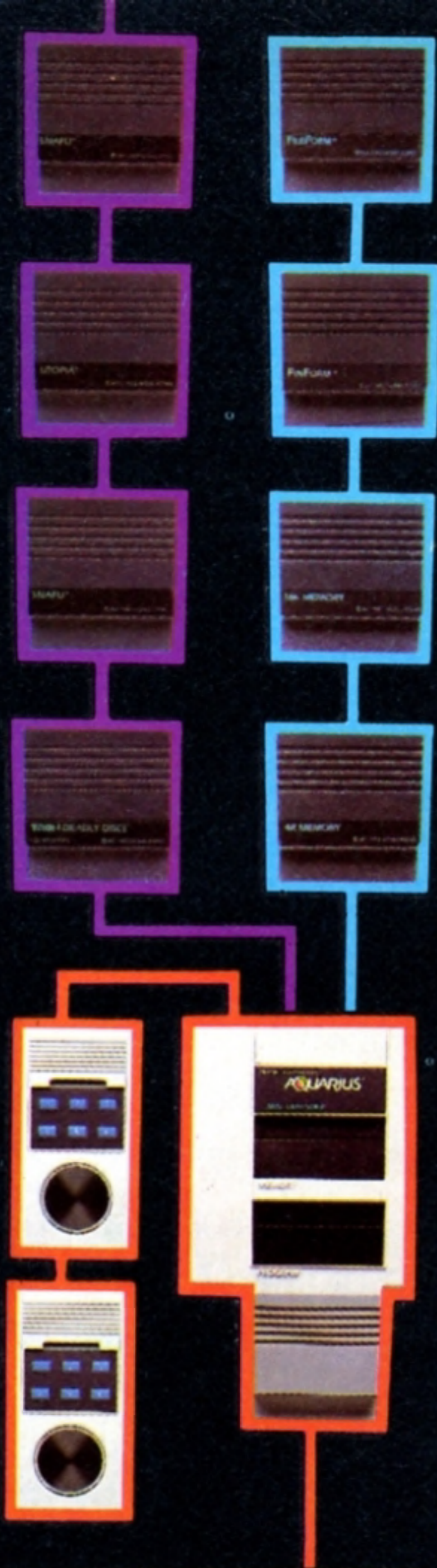
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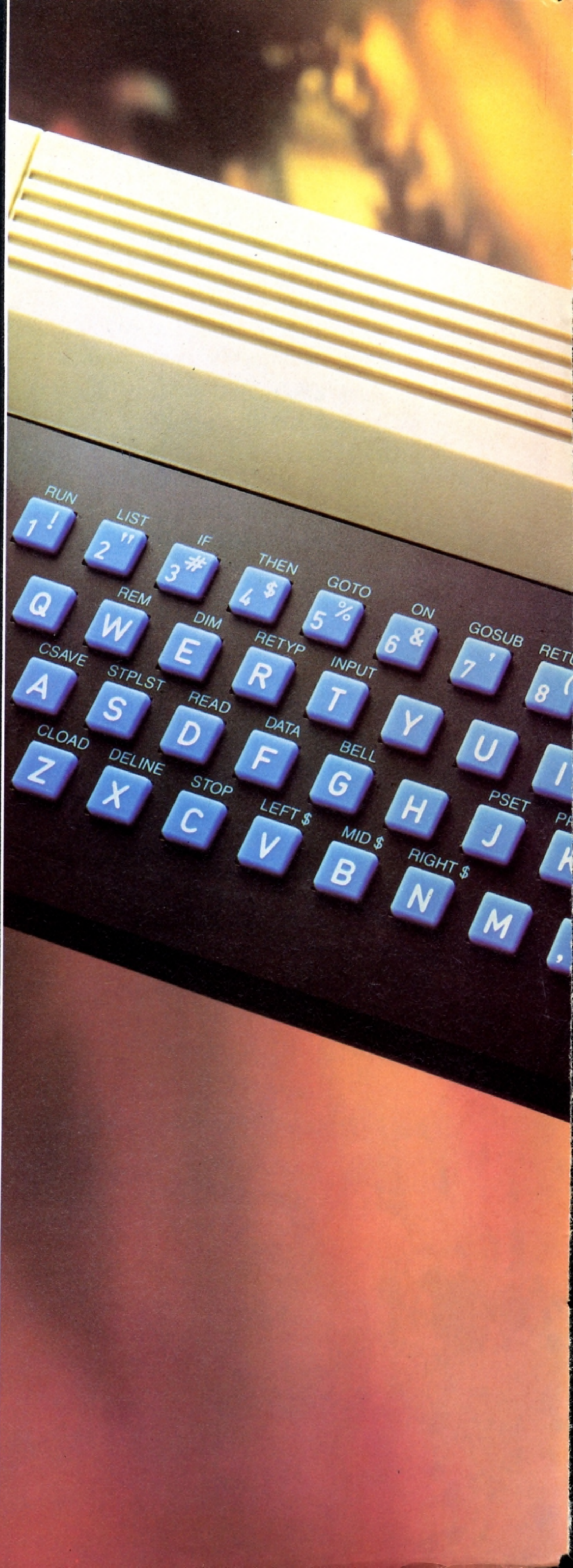
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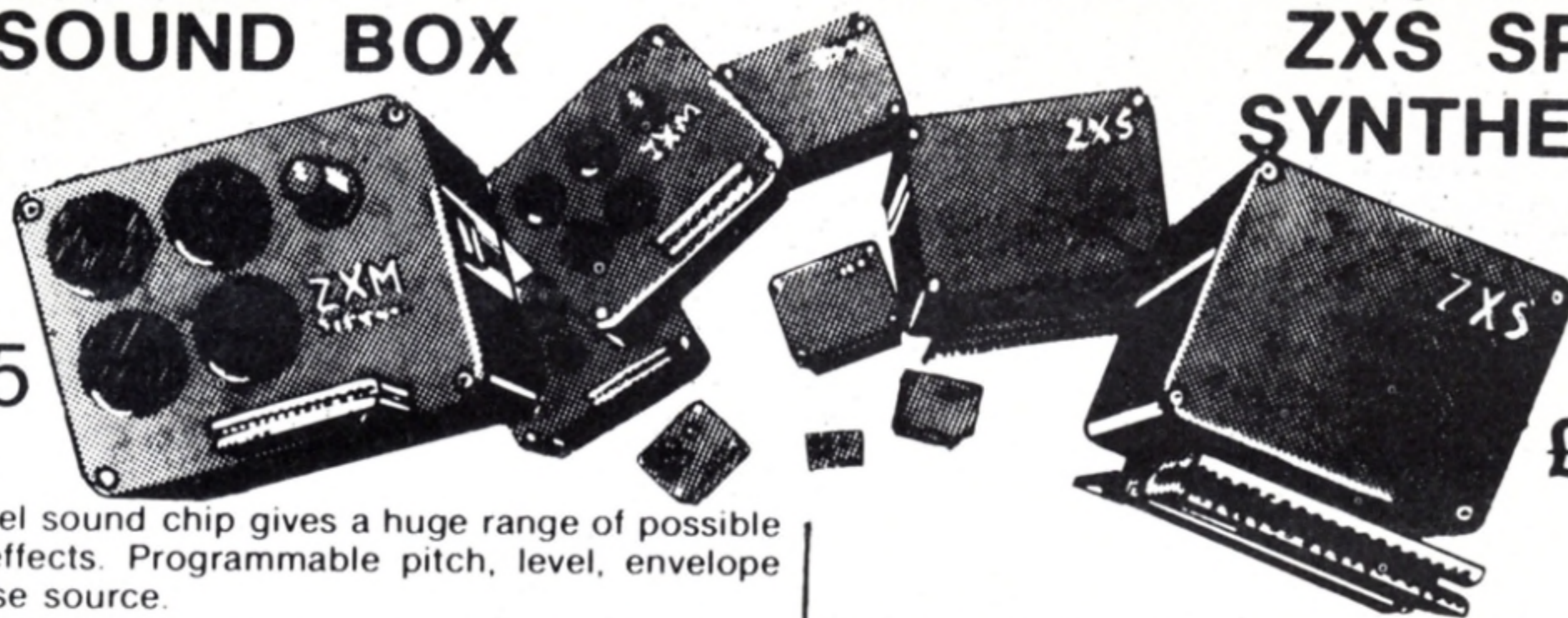


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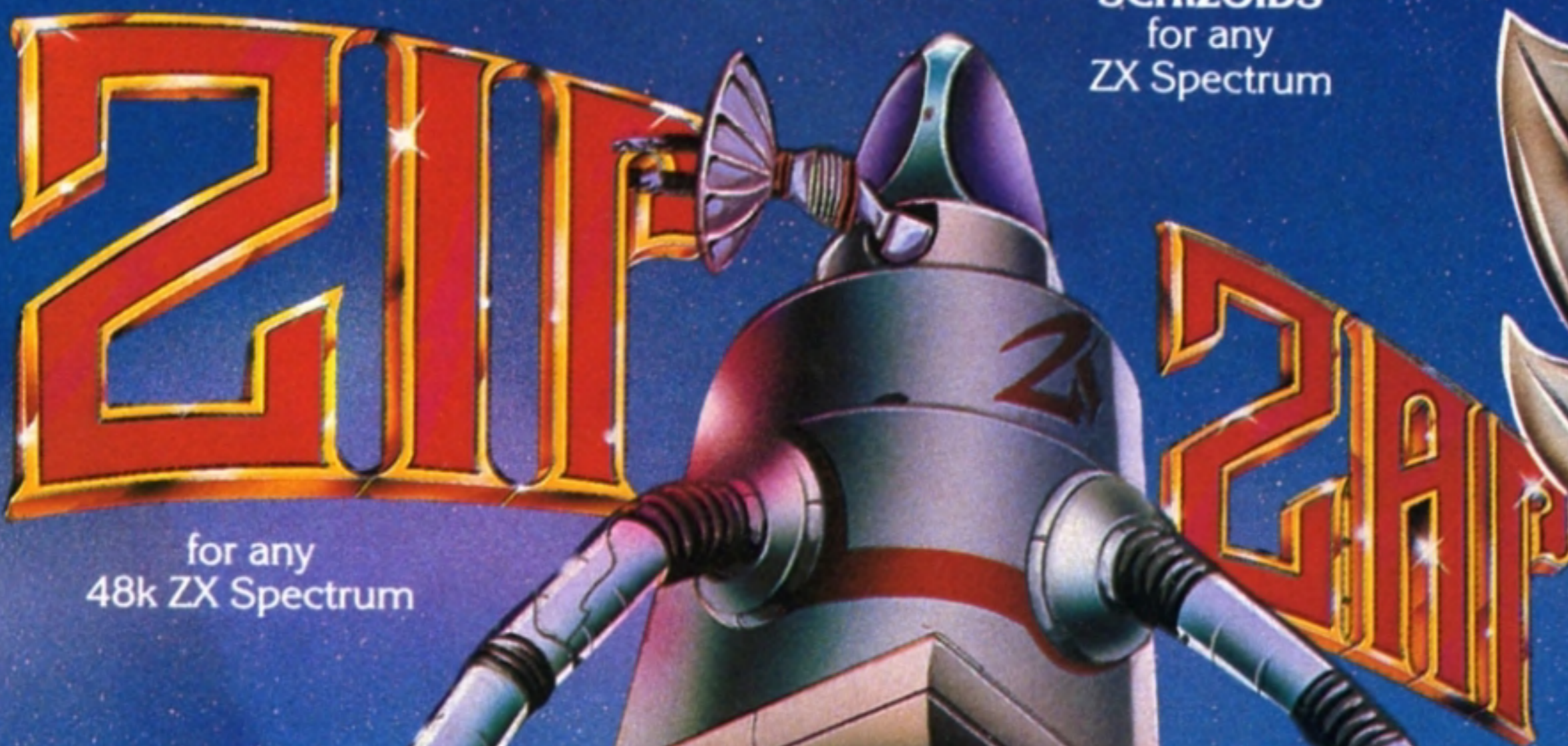
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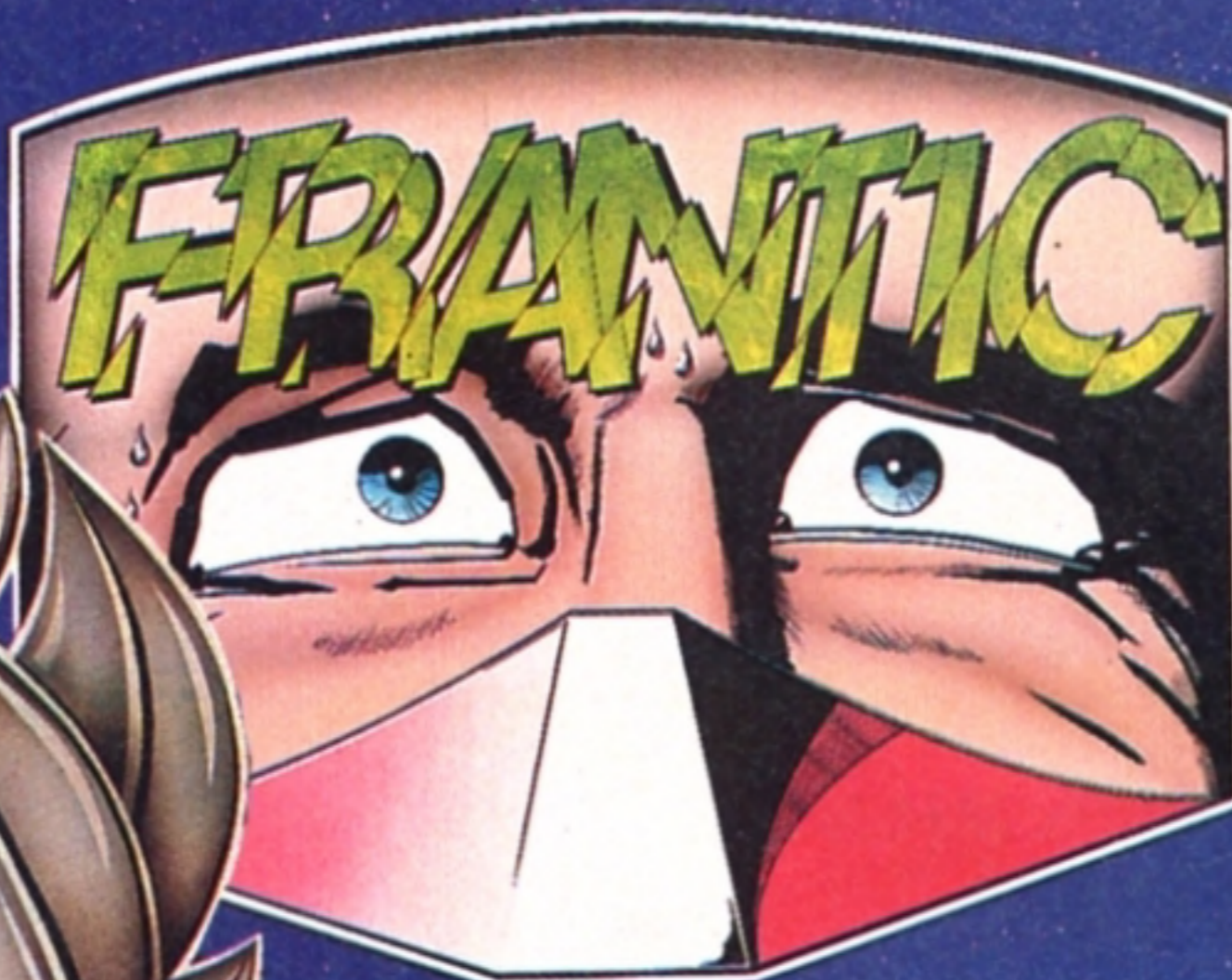
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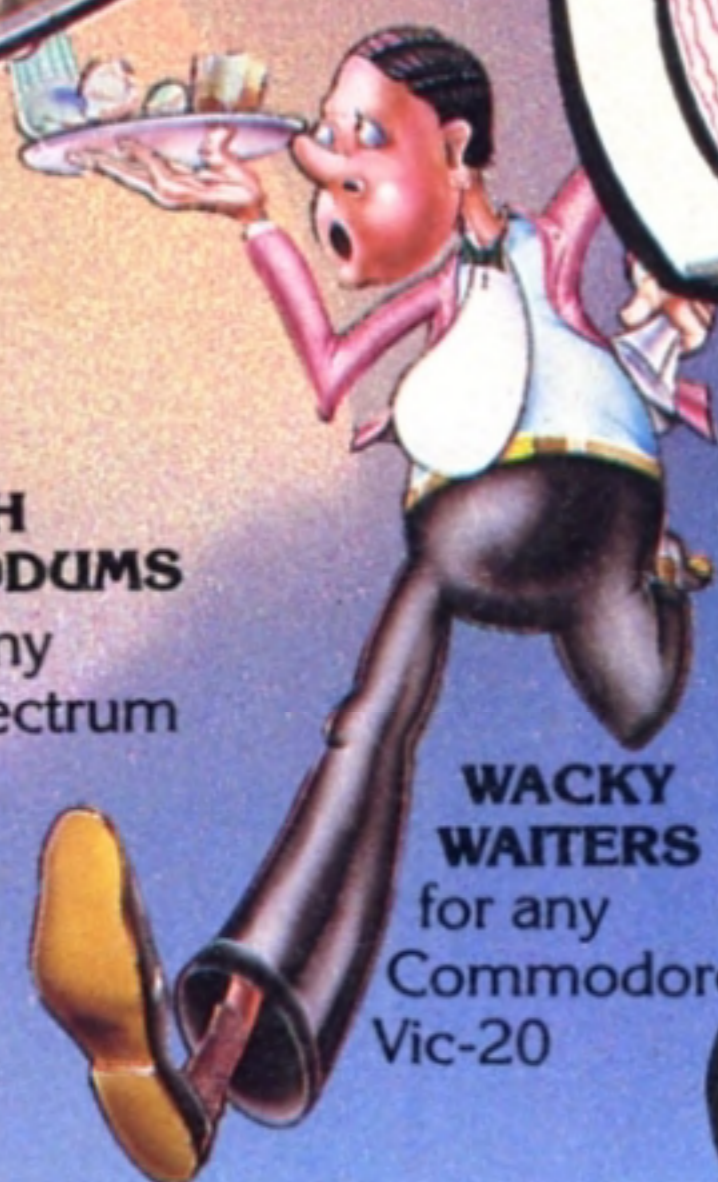
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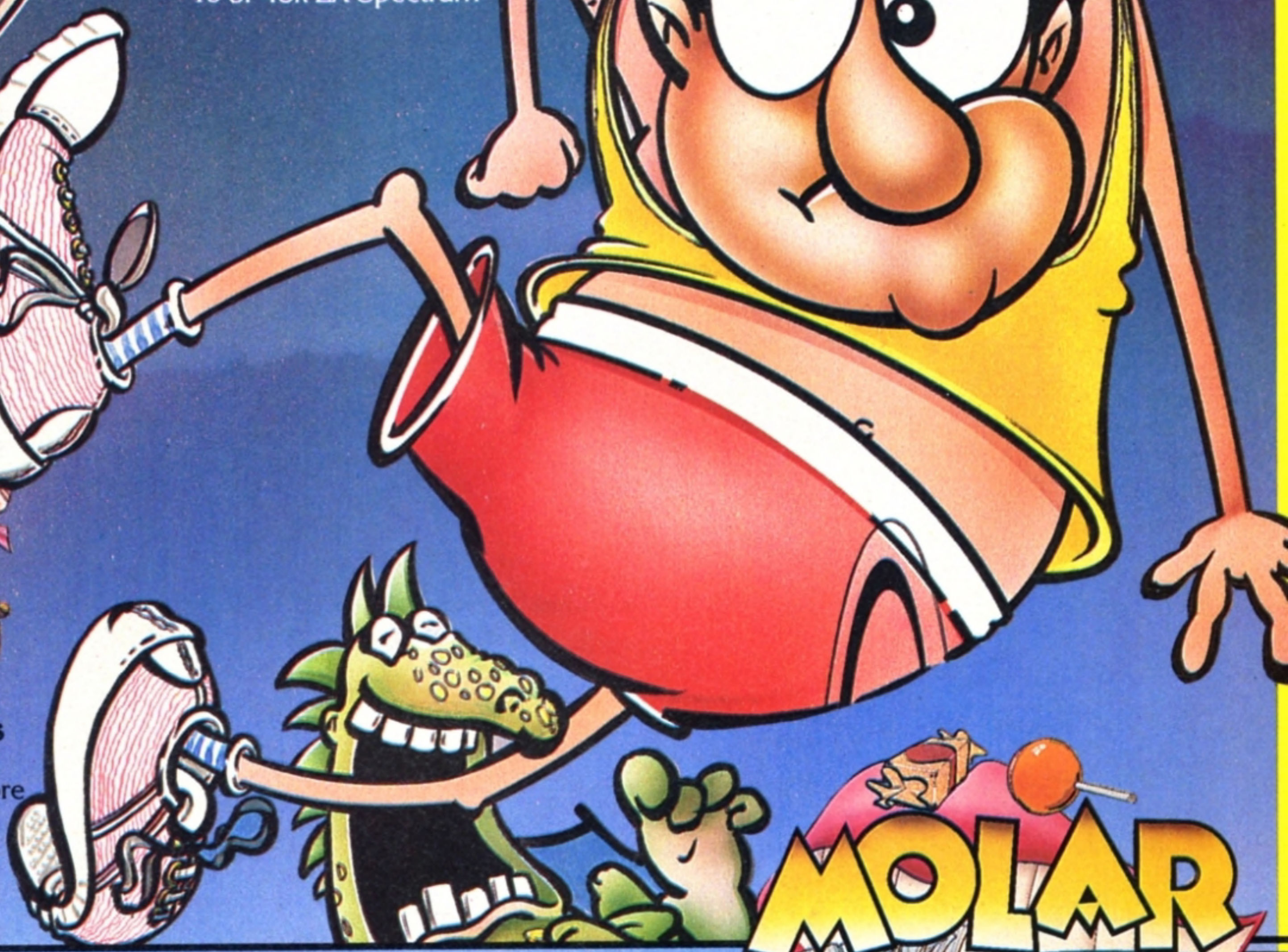
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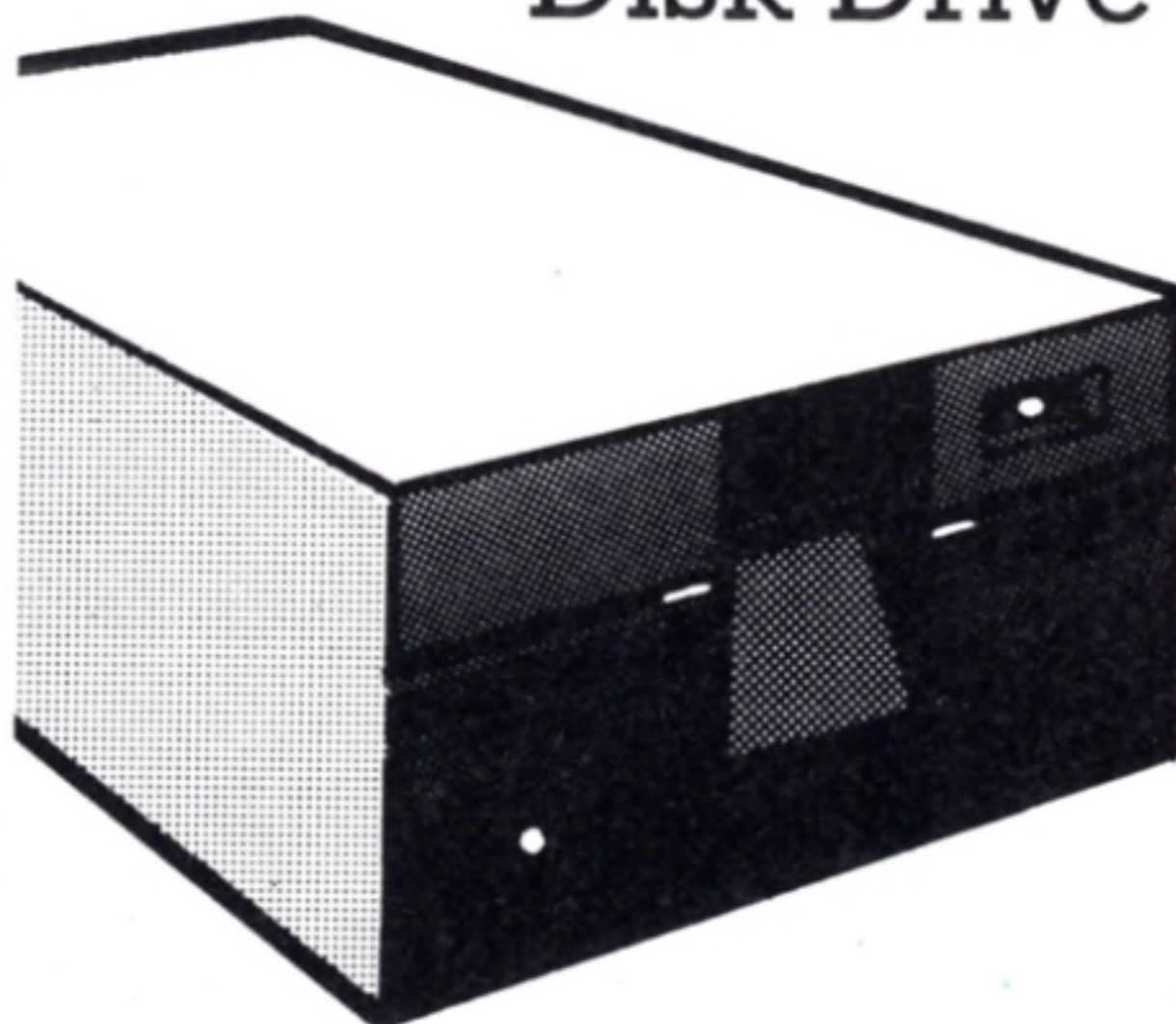
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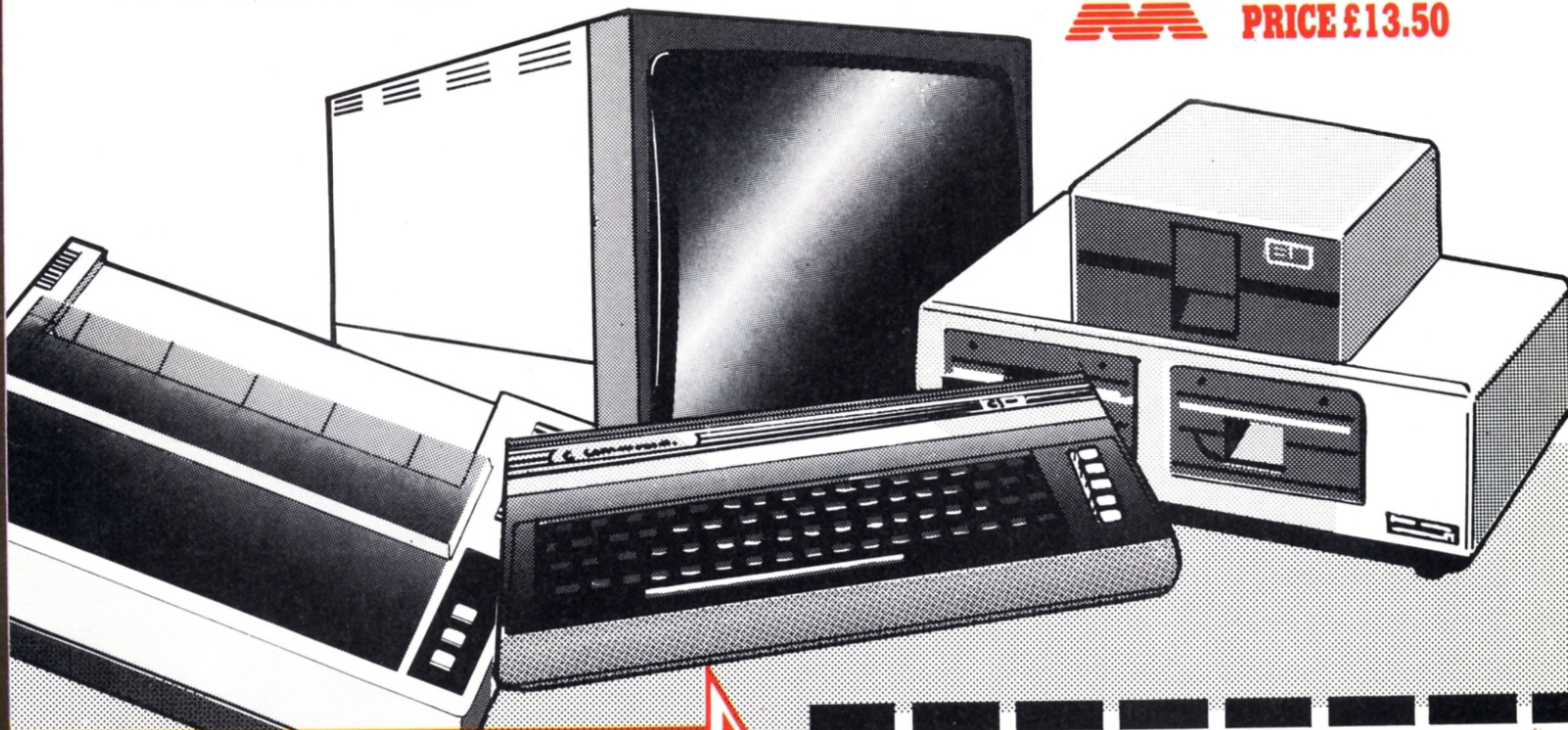
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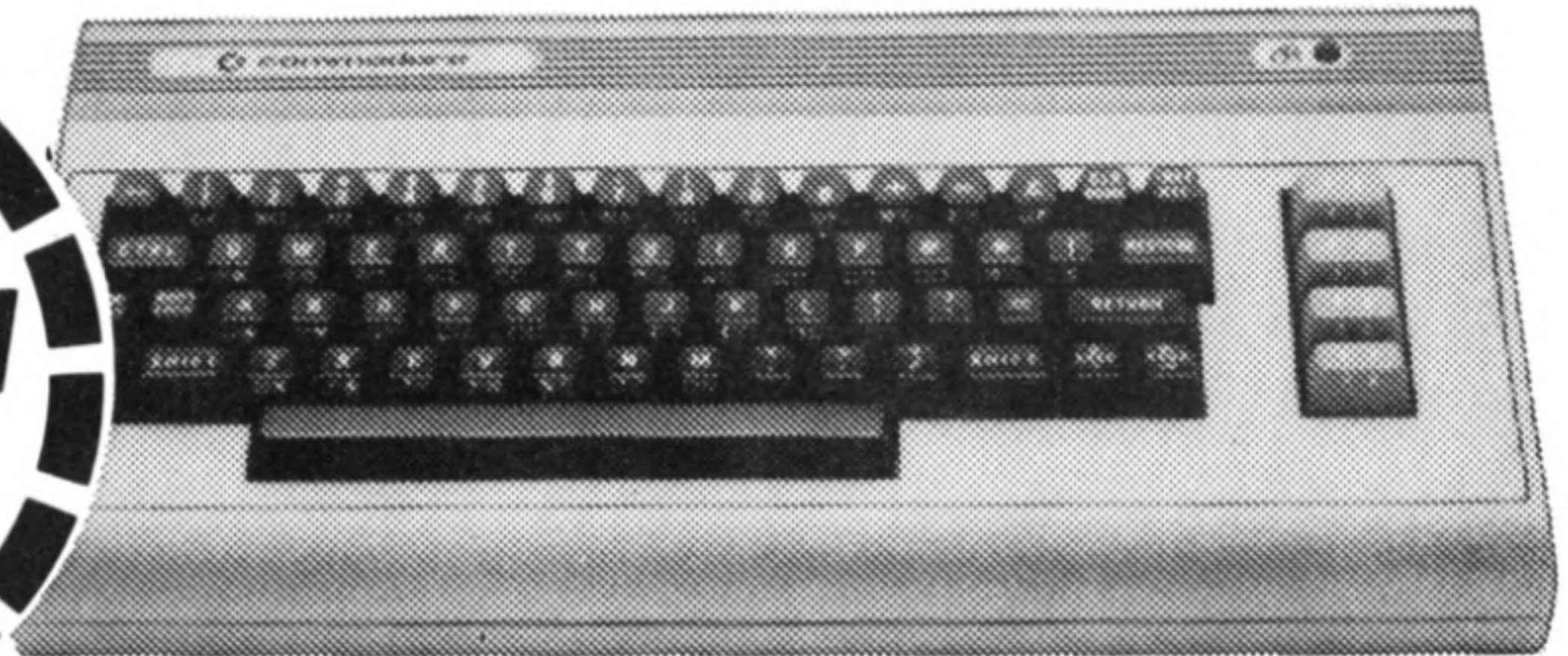
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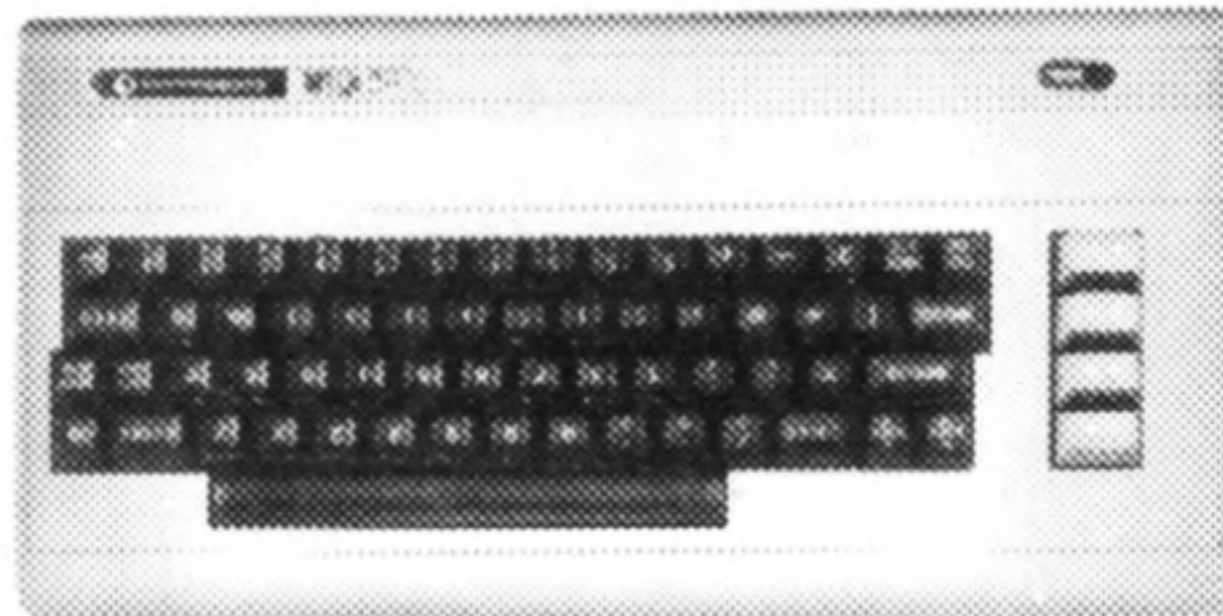
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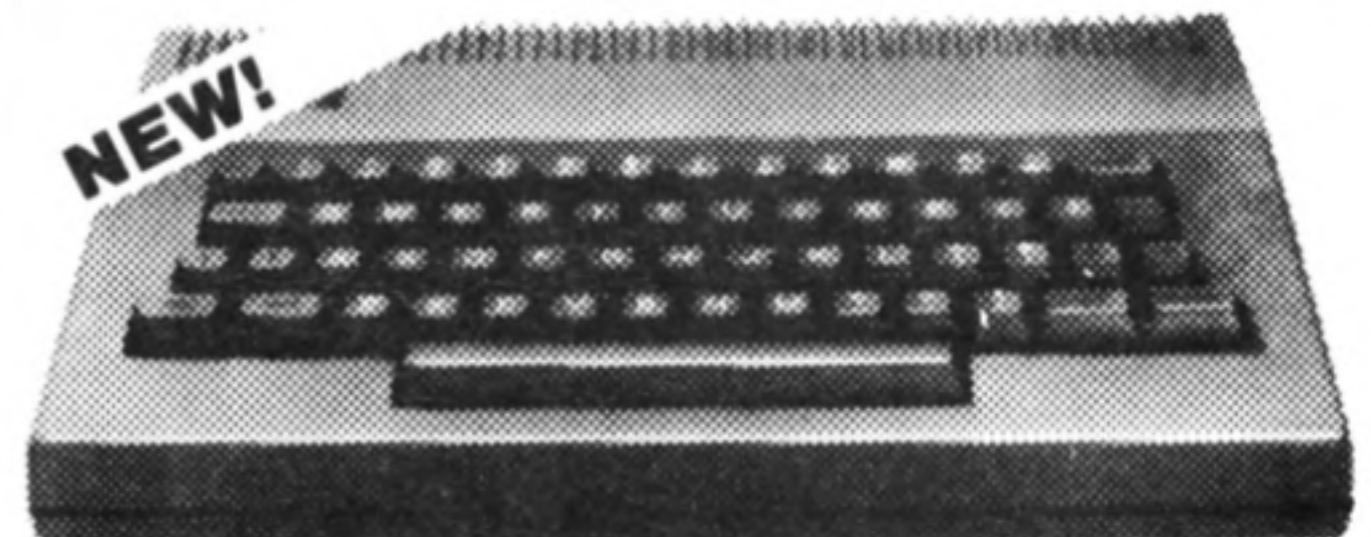
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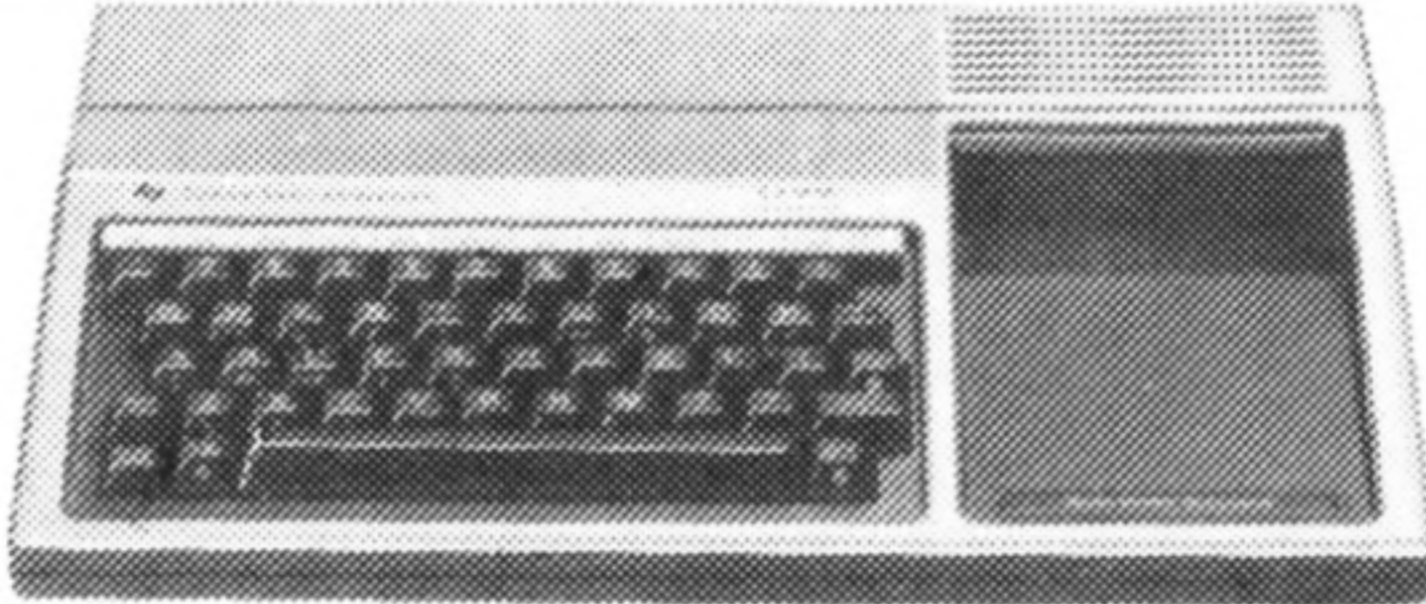
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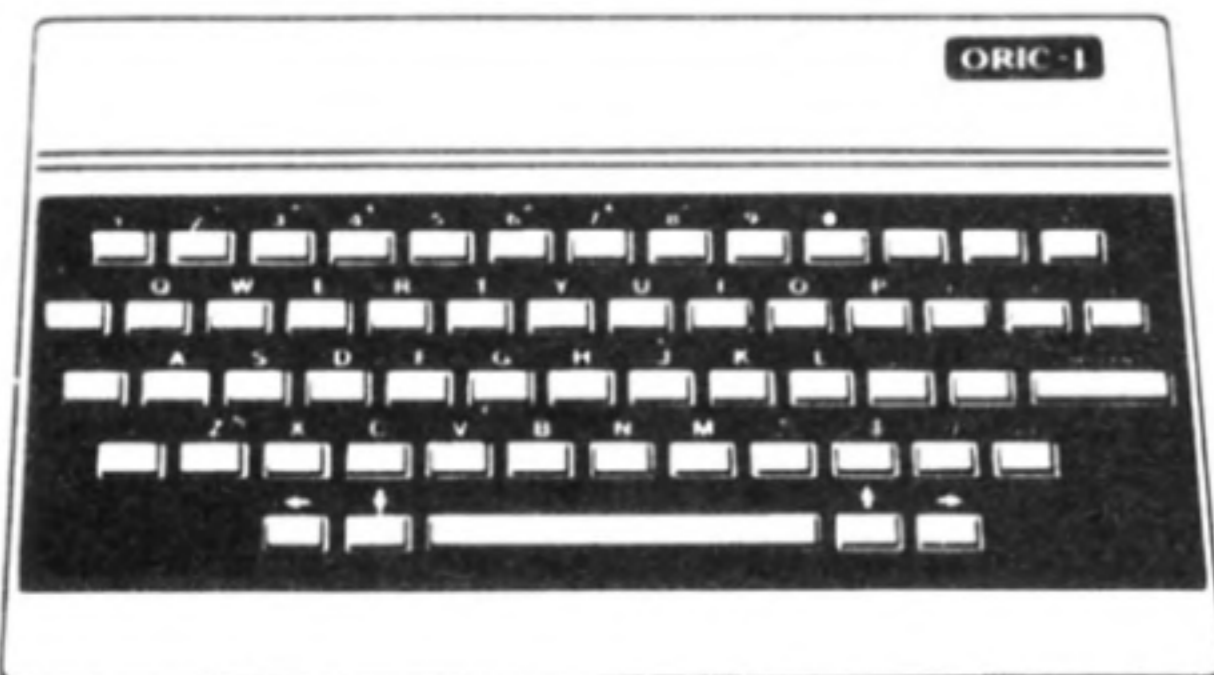


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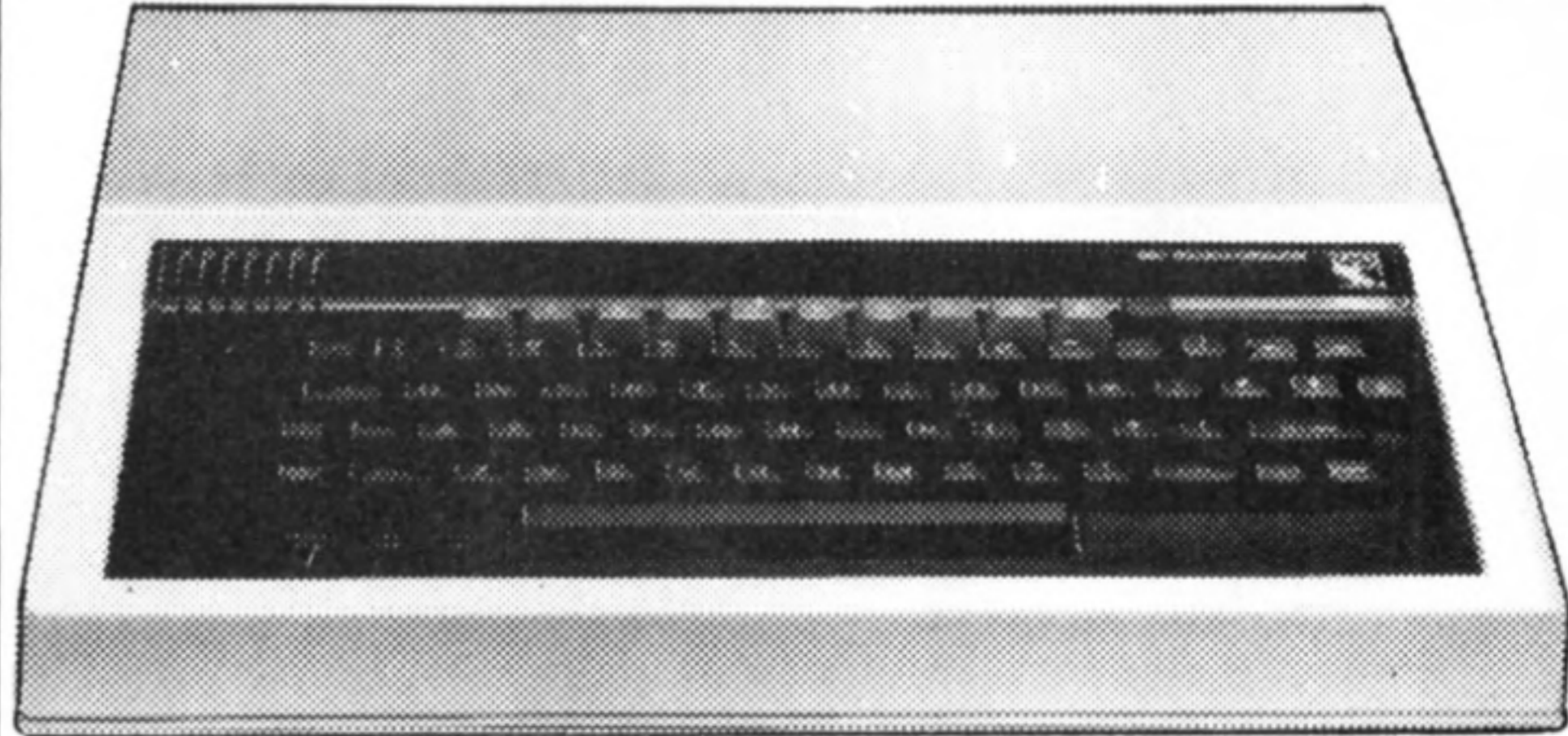
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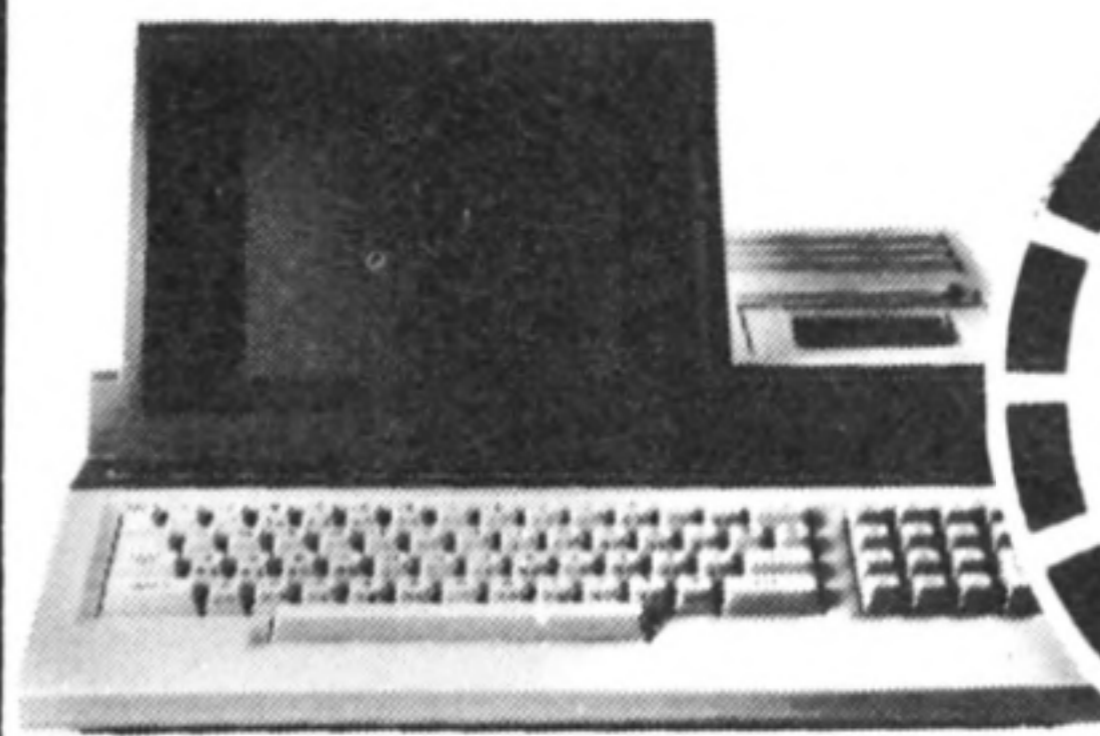
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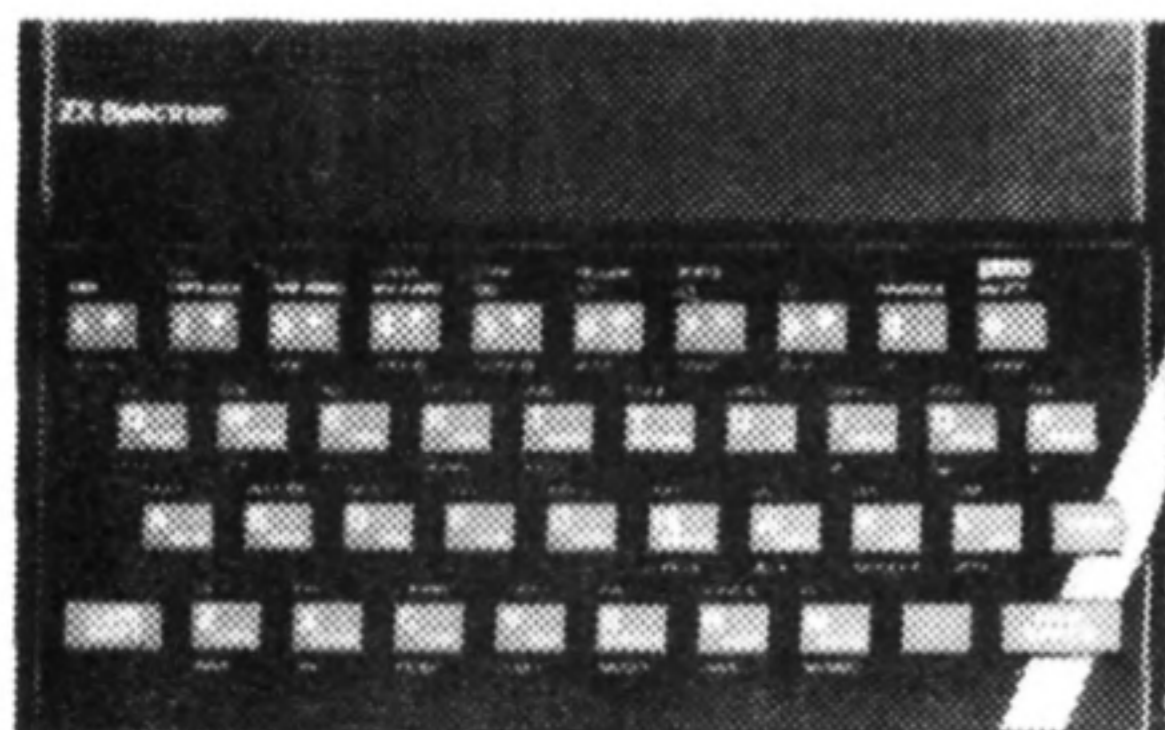
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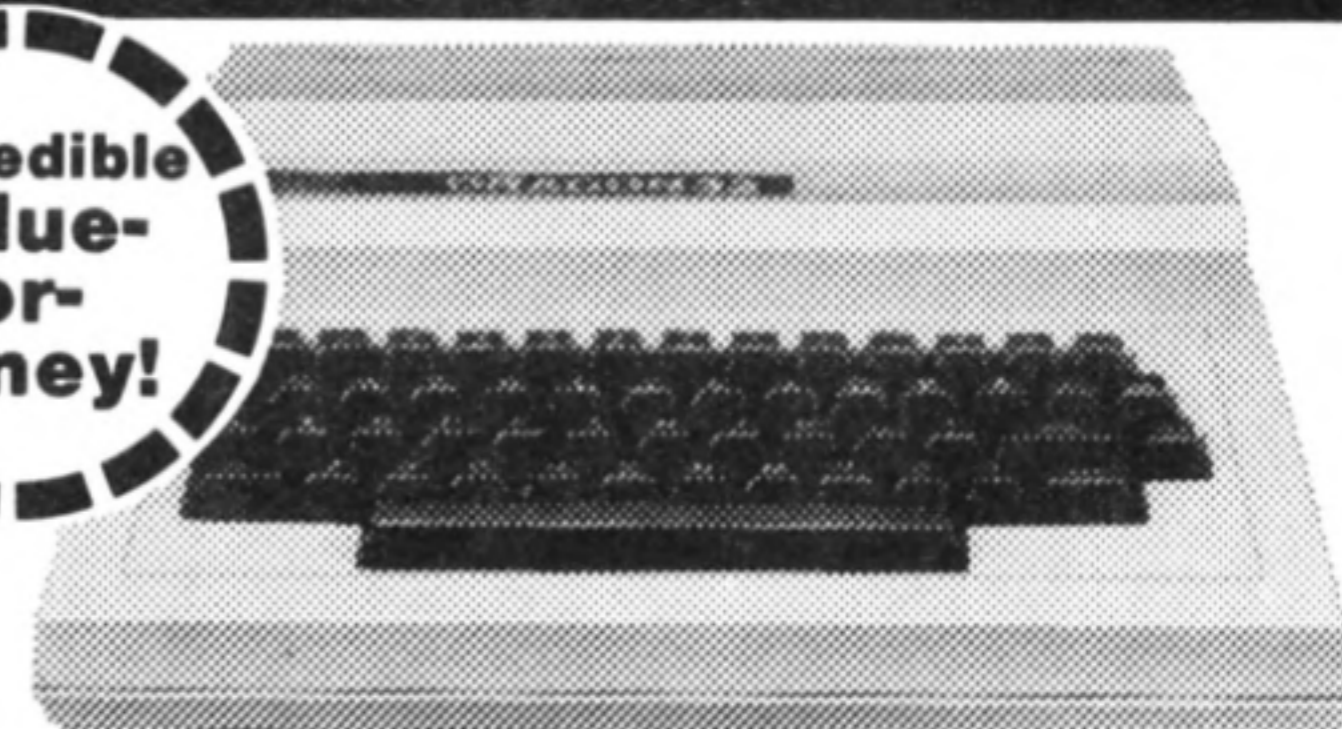
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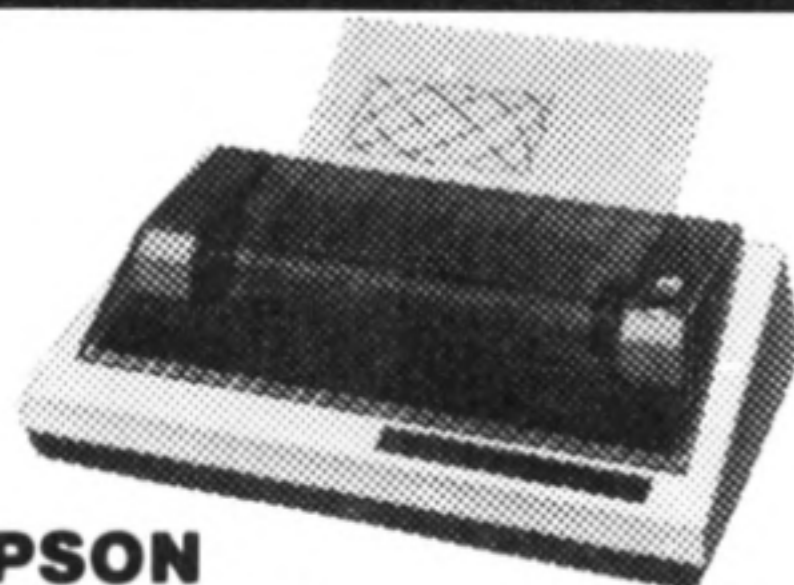


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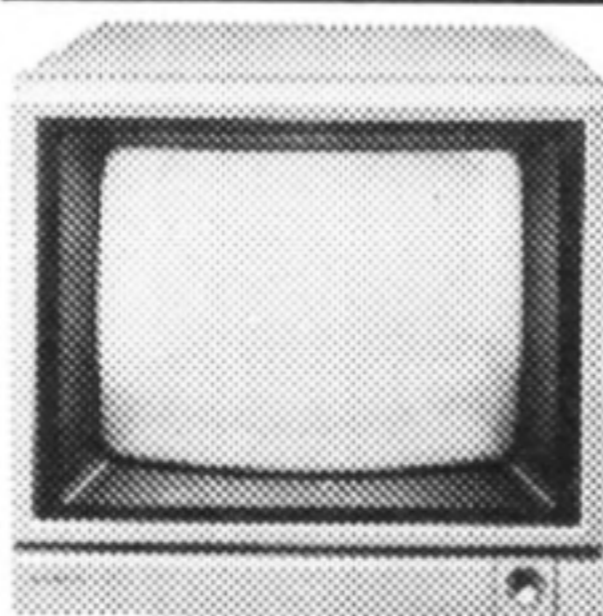
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BASILDON Godfrey's 28-32 East Walk, Town Centre. TEL: (0268) 289379
CHELMSFORD Maxton Hayman Ltd., 5 Broomfield Rd. TEL: (0245) 354595
GRAYS H. Reynolds, 79 Orsett Rd. TEL: 0375 5948
ILFORD Woolfms, 76 Ilford Lane. TEL: (01) 478 1307 (Opening Soon)
LOUGHTON Micro & Movie Channel, 309 High Rd. TEL: (01) 508 1216

GLOUCESTERSHIRE

GLOUCESTER The Model Shop, 79-81 Northgate St. TEL: (0452) 410693

HAMPSHIRE

ALDERSHOT David Saunders, 51 Station Rd. TEL: (0252) 20130
BASINGSTOKE Fisher's, 2-3 Market Place. TEL: (0256) 22079
PORTSMOUTH Computer Corner, 261 Commercial Rd. TEL: (0705) 833938
PORTSMOUTH Waterlooville G B Microland, 7 Queens Prde. TEL: (07014) 59911
SOUTHAMPTON R. J. Parker & Son Ltd., 11 Portsmouth Rd., Woolston. TEL: (0703) 434137/8
WINCHESTER Winchester Camera & Computer Centre, 75 Parchment St. TEL: (0962) 53982 (Just Opening)

HEREFORD

HEREFORD Melgray Hi-Tech Ltd., 49 Broad St. TEL: (0432) 275737

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HATFIELD Microworld, 2 Crawford Rd. TEL: (07072) 64137
HEMEL HEMSTEAD Faxminster Ltd., Computer & Electrical Discount Centre, 25 Market Sq. TEL: (0442) 55044
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POTTERS BAR The Computer Shop, 197 High St. TEL: (0707) 44417
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WATFORD SRS Microsystems Ltd., 94 The Parade, High St. TEL: (0923) 26602

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ACCINGTON PV Computers, 38A Water St. TEL: (0254) 36521/32611

BLACKBURN Tempo Computers, 9 Railway Rd. TEL: 0254 60554

BURNLEY IMO Computer Centre, 39-43 Standish St., BB11 1AP. TEL: (0282) 54299
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OLDHAM Home & Business Computers Ltd., 54 Yorkshire St. TEL: (061) 633 1608
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LINCOLN MKD Computers, 24 Newlands. TEL: (0522) 25907

LONDON

E6 Percivals, 85 High St. North, East Ham. TEL: (01) 472 8941
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EC2 Devron Computer Centre, 155 Moorgate. TEL: (01) 638 3339/1830
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NW4 DA Vinci Computer Store, 112 Brent St., Hendon. TEL: (01) 202 2272/3/4 (Just Opening)
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SE15 Castlehurst Ltd., 152 Rye Lane, Peckham. TEL: (01) 639 2205
SW6 Chelsea Micros Ltd., 14 Jerden Place. TEL: (01) 385 8494
W1 Devron 4 Edgware Rd. TEL: (01) 724 2373
W1 Computers of Wigmore Street, 87 Wigmore St. TEL: (01) 486 0373
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KILMARNOCK Vennals, 49 Foregate. TEL: (0563) 32175
KIRKCALDY Kirkcaldy Photographic Services, 254E High St., Fife. TEL: (0592) 204734
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SHROPSHIRE

SHREWSBURY Computarama, 13 Castlegate. TEL: TBA

SOMERSET

TAUNTON Grays, 1 St. James St. TEL: (0823) 72986

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STAFFORD, Computarama, 59 Foregate St. TEL: (0785) 41899
STOKE-ON-TRENT Computarama, 11 Market Sq., Arcade, Hanley. TEL: (0782) 268620

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BURY ST. EDMUNDS Bury Computer Centre, 11 Guildhall St. TEL: (0284) 705772
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CAMBERLEY Camera Arts (Micro Computer Division), 36 High St. TEL: (0276) 65848
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Check your area there are many new **SPECTRUM** dealers throughout the U.K. So there's a good chance there'll be a **SPECTRUM** centre near you!

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MAJOR PRICE BREAKTHROUGH!

MICROCARE KEEPS YOUR COMPUTER HUMMING!

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Fully guaranteed for 12 months.

No, you're not dreaming! Those are the prices charged by MicroCare for repairing any electronic fault, however serious, in the above computers. They are ££££££'s below the price of Sinclair's repair service, and we give a guarantee!

We'll return it promptly, and we'll quality check your unit before it leaves our service centre.

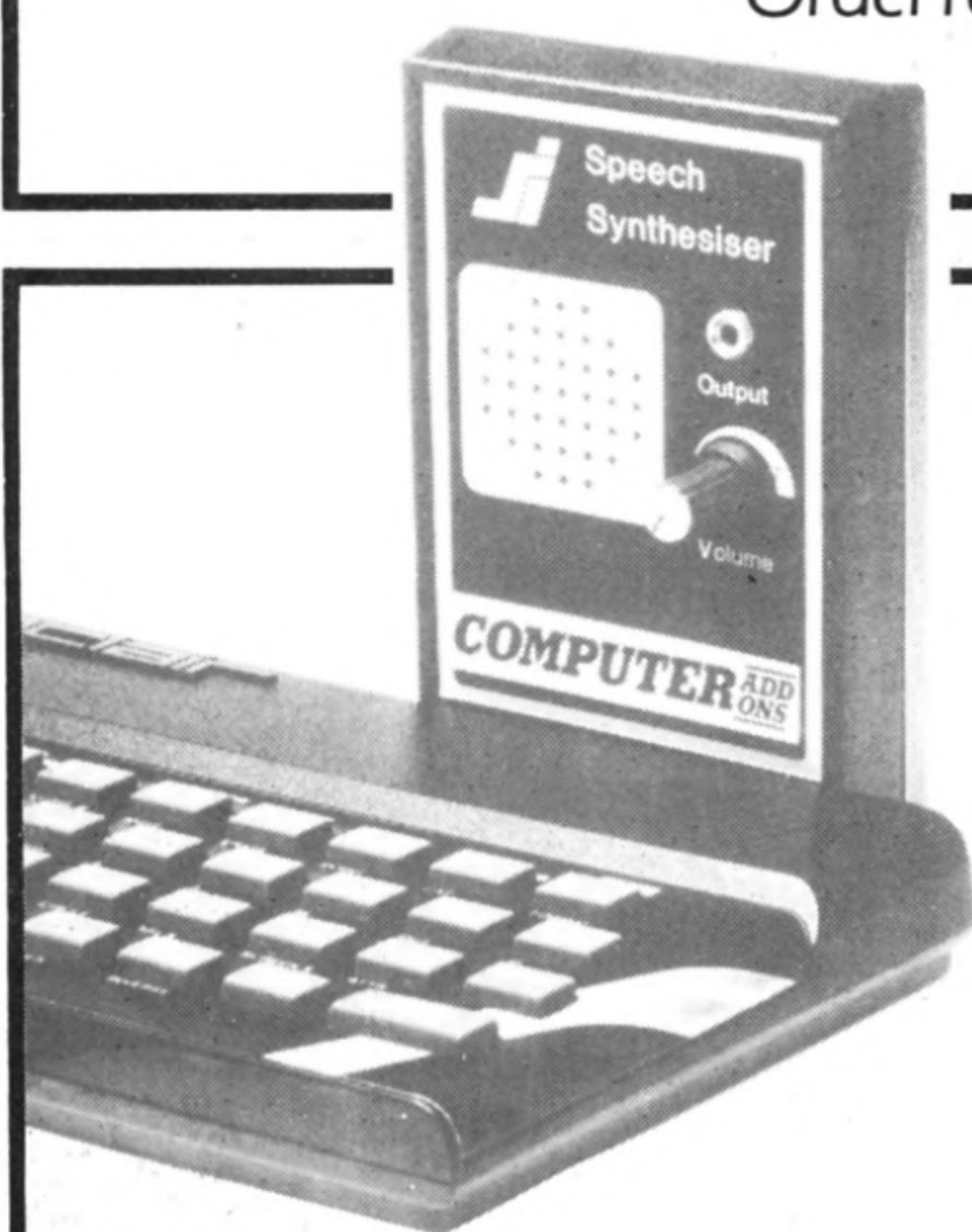
We have the experience it takes. We have the parts on hand. So act now. Let MicroCare get your computer humming again!

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Cheques to be made payable to MicroCare,

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FANTASTIC ZX81 & SPECTRUM SS1 SPEECH SYNTHESISER

SIZE 3 1/2" x 5 3/4" x 1"

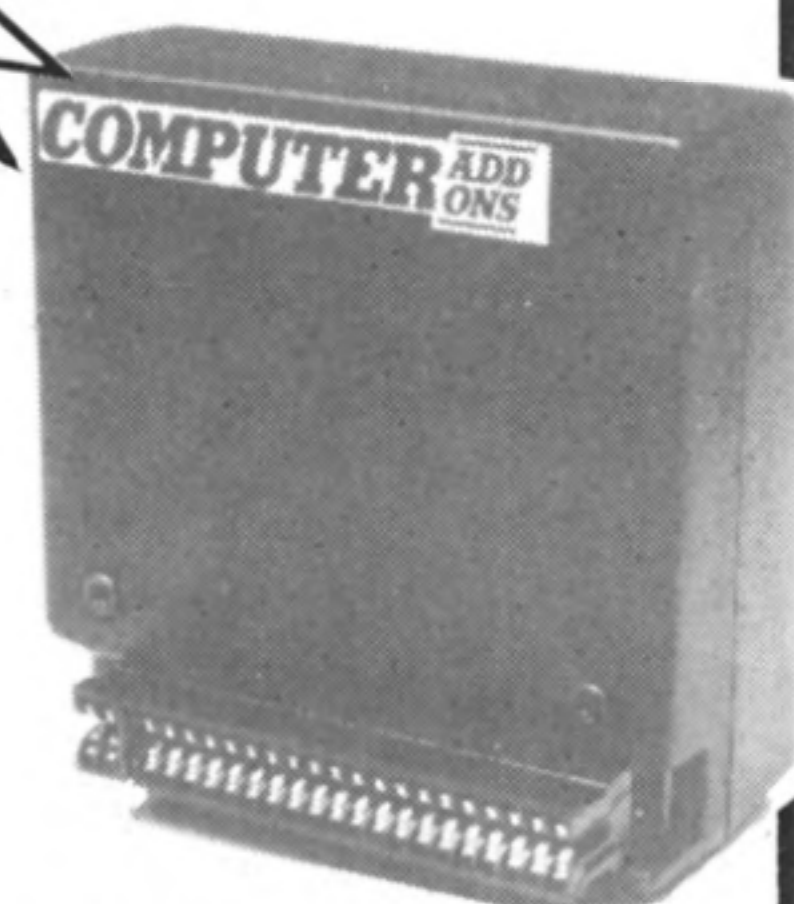
- ★ Making amazing speech effects with your ZX Spectrum.
- ★ Specially designed for use with your Spectrum. Just plugs in, no dismantling or soldering.
- ★ No power pack, leads, batteries or other extras.
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- ★ Uses no memory addresses.
- ★ Free Dictionary of Sounds.

SS1 SPEECH SYNTHESISER £39.00 plus 60p P + P



16K
Memory
extension
for only

£15.99!



FABULOUS SINCLAIR ADD-ON OFFER FOR ZX81 OWNERS

These are the real thing. ZX81 memory extensions made for the USA and specifically screened to stop radio interference.

- ★ no soldering
- ★ easy to fit
- ★ simply plug in
- ★ no loss of memory through wobble or white out

Fully Guaranteed for 12 months

ME1-16USA £15.99 plus 60p P + P

NEW

TAPE LOAD ANXIETY?

Vu load takes the frustration out of loading your ZX81 or Spectrum programmes.

- ★ helps to ensure programme load every time
- ★ monitors tape output level
- ★ gives positive save indication
- ★ detects blank tape without disconnecting cassette wires
- ★ ready to use - no wiring

TL £19.99 plus 60p P + P

NEW

MICRO TAPE

save it - first time on American microtape

- ★ Specially designed for use with micro computers
- ★ Low drop out occurrence
- ★ Uniform coating
- ★ High saturation level
- ★ So good, we can guarantee them for 12 months

AUDIO DIGITAL AD.C12 - 55p;
AD.C15 - 60p; AD.C20 - 65p; + 40p P + P

NEW LOW PRICE
Series B ONLY
£20.50!

Spectrum 16K-48K

With our ME48 memory expansion add-ons your Spectrum can increase its capacity by up to three times.

- ★ no soldering
- ★ easy to fit
- ★ simple to plug in
- ★ fully guaranteed
- ★ no loss of memory through wobble or white out.

NB. Before ordering your Spectrum add-on please check which Spectrum you have in your possession. At the back of the ZX Spectrum the metallic contact strips can be clearly viewed. In the series A the space separating the strips is the same width as the strips. In the series B the strips are twice as wide as the space between.

SPECTRUM
ME16-48 Series A £34.50 plus 60p P + P
Series B £20.50 plus 60p P + P
ME16-80 Series B £46.00 plus 60p P + P
ZX81
ME1-64 £44.25 plus 60p P + P
FITTING/TESTING SERVICE. While you wait, personal callers Monday - Friday 9.30-5.00, £3.00. By return of post £7.00.

NEW LEVEL-VU PRISM

- Allows you to see your tape counter without moving from your seat!
- ★ attaches easily to recorder body or lid
 - ★ fits most recorders including Radio Shack, Vic-20, Atari
 - ★ greatly magnifies counter numerals

LVP £3.99 plus 40p P + P

COMPUTER STANDS

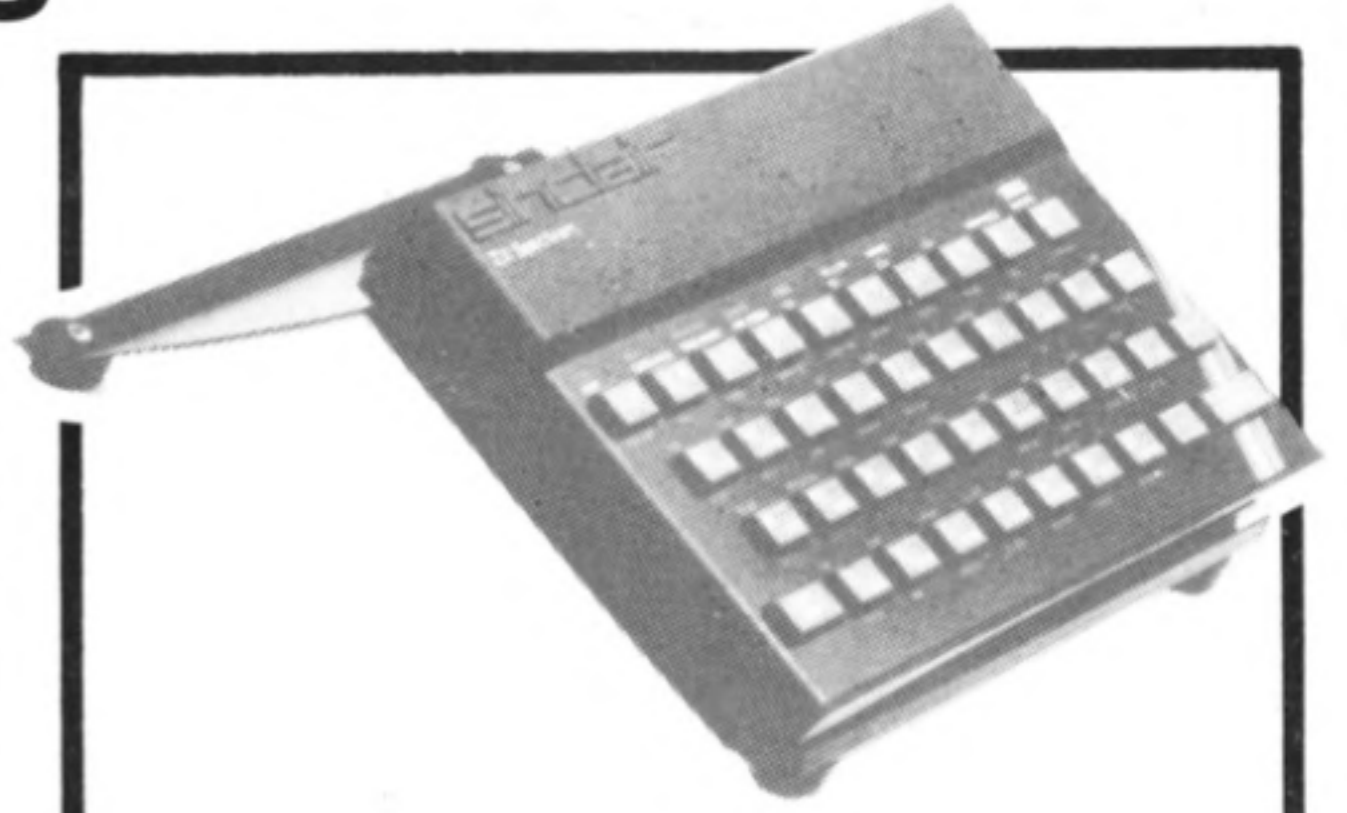
POWER BASE

Raised stand for ZX81 and Spectrum. Fitted LOAD/SAVE switch, and power ON/OFF for screen clearing. Saves wear and tear on connections. Front lip holds computer in place. No soldering, comes complete with all necessary plugs and cables.



Spectrum ref. PBS1 £13.50 plus 95p P + P

ZX81 ref. PBZX81 £13.00 plus 95p P + P



COMPUTILT STAND

Designed to tilt the computer to a better working position. Front lip holds computer in place. Also useful as a document stand when entering information.

Spectrum or ZX81 ref. CS1 £4.50 plus 60p P + P

WOBBLE STOPPERS

At last, a fool proof method of avoiding ZX81 whiteouts caused by Ram-Pack wobble. Simply turn the plastic thumbscrew until the Ram-Pack is held

firmly against the ZX81. No soldering no stick-on pieces, just common sense! Flat or tilted models.



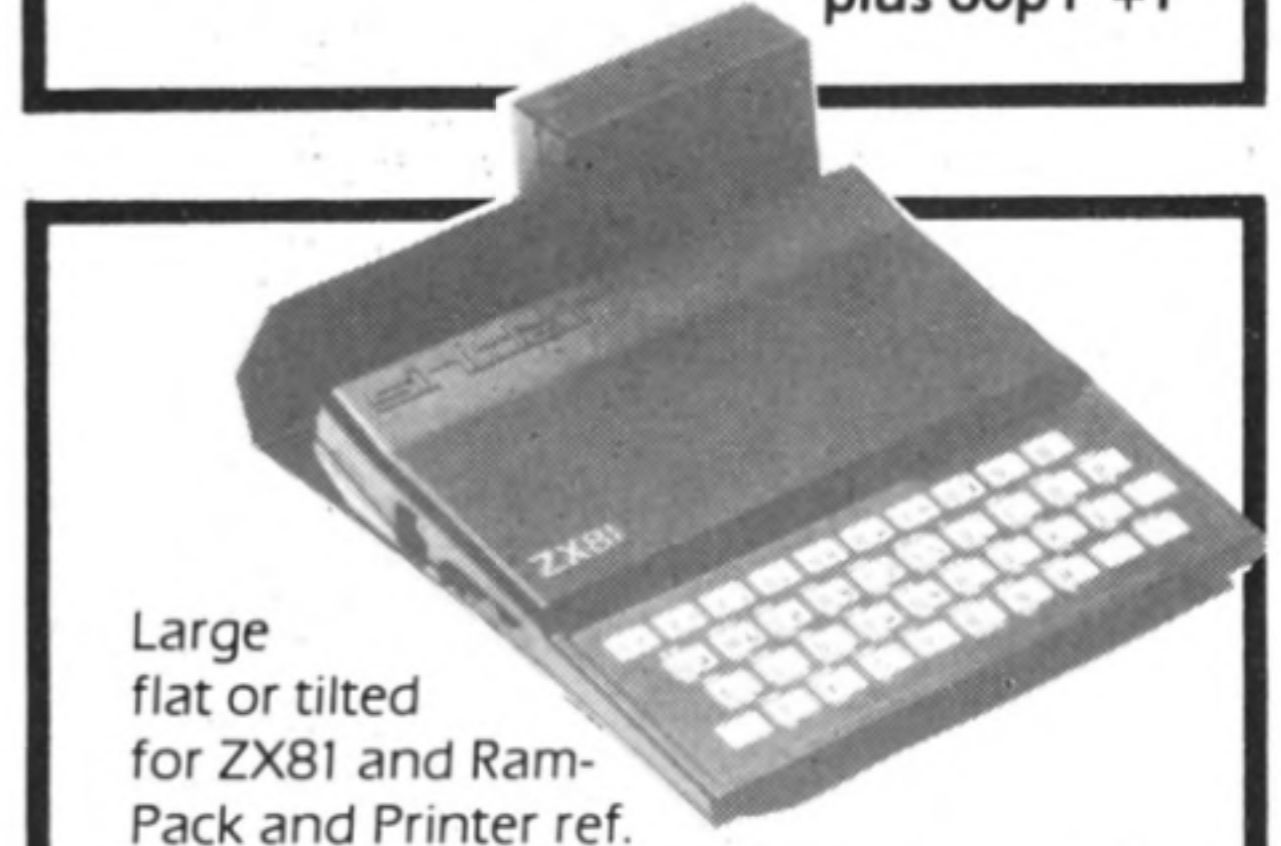
Small flat ZX81 and Ram-Pack ref. SW plus 60p P + P

£5.25



Small tilted for ZX81 and Ram-Pack ref. STW plus 60p P + P

£6.25



Large flat or tilted for ZX81 and Ram-Pack and Printer ref.

LW £5.75 flat LTW £6.75 tilted plus 60p P + P

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7-9 Thane Works, Thane Villas, London N.7. Tel: 01-609 7919
Trade enquires welcome

ALL ITEMS NORMALLY DESPATCHED WITHIN 24 HOURS
Please tick appropriate box to order your Computer Add-On.

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ME16-48 Series A Series B SS1
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ME16-80 Series B ME1-64
LVP PBS1 PBZX81 CS1
SW STW LW LTW

NB. Add Post and Packing to the price of each item.
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*Allow 28 days for delivery.

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Date _____

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Address _____
Occupation _____

COMPUTER ADD-ONS
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dk'tronics

ZX KEYBOARD FOR USE WITH 81 SPECTRUM

Our new cased keyboard has 52 keys, 12 of which are used for the numeric pad. The numeric pad offers useful features, you can cursor with one hand and it will be a boon for anyone who enters a lot of numeric data. The pad is a repeat of the 1 - 9 keys, it also has a full stop and a shift key. The numeric pad keys are red in colour, the normal keyboard keys are grey, with the case being black, which results in making the keyboard very attractive. The keyboard case dimensions are: 15" x 9" x 2½". The computer (either 80/81 or Spectrum), fits compactly inside.

You will have to remove the computer from it's original case, it is then screwed to the base of the case. The case has all the bosses already fitted and the screw holes are marked. Also fitted inside the case is a mother board (81 model only) which allows 16K, 32K and 64K to be fitted in the case. All connectors are at the rear of the case i.e. Power, Mic, Ear, T.V. and the expansion part. The case is large enough for other add-ons also to be fitted inside. One of these could be the power supply then you could very quickly fit a mains switch or a switch on the 9V line. This means you have a very smart contained unit. This case does not stop you from using any other add-ons that you may have eg Printer etc. We are convinced that this is the best keyboard available at present. It offers more keys and features than any other keyboard in it's price range.

NOTE...

The case can be purchased separately with the keyboard aperture uncut, therefore if you possess one of our early uncased keyboards, or in fact, any other suppliers' keyboards these could be fitted. The keyboard is connected to your computer by a ribbon cable and this has connectors fitted which simply push into the Sinclair connectors. It is a simple two minute task and requires no electronic skills. This keyboard does not need any soldering. Please specify on order whether you require the ZX81 or Spectrum case.

SPECTRUM MODEL

This is supplied with Spectrum legends, and a slightly different base for fitting the Spectrum inside, again, all the connectors are at the rear of the case and there is plenty of room for the power supply (and other add-ons). Should you wish to change, we can supply both the Spectrum legends and details of updating your case which will enable modification from the ZX81 to Spectrum. PLEASE specify on your order whether you require the ZX81 or Spectrum inside.

£45



MEMORY FOR ZX 81

- 16K Memory £22.95
- 64K Memory £52.95
- 16K (Uncased) £19.95
- 64K (Uncased) £49.95

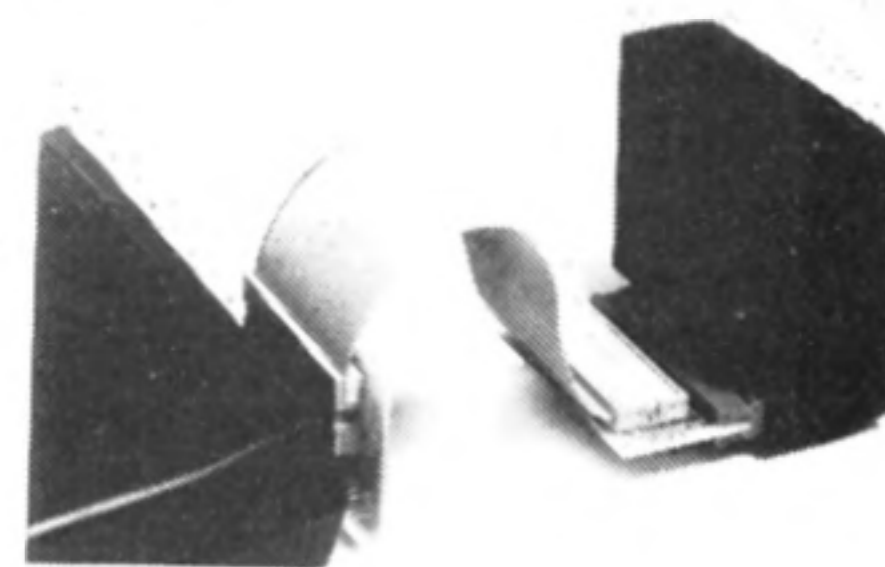
SPECTRUM MEMORY

- MKI £30
- MKII £30



FLEXIBLE RIBBON CONNECTOR

If you have ever had white outs or system crashes this could be the answer. It stops the movement between the computer and the RAM expansion, it is supplied with a ribbon 6 inches long, with a male connector at one end and a female at the other.



ONLY £10



dk'tronics

DK Tronics, Unit 2, Shire Hill Ind Est, Saffron Walden
Essex CB11 3AQ. Tel: (0799) 26350 (24 hrs) 5 lines.

ZX 80/81 SPECTRUM HARDWARE

SPECTRUM/81 TOOLKIT BOTH AT ONLY £6.95

This is the toolkit which won acclaim in the feature in the August 1982 issue of Sinclair User. "It is the most impressive programm, fast in execution with clear and full instructions . . . it stands out from the rest of the field". The ZXED is a powerful editor for use on the expanded ZX81. It is intended for use by the serious BASIC programmer and offers several useful and time saving features most helpful during all stages of program development. The facilities provided are as follows: ALTER, BYTES, COPY, DELETE, FIND, HELP, INSERT, KEEP, MOVE, RENUMBER, AND VERIFY.

The Spectrum Toolkit contains most of the features above plus autoline numberer and append, and will run in the 16K and 48K Spectrum.

4K GRAPHICS ROM £24.95

This module unlike most other accessories fits neatly inside your computer under the keyboard. The module come ready built fully tested and complete with a 4K graphic ROM. This will give you an unbelievable number of extra pre-programmed graphics. This now turns the 81 into a very powerful computer with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders, graphics and that only accounts for about 50 of them, there are still approximately 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there, it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

SPECTRA-SOUND

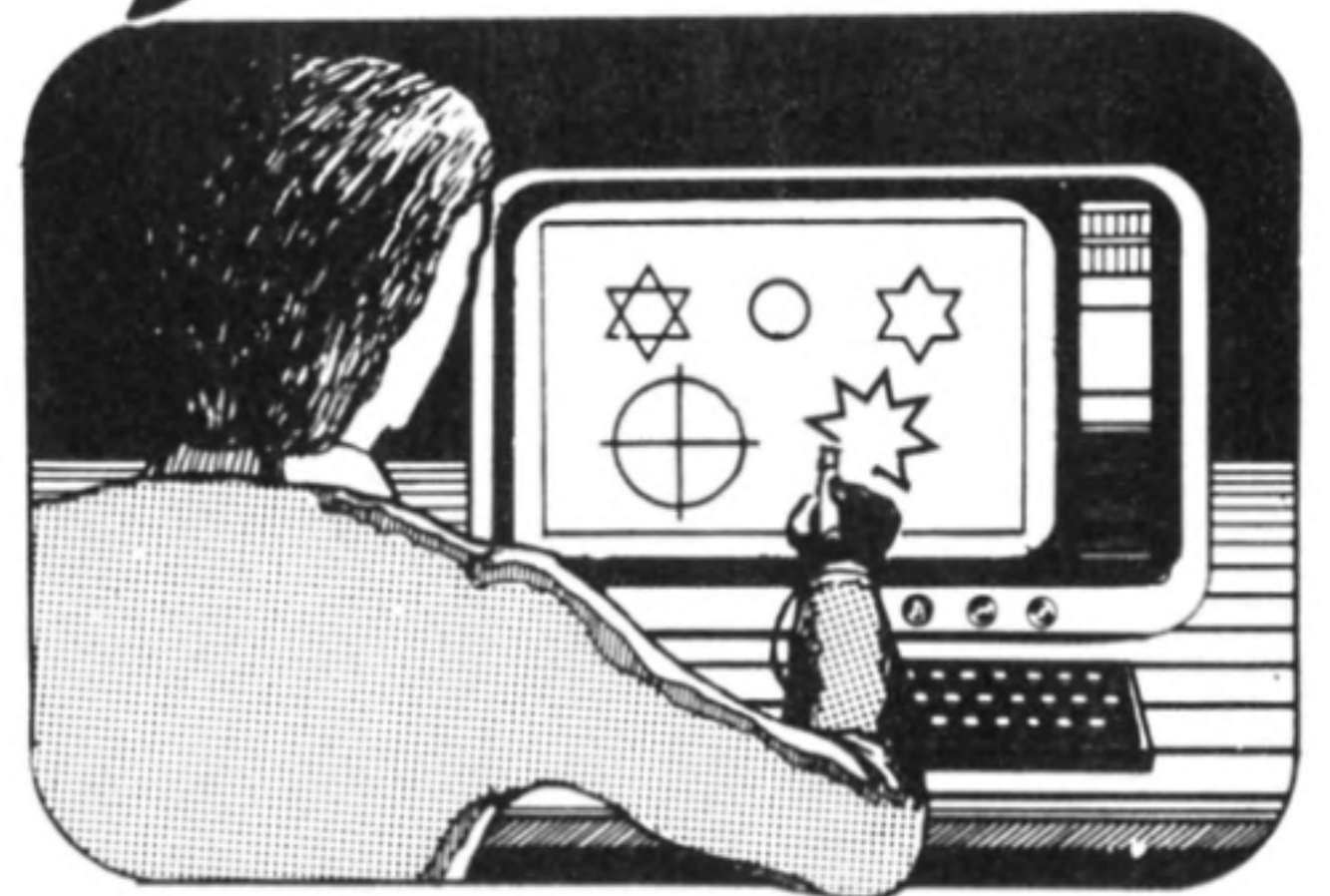
The so called speaker in your Spectrum is really only a 'buzzer'. With the DK Tronics "SPECTRA SOUND" you can generate fully amplified sound through the speaker on your T.V. set. SPECTRA-SOUND is a very simple but highly effective add-on. This means that you no longer have a faint beep but a highly amplified sound, which can be adjusted with the TV volume control.

The SPECTRA SOUND fits compactly and neatly inside the Spectrum case and is connected by three small crocodile clips.

NEW AT ONLY £2.95

£19.95 *Light Pen*

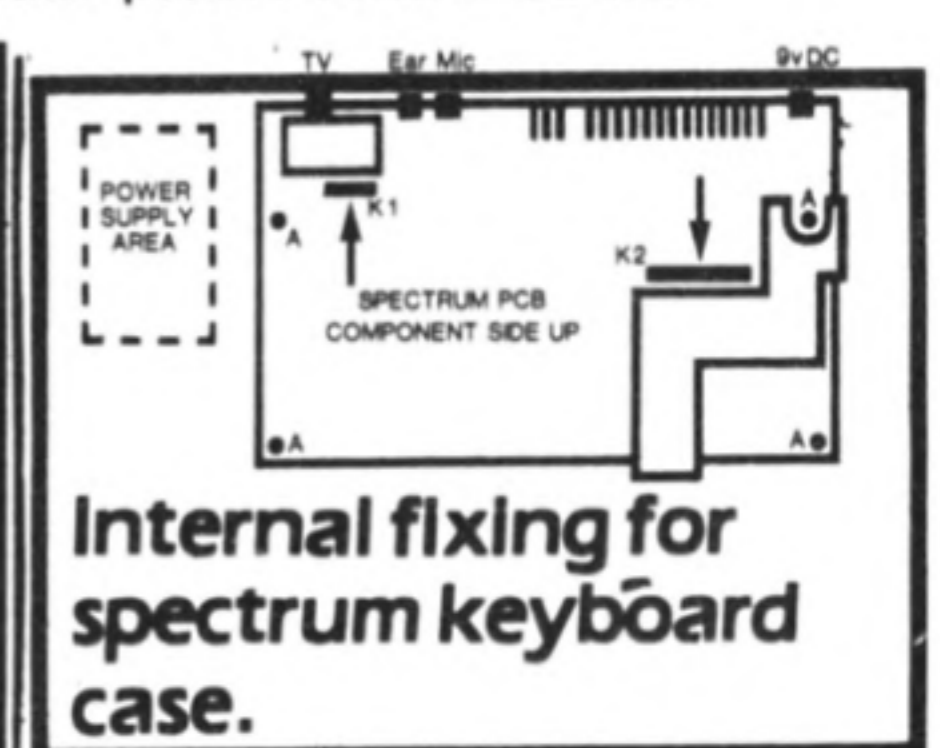
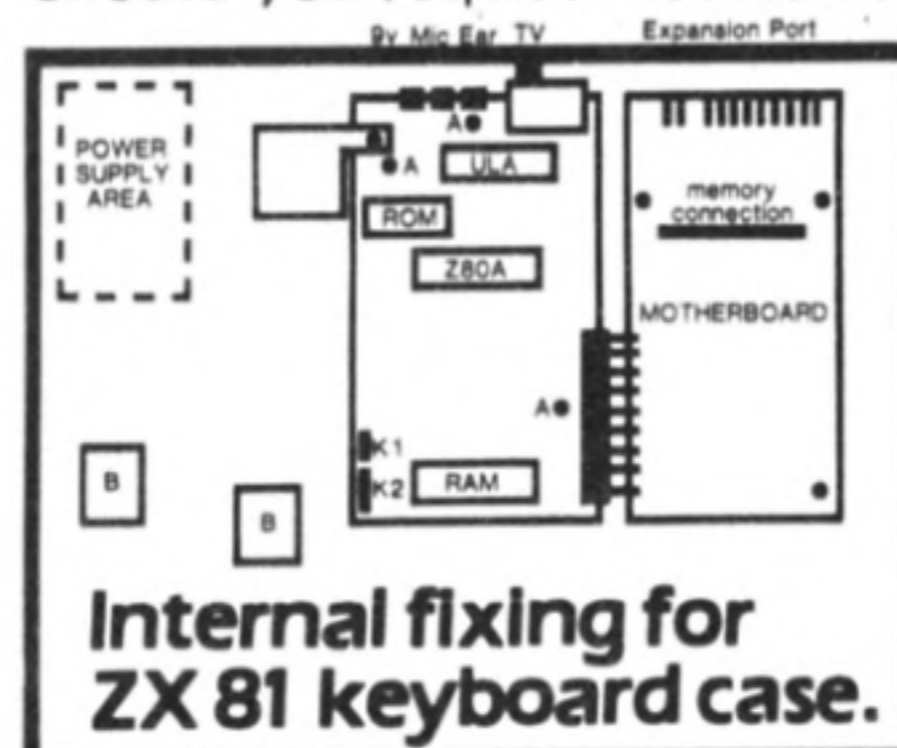
LIGHT PEN
The pen enables you to produce high resolution drawings on your own T.V. screen. The controlling software supplied with the light pen has 16 pre-defined instructions. These are chosen from a menu positioned at the bottom of the screen next to the pen.



You can utilise the menu for changing colour (Border, Paper, Ink). Drawing circles, arcs, boxes, lines. You are also able to fill any object with any colour, and insert text onto the screen at any chosen place. Of course you can also draw freehand. There is a feature to retain the screens and animate. On the 48K Spectrum you can retain 5 screens. You can also use the machine code on it's own in your own programs, for selecting out of a menu etc. The software provided will return with the X,Y, cords for it's position on the screen.

The light pen is supplied with a control interface in order to adjust the sensitivity/pen alignment.

This simply plugs into the ear socket on your spectrum. Should you require further details please send a S.A.E.



Please state type of machine, which ROM memory size, quantity, and place when ordering.

Please send me @ £

Please send me @ £

Please send me @ £

Please add on £1.25 for p/p

I enclose cheque/P.O. payable to DK Tronics total £.

or debit by Access/Barclaycard No.

Signature

Name

Address

Send to DK Tronics, Unit 2, Shire Hill Ind Est, Saffron Walden, Essex CB11 3AQ. Tel: (0799) 26350 (24 hrs) 5 lines.



HARDWARE

Atari 400 with 16K RAM (AF36P) £199.95
 Atari 400 with 48K RAM (AF37S) £299.00 ★
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 All above with BASIC and handbooks
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 Full details all above in MAPLIN catalogue.
 ★ Delivery next day by Datapost

SELECTED SOFTWARE

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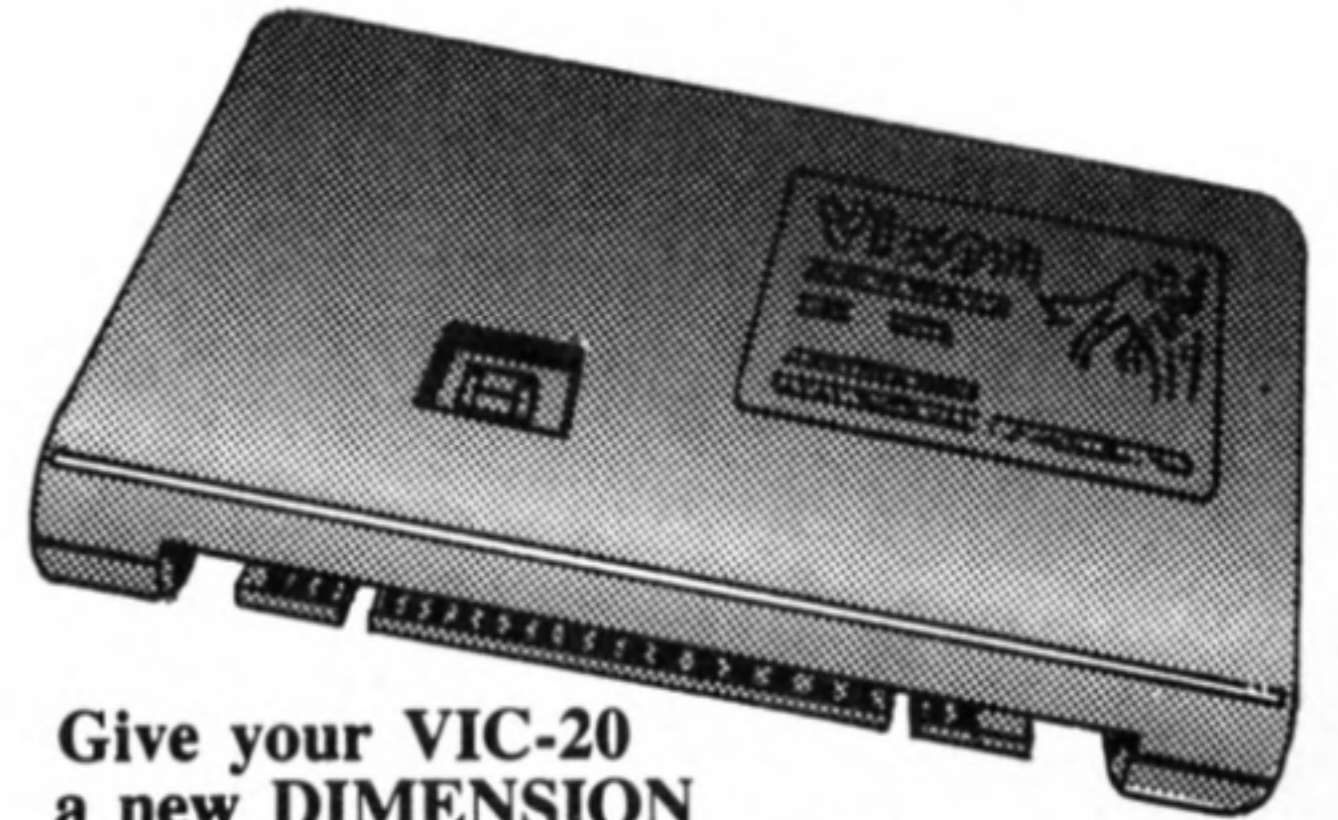
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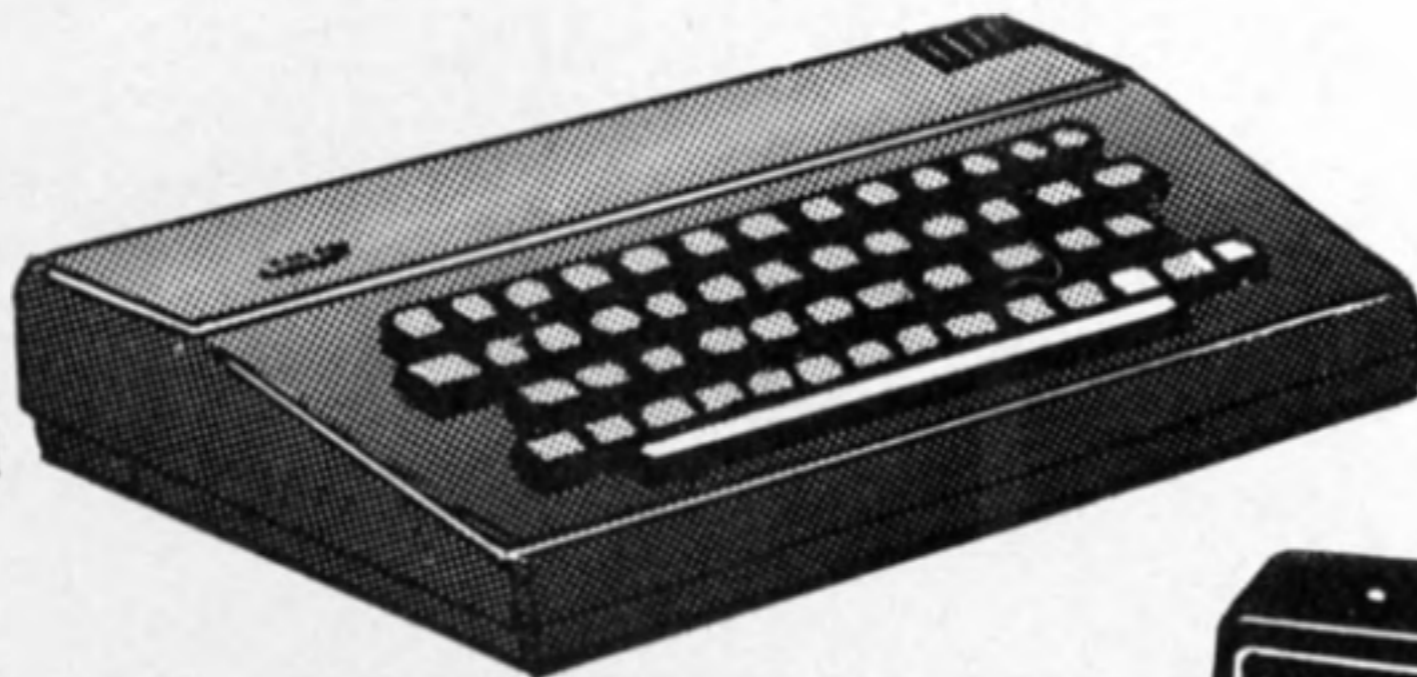
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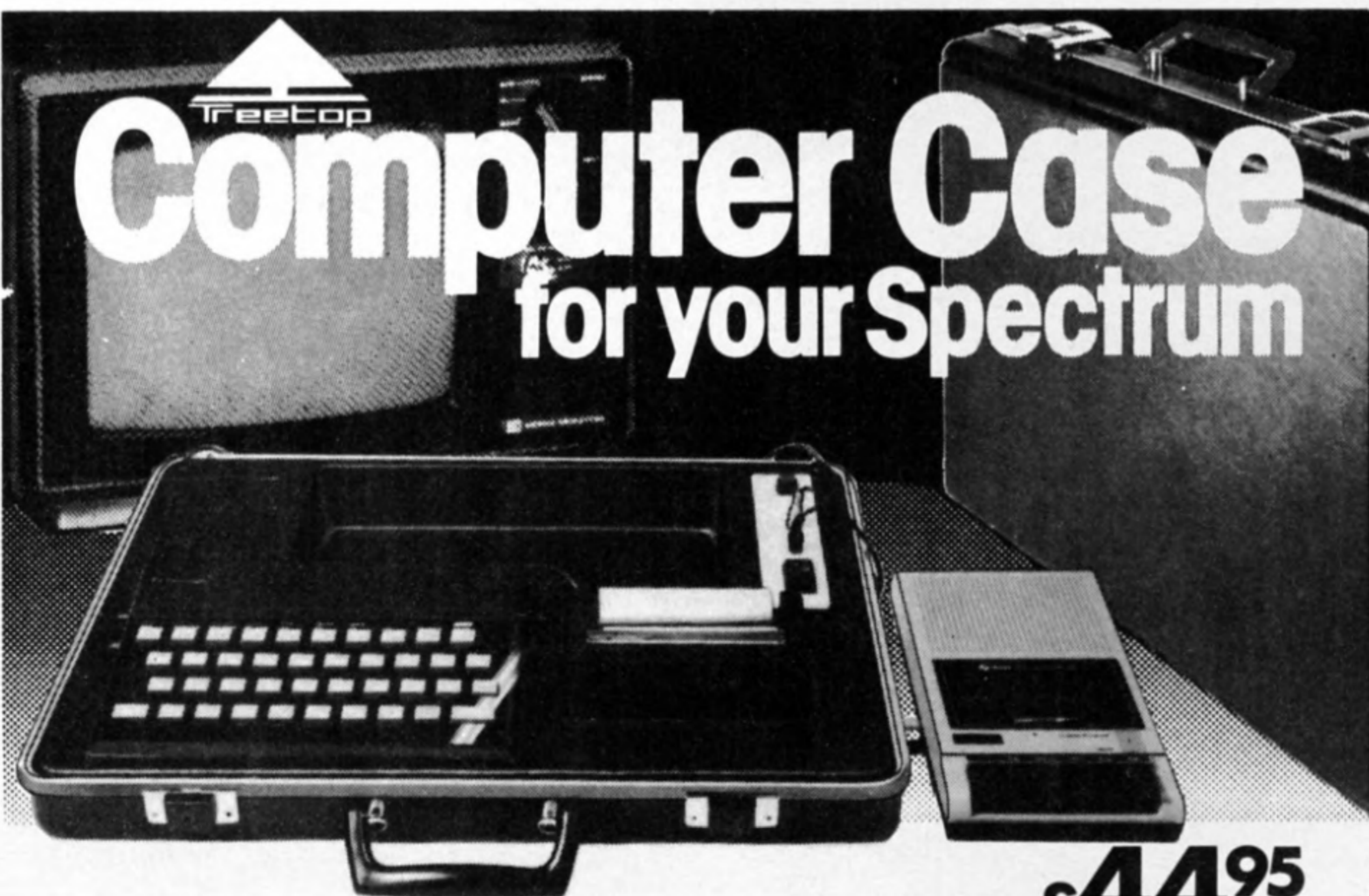
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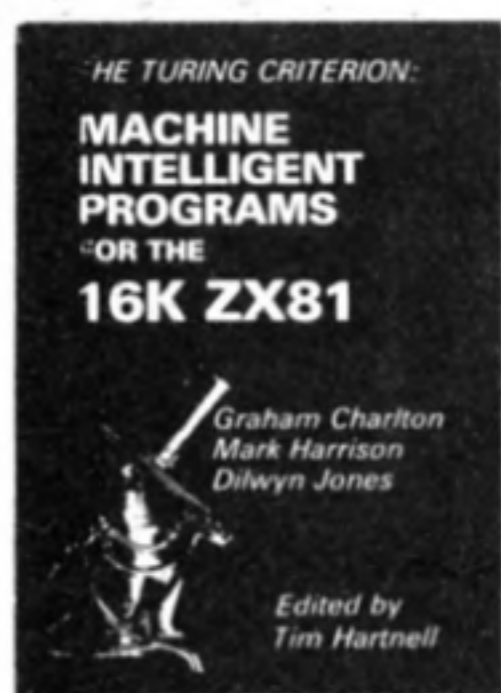
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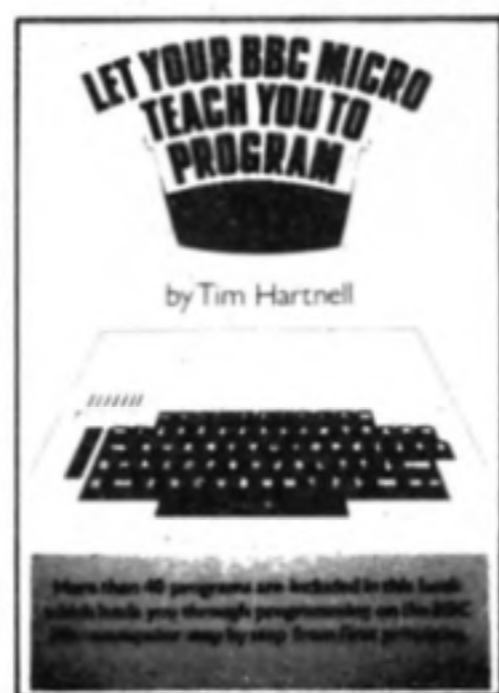
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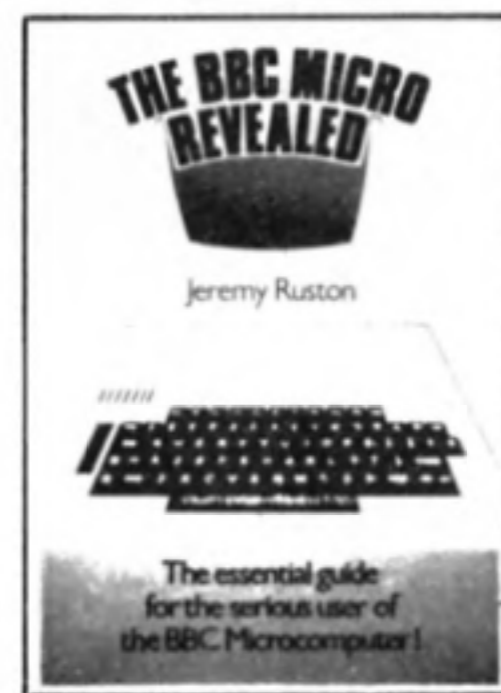
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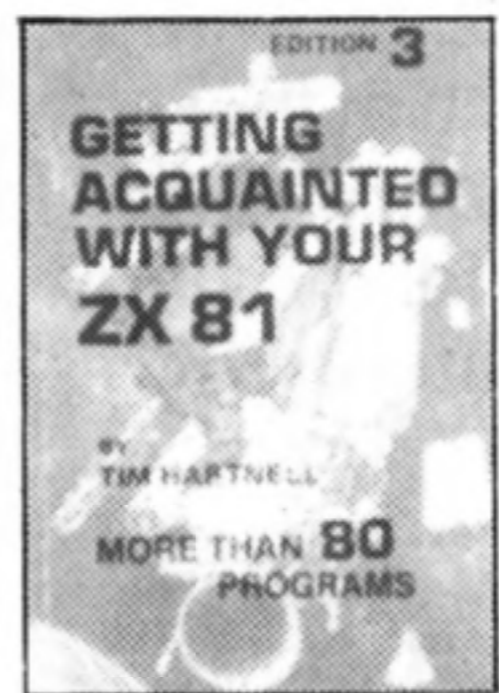
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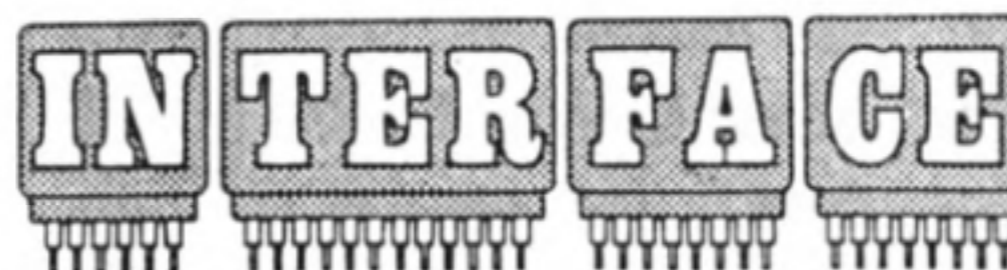
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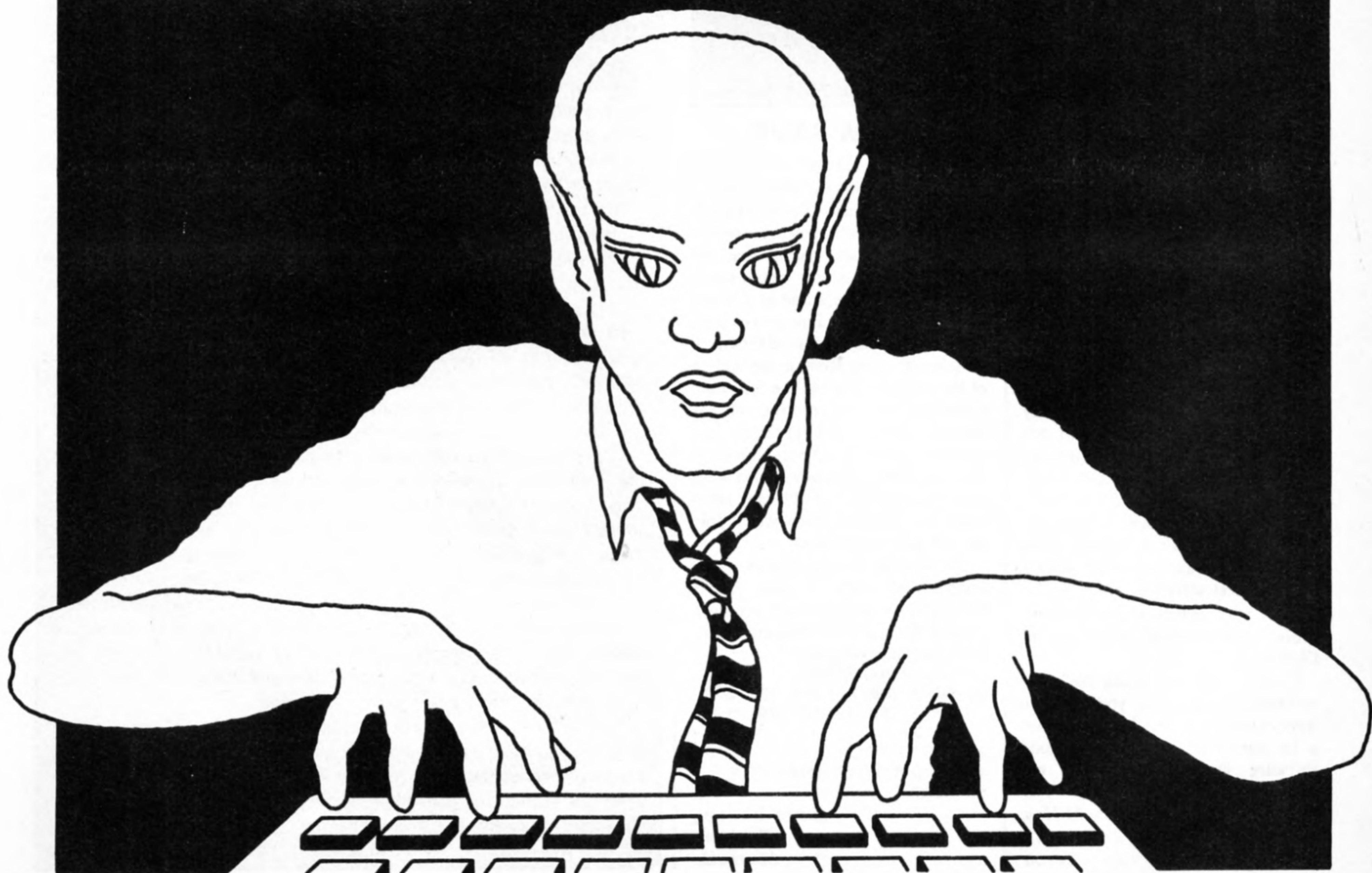
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SAVE ME FROM ADVENTURE

Deep into my Agatha Christie I hardly heard the surreptitious suggestion "Why don't we get a micro?"

"A micro what?" I asked carelessly, my mind more engaged on the first body in the conservatory than the promises of a microwave or even a microscope.

"You know, a microcomputer", came the knowledgeable reply.

I should of course have decreed there and then that no computer, micro or otherwise, would ever enter our home. Next time I'll know. The arrival of the black box caused a fuss more generally applicable to the birth of kittens or the death of a great aunt.

We spent long hours playing all kinds of zap and aliens games. Never ending beep-beep-beep, boing, zap and splat, rather like a sort of animated *Beano* with sound. The tapes multiplied, the aliens got nastier and his scores went off the top of the counter. Mine stayed in the hundreds.

Then we bought a maze game and ate apples all day. A definite improvement — my scores rocketed and at last I was the one with eyestrain. We began buying a magazine or two. We read such delights as *Peeking and Poking* and *Debugging Your Program* — akin to delousing?

I had just begun to delight in the intricacies of machine code, getting excited about LDRs and RRCAs and how to collapse my stack, when he triumphantly produced an adventure game.

I tried to explain that I didn't want to steal someone else's treasure or chop off a goblin's head — I'm just not violent or materialistic. Golden chalices would simply look out of place on our table.

Every day of the week he rushes home from work to see if he can outwit the witch, swim the river or rescue the helpless princess. My suggestion of saying please to the goblins was met with a roll of the eyes and a "Shshsh — I'm thinking".

Still, at least I can remain undisturbed to discover the identity of the murderer after all. And of course, make the coffee while he is busy rescuing yet another princess in distress.

A M Morton, Kew, Surrey.



GENERATING SOUND

I saw the Mozart lives article — *Your Computer*, March 1983. I already had a programmable sound generator, the Zon X-81 by Bi Pak — and wondered if it would work. After a lot of typing I eagerly connected my sound generator and hey presto! It did not work. After all that typing I was not going to give up. I worked out what changes needed to be made and it worked perfectly.

If anybody would like to use their Zon X then the following changes will have to be made.

In line 3 change the values of R and RO:

```
LET R = 223
LET RO = 15
```

Change line 4 to:
4 LET PL = 32350 : IF PEEK 31416
<> 148 THEN LET KY = B/KY

Then enter as direct commands:

```
POKE 32430,223
POKE 32470,15
POKE 32479,223
```

As I said earlier it takes a lot of typing but it is well worth it as it shows the capability of the PSG and makes a change from the usual explosions, zaps and so on.

*Kevin Sibley,
Slough,
Berkshire.*

INTEGER STORE

In your July issue Nick Goodwin says he has not found much use for multi-dimensioned string arrays. One use on the ZX-81 is to store a list of positive integers in two-byte form,

as otherwise the ZX-81 lacks this facility.

Integers up to the limit of 65535 can be placed in a two-dimensional string array of the form A\$(N,2) with the lines:

```
LET A$(N,1) = CHR$(INT  
(integer/256))  
LET A$(N,2) = CHR$(integer-CODE  
A$(N,1) * 256)
```

This makes it possible, for instance, to store all prime numbers up to 65535 in less than 16K. An undimensioned string cannot do this because, as Mr Goodwin points out, in practice it cannot be expanded much beyond 7K. Such a list is sufficient for testing for primes up to the ZX-81's limit of accuracy.

*Barrington Bayley,
Telford,
Shropshire.*

LITTLE BUGS

A little bug crept into the Ace sounds article in your July issue. It occurs in the word defined as Note. The mnemonics

IN A,(O) and OUT A,(O)

both need a number after them to function correctly. In this case the numbers are both zero, so the word Note should read:

```
CREATE NOTE 205 c, PAUSE , 219 c,  
0 c, 205 c, PAUSE , 211 c, 0 c,  
29 c, 32 c, 243 c, 201 c,
```

Another problem occurred in Mark Carne's Dangerman in the Software File of the same issue. Although the actual program was correct there was no way of telling what character the question mark in line 1 was. It should have been CHR\$ 78. To enter this

ARCADIA RAVE

The reviews would be greatly improved if the reviewers spent more time trying out the programs.

In the July issue, Meirion Jones said that Arcadia was "just a lacklustre version of Galaxians" but that Schizoids — by the same company — was "much better". This is patently untrue! If Mr. Jones had played these two games for some time he would have discovered that Arcadia has 12 screens of totally different aliens, all of which are anything but dull, whereas to score points in Schizoids all you have to do is avoid the rubbish. The software shop that I go to sent a batch of Schizoids back after testing them because they want to be seen selling only the best software.

Also, why review these two and Mqlar Maul without reviewing Ah Diddums?

Finally, why not bring back the software rating table you used to have at the end of articles. It makes it a lot easier to pick out the good software without having to ask around.

*Andrew M Hay,
Sidmouth,
Devon.*

PROGRAM SAVE

In his article entitled Food for the Dragon — *Your Computer*, July — Vincent Cockett used Poke 114,25 to stop the reset button being used to break his program, stating that the button's subsequent use would result in the computer restarting as if it had just been turned on. This proved only too true and after my loss of the entire program by using Reset in the middle of the program I wrote the following short machine-code routine for the Dragon which will reinstate any program which has been Newed in this way. The program will also work after a normal New or after any other crash providing that the power supply has not been interrupted.

The routine will bring back a lost program on entry of Exec 32750. However, the program will not work if a new Basic line has been entered or a new variable assigned.

```
10 CLEAR 200,32749
20 DATA 158, 25, 189, 131, 243,  
48, 2, 159, 27, 159, 29, 159,  
31, 57
30 FOR T=1 TO 14
40 READ A: POKE 32749+T,A
50 NEXT T
```

*Andrew Williams,
Southport,
Merseyside.*

NOBBLING SPECTRUM SOFTWARE

Quote from your April news item, Double Dragon. "Commodore . . . would only say that price was 'all to do with what the market will bear — not to do with what it costs to make'." Quote from your February Response Frame, Time Bomb: "In the first place copying commercial software is robbing the programmer of his/her royalties . . . I can have little sympathy for you if . . ."

Atari software usually sells at between £10 and £30. Also, it is unusual for a Spectrum program to set one back by more than £10. These prices refer to cassette tapes. Of course, games software for the Atari machines is almost certain to be more satisfying but this is a function of the machine, not of the software houses.

In fact, upon careful examination of software pricing one is quickly struck by the fact that the price of commercial software is positively correlated with the price of the host machine. Slight non-linearities in the correlation can be accounted for by introducing the gullibility factor associated with buyers of particular machines.

I nobble software. I do so to acquire a program for my personal use. I also buy. I won a Spectrum and, as a student, I am temporarily affluent. This mixture of buying and procuring makes the average price more realistic. There is no way a program can be made impregnable to someone who is *au fait* with the host machine, so long as the expenditure of effort continues to be rewarding.

If the programmer finds himself suffering from reduced income and if lots of these creative gents so suffer, then their collective misery may yet bring upon them the realisation that it is they and we who count in this sordid business, and they may send their middlemen to join the Golgafrincham Fleet.

Probably not, though. The consumer electronics industry, which now has a good grip on micros, will not allow it. Not that I mind. I keep my overheads low. I manage. But now and then I feel really sorry for others, the consumer classes, those poor unimaginatives, terrified by imaginary time-bombs.

Tim Magee, Bradford, West Yorkshire.

just enter the following Poke, not forgetting to put a space after the graphic T:

POKE 16517,78

Incidentally, I was very impressed by "Ace sounds".

Timothy Skinner,
Hoveton,
Norfolk.

SWAP FAULT

Although I think I checked my Swap program in the July issue, a fault sneaked in.

I discovered it when I got a letter from R J Fox, Surrey, another *Your Computer* reader, who asked me how to change the program to divide a 32K RAM into two 16K parts.

First the error in the original program. Even if it might seem to work, it only swaps two 6K parts instead of two 8K parts. To correct this, change the contents of 16537 to 1F H.

To split a 32K RAM into two 16K parts, start by Poking 16389,127 and New. After this, change 16531 to 80 H and 16537 to 3F H. All USR-routines start at the same addresses.

Peter Havlykke.

HARDWARE

In the article Submarine Mission in the August issue of *Your Computer* details of hardware were omitted. The two-computer version — to be covered in *Your Computer* October was written around the PSGIO — sound/IO — board used for the Mozart programme in your March edition. One board is needed for each computer, though only a single connecting cable is necessary. Like the cassette, both are available from Protek Computing, Clydesdale Bank Bldng, S. Queensferry, Scotland.

Prices are as follows: PSGIO board, each £19.25 inc p/p; cable £4.75 inc p/p.

Rod Hopkins,
Dunfermline,
Fife.

The correction for the 48K version of the Spectrum 3D rotator in *Your Computer*, August Letters, itself stands in need of correction. F& is of course a printing error and should read F7.

Lines 40 to 60 in program 1 of the Vic Saucer Attack in the August issue have been corrupted. Fortunately this program just prints the title screen and can be left out. More importantly some of the data items in program 2 are illegible. The last three numbers in line 200 are 68, 254, 254; the last five in line 210 are 124, 254, 254, 16, 56; and the last three in line 220 are 124, 254, 254.

If you are unable to key in the program but would like a tape of it, send £3.50 to: Damian McComb, 23 Woodland Drive, Quarry Vale, Dungannon, Northern Ireland.

In August's BBC Squeeze program line 4090 should contain the number 155 instead of 150.

THE CEASEFIRE HAS BROKEN. After 16 months of silence the big guns of British home computing, Sinclair Research and Acorn, opened up on the same day. Both the Microdrive and the Electron have been on the verge of being launched for so long that neither holds any real surprises — beyond the fact that they now really do exist.

What is surprising though is that the Microdrive is likely to have a greater bearing on computing in the immediate future than the Acorn computer. It is probably the first time an add-on has upstaged a new micro from any company let alone one from a manufacturer as important as Acorn. With the Microdrive Sinclair has proved that a product need not be mechanically sophisticated to be technologically significant.

The months of waiting may indicate that the Microdrive has been costly to perfect even though the components it contains are inexpensive. Because it costs little to build, in a year's time you will probably be able to buy the Microdrive and Interface 1 together for £50 and blank cartridges for £2. After all the minimum price of the 16K Spectrum has dropped from £125 to £90 in just four months.

But even at its present price the Microdrive will affect demand for storage devices above and below it in cost. It fills the yawning gap between the sluggish cassette and the expensive floppy disc drive.

Other companies have also been aiming to make that bridge — Coleco, for example, and Texas Instruments — whose £109 Wafertape is due shortly. Providing Sinclair's product proves sufficiently reliable the price of floppy disc drives may be forced down to compete for sales to those who want fast mass storage for their home micro. At the moment the cheapest disc drive costs three

times as much as the Microdrive.

In the 1960s the Philips compact cassette knocked out the reel-to-reel as the main erasable recording medium. Many are now asking whether the Microdrive will in turn deal a similar blow to the cassette.

Sinclair's drive is part of a two-pronged attack on cassettes. His Interface 2, due to be launched later this autumn has a port for cartridges as well as a joystick facility. With plug-in cartridges available for the Spectrum — the machine that sells more cassettes than any other — the effect on the way software is sold in this country could be dramatic.

At the moment cartridges make up only a tiny percentage of all program sales in the UK but in the States, where all the big-selling micros have ROM cartridge ports, there is a fifty-fifty split. For machine owners plug-in modules rule out loading problems; for software manufacturers they reduce the risk of piracy and can justify higher selling prices.

The Microdrive itself could also have something to say on the matter of piracy — but only if Sinclair sells tapes to the software houses at a low enough level to make the difference between a blank and a commercial program as small as possible.

Using the Microdrive the sort of software that runs on the Spectrum will become more ambitious: mass storage favours games of strategy, such as board-games and complex adventures, as well as the more serious spreadsheet programs that could load VisiCalc-type files from the stringy-floppy.

It is clear that Sinclair has transformed the Spectrum without making any changes to the machine itself. But if only Sinclair would produce a real keyboard, a Spectrum-like machine incorporating two Microdrives could out-perform micros which cost more than £1,000.

How to write for Your Computer

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

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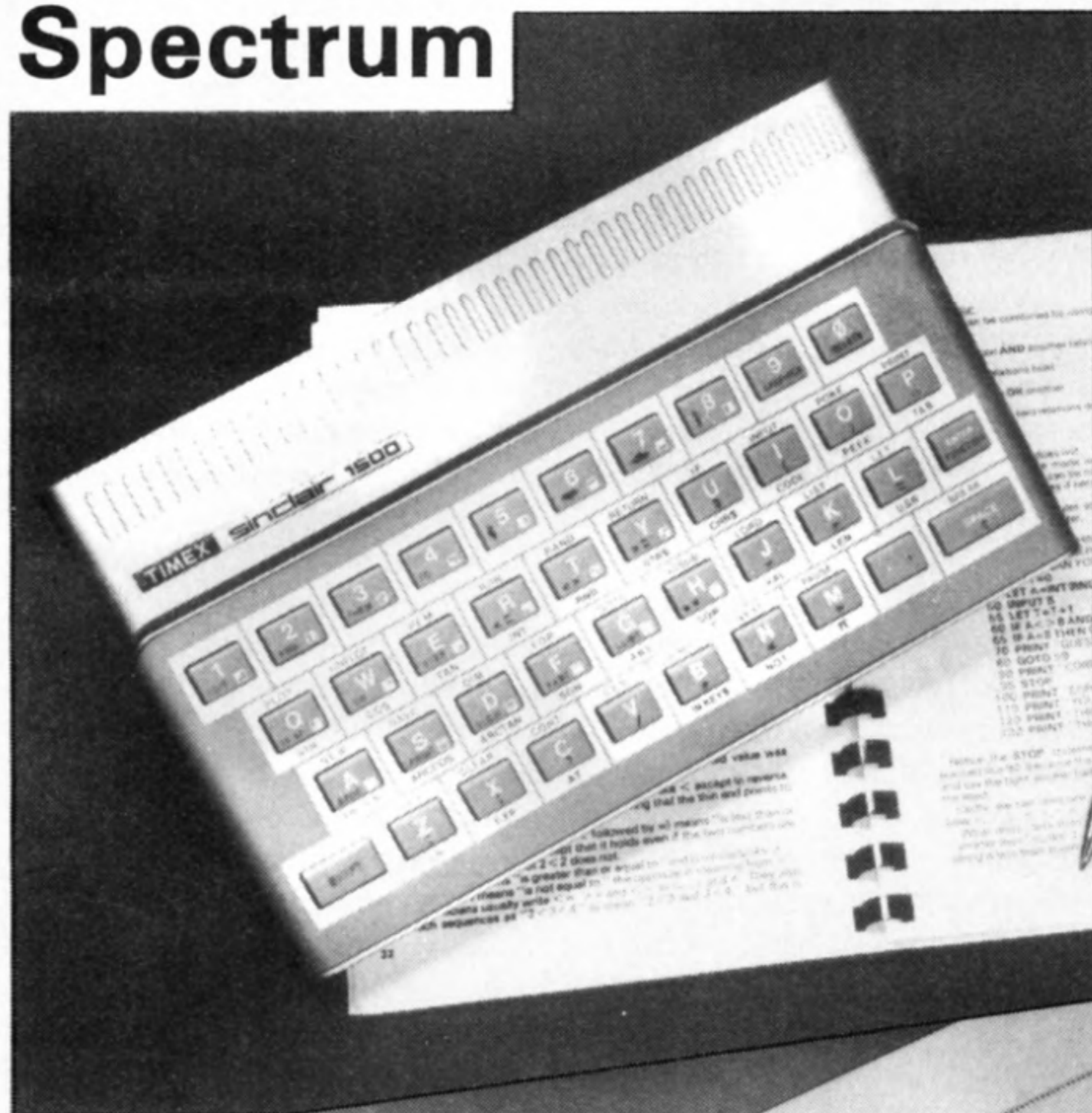
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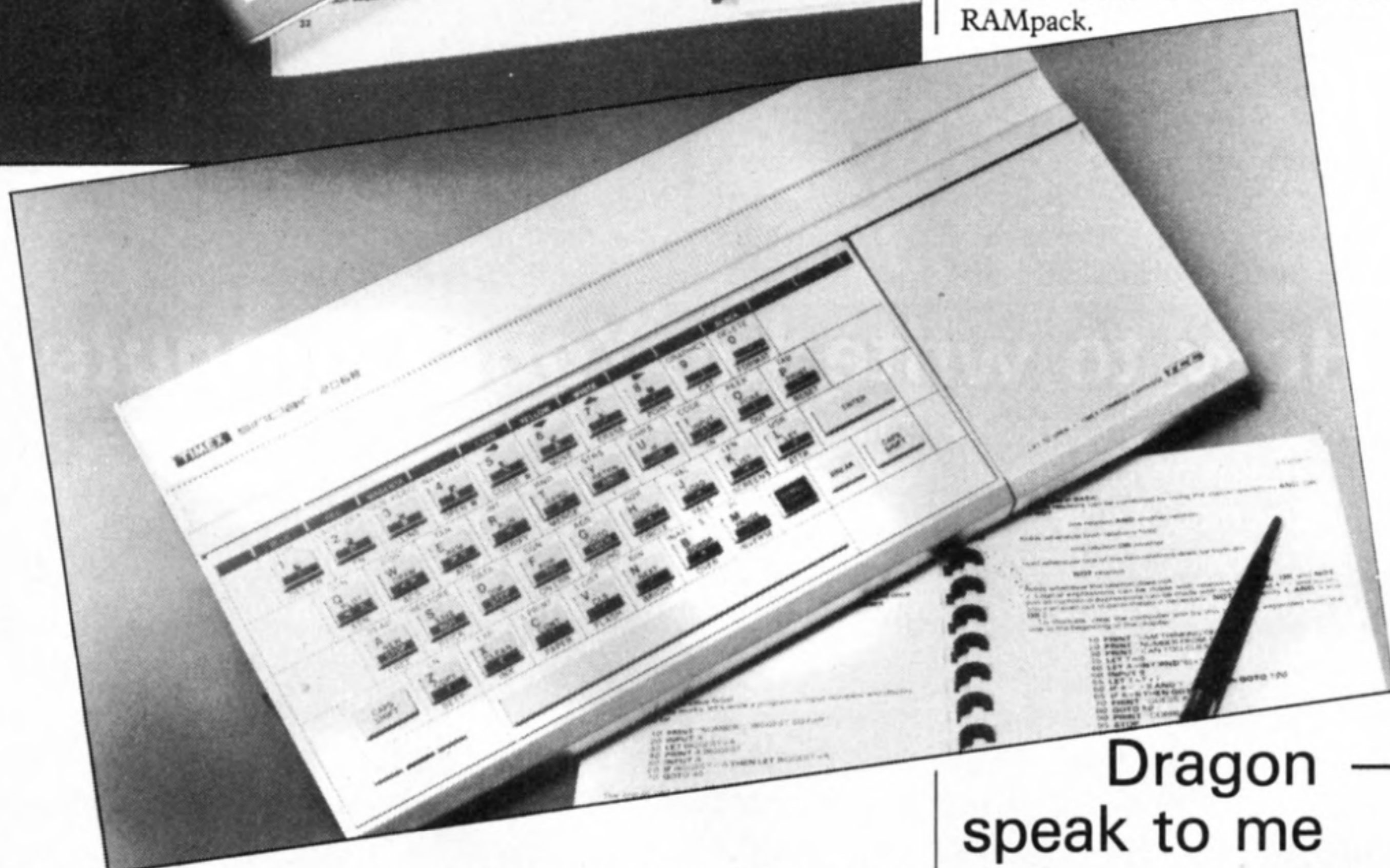
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Today's American Timex-Sinclair 2000 could be tomorrow's British Spectrum



NOW THAT THE NEW range of Timex Sinclairs has gone on sale in America the implications are clear for Britain. Sinclair's launch of the Interface II in September which allows cartridge software and joysticks to be plugged into the Spectrum is only a temporary measure. To keep the Spectrum competitive as Texas, Atari and almost everyone else drops their prices to £100 Sinclair will have to build in even more features. Although he plans to move into the 16-bit arena Sinclair is not planning to move out of the games machine bargain basement just yet. A Spectrum with built-in cartridge and joystick ports together with three channel sound and a better keyboard around fit the bill. This is almost exactly what the Timex Sinclair 2000 is. The Spectrum lookalike Timex 1500 is merely a ZX-81 with a built in 16K RAMpack.



In the 1980's a microbus was a red VW van full of hippies. Now a Swansea Sord dealer called Coteglade has appropriated the word to mean a double-decker loaded with microcomputers. "There is no way that a person in Bangor or Aberystwyth is going to travel to Swansea simply to see us" says Coteglade's Andy Shercliff "so we must go to them".



Dragon — speak to me

NOW YOUR DRAGON will be able to articulate — a synthesiser enabling speech to occur simultaneously with graphics is available from JCB Microsystems.

Depending on length of individual words, around 40 words can all be spoken from one command. Five new Basic commands are introduced when the module is plugged in. The Say command controls around 200 predefined words, but you can create your own vocabulary from a set of 64 allophones, or speech sound components.

The £37.95 speech synthesis module is based on the General Instrument SP0256 Speech Processor. Apart from the Texas Instruments synthesiser, which is also used in the BBC, there is only one other chip, the Votrax, in current use for this end of the market.

CRL names the fifth man



THE SMILE that says I've finished. Following three months of after-school programming, 15-year-old Richard Taylor has put the final touches to Fifth, an extension to Spectrum Basic for the machine-code-shy games programmer.

Taylor is also author of the highly successful Computer Rentals High Resolution program for the ZX-81, the software equivalent of a course of monkey glands for Sinclair's aging machine.

CRL boss Clement Chambers is clearly deeply impressed by Taylor's software writing: "After the hi-res program I thought 'Who is this masked man'." At £9.95 Fifth offers 25 commands and 13 extra functions for fast and smooth animation and will also help you create more impressive sound effects.

It is interrupt-driven and so is unaffected by the speed of Basic. Its main advantage for the layman over machine code is that a Fifth routine can be nested in a Basic program and because of its Basic-like format reveals at a glance just how it works and what it is there for.

Sinclair prize for breakfast

SNAP, CRACKLE, POP, zap, zap, zap; Tony the Tiger says Sinclair is Grrreat! Instead of the traditional plastic cartoon characters which drop out of the box into your bowl of cornflakes, Kellogs and Asda stores have come up with a new way to sell more cereals. From 12 September to 8 October anyone buying a packet of Frosties and a packet of Rice Krispies from an Asda store will be able to enter a wordsquare competition to win £250 of Sinclair goodies. Each of the 93 stores will have a prize to give away consisting of a 48K Spectrum, ZX Printer and ten Sinclair cassettes ranging from Vu 3D to Horace goes skiing.

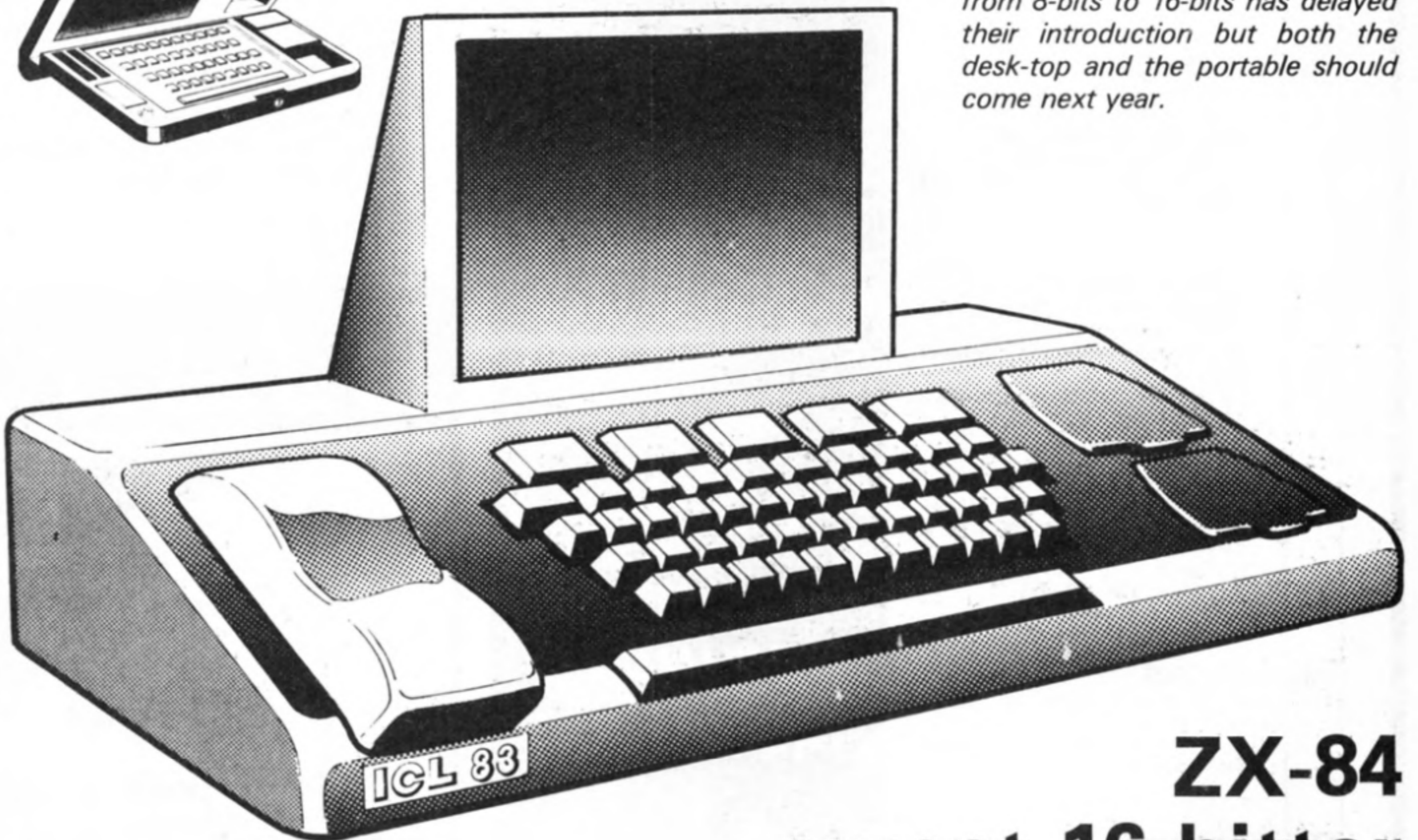
Prices — Texas and Atari enter the £100 bargain basement

TEXAS INSTRUMENTS has set off another avalanche in computer prices by dropping the 16-bit TI-99/4A from £150 to £99. Better design has made the cuts possible. Atari is reacting by dropping the price of the 400 to around £100 and the 800 to £200 in order to make way for the new 600XL which arrives this month for £159 and the 800XL which will cost £249.

Rumbelows has taken £10 off the 16K Spectrum, to £89.95 and Sinclair is selling a ZX-81 starter pack which consists of ZX-81, RAMpack and a free software cassette for £45. Two years ago it would have cost you £125. With ZX-81s wholesaling at less than £20 further cuts are likely. The Colour Genie previously £199 for 16K is now on sale at £168 for 32K plus £40 worth of free software.

The Aquarius is not being officially discounted by Mattel, although Silica Shop is offering the 4K machine with 16K of RAM for £99. The RAMpack would ordinarily cost £29.95. Sord has already sliced the M-5's price by £40 to £149.95. Existing M-5 users will be able to obtain the Basic-G graphics cartridge, ordinarily worth £35 for free.

Dragon Data believes that "There are two market leaders as far as we're concerned — Sinclair and Dragon," and to this end a 64K Dragon will soon be introduced for less than £200. A Dragon 128 is also planned. Officially Commodore who helped to start the price collapse by reducing the CBM 64 to £239 will only say "Everyone else is fighting us," but in America the 64 is set to drop to \$99 eventually. In Britain the price could be £150 this year and £99 next with the Vic-20 selling for unbelievably low prices.



ZX-84 sweet 16-bitter

WHATEVER SINCLAIR may do to freshen up the appeal of his 8-bit Z-80 based ZX-81s and Spectrums he knows that the future lies with 16-bit processors with greater speed that can address more memory.

The core of his plans for 1984 is a £300 machine designed around a Motorola 68000 16-bit processor, which will compete with business machines like the IBM PC which can cost ten times as much. Sinclair's machine will incorporate Microdrives which will make it slower than its disc-based rivals but will make it easier to make it portable.

Sinclair would like to build the flat screen into the project — now codenamed ZX-84 — but delays may make that impossible. His first flat screen TV will now probably be launched in October and so it may

Your Computer breaks record

YOUR COMPUTER is now much the biggest-selling computer magazine in Britain, and that is official. The latest figures from the Audit Bureau of Circulations which keeps watch on magazine and newspaper sales shows that *Your Computer* sold an average of 120,488 copies each month for the first half of this year. No other computer magazine has yet broken the magic 100,000 barrier. When *Your Computer* started up in June 1981 it was Britain's only home computer magazine. It started as a bimonthly with a 40,000 print run but was such a success that it went monthly in October of the same year.

Your Computer artist's impressions of the new range of Sinclair micros. The decision to move up from 8-bits to 16-bits has delayed their introduction but both the desk-top and the portable should come next year.



Olympus is offering a pocket-sized microcassette recorder designed specifically for loading home computers. In addition to storing programs on CT15 tapes the PearlCorder C100 can be used as a conventional dictation recorder. The only catch is the price, around £70 when it is launched next month.

not be possible to produce the larger flat screens for the ZX-84 till the middle of next year.

Sinclair watchers speculate that the ZX-84 will also contain a Z-80 chip, partly to encourage current ZX fans to move up.

Apple falls on the MPF II

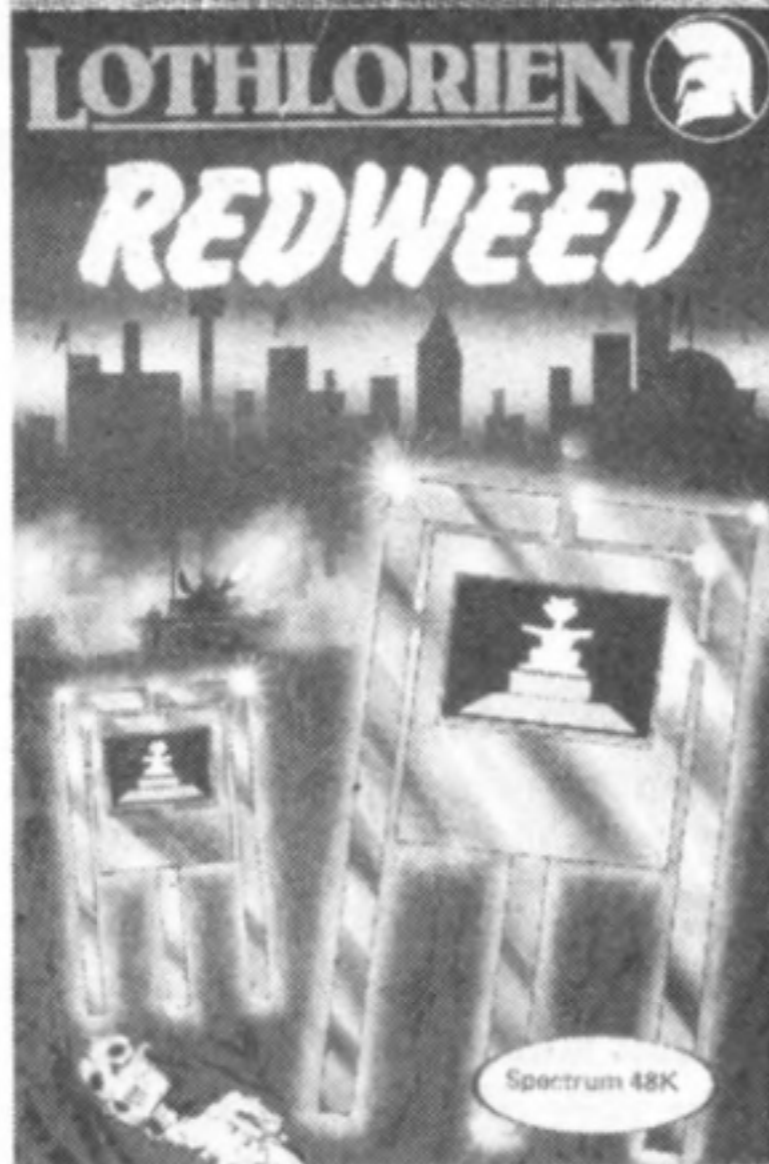
WHEN THE MICROPROFESSOR MPF II appeared, with the performance of an Apple for a fraction of the price it looked too good to be true. Now Apple has obtained a high court order restraining Sirtel from selling the Microprofessor in Britain. Apple's Mike Spring claims that the MPF II which is built by Multitech in Taiwan contains a copy of the Apple ROM.

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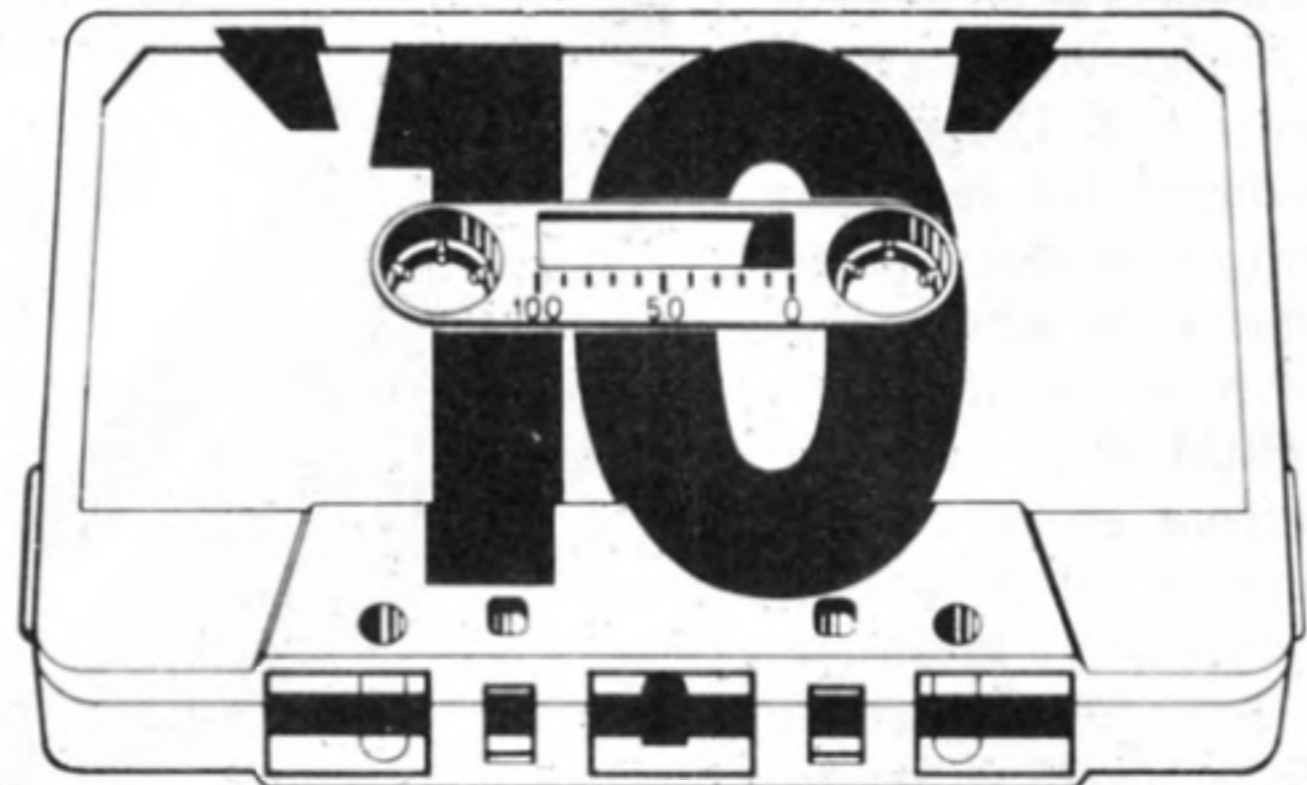
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My Talking Computer will teach me to tell time and learn tables



YOU ARE NEVER too young for computers says Burke C Pullman of Microspeech. The first product from Microspeech designed to demonstrate this is a talking computer for 3 year-olds and up. For around £60. My Talking Computer comes

complete with a suite of programs ranging from a talking clock which Microspeech claims can teach a child to tell the time in less than a day, to tables programs, calculations and games.

Burke C Pullman says that they adopted a non-standard keyboard because "the Qwerty keyboard is intimidating." Each program has a separate overlay for the spillproof keyboard and the overlays are bound into a book. When the child pushes the square marked On an American woman's voice asks him or her to press Go and then asks questions or plays games which require the child to respond by pushing the correct areas of the keyboard. The most spectacular program is the talking clock which has clock hands instead of the keyboard which the other programs use. The voice issues

commands like "Set the hand to two thirty" and soundly ticks-off anyone who gets it wrong before eventually giving instructions to get it right. The Talking Computer has been used with some success in a remedial unit at Fountaindale School.

The machine is battery powered and sturdily built to resist the ravages of young children. Inside it has an 8-bit processor not entirely unlike a-6502, 28K of RAM and a massive 128K of ROM containing 21 programs. The computer will accept further 128K and 256K ROMs which will deal with music, learning foreign languages, and more games. My Talking Computer was designed in Britain by Microspeech and Electroplay and is manufactured in Hong Kong. It will be available in High Street stores from October.

Snow white software from magnificent 7

SEVEN LEADING U.K. software houses have formed the nucleus of an organisation which says it is committed to maintaining promised mail-order delivery times, replacing defective stock and dealing promptly with customer and dealer complaints.

Gosh, as Batman would say — and indeed GOSH is the acronym formed from the new organisation's title, the Guild of Software Houses. The seven sisters of the British software world who founded GOSH are Bug-Byte, New Generation, Virgin, Salamander, Quicksilva, Silvasoft and Softek. So if these companies are failing to provide you with proper service you now have carte blanche to get on the phone to GOSH secretary Mike Johnston, 01-801 9172.

"We needed an organisation with teeth which means putting in a lot of money to run an office" commented Guild Chairman Nick Alexander. So members pay a hefty £500 on election to the Guild. If they blot their escutcheon they will be subject to the Guild Disciplinary Procedure involving fines, expulsion and general casting into the outer darkness.

The Guild is really the brainchild

of the Computer Traders Association, itself formed in September last year by companies like Atari, Tandy, Boots, John Menzies, Virgin and Silvasoft. "There are two aspects to software trading — political and legal" said Nigel Buckhurst of the CTA. "While we're very good on export advice and dealing with government departments, we felt it was wrong for CTA to get too involved in legal problems, which are also very expensive."

Hence the formation of the Guild. As time goes on, CTA plans to form other specialist sub-groups and is working on one dealing with business computers together with the Office Machine Equipment Federation.

More importantly CTA has plans to stop the selling of software in the U.K. altogether. This is a legal nicety — software will be licensed rather than sold, so it will never be the property of the end user. This would make life tough for tape libraries and software poachers. This could be almost as revolutionary as the clause in GOSH's customer guarantee that says members undertake to avoid advertising products as available before this is in fact the case.

Sweet Talker is a new plug-in speech module for the Spectrum from Cheetah Marketing. It is an allophone speech device with a built-in speaker. Cheetah promises "no more lonely nights — a companion for just £34.95" presumably referring to the time it will take you to program in speech one sound at a time. Also illustrated is Cheetah's 32K RAMpack for the 16K Spectrum, which costs £39.95. Cheetah is on 01-240 7939.



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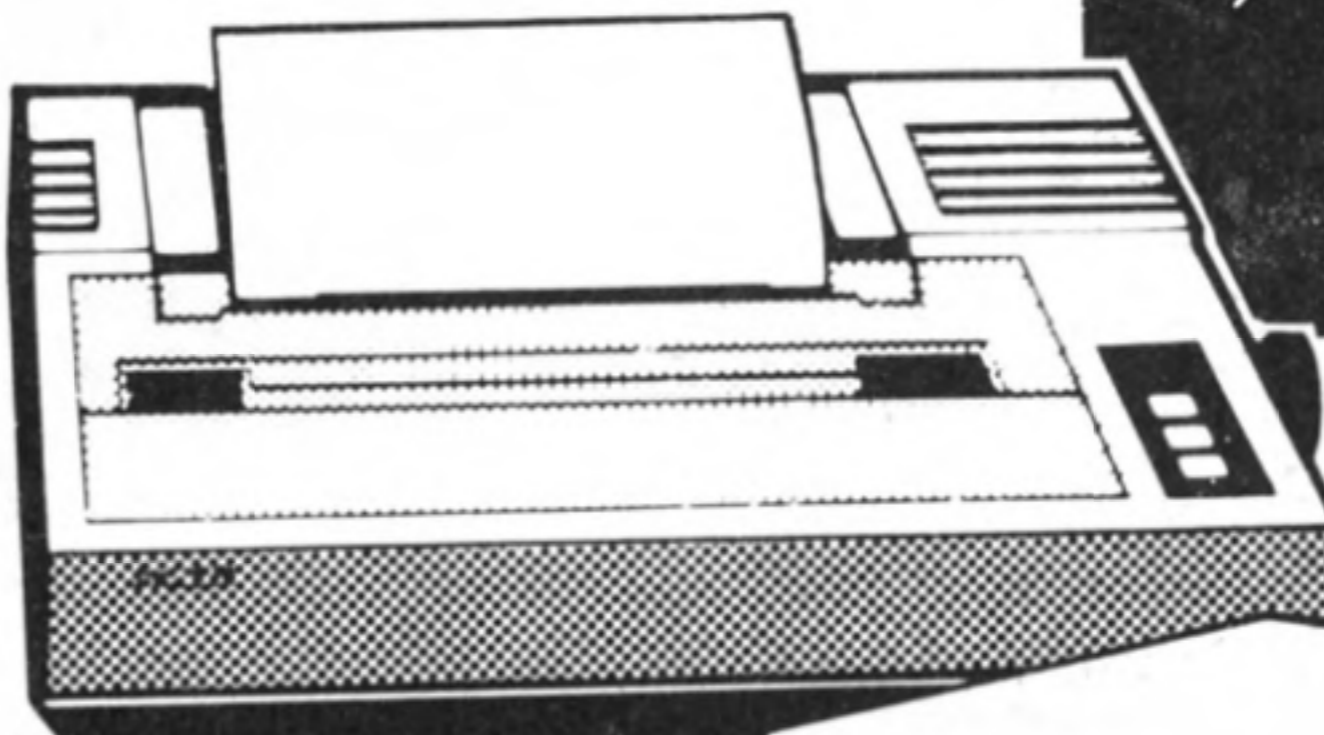
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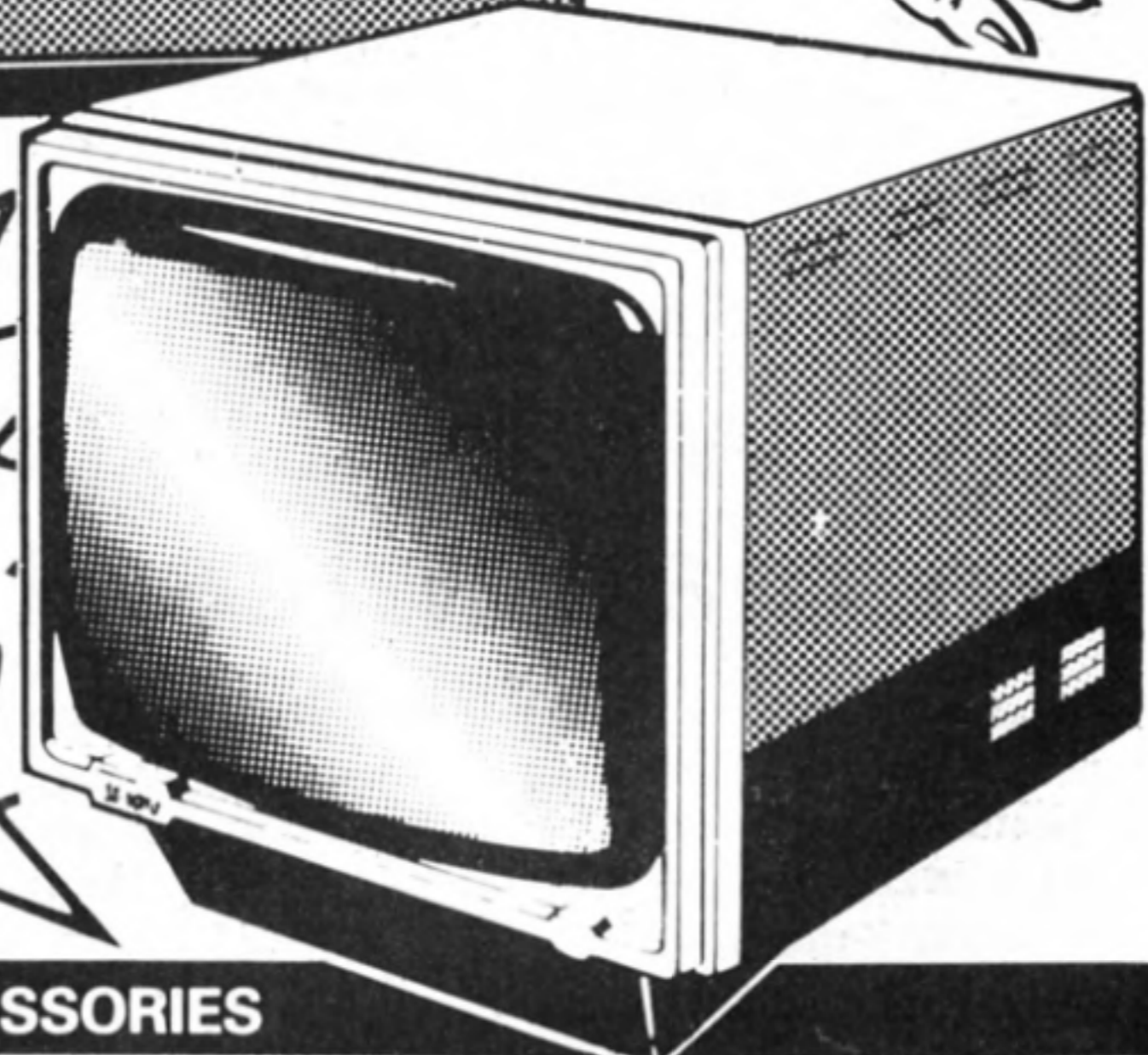
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I could do that...

Computers use quite a nice trick when they subtract one number from another: they simply switch all the bits in the number to be subtracted — 0 to 1, and 1 to 0, then add 1 — called the "two's complement" of the number. Then all that need be done is to add the resultant numbers. For example: in a 4-bit computer, taking 5 from 11 gives, in binary:

	1011
	- 0101
First — Invert 5	1010
Second — Add 1	1011
Now add	1011
	+ 1011

Gives	10110

The most significant bit will not fit in 4 bits — and the computer simply ignores it . . . so it is left with 0110 — 6 — the correct answer! Last month's puzzle dealt with addition — so those of you that did the puzzle will already have done half of this month's. We are looking for the best program to take two 16-bit numbers, in binary, and subtract the second from the first, giving the result in binary too. Next month: Multiplication.

July's competition to write a program which displayed the spread of random numbers proved easy enough for most entrants. The £15 prize goes to S Middleton, 57 Downs Valley Road, Woodingdean, Brighton, for the following program to run on a Dragon 32:

```

10 R=100:DIM F(R)
20 PMODE 4,1:PCLS 0:SCREEN
  1,1
30 FOR I=1 to 150*R
40 N=RND(R)
50 F(N)=F(N)+1
60 PSET (28+N*200/R,
  192-F(N))
70 NEXT I
80 GOTO 80
  
```

BEGINNERS

First bytes

Starting out in home computing? First Bytes is for you. Just write to

Your Computer with any hardware or software problems, no matter how small or simple.

Machine code

"Not only do I not understand machine code but I find the business of typing in other people's machine code programs confusing. Could you explain what, for instance, a hex loader is and what it does?"

UNLESS YOU HAVE an assembler there are two problems with writing machine code on a home micro; that is, where to enter it and how to enter it.

These problems are highlighted on the ZX-81. So slow is the ZX-81's Basic that anyone wanting to write a fast-moving game is greatly encouraged to learn machine code, and perhaps more people have learnt Z80 code on this micro than on any other. Yet, at the same time, it is a particularly awkward micro on which to write machine code.

For a start where can you store the code? One possibility is to lower the top of the Basic program area, RAMtop, and house the code above it. But how can you save it there? Unlike other micros the ZX-81 has no facility for Saving a specified block of memory: you can only Save a Basic program.

The solution adopted by most programmers is to store the code within a Basic program in a Rem statement. It can be safely Poked into the line after the Rem since the Basic interpreter ignores any character after the Rem.

First you need to ensure that there



are enough characters on the line to accommodate your machine code routine and also you need to find out where in memory the Rem begins — the start address of your machine code. If the Rem statement on the ZX-81 is the first program line the start address will be 16514.

This rather cumbersome procedure is unnecessary on most other micros. Commands like the Spectrum's Save " " code and the Dragon's CSaveM allow you to Save a stretch section of code anywhere in memory, whether within a Basic program or not.

The other problem that often mystifies beginners is the business of entering code. It is probably easiest to insert the machine code instructions in Data statements, read them into a variable and then Poke them into the required section of memory.

The alternative is to input them

directly from the keyboard and for this you will need a hexadecimal or decimal loader. A good loader should allow you to input numbers either one at a time or in string and then print out the number and the address to which it has been Poked.

In addition a hexadecimal loader will need to convert the hexadecimal input to decimal. This is because although most machine code programmers prefer to work in hexadecimal most home computers require a number to be in decimal before it can be Poked into memory.

You do not need to understand machine code to be able to use it in your own programs. Many short but effective routines have been published. Typically they are for scrolling the display or inverting the display. If you understand how and where to insert them you can easily pep up your Basic programs.

What does CP/M do?

"Can you define CP/M and explain its advantages?"

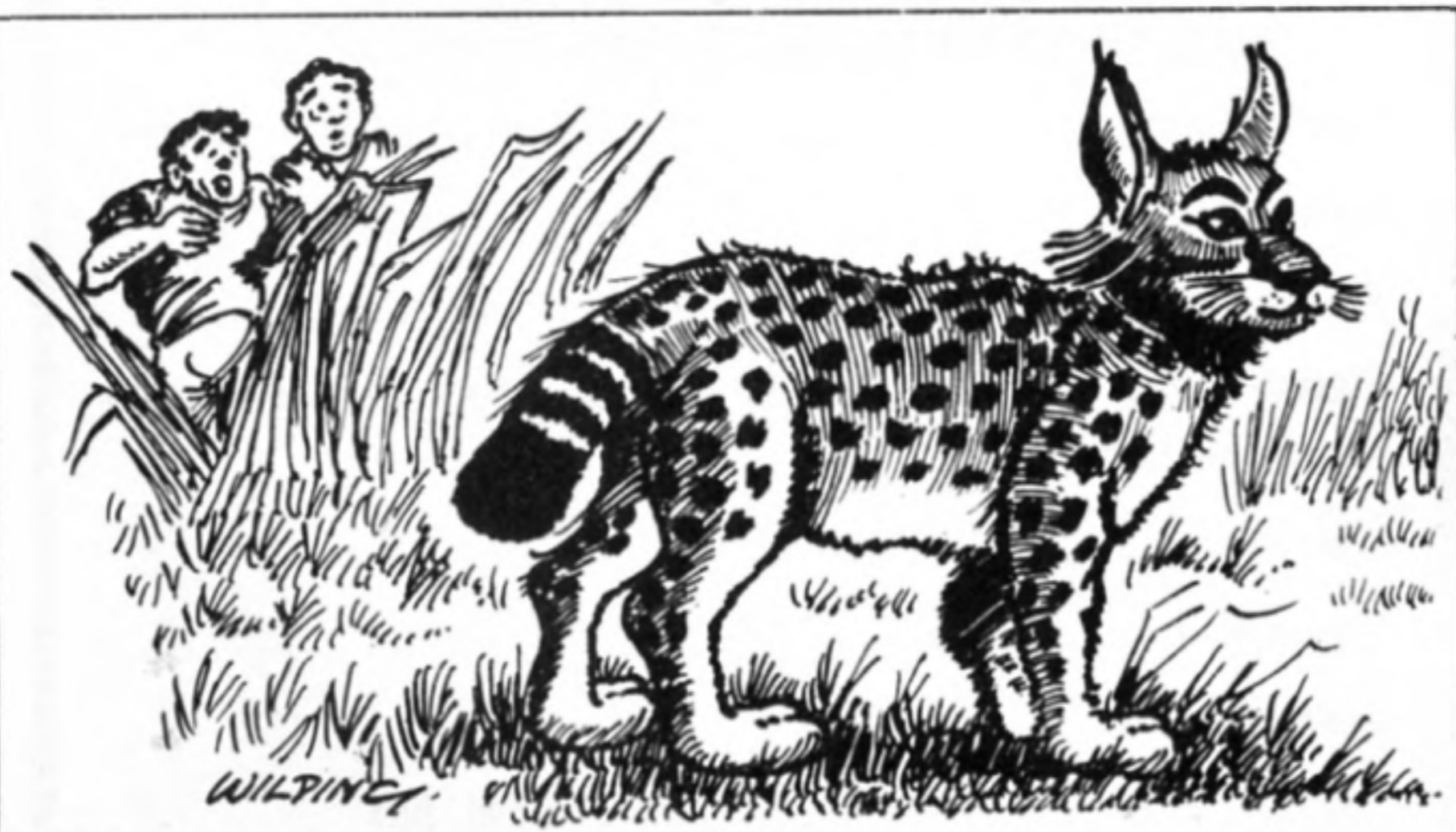
CP/M IS A SPECIAL type of program known as an operating system. It usually comes as a standard supplied software package with larger computer systems. Generally it runs on Z80 or 8080-based micros, though there are versions available to run on other processors. It also requires a certain amount of memory, usually 64K and at least one disc drive.

The Computers Lynx will probably be the first cheap home

computer capable of running CP/M, which will greatly increase its importance. But for it to be capable of doing so a user must add memory, in this case 128K of RAM is needed, and a disc-drive.

Nowadays CP/M is firmly established as the standard micro operating system, especially among business or serious users. Originally it was developed as a tool for hobbyists by Gary Kildall, a young

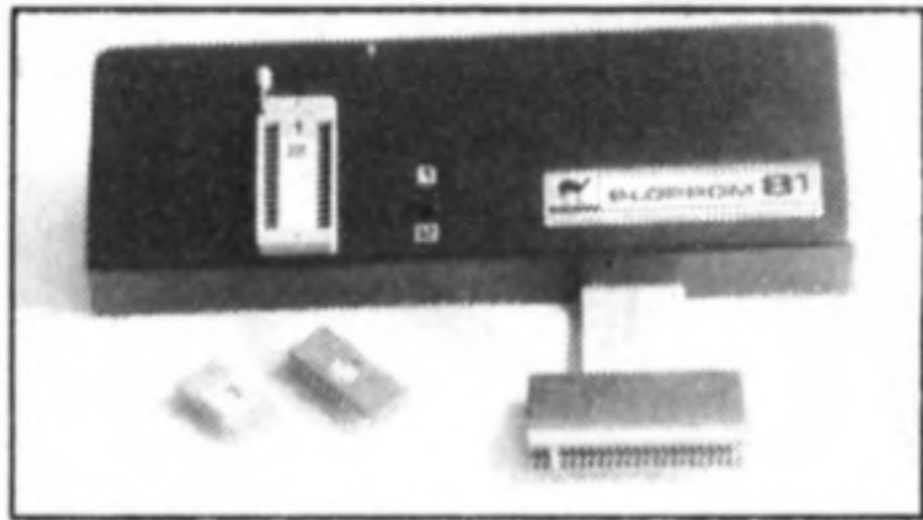
(continued on page 47)



"Does it run CP/M?"

CAMEL PRODUCTS

BLOPROM-81



```

STATUS ) NO. SYSTEM - HEX
        ) EPROM TYPE - 27128
        ) RAM START ADDR - 4000
        ) EPROM ST. ADDR - 0000
        ) JOB LENGTH - 4000
        ) TASK - CHECK

WHICH TASK DO YOU WISH TO DO
W) CHECK THAT EPROM IS CLEAN
X) READ THE CONTENTS OF EPROM INTO RAM
Y) BLOW AN EPROM WITH DATA FROM RAM
Z) VERIFY THAT EPROM DATA IS THE SAME AS IN RAM
Q TO QUIT.....R TO RESTART

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```

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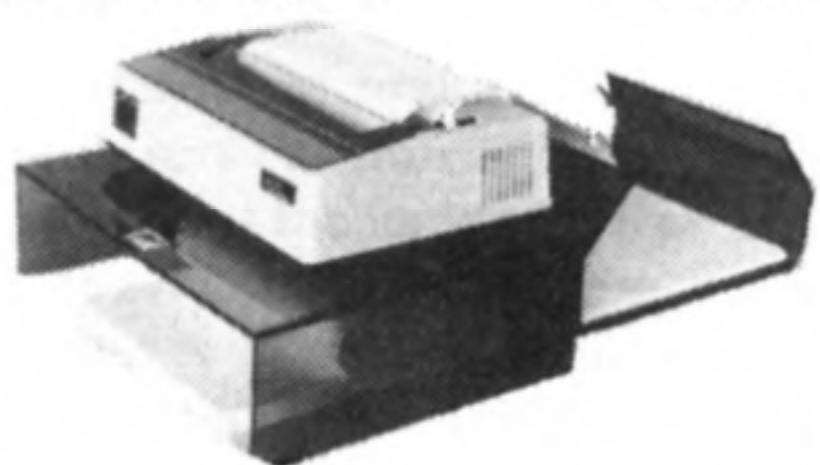


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(continued from page 45)

American computer fanatic who is now a multi-millionaire at the helm of Digital Research, one of the largest micro-software houses in the world.

What makes CP/M so wonderful is that it makes every computer look the same as far as software is concerned. In principle you should be able to load a disc from any CP/M computer into another and the software contained on the disc should load. In practice this does not often happen because different machines use different disc formats and have differing disc hardware.

Discs recorded in the IBM format tend to be the most common and they can usually be swapped between different CP/M machines. The larger machines usually have Basic on disc rather than in RAM,

and this means that applications software, that is the programs that run on the machines, only have to be written for one CP/M machine.

It is a trivial matter to transport them to other CP/M machines provided they contain no instructions that make special use of a machines features.

Because CP/M is available on such a wide range of machines, there is a very wide choice of available software. Any manufacturer designing a new business micro will choose to run CP/M as this wide range of software makes his micro look all the more attractive to the buyer. A software manufacturer, on the other hand, will develop software for CP/M because so many people already have it.

Digital Research has developed a similar product to CP/M which

BEGINNERS

first bytes

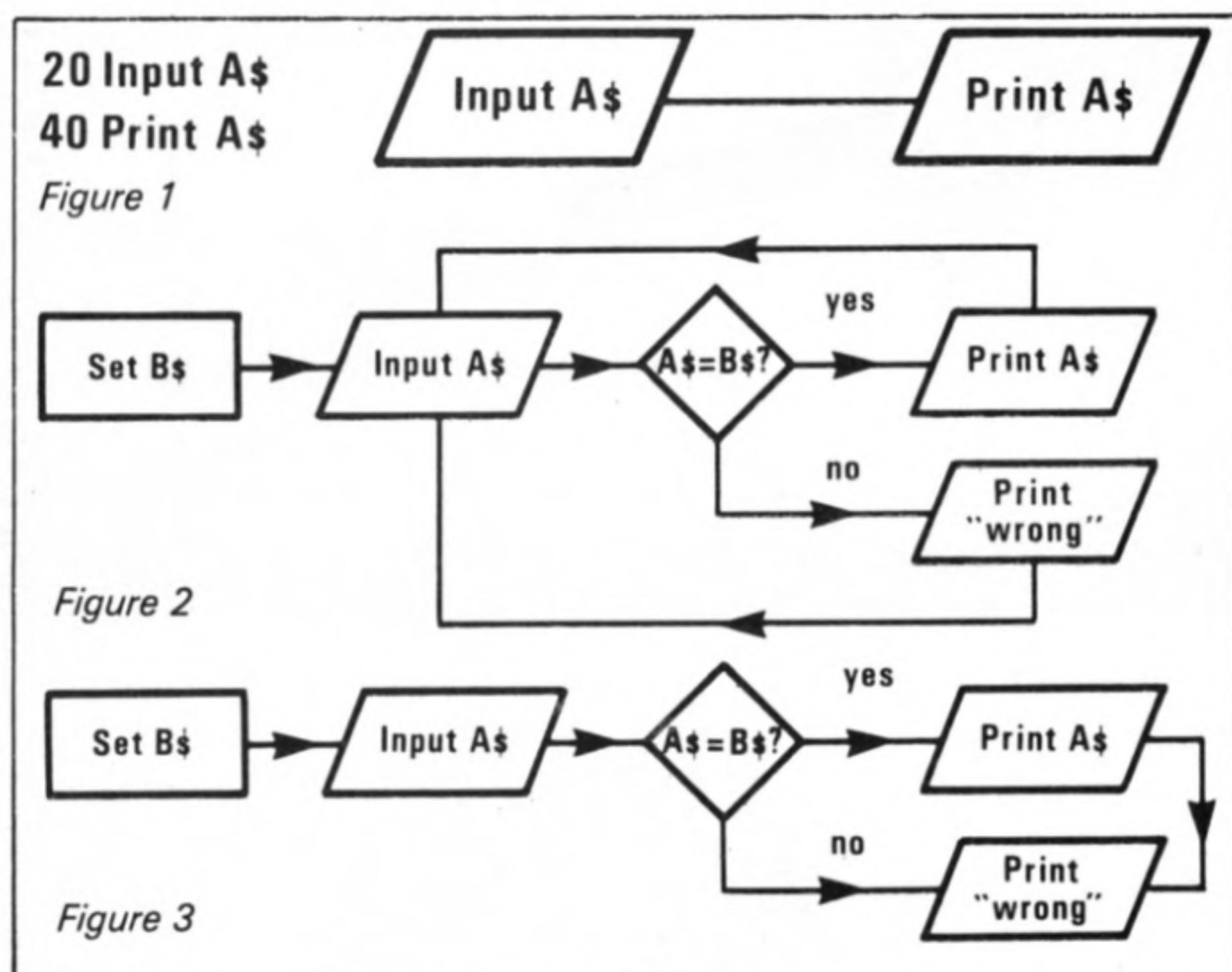
performs the same standardising task, but for graphics. It allows a programmer to develop graphic images on one machine, and will allow the same image to appear on another machine when fed with the same data.

It is unlikely that CP/M will appear on the Spectrum, although

not impossible. The reason for this is that Sinclair Research has opted for a non-standard mass media, the Microdrive, and supports it with a number of built-in commands — the ones that appear on the keyboard but cannot yet be used.

Also as the Spectrum has only 48K, loading in CP/M and a relevant version of Basic would not leave much room for applications software.

Program flowcharts



COMPUTER SCIENTISTS always insist that you must carefully plan and flowchart your program on paper before you ever touch the keyboard. On the other hand most computer users just hack around on the screen until it works, so is all that preliminary planning really the best way to go about it? The answer of course is yes and no, as it all depends on how complicated the program is, and how experienced you are.

Without a doubt flowcharts are an excellent way of finding bugs in your programs but to make a start you need to understand the language. There are many symbols used in flowcharting but as far as most programs are concerned there are only three different situations and symbols to worry about.

Input/output describes entering responses from the keyboard or joysticks and sending output to the screen, sound channel or printer.

Process describes any part of the program which manipulates the information.

Decision points are usually the most important parts of the program as it is the arrangement of these which make the computer appear intelligent.

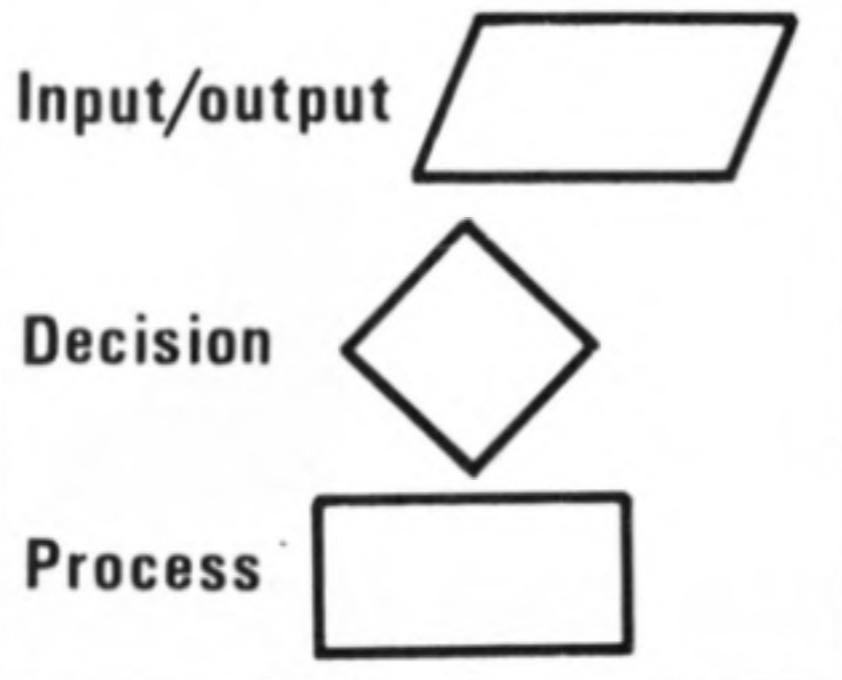


Figure 1 is a very simple flowchart of a routine to print a character on the screen.

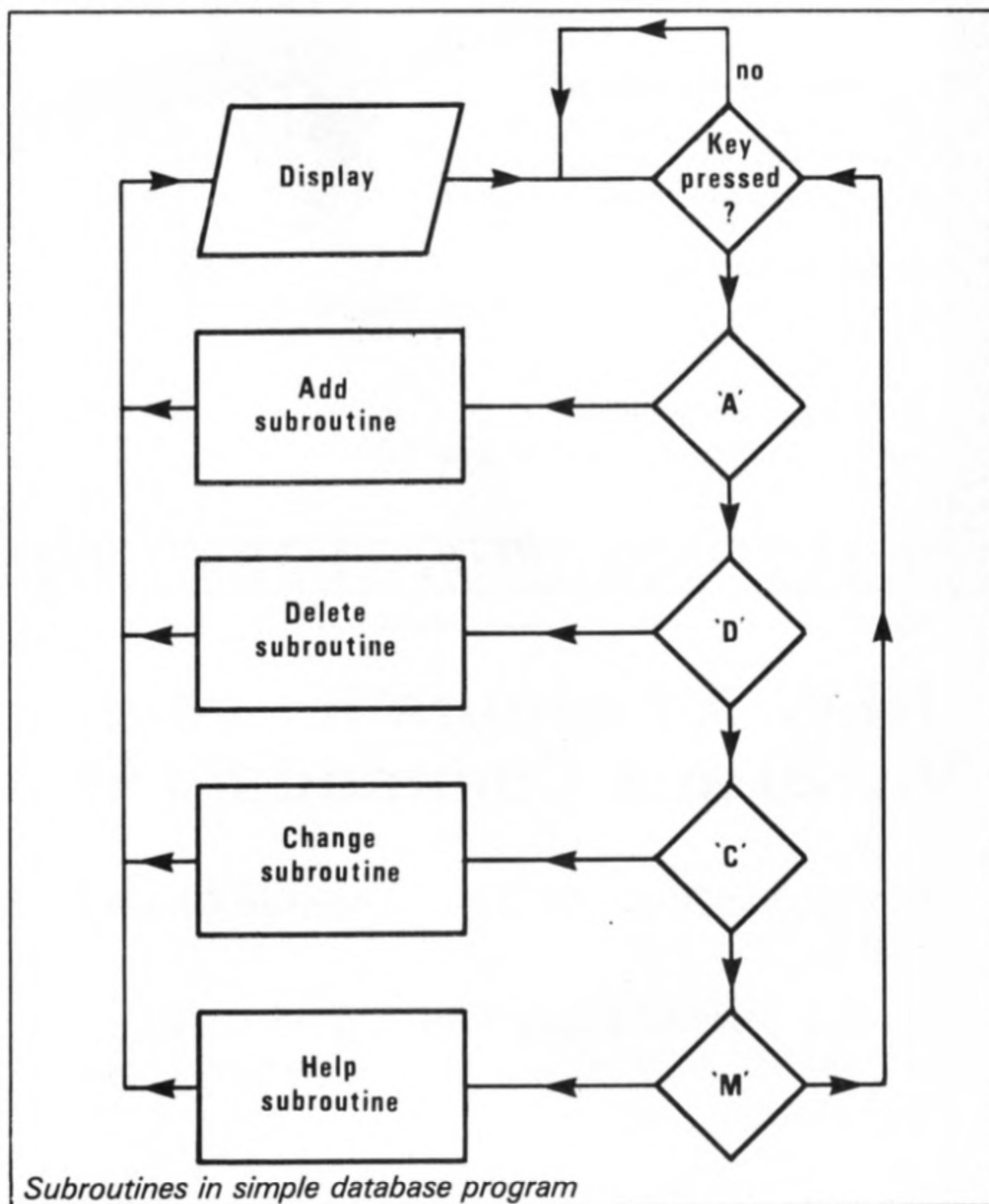
Now add a process, a decision point, and an alternative program path.

```
10 LET B$="TEST"
30 IF A$<>B$ THEN 100
100 PRINT"WRONG"
See Figure 2.
```

Of course that program does not do what you really wanted as even if you are right you are told you are wrong! What we need to add is a longstop which catches you when you are right, and why not automatically return for another input? There is no point going back to the start as B\$ is still set.

```
50 GOTO 20
110 GOTO 20
See Figure 3.
```

Keith and Steven Brain



Using subroutines

MOST VERSIONS OF Basic allow you to use subroutines, but when should you bother to use this programming method? The important thing about calling a subroutine with Gosub is that the program remembers where it was and Returns to that particular point. The parts of a program to put in a subroutine are really any groups of lines which are used several times.

There is not much point in putting a single instruction like

```
PRINT A$
```

as a subroutine, as you still have to put Gosub — line number — wherever you want to call it in the program. The more complicated your program and the more complex the contents of your subroutine, the more useful it is likely to be.

Arranging your program as a series of subroutines can make it easier to plan, and may also make it run faster. Frequently used subroutines should be put near the start of the program, as each time a Goto or Gosub is met the system searches for that line number from the start of the program.

Parts like instructions which are not needed frequently are often put at the end of a program and are only called at the start of a program, or if you need help. For example, a simple database program might consist of a help subroutine, three 'action' subroutines, and a keycheck routine which decides where the program should branch. See drawing above.

Keith and Steven Brain

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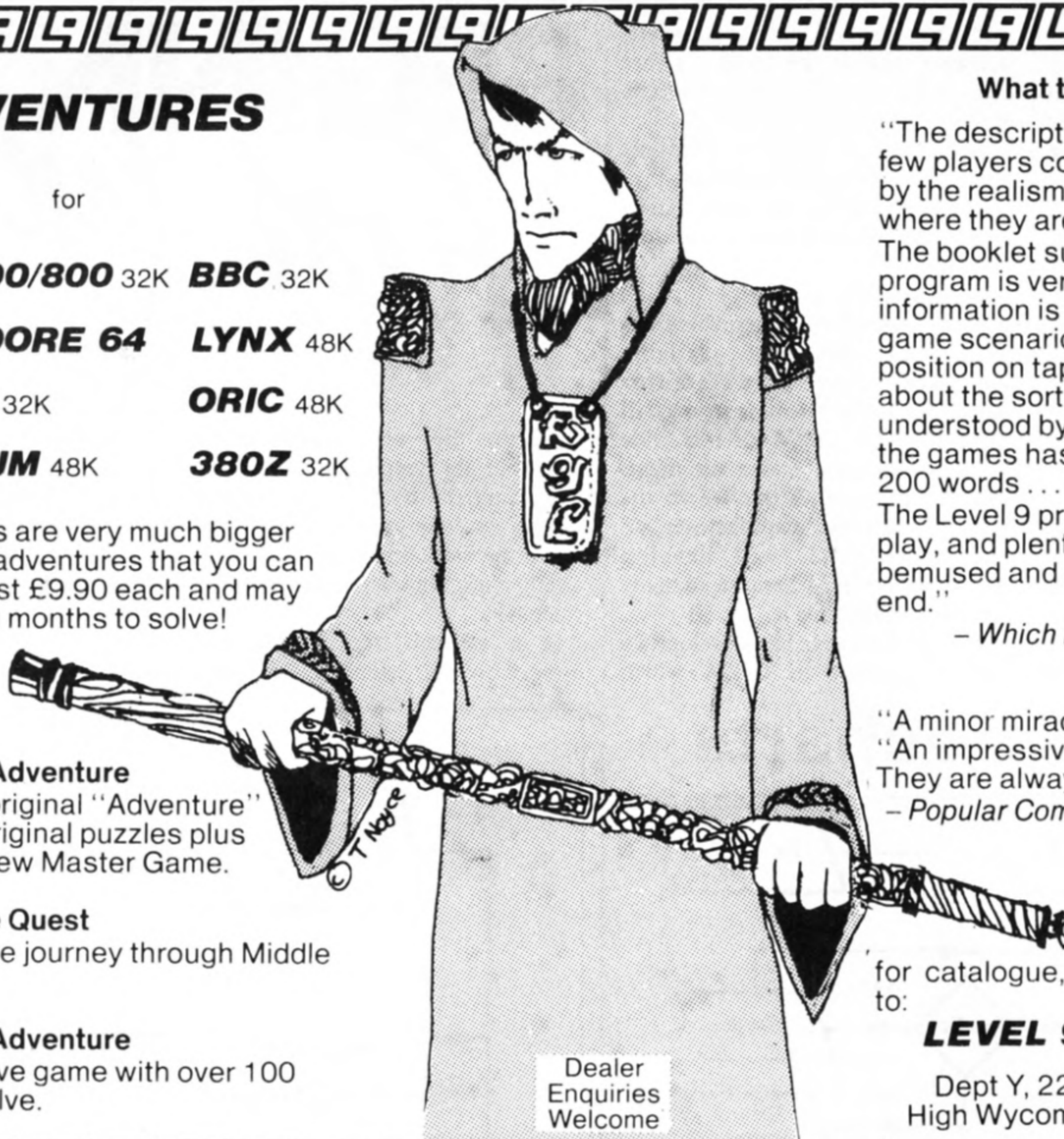
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Local news

Aylesbury

The Aylesbury ZX Computer Club was one of the first to stage a public demonstration of the new Sinclair Microdrive. Other equally exciting events are planned. For details phone Keith Pyott on 0296 63087.

Merseyside

Once a fortnight the Merseyside Commodore Users' Group congregates at Maghull Deyes High School, Deyes Lane, Maghull, Liverpool. Meetings start at 7.30. Contact Mr J P Jones on 051526 4813.

Manchester

Not only TRS-80s but also Dragons and the burgeoning new wave of Tandy computers are catered for on the last Wednesday of each month at Barton Aeroclub, Barton Aerodrome, Irlam, near Manchester. Telephone 0942 812843.

Southend

The Esplanade Hotel, Western Esplanade, Southend is the venue every Monday evening for the Southend Computer Society. Contact Robin Knight on 0702 21845.

Chadderton

Every Thursday South Chadderton Computer Club meets at Turf Lane Centre, Turf Lane, Chadderton between 7 and 9.30. For more information: Mr Jakeman, 26 Marble Street, Oldham, Lancashire. Telephone 061678 0547.

Darlington

Darlington Computer Club normally meets weekly, but events are less regular during the summer. Technical library is provided. Contact Leslie Boxell, 8 Vane Terrace, Darlington DL3 7AT. Telephone: 0325 467766.

Southport

Tuesdays and Wednesdays weekly is when Southport Computer Club meets. Contact Ian Bristone, 28 Weld Road, Southport, Lancashire. Telephone: 0704 64524.

COMPUTER

Meirion Jones finds a welcome in the hillsides at Cardiff Computer Club where there is much excitement over Sinclair's recently announced Microdrive package.

club

TRADITIONAL WELSH dry Sundays have already been washed away in a tide of Brains Dark; Cardiff's local brew. Now choir practice and rugby training are under threat; this time home computers are leading the nation's youth astray.

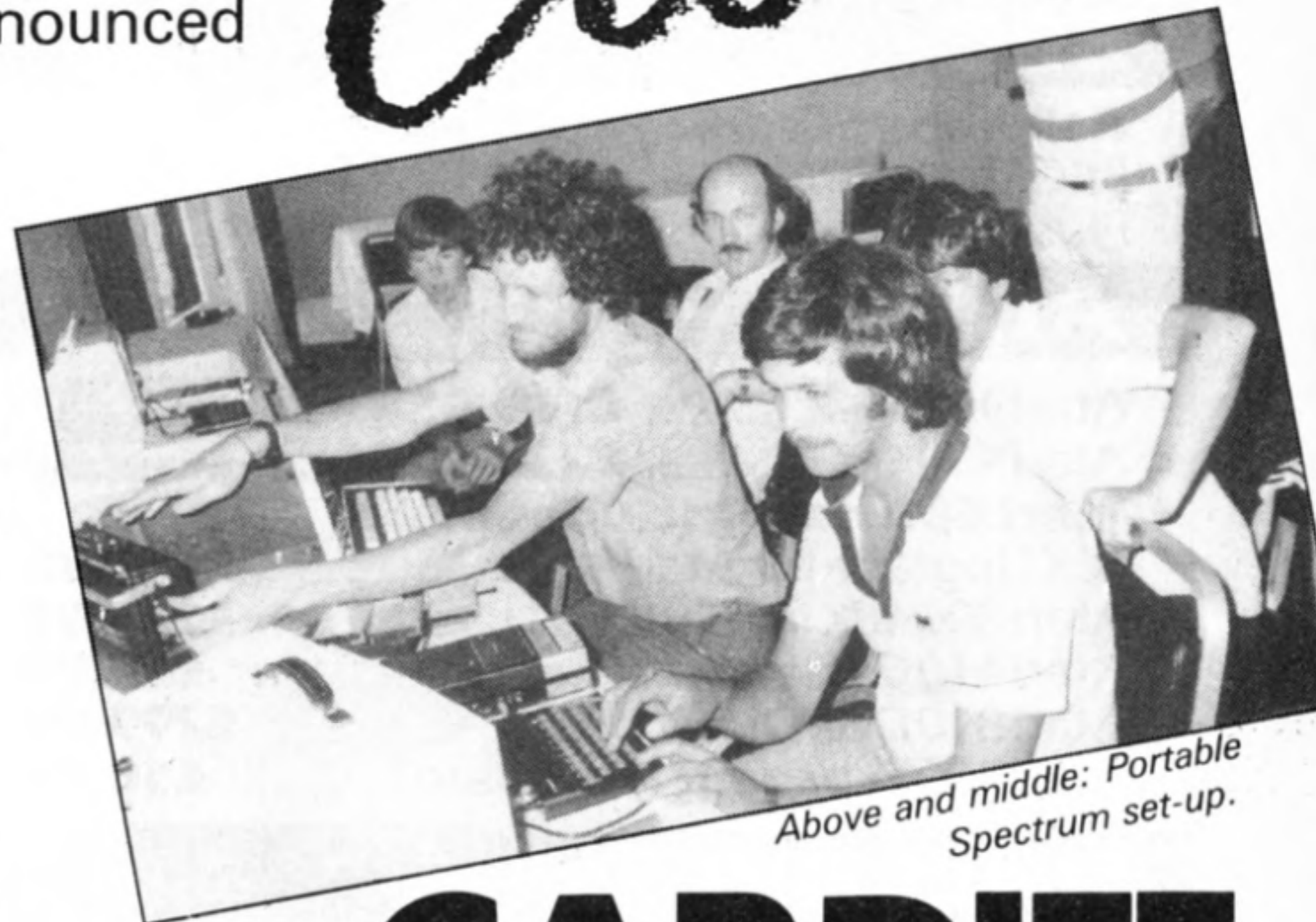
On the last Sunday of every month up to 80 Sinclair enthusiasts turn up at the Central Hotel in Cardiff with their ZX-81s and Spectrums for the Cardiff ZX Club. There are now 120 members but back in November 1981 when the club started as The '81 club there were only two — Steve Smith and Mike Hayes.

The sudden growth of the club and perhaps over-exposure to adventure games has had strange effects on its founders. There is still no formal committee but Steve Smith says: "You can put me down as Emperor if you want".

Sinclair's Microdrive was the main topic of conversation at the meeting. Tim Gilberts who runs the Barry-based software house Gilsoft plans to write adventures that will take advantage of the 85K storage on each Microdrive cartridge.

David Bath who runs a small business in his spare time selling American science-fiction magazines is looking for more practical advantages. He originally bought a ZX-81 to help him with sorting out the orders. He soon moved on to a Spectrum and now finds that it takes two hours to organise which magazines go to which customers, compared with six hours when he

Below: Tim Gilberts demonstrates Gilsoft's adventure writing Quill program.



Above and middle: Portable Spectrum set-up.

CARDIFF

did the magazine collation manually.

The Interface 1 will allow him to connect a printer to produce sticky labels, and with a Microdrive to store the information his whole task



could be completed in minutes.

Cardiff ZX Club runs machine-code tuition sessions but the afternoon I was there was too hot for work. There was a different game on each of the 20 TV screens dotted around the room. Of the commercial programs Bug-Byte's Manic Miner seemed the favourite, also going down very well was Duncan Kinnaird's *Star Wars* game from our July issue.

The ZXers split long programs such as our Flight Simulator in December or our Submarine Mission in August into as many as six sections each of which is entered by a different member of the club.

The oldest member of the club is probably Henry Morgan from Llanrumney. But many of the members are as young as 12. Although many at the Sunday meetings are still at primary school there is also a mid-month session which is held in a fortress-like public house in Canton apparently for the sole reason of keeping out under 18-year-olds.

There are 5,000 home computers in and around Cardiff most of which are Spectrums. If you own a Sinclair and want to join the ZX Club you can contact Mike Hayes on 0222-371731.

For BBC Micro owners there is also the Cardiff BBC Users which meets on alternate Wednesdays — August 31, September 14 and so on — at University College Cardiff Mechanical Engineering Department, Newport Road, Cardiff. Contact Geoff Barker on 0222-701023.

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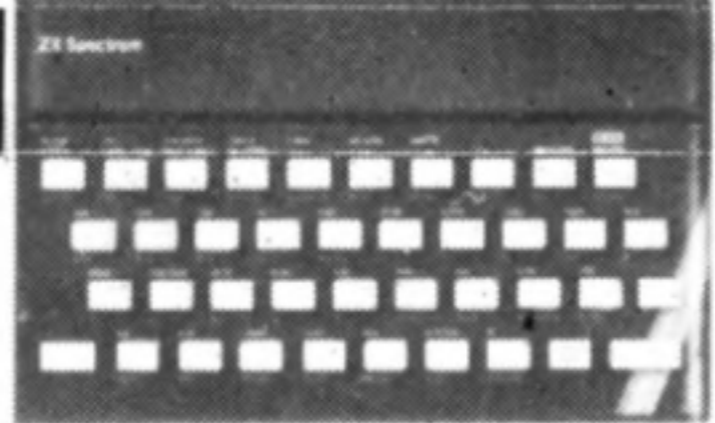
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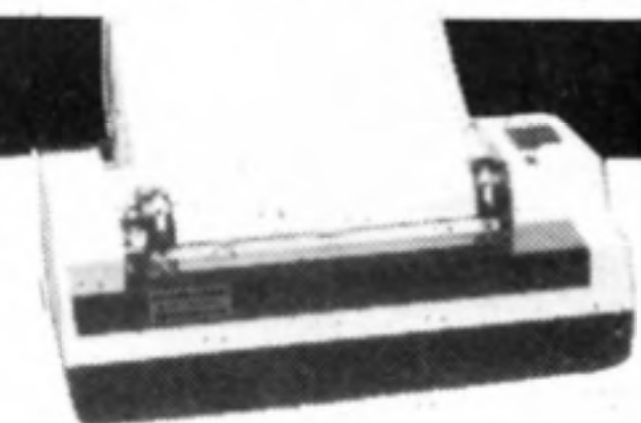
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Orc Attack

Atari 400/800/1200: Novelty:
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★ ★

You defend your castle against hordes of orcs trying to scale the wall, fending them off with swords, rocks and boiling oil. They fight back with daggers and, if you are unlucky enough to be caught in the path of one, your head is severed. If you kill the orcs before they kill you the Sorcerer's spirits attack. If you survive that you have to slay the Stone Warts. I'd sell the castle. Good graphics and animation.

Vic Rescue

Vic-20 unexpanded:
Shoot-'em-up: £5:
Interceptor Micros.

★

The aim of the game is to release a rescue pod from the mothership and get the humans off-world having weaved through the asteroid belt. The graphics are unexciting and in space no-one can hear you scream. This explains why the only sound in this game is the noise of your spaceship crashing into an asteroid.

Star Jammer

Dragon 32: Shoot-'em-up:
£7.95.

★ ★

In Star Jammer you manoeuvre your ship by joystick in order to get an alien ship in your sights, then shoot it down using your laser. Stargates are triggered automatically by beacons on your ship as you approach. Graphics are workmanlike and it is certainly tricky to keep the attackers in your sights.

SOFTWARE

Shenmue

Terrordactyl

■ 48K Spectrum
■ £6.95
■ Melbourne House

★ ★

SOME YEARS AGO Terry Dactyl and the Dinosaurs made their one mark on the pop charts. Unfortunately the tune was so much like Mungo Jerry's *In the Summertime* that now only Keith can still remember it was called *Seaside Shuffle*. Terrordactyl is likewise doomed because of its similarity to *Space Invaders*.

There is nothing wrong with the 30 graphics or with the setting. You are on a flight of Lost Jungle Airlines which crashes leaving you staring across a plain with a smouldering volcano on your right. You are armed with a tank-style gun which you fire at waves of invaders that come over the horizon and get bigger as they move towards you. Every so often a very life-like Pterodactyl comes screeching towards you and you must avoid it or kill it first time. If you can survive you are treated to a glorious sunset and sunrise and you go on to Day 2, Day 3, and so on.

But the game soon becomes tiresome, which is a shame because dinosaur mania has been sweeping the country since July when a 200 million-year old meat-eating fossil called Claws was discovered in a Croydon clay pit.

Claws may have been the most exciting thing ever to come out of Croydon but Terrordactyl is certainly not the most original program to come out of Melbourne House.

Manic Miner

■ 8K Spectrum
■ Bug-Byte

★ ★ ★ ★

MINER WILLY stumbles on the riches of a lost civilisation while prospecting in Surbiton. Your job is to guide him back to the surface avoiding poisonous pansies, spiders and slime, and worst of all, the manic mining robots. Willy must also collect the keys which are vital to his escape to each of 20 lethal levels.

The game has excellent graphics, and keyboard control gives you plenty of choice as to which keys are most convenient for you to use. There is lots of wacky humour, too from the penguins in the cold room to the ferocious toilet seats in Eugene's lair, a witty side-swipe, no doubt, at one of Imagine's star programmers. Satire on other games also creeps in — Pac-Man lookalikes are to the fore in the processing plant and there is a Kong Beast and a



Return of the alien Kong Beast. Not to forget the Attack of the Mutant Telephones — do not ring us we will ring you, eh, Llamasoft's Jeff Minter?

Games like this certainly make the average micro user of the paucity of imagination that less dynamic software houses are stricken with. What is the point of buying one game if so many elements of different arcade games can be so effectively combined? The animation is excellent. With games like this Bug-Byte will be laughing all the way to the bank — which occurs, in Manic Miner, on the 15th screen.

Submarine Commander

■ Vic-20
■ £24.95 cartridge
■ Thorn EMI Video Ltd

★ ★

FULL FATHOM FIVE thy father lies; of his bones are coral made: those are pearls that were his eyes. Yes, Dad's been at the Vic-20 submarine patrol simulator again, and, let's face it destroying all enemy merchant shipping in Mediterranean waters has never been an easy number.

This is a competent implementation of Submarine Commander, but lacks, in comparison with the Atari

version, the monotonous rumble of engines throughout the mission and the colourful map. There are two main display screens; one shows a map of the Med with ships moving about, which you have to steer towards using the compass; and the other gives you a view through the periscope. You can also call up a sonar display when submerged, with a realistic pinging sound.

As you close in on the convoy they will start to bombard you — the screen shakes convincingly — and be careful not to get too close to the sea floor on the coastline, as this does not help your promotion prospects. Diving is also risky because too great a depth will fracture the hull causing wet feet all round. It is worth keeping your weatherbeaten old seadog's eye on the oxygen level, fuel, battery charge — most of you will be aware by now that diesel submarines run on batteries when submerged, and that the batteries are charged by diesel engines when snorkelling or running on the surface.

Submarine Commander has nine game variations, but not really enough new surprises occur to lift this one out of the merely good category. The occasional air attack would have been nice, for example. But the game is well thought-out: it is up to you to decide if it is worthwhile buying just another game at this sort of price, when you could more profitably buy a new peripheral — or maybe even another micro!





Sinclair's Microdrive promises fast mass storage at a price you can afford. Kathleen Peel finds out if this is the tape of things to come.

SIXTEEN MONTHS after they were announced the first Microdrives are just being delivered. The price is still £50 for a drive which takes 85K tape cartridges instead of the 100K originally promised, but you can find and load a program in a few seconds. You will also need the Interface 1 before you can plug in up to eight Microdrives, but this interface gives you RS-232 and local area networks.

The Microdrive is housed in a box 90 by 85 by 40mm in size with an aperture at the front for loading the cartridge, and printed circuit board edge connections on both sides towards the rear. The right hand connector plugs via a flexible cable to the interface unit, if it is Microdrive 1 or plugs directly through a double ended socket to the next Microdrive. The drives are secured to each other by a plate underneath the housings. This should prevent the dreaded wobbles.

There are two small printed circuit boards inside which are without modification. The lower board provides the two edge connections, while the central vertical board houses a ROM and the tape head, which is used for both record and erase functions.

The mechanism is uncomplicated. The drive is generated by a rubber roller mounted directly on the end of the motor spindle. Pressure is applied by a leaf spring on the opposite side of the cartridge. The spring also maintains the cartridge position relative to the head, a very simple and highly efficient set up. My only worry would be head wear due to the abrasive action of the tape.

When the Microdrive is running, an LED indicator is lit. A warning is given not to remove the cartridge while this light is on.

The cartridge is claimed to be able to handle up to 50 files and have a minimum storage capacity of 85K. The two spare cartridges supplied for the review both had 90K of storage space available when formatted.

Typical access was very fast in comparison with cassettes but, human nature being what it is, you tend to notice when it is slower than usual. It can take longer to type in the load command than to find and load a short file.

The storage media is an endless loop of tape. The cartridge is very small 45 by 35 by 7mm., including cover and makes the opposition's 75mm. floppies seem huge in comparison. The cartridge can be write-protected in a similar manner to cassettes by removing a plastic tab, a piece of sticky tape will re-enable write.

I assume that before long we will be able to purchase S100 and S200's — Sinclair 200K — cartridges. In some applications it is quantity of storage rather than speed of access that is important. It will also be necessary to store the cartridges in a holder similar to those available for cassettes. The Sinclair hardware add-on industry is in business again.

Sinclair only supplies one blank cartridge per Microdrive, further cartridges are supplied singly with an order form for repeat purchases. Bearing in mind Sinclair's advice on the need for back up copies, it just is not sufficient.

It is possible to use strings for filenames in the Microdrive commands and variables for the Microdrive number. Because of the initial high cost of the cartridges, it makes sense to

```

1 REM AUTO FILE HANDLING SHELL
5 SAVE "m";;"zzzzzzzzzz"
7 LPRINT "zxc created"
10 OPEN #5;"m";;"cat"
20 CAT #5;1
30 CLOSE #5
35 LPRINT "cat saved"
40 CLS : CAT #3;1
45 LET c=0
50 OPEN #6;"m";;"cat"
60 FOR n=1 TO 51: INPUT #6;x#
65 LET c=c+1
67 IF c<3 THEN NEXT n
70 IF x#="zzzzzzzzzz" THEN GO TO 100
80 LPRINT x#,c;" ";jn
90 NEXT n
100 CLOSE #6
220 LPRINT : LPRINT "done": LPRINT : LP
RINT x#,c;" ";jn
225 ERASE "m";;"zzzzzzzzzz"
227 LPRINT : LPRINT "zxc erased"
230 ERASE "m";;"cat"
235 LPRINT : LPRINT "cat erased"
240 CLS : CAT 1
245 CAT #3;1: LPRINT "stop": LPRINT
250 STOP

1 GO SUB 9990: LET y=40: RESTORE
2 DATA "
90 LET z=0
97 INPUT "print to screen y/n ";z#: IF
z#="y" THEN LET z=1: LET y=32: GO TO 1
01
101 LET d=0
102 READ a$: IF y=32 THEN GO TO 106
103 IF a$(1)="0" THEN LET a#=a$(2 TO )
: GO SUB 9980: GO SUB 9960: GO SUB 9990:
GO TO 102
104 IF a$(1)="&" THEN LET a#=a$(2 TO )
: GO SUB 9980: GO SUB 9950: GO SUB 9990:
GO TO 102
105 IF a$(1)="x" THEN LET a#=a$(2 TO )
: GO SUB 9980: GO SUB 9970: GO SUB 9990:
GO TO 102
106 IF LEN a#>y THEN GO TO 120
110 IF z=1 THEN PRINT a#: GO TO 112
111 LPRINT a#
112 GO SUB 100
115 GO TO 102

120 LET c=0
125 IF c=y THEN GO TO 150
130 LET b#=a$(y-c)
135 IF a$(y+1-c)=" " OR b#=")" OR b#=","
OR b#="." OR b#=":" OR b#=";" OR b#="?"
OR b#="CHR# 34 THEN GO TO 155
140 LET c=c+1
145 GO TO 125
150 LET c=0
155 LET c#=a$( TO y-c)
156 LET a#=a$(y+1-c TO )
157 IF a$(1)=" " THEN LET a#=a$(2 TO )
160 GO SUB 200
165 GO SUB 180
170 GO TO 106
180 LET d=d+1
185 IF d<22 THEN RETURN
190 PAUSE 500: REM IF z=1 THEN COPY
192 CLS : LET d=0: RETURN
200 LET g#=" "
205 FOR f=LEN c# TO 1 STEP -1
210 IF LEN c#>y-1 THEN GO TO 240
215 IF c#{f}=" " THEN GO TO 220
216 NEXT f
218 GO TO 205
220 LET c#=c#( TO f-1)+g#+c#{f TO )
221 LET f=f-1
225 LET c=c-1: IF c<=0 THEN GO TO 240
230 GO TO 216
240 IF z=1 THEN PRINT c#: RETURN
242 LPRINT c#: RETURN
999 REM TIDY PROGRAM
1000 DATA "": REM Enter files to be dele
ted here, then RUN1000
1001 DATA "zxc"
1002 RESTORE 1000
1003 READ a#: IF a#="zxc" THEN CAT #3,1
: STOP
1004 ERASE "m";;"a#"
1005 GO TO 1003
9950 LPRINT CHR# (10): LPRINT "S0": LPRIN
T CHR# (17): LET y=80: RETURN : REM set
80 chars
9960 LPRINT CHR# (10): LPRINT "S1": LPRIN
T CHR# (17): LET y=40: RETURN : REM set
40 chars
9970 LPRINT CHR# (17);CHR# (29): RETURN
: REM change colour
9980 CLOSE #3
9981 FORMAT "b";"b"
9982 OPEN #3;"b"
9984 RETURN
9990 CLOSE #3
9991 FORMAT "t";"t"
9992 OPEN #3;"t"
9995 RETURN

```

Program 1.

```

10 DATA "": REM Files for deletion
20 DATA 'zxc'
30 RESTORE
40 READ a$: IF a$='zxc' THEN GOTO 70
50 ERASE 'm';;"a#"
60 GO TO 40
70 CAT #3;1: STOP

```

Program 2.

```

10 LET a$='kate'
20 LET d=49
30 LET b$=a$: LET a$=a#+CHR$(d)
40 SAVE 'm';;"a#"
50 LET a$=b$
60 LET d=d+1
70 IF d=110 THEN CAT #3;1: STOP
80 GO TO 30

```

REVIEW



ZX MICRODRIVE

produce the tidy facility shown in Program 1.

Program 2 was used to test the file storage capacity of 50 files. Three points emerged from the tests:

- Each file appears to occupy a minimum block of 512 bytes.
- As the limit of 50 files is exceeded, file names disappear from the catalogue in an apparently random fashion, but they still occupy space on the cartridge and are still loadable.
- The average time taken to Save a short file in this manner is 10 seconds.

An attached Microdrive has no effect on the vast majority of commercial software. Only in one case where a program used interrupt control was a program found not to work, and I am not sure why not. If you open a stream to the Microdrive or Net then problems will arise, but if you do not try to use the Microdrive or try to Network a program

then it should make no difference whatsoever.

The user is warned not to remove a cartridge while the Microdrive's LED is lit and not to switch on or off with a cartridge in the drive. This I continually forgot with no apparent mishaps to the stored data.

I think the user would be wise not to leave a cartridge in the drive for long periods of storage, the pressure roller may take a permanent set and upset the tape transport.

I would have liked a protective flap over the cartridge entrance, not all drives will be used in a clean environment.

The ZX Interface 1 was also announced in April 1982. It was simply called the RS-232/Network interface board and was expected to sell for £20. Since then it has been expanded and now serves three functions:

- Microdrive controller
- RS-232 interface
- Local-area network

This little box of goodies is something special. There are flaws but it is still a very powerful addition to the Sinclair range of computer peripherals.

Surprisingly the two printed circuit boards in the Microdrive show no signs of modification whereas the printed circuit board in the interface has been altered. The board contains two integrated circuits, a prototype Ferranti LSI and an EPROM.

A Sinclair spokesperson has stated that the equipment delivered to customers will, in fact, contain proper production devices.

The interface plugs into the Spectrum rear connector and is attached through two existing screw holes to the underside of the Spectrum, the original screws may be discarded. A duplicate rear connector port is available on the interface as are the two 3.5mm. network sockets and the nine-pin d-shell connector for

(continued on page 55)



TANK BATTLE
Enemy tanks invade your position. Manoeuvre your tank controlling its gun barrel for accurate range. WATCH your salvos disintegrate the enemy BUT BEWARE the accurate return fire. Realistic graphics and sound. 5 levels - strategy to desperation.

HOUSE OF BUGS
The Bugs in this game will raise the blood pressure to the limits and drive spectators into a FRENZY! KILLER BUGS roam the top floors. Escape by clinging to the ceiling. You damage the plaster and need high scores to make repairs. Excellent graphics and sound.

LAS VEGAS
FRUIT MACHINE - Replica of a fruit machine - watch the symbols spin - nudge, gamble - WIN or LOSE - true percentage payouts. BLACK JACK - Break the bank with a five card trick. The Spectrum croupier is FAST and wants your stake money. Superb graphics.

BARON
Could you accept responsibility of a Barony? Farm your lands, maintain workers, hire mercenaries, wage FEUDAL WARS? Yearly analysis of success or failure of your decisions. Game of strategy for up to four players. Graphics.

DUNGEONS OF DOOM
Two challenging adventure games - to SEEK or ESCAPE. Graphics show your position - status reports - different layout with each new game. 4 players can search different levels and race for SUCCESS or SURVIVAL.

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If the MINES do not get you, then the COBUS WILL! 8 mind-stretching mazes - new layouts - progressive difficulty - ZOG the cobus and take a breather, BUT NOT FOR LONG...

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HIGHER AND LOWER - Skill hunches and sixth sense are needed to beat this FAST DEALING MACHINE.
MASTERMIND - Play the MICROMIND with all the features of the well known game.

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Leap over deadly martian invaders - Scale ladders - Jump the mantraps - rescue the 'Girl of your Dreams' - oxygen pollution and time limit - for SUPERHUMANS ONLY

ADMIRAL GRAF SPEE
An original game of strategy based on factual records of the Graf Spee's formidable presence in the Atlantic. As her Captain use full graphic instrumentation to calculate speed, distance, ammunition status; LOCATE and manoeuvre into visual range and destroy enemy ships which can also evade, SEEK and DESTROY you!

SPECIAL MISSION
TOP SECRET - save the world from destruction. TIME is running out. HOW? WHY? WHEN? Will you live to complete the adventure?

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by Simon Mansfield.
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Spectrum 48K

GODZILLA & THE MARTIANS by Neil Streeter.
Machine: ZX/
Spectrum 16K/48K

SPECIAL MISSION by Tony Frampton.
Machine: T199/4A-
extended basic

COBUS MAZE by Dave Gibson.
Machine: VIC20
unexpanded joystick or keyboard

DUNGEONS OF DOOM by Simon Mansfield.
Machine: ZX81/16K/
Spectrum 48K

MONOPOLY by Simon Lacey & Richard Fry.
Machine: Dragon 32K/VIC
20 + 16K

HOUSE OF BUGS by Tony Frampton.
Machine: T199/
4A-extended basic

BARON by Simon Mansfield.
Machine: ZX81
16K/Spectrum 48K

CHALLENGE by Neil Streeter.
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(continued from page 53)
the RS-232 printer/peripheral interface.

The Microdrive plugs into the exposed printed circuit board edge connector at the side through a flexible cable. The whole assembly is rigid and now the keyboard has been tilted, feels much easier to use.

The interface unit acting as the Microdrive controller, expands Sinclair Basic to include elementary file handling and communications commands. These are listed in Table 2.

The commands are created by paging the new ROM which creates an additional set of system variables. It looks from an cursory glance, that it is possible to re-vector the input-output routines used in both the Microdrive and Network channels.

The commands become a bit of a chore to handle after a while and you are soon driven to looking at producing your own simple operating systems.

Program 1 — tidy — is useful in containing the very rapid growth of a user catalogue. Program 3 — shell — is a means of handling the entire catalogue without coming up with the End Of File message and having unclosed streams and files.

Line 80 can be changed to provide whatever function the user wishes to apply to the catalogue. The printer outputs are not essential, they are there purely to aid fault finding.

The RS232 interface, which operates over a range of 50 to 19.2K baud with no parity, 8-bit

character and two stop bits, should cover just about all but split-speed operation. There are two modes of operation.

The t channel is normally used for listings. the control codes are not sent except for 13 — carriage return — and the token codes are expanded. There is no graphic capability. These characters are replaced by code 63 (?).

The b channel sends the full 8-bit code and is used to send control codes to printers etc. Program 4 was written in order to produce this review and demonstrate the use of these channels. The Tandy four-colour printer has been used as the remote end of the RS232 interface, control codes are used to change to graphic and text modes, change pen colours and print size.

I can not recall ever having said that something from Sinclair was expensive, but £15 for an interface lead is a bit steep.

The ZX Net — local area network — promises to be a very powerful tool. The network is set up by simply joining two Spectrum interfaces together with the 10ft. long net lead. The manual reveals a network operating at 100K baud with handshaking between two attached devices. Up to 64 Spectrums can go on the net.

Print station facility

There is also a broadcast facility to download information to anybody listening on the net. This would permit a teacher to broadcast a program to the whole class at once.

Other uses include the ability to set up a print station to service all the Spectrums on the net. Perhaps when Sinclair has managed to clone a few interfaces these properties can be evaluated.

The manual falls short of the usual high Sinclair standard due, in part, to the fact that it is not a derivative of an earlier work. Everything appears to be there but I think some of the text needs presenting in a much simpler form.

The demo tape contains a print server program, untested, and a poor-man's Horizons tape-a-data base-program which provides the meaning of the Microdrive commands from a database at what can only be described as slow, I was not impressed.

CONCLUSIONS

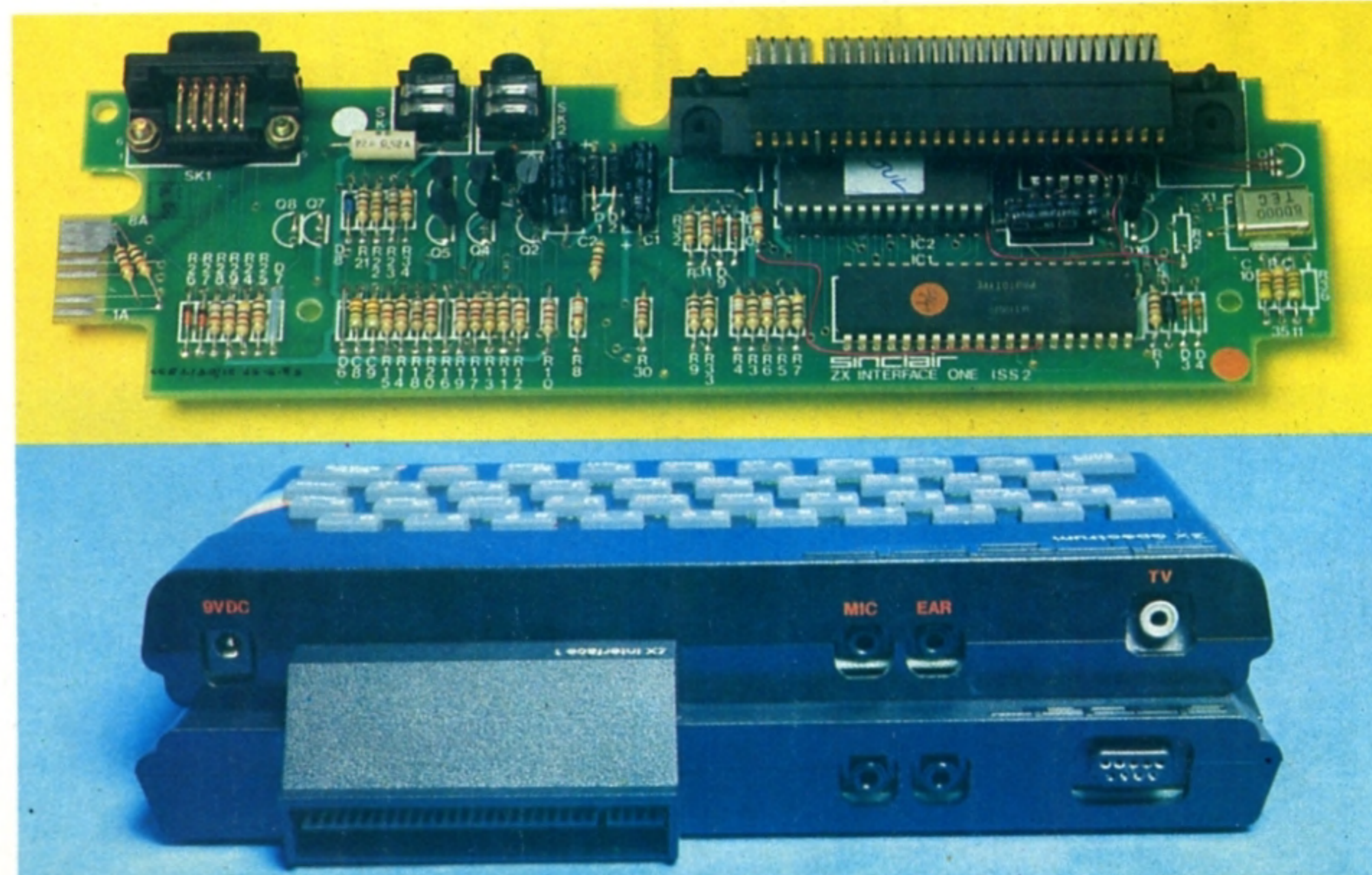
- The drives possess slightly less storage than hoped, they cost slightly more and they are slower than expected. Nonetheless another outstanding Sinclair buy.
- The interface is a real gem. I know of some professional systems that could not match its performance.
- Together the devices have worked without any problems throughout the review period, a very good sign.

Table 1: Microdrive command format

LOAD* "M";1;"NAME"	The * indicates load from a microdrive
SAVE* "M";1;"NAME"	
LINE 10	Set name to run for autorun startup Line optional
VERIFY* "M";1;"NAME"	
MERGE* "M";1;"NAME"	Will not merge programs saved with a line number
ERASE "M";1;"NAME"	
FORMAT "M";1;"TITLE"	Title refers to a header for the cartridge

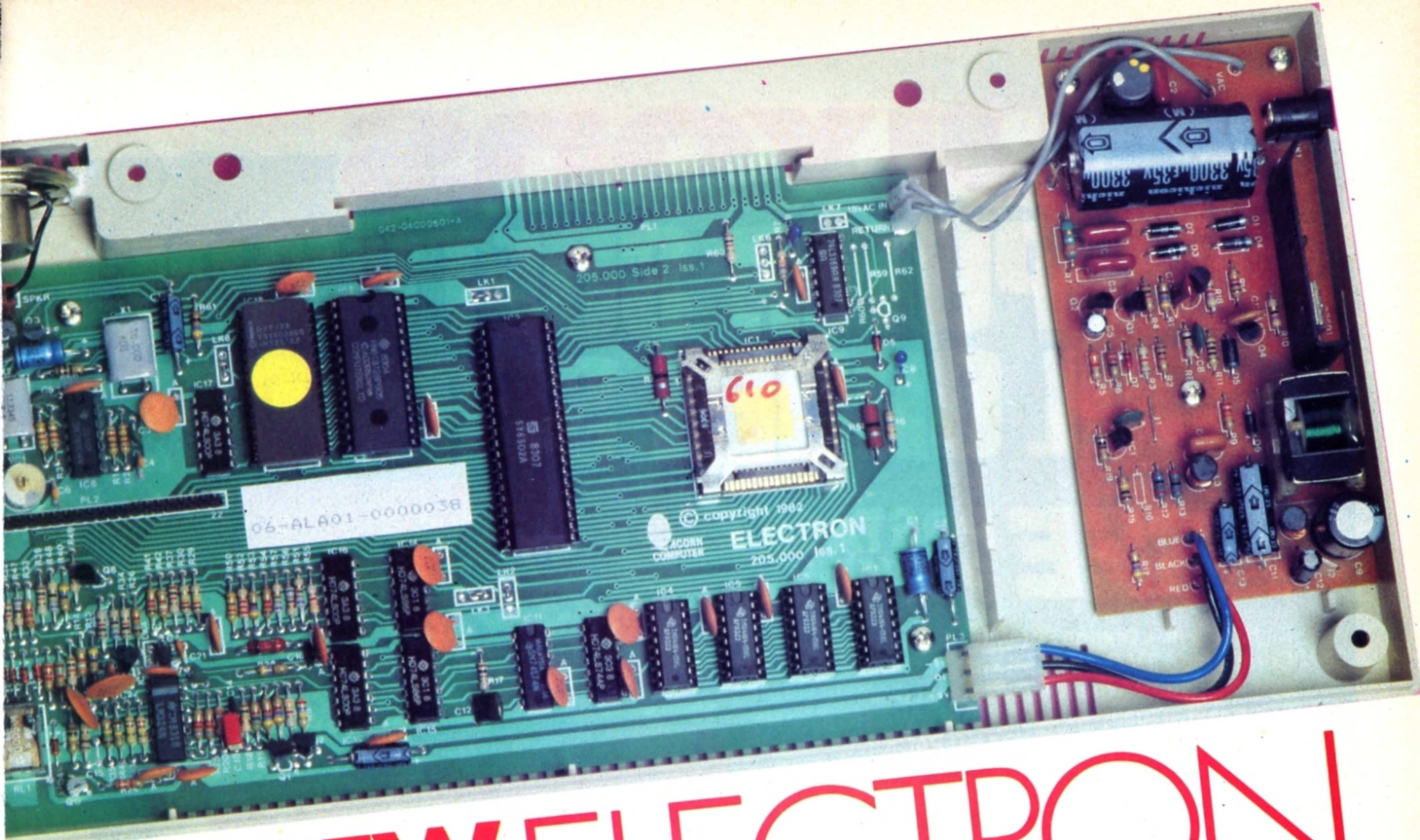
Table 2: Extended Basic commands

* Specifies a Microdrive function	
CAT Y	Y is Microdrive number 1 to 8
CAT #Z;Y	Z is stream number 0 to 15
CLOSE # Z	
ERASE "M";Y;"NAME"	NAME is a file name
FORMAT "M";Y;"TITLE"	TITLE is a name for the cartridge
FORMAT "N";X	N means Network and X station No. 0 to 64
FORMAT "T";S	T indicates RS232 text and S is the baud rate
FORMAT "B";S	B is for RS232 binary data
INKEY\$ #Z	Return a character or null
INPUT #Z;Var	Inputs a variable
LOAD * CHAN	Load prog, data or file from B M or N channel, all other load options apply
MERGE * CHAN	
MOVE from TO dest	Only moves data
OPEN #Z;CHAN	Links stream to channel
PRINT #Z	Outputs to specified stream
SAVE *;CHAN	Saves prog, data or code to B M or N channel only
VERIFY *;CHAN	
Channels:	data can be sent to various devices, your screen, ZX printer, microdrive file, another Spectrum on the same network and the RS232 interface. Data can be received from the following devices, the keyboard, a microdrive file, another Spectrum on the same network and the RS232 interface. These devices are known as channels
Streams:	the routine from one channel to another is called a stream, there are sixteen streams in the Spectrum system.





Dr. Neil Cryer looks at the Beeb's baby brother — the Electron micro from Acorn.



REVIEW ELECTRON

THE ELECTRON could not be made much smaller, yet still have a full-size keyboard. It feels solid: no flexing of the case, however hard you try.

It is light, yet feels as though it would stand up to very rough treatment. Also there are no holes for kids to poke things in; so it should go down well with schools. Although the Electron, at £199, is half the price of the BBC Micro it has a better keyboard.

The Electron comes complete with an ultra-large plug which houses the power supply. A thin, very long flexible lead connects it to a small socket on the right-hand side of the case. I find that I have to keep taking the knots out of this lead but there are no signs of trouble, after two months hard pounding. When you switch on the Electron makes a little beep which is reminiscent of the Beeb, but quieter, and a green light appears to the left of the keyboard.

On many occasions I have left the Electron on all day. Even in the tropical heat which we have been suffering recently, the power supply stayed quite cool. The Electron does get warm underneath but not hot.

The Electron plugs in to a normal television or to a colour or black and white monitor. Three suitable sockets are supplied on the left of the keyboard.

The cassette connection is via a 7 pin DIN socket to the left of the keyboard. The signals here are at the same levels and with the same connections as for the BBC Micro. This means that any cassette recorder set up for the Beeb will plug straight into the Electron and load with no problems. The motor on the tape recorder can be controlled from the Electron, just as with the BBC.

When plugged in, the Electron produces the welcoming message on the screen:

```
Acorn Electron
BASIC
```

There is also a little symbol of an acorn at the end of the first line. Then the Electron sits waiting for your words of wisdom, either via the keyboard or the cassette connector — also on the left.

The Basic on the Electron is debugged BBC Basic. It is particularly noteworthy in that it positively encourages clear, structured programming. You will find it quite effortless to remove Gotos from programs and replace with such things as Repeat — Until loops, For — Next loops and procedures. Thus, the long variable names and the multi-line procedures and functions mean that your programs should soon become super-clear. You should find that you — and even other people — will be able to understand how your programs work, even months later.

Comprehensive user guide

The Electron comes with a readable and comprehensive user guide. It is well written but would benefit from an index. Also provided is an introductory cassette — which holds a number of demonstrations and games, together with a language called turtle graphics. This language is used extensively in another handout with the Electron: a short book entitled *Start Programming with the Electron*.

Entering programs for the Electron is particularly simple for one-finger typists. The tops of the keys are marked with the usual typewriter symbols. However, on the fronts of

the keys, you see, clearly printed, a whole set of Basic words such as For on the F key and Next on the N key. If you put one finger on the function key and then press one of these keys, you get whatever Basic word is printed on its side. This special feature is called single-key entry. For most people, it will save a lot of time and typing errors and will clearly be a boon. Touch typists will probably prefer to type everything out in full, which is also allowed.

As an example of single-key entry, suppose you press the Func key together with the D key. You get the message Draw on the screen as part of the current program line or instruction. You can add to this by typing on the keyboard or, indeed, you could erase all or just part of it by pressing the Delete key, if you so desired.

The number keys double as user definable function keys. So, if you would prefer some other message to appear on the screen as a result of a single key entry, then you can program one of the number keys to cause this. Any of the number keys can be defined to do a variety of things. For example, a single key press could be made to enter the instructions Renumber and List one after the other. Some people using the Beeb, which has similar keys, have entered whole programs as a key definition. This can be particularly useful for editing with the various programs which have been published for such purposes. The number keys still give the numbers if pressed without the function key.

The screen display for the Electron is exactly as for the BBC Model B, with the exception that mode 7, the teletext mode, is

(continued on page 59)

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(continued from page 57)

not available. The Electron starts up in mode 6 with 25 lines of 40 characters to one screen. There are seven screen modes, numbered from 0 to 6, giving you from 20 to 80 characters per line, with either 25 or 32 lines per screen. Most of these modes allow mixed graphics and text in a number of colours. This is just the same as for the BBC Model B with from 2 to 16 colours, 8 steady hues and 8 flashing. The compromise between resolution and number of colours is the same as with the BBC Model B with mode 0 giving a resolution of 640 pixels by 256 in two colours while mode 2 gives 160 by 256 pixels in the 16 colours.

If you are not content with the standard character set of ASCII characters you can always define your own. By printing one character in one colour in the same place as another, you can also get multicoloured characters. Schemes for doing this for the Beeb have been published and they will work in exactly the same way for the Electron.

The Electron is slower than the Beeb — about 2/3rd the speed. There is no doubt that this must be a disappointment to the games software writers. Within the speed limitation, though, most games for the Beeb should still work on the Electron, provided they don't use mode 7 and don't try to scroll the screen sideways.

The Electron uses a massive ULA to do almost everything. This includes doing all that the 6845 video chip did in the Beeb. A impressive design this, going much the way Sir Sinclair did with his ZX breed. There is no screen blanking while loading from cassette, just a message giving the current block number being loaded and the program name.

You will see from the photograph of the inside of the Electron that there are very few chips. The main one which catches the eye is of course the ULA. There are 64 connections round this chip. When you think that the majority of the functions of the Beeb are also

performed by the Electron you realise also that the masses of chips inside the Beeb have been replaced by this one ULA.

The sound on the Electron only allows one channel at a time. This is disappointing and means that you cannot produce BBC-style music. You can program the envelope of a note in terms of how the frequency should vary while the note is sounding. It is a pity that you cannot also program the amplitude as with the Beeb. Although you can still get most of the usual laser gun and other games effects, you will not be able to produce the Beeb's imitations of various musical instruments.

The sound is produced on one of three tone channels with a fourth for noise. Each channel has been arranged with a different priority. A note on channel 1 will cut off a note already sounding on channel 2, whereas a note on channel 2 will have to wait for any sounding on channel 1.

Basic programs load into memory at address E00, just as for the Beeb, and the memory map for the Electron looks very similar to that of the Beeb. All the relevant VDU, *FX and machine code call points are implemented as for the Beeb. By relevant I mean that some of the specialised VDU options for the BBC Micro, which addressed the 6845 chip, cannot work on the Electron as the ULA now replaces the 6845. The codes for turning on and off the printer are a little superfluous without a printer connection, but when a printer expansion is added, then presumably these will work normally.

This brings me to the assembler. The Basic includes a 6502 assembler, allowing all 6502 op codes and addressing modes, and it can be addressed from within a Basic program, just as for the Beeb. This now includes the use of Equs for storing strings directly in memory, Equb, Equw and Equd for byte, word and double word storage — 4 bytes at a time. These are a very welcome addition for assembly language programmers and make such programming very much simpler. Macros will still have to be implemented via functions or procedures as described

elsewhere in the literature for the Beeb.

Now for the features that the unexpanded Electron does not have. These include sideways ROMs; so software such as View, Beebcalc and Beebpen will not work unless you are willing to unplug the Basic ROM and plug in the other ROM instead — which does seem to work. Even this will probably not be possible in the future, as the Basic and operating system chips sit on a little daughter board plugged into one socket. It would seem fairly clear that the intention is to replace the daughter board eventually by one 32K ROM.

According to Acorn, the following, which are well-known in connection with the Beeb, will be available for adding to the Electron externally:

- Disk interface
- Tube interface
- Econet interface
- RS423
- Printer port
- User port
- Analogue input
- Sideways ROMs

All these will presumably be connected via the 50 way connector on the back of the Electron. There are two brass bushed screw connectors either side which look purpose-made for the very substantial bolt-on expansion system which Acorn is already talking about. No details are available at the moment, but clearly there will be an immediate market for them.

CONCLUSIONS

- The Electron offers almost all of the same programming facilities as the BBC Microcomputer.
- There will be plenty of software for the Electron because of the close compatibility with the BBC Microcomputer.
- The Electron will be expandable.
- At £199 it is more expensive than some people had hoped. Nevertheless, it should sell well because of the reputation earned by its big brother. ■

MIDNIGHT SOMEWHERE on Terra. I was slumped on a contour couch watching the late show when a World Government announcement suddenly broke in: "All pilots with Gridrunner experience report to joystick port two immediately". It could mean only one thing — the droids were back! The other thing that it might mean, however, is that the *Your Computer* reviewer is space-happy.

As hardware, the Commodore 64 is certainly value for money. With its 64K of onboard RAM — of which 38K is available for Basic programs — a choice of 16 colours and two character sets including predefined graphics characters, plus a fully-fledged sound generator there is no doubt that it is a very appealing machine.

No messing about with 3K or 16K RAMpacks to avoid irritating out-of-memory errors. It plugs straight into your monitor — no PAL modulator required.

But as yet, the software houses seem to find the CBM 64 a positive *embarras de richesse*. Sadly one is left feeling here is a host of rapidly re-implemented Vic-20 programs aimed at cashing in quickly on the new



CBM 64

SOFTWARE

market. It also seems that the machine's larger memory is paradoxically a handicap, permitting lazy programming with extensive use of Basic routines which make many 1K ZX-81 games exciting by comparison.

Melbourne House's Super Cassettes A and B contain plenty of examples of the latter syndrome. The idea is sound. Two bumper-bundle games cassettes backed up by a separate Commodore 64 games book written by Clifford and Mark Ramshaw, containing the actual listings. As an introduction to computing it is reasonably sound. Any book written by two siblings so apple pie-eyed as to dedicate it to "Mom and Dad" cannot be all bad. But there is still room for improvement.

Documentation accompanying the cassettes is wrong in one or two places — always more dispiriting for a newcomer to computing than one long inured to the slings and arrows of outrageous fortune. On Super Cassette A many cats and dogs fell to their doom while I figured out which keys would actually move my catcher left and right. They are M to go right and Z to go left. Rest assured, Cliff and Mark have got it right in their book.

All in all, this is potentially a neat introduction to computing for someone who has never seen Luna Landa on a ZX-81, or who enjoys the rare pleasure of being able to lie back, relax, and have a cup of coffee in between launching occasional rocket salvos at some of the most cautious and diffident UFOs yet to attempt encroachment on Earth.

Audiogenic's Motor Mania brought a much-needed release from these psychological frustrations — a taste of the open road, albeit somewhat lacking in clear resolution. You participate in a cross-country car rally beset by drunken drivers, potholes, road patches, broken glass, logs, cross-traffic and

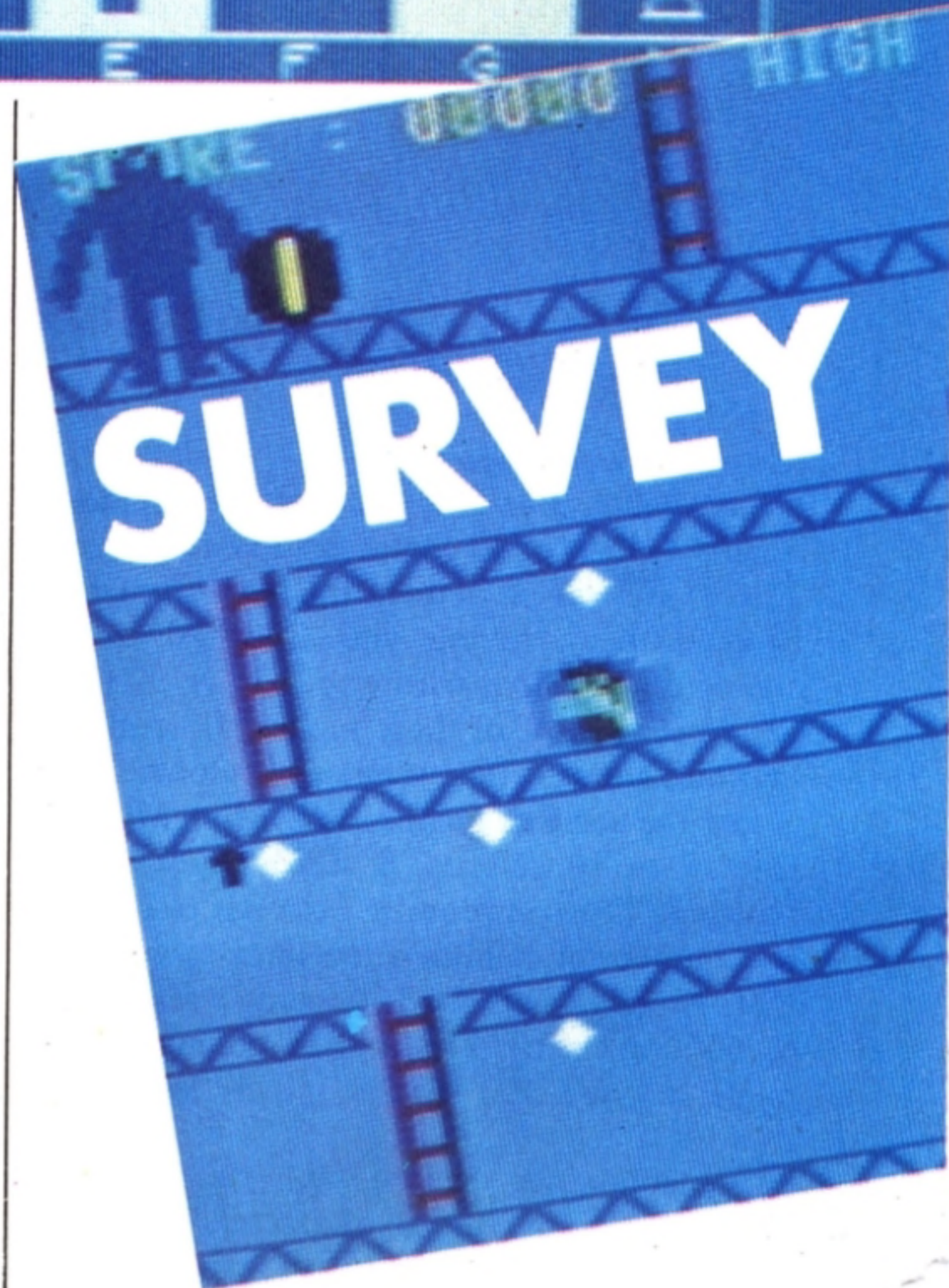
avalanches. It may not get BSM approval, but it is often the unexpected things that catch you out in a driving test. This is an absorbing test of your reactions but the instrumentation on the right hand side of the screen could surely have been presented with a better definition.

The other CBM 64 offering from Audiogenic is Renaissance, reportedly the full-function, computerised version of the age-old game of Othello. This is not my favourite game and I was still waiting eight minutes later for the computer to make its first move. I guess the CBM 64 is not over-keen on it either.

But it certainly did not get the hump about Attack of the Mutant Camels from Llamasoft. Written by Jeff Minter this at least sounds as though it might be original, although in another life those camels could well have been Imperial AT-AT walkers. Enough of this speculation. In a scenario that, had it been made into a SF movie in 1952 would probably be showing late nights in independent West End cinemas, the Earth is threatened by kidnapped camels, mutated into 90-foot high laser-spitting neutronium-shielded monsters.

The neutronium means that not only can the deadly dromedaries hand it out, they can also take it so you have to be pretty persistent as well as nippy when manoeuvring your rebel snowspeeder, sorry, spaceship around their nobbly knees. As you remorselessly pump your shells into them, they gradually change colour and disintegrate. At least it's better than cold-harpooning whales. Good graphics, remorseless sound effects, this is a fine shoot-'em-up game.

On a musical note, Irving Berlin once said to Cole Porter, "Listen, kid, take my advice, never hate a song that has sold a half-million copies". Likewise, you should never hate a



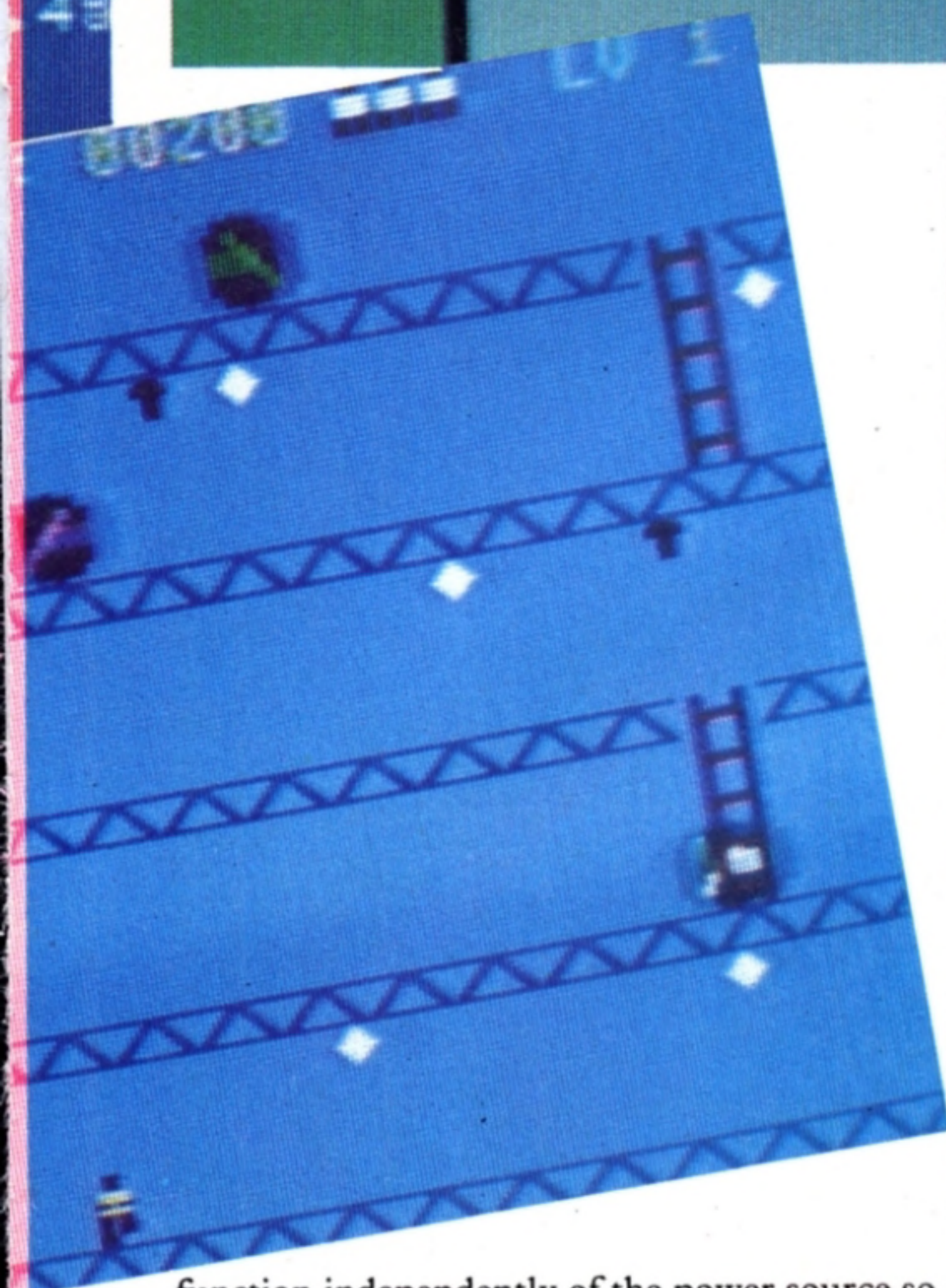
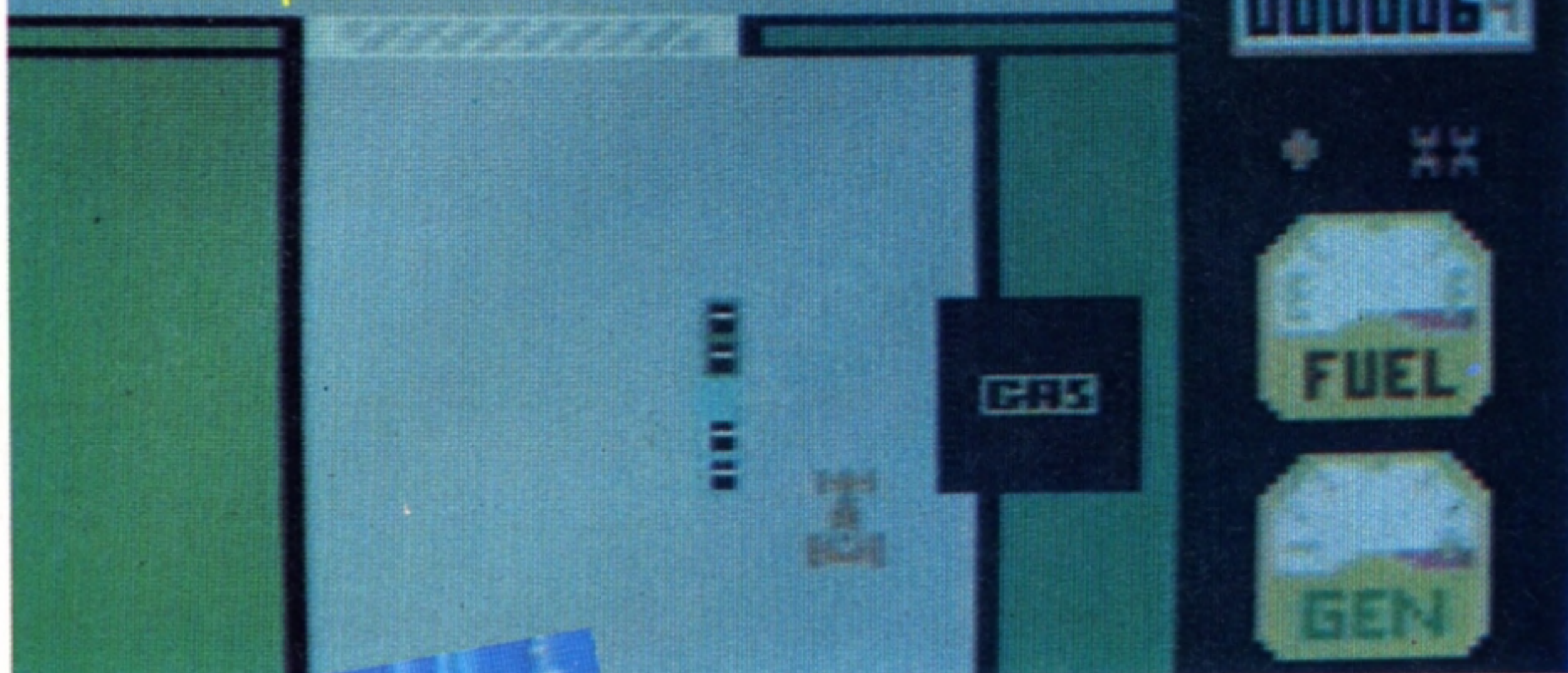
game that is number one in the U.S. popularity stakes. Such is the lot of Minter's best-known baby, Gridrunner, and its even faster offspring, Matrix, is no doubt following in its footsteps.

For those of you who did not serve in the first lot the infamous Grid Wars broke out when alien droids were discovered to be infesting the Earth's vital energy grid, sapping our power. As you probably gathered from the opening paragraph, I was right in the thick of those early battles, zipping around, zapping away with my plasma cannon at the linked droid segments. God, it was hell.

Back then, they traversed the grid horizontally. Pods would lodge on the grid gradually evolving until they hurled a bolt of energy downward. Then there were the X-Y zappers running along two sides of the grid. Their crossfire was what formed the pods, and was very likely to be the end of you if you got caught in its way. I still wake up in a cold sweat thinking about it.

But the return of the droids necessitated the formation of the crack Matrix squadron. Things are no easier. The new ship can

Skullships, duels with mutant camels, gets to grips with Zzyaxian Bugships and, perhaps worst of all, meets the dreaded pink monsters.



function independently of the power source so you are not just confined to the bottom seven lines of the grid. But now there is a fifth column. Watch out for the Snitch — the treacherous humanoid who runs along the top of the grid giving your position away.

How could anyone ally themselves with fiends who use such bizarre psychological warfare tactics? Sometimes camels appear and run down the grid. Argh. These tend to reduce your score. Deflexor waves make your projectiles ricochet off.

Worse, there are diagonal waves of droids — they are no longer confined to trundling back and forth across the matrix. Seven mystery bonuses can be scored, but it is down to you to find out how. Answers on the back of a £5 note to the Spaceman's Rest and Rehabilitation Centre, please.

After all this excitement, Laser Zone comes as a bit of a let-down. It is not particularly interesting visually or aurally. You have to manually co-ordinate two cannons on X and Y axes as Iratrain Skullships and Zzyaxian Bugships slide towards the sides of the screen. As the battle progresses rabbitrons, cosmicats and maniac mice show up, and some swear to seeing a camel.

However, the Iratian death satellite does make an entrance and, like the mutant camels,

it is coated in neutronium so it takes a bit of blasting since it is well-nigh impregnable.

Also well-nigh impregnable was the documentation for Anirog's 3D Time Trek. Perhaps starship captains really are smarter than spacefighter pilots. They need to be when the manual says things like press D for damage report when it means Ctrl D. You are given no clues as to how to get the galaxy map up. In fact it is M. Still this is apparently a prototype starship.

It is the usual Star Trek format but you get visual acquisition of Klingons flying towards you — a chance for a bit of shoot-'em-up after all that cerebral chart-reading. A competent implementation.

Interceptor Software's Star Trek does not have quite the same pleasures of interactive fighting, but it does give you an option of three types of game scenario: Klingon Invasion, Galactic War and the Final Frontier. The instructions and controls are wonderfully convoluted in the best tradition of Star Trek, but one feels that the sound potential has not been fully realised.

However I should confess that while testing this implementation I was dismissed from Starfleet for genocidal war crimes against an alien civilisation.

The company serves up a reasonable implementation of Scramble which, instead of that rather obscure manoeuvre of bombing fuel dumps to get more energy, has you destroying the forcefield projection dishes which stop the energy being beamed to you from the mothership. Much more plausible.

Interceptor's version of Pac-Man holds no surprises but is certainly a fast enjoyable game. The gulper was not very responsive to the joystick so I should stick to keys on this one. The monsters all have names like Zippy, Stilty and Gippy. There is one rather indolent blob called Chris. Zippy is pink and relentless — as devotees of previous software reviews will know, a pink monster is always very, very nasty.

There are nasty monsters in Panic 64, also from Interceptor. Standard Panic format — only instead of digging a hole in the masonry to cause the pursuing blobs to fall into oblivion, you have to place a time-bomb. This has the rather disconcerting result that they can still bump you off if you misjudge the length of your fuse. There is a fundamental logical flaw in the game insofar as it is quite possible to hang things up by blowing two or

three holes in various levels and then standing there while the monsters fall into a loop. This is a no-win situation. Apart from this it is well-implemented.

Crazy Kong — diamonds are a girl's best friend and your job is to collect a load of them at the same time as you are avoiding the barrels that the insane simian is rolling down from the top of his steel fortress where he is holding your girlfriend captive. Apart from assuming that you are male this program also assumes that you can figure out the keyboard version for yourself. Following the documentation, I was crushed to death several times pressing 3 to jump before I discovered you had to press the Ctrl key as well. As for jumping when you hit the spacebar forget it.

For the intellectuals among us, there is always what is described as the world's strongest chess program for home computers. Grand Master from Audiogenic is well-documented.

You can have response times from five seconds up to several days. The latter is for postal chess although, if your brain is as slow as mine, it is quite a useful option. But since the original version of this game will run perfectly happily on a Vic-20, perhaps we can look forward to even stronger programs in the future.

In conclusion, it must be said that the CBM 64 is not yet well served by the software houses, who seem to be in a creative rut. Documentation on many games is atrocious which is one reason that utility programs have not been reviewed here.

So we must look to the future. People who have seen the Chromasonics 3D football game for the CBM 64 at micro shows will believe that great things are possible although development problems made it impossible for them to let us review the game. The advent of Simons Basic will further enhance the machine's capabilities — and the first software house to really use this facility or, indeed, any of the real 64 potential will make a lot of money. But for now, if you are thinking of buying a CBM 64, my advice is don't. In a few months time there will be good software around, and the machine will be cheaper. ■

Company	Program	Price
Anirog 8 High Street Horley Surrey	3D Time Trek	£5.95
Audiogenic PO Box 88 Reading Berkshire	Renaissance Motor Mania Grand Master	£8.95 £8.95 £17.95
Interceptor Lindon House The Green Tadley Hampshire	Panic 64 Scramble Spriteman Crazy Kong Star Trek	£7.00 £7.00 £7.00 £7.00 £7.00
Llamasoft 49 Mount Pleasant Tadley Hampshire	Attack of the Mutant Camels Gridrunner Matrix Laser Zone	£7.50 £5.00 £7.50 £7.50
Melbourne House 380 Station Road Harrow Middlesex HA1 2DE	Super Cassette A Super Cassette B	£6.95 £6.95

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ADVENTURES

DO YOU LIKE travelling to exciting places and making interesting new acquaintances — some of them human? Can you hold your own in a tussle with a troll or when battling with Beelzebub? Do you have a good sense of direction and an ability to cope with the odd bad spell — as in wizardry, not weather? When did you last tackle a turret and win the unspoken — and best left undescribed — thanks of a beautiful princess?

If you answer “Eh?” to these questions, then it is definitely time that you found your way into computer adventure gaming; and rather than spend £25 or more for a decent ROM cartridge, or something less for what is often something very much less, maybe you ought to know just how easy it is to devise your own adventure storylines and develop them into simple programs that will give you and others hours of fascination, triumph and exasperation.

Unlike the genesis of Space Invaders — it was, you may remember, that dear little game

of ping-pong played on an oscilloscope which Willy Higinbotham, an American physicist, invented as a lab entertainment in 1958 — the

```
1 REM CROWN OF ATLANTIS
2 REM GRID & COMPASS MINI ADVENTURE
3 REM COPYRIGHT JOHN FANSLY 1983
4 PRINT"ICLF SCR3"
5 REM SET TERRAIN
10 DIM L(10,10)
15 REM MINE RISK
20 M=2
25 REM ZERO GRID
30 FOR I=1 TO 10 FOR J=1 TO 10
40 L(I,J)=0
50 NEXT J,I
55 REM SITE RUINS
60 FOR I=1 TO 6
70 READ R,C
80 L(R,C)=1
90 NEXT I
95 REM SITE CORAL
100 FOR I=1 TO 6
110 READ R,C
120 L(R,C)=2
130 NEXT I
135 REM SITE FEATURES
140 L(2,3)=3 REM FISH
150 L(3,9)=4 REM WHALE
160 L(5,7)=5 REM WRECK
170 L(6,1)=6 REM SPIRE
174 L(7,4)=7 REM SQUID
175 L(8,8)=8 REM ANCHOR
190 L(6,5)=9 REM CROWN
200 REM FIRST POSITION
210 R=INT(RND(1)*10)+1
220 C=INT(RND(1)*10)+1
230 REM MAIN LOOP
```

(listing continued on next page)

birth of the computer adventure game or CAG is badly documented. But it undoubtedly grew from some idle programmer's search in the mid-1970s for a text-orientated pastime that he could play when nobody was looking — loosely based on the Dungeons and Dragons concept that was sweeping the United States.

Like Higinbotham's ping-pong game, the early CAGs were a kind of cult entertainment that only the knowing tab-collarers at IBM and Sperry Univac could play — until the day in 1978 when one of their number, by the name of Scott Adams, sent his mainframe buddies into peals of laughter by revealing his intention to scale down an adventure to fit his TRS-80 with all of 16K.

The rest, as they say, is history. Scott Adams went on to become the author of some wholly original CAGs whose themes have provided the stuff of plagiarism for pale imitators — but his Adventureland, Pirate's Cove, Mystery

(continued on next page)

(continued from previous page)

Fun House and The Count are among the classic originals.

All are well worth playing as examples of inventive and imaginative programming before you try your own hand. Adams is also rightly credited with inventing the puppet, but more about that later.

So what exactly is adventure gaming? In essence, it is a mapped conundrum; an unfolding story, often having a mythical theme, in which you, the player, find yourself in different locations and presented at each with a choice of actions and/or objects, with the ultimate objective of finding hidden treasure, rescuing an imprisoned maiden, slaying a dragon, or whatever.

For example, Adventureland — the Scott Adams title that started it all, and now available in ROM cartridges for many popular micros — involves a trek through increasingly hostile countryside in a quest for hidden treasures. Pirate's Cove, another Adams scenario, takes the player from a London flat on to three other locations; it introduces some particularly strong characters and plenty of humour. The Count sets the challenge of finding a way through the corridors and cellars of Dracula's castle with the aim of staking him out before sunset.

Lateral or 3D routes

From these brief descriptions, you will understand that the routes or playing boards of most CAGs are either lateral, in that they cover several different locations — for example, from a museum to the shores of a secret island, and from there to a magic waterfall — or three-dimensional in the sense that they require the player not only to travel from one room or chamber to an adjacent one, but also to explore different levels of the same building, structure or tomb — such as in House of the Seven Gables or Pyramid of Doom.

Three-dimensional adventures can be very much more complex to conceptualise and flow-chart — and on-screen improvisation is not recommended when writing CAG programs — so novices will probably find it easier to cut their teeth on devising a conventional lateral scenario to begin with.

Adventure writers would argue that one of the best reasons for trying your skills at programming this kind of material is that it involves, in an attractive way, all the main building blocks of Basic; variables and string handling, string-chopping and concatenation, randomising, If-Then and loop logic, screen presentation, and — if your micro runs to even limited colour and sound — the optimisation of simple graphics and sound effects.

In short, adventure-game writing can serve as a valuable refresher course in good programming manners — and this also applies, of course, even if you are already into machine code.

There are some notable exceptions to the rule — Melbourne House's innovative Hobbit is one of them — but most CAGs usually sacrifice, for purposes of memory economy, the highly colourful and animated screens of action games such as Frogger or Pac-Man in favour of a screen display comprising simply two or three sentences providing information and inviting or suggesting a response. For example, one screen might read:

The castle gate is locked.
The ground is soft.
There is a spade nearby.
It is almost inevitable that you would type in:
Take spade
and hit Return. The screen might then prompt:
Now what?
and you may command,
Dig ground.

The pairing of a verb with a noun to make a character string that matches, somewhere along the data line, with those verbs and nouns you have seeded in the program is usually, but not always, the essence of all but the simplest adventure writing.

It merely exploits your micro's ability to interpret and act upon the Left\$, Right\$, Mid\$ and Val functions, and this technique will be described in detail in the second part of this article, in next month's issue.

For the moment, it would not be a bad idea, as part of beginning to visualise your own adventure, to start jotting down in a notebook a selection of those short, useful verbs. Here are some of the most popular to get you thinking: North, south, east, west, up, down, go, enter,

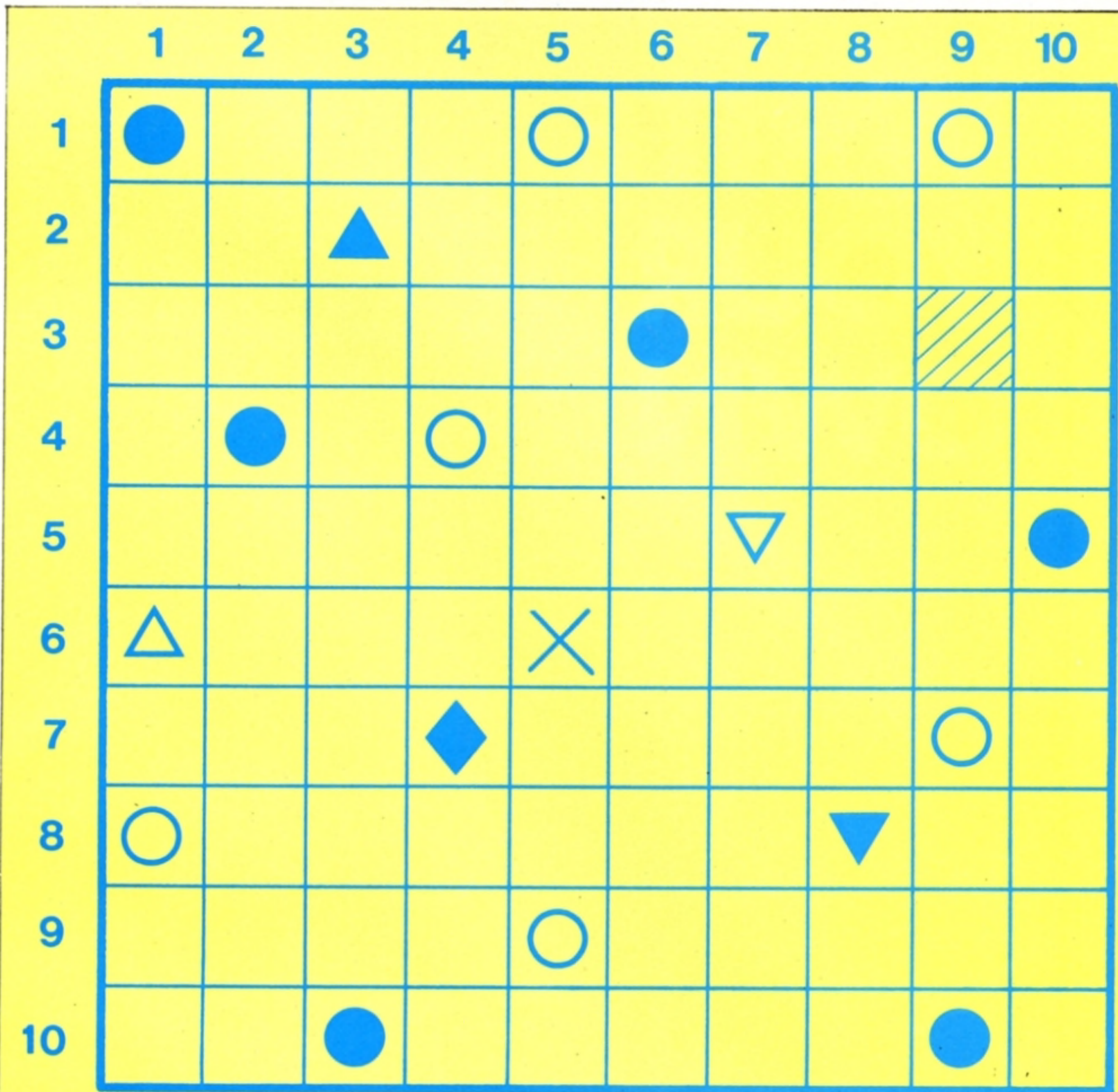
open, close, push, pull, get, take, move, steal, unlock, drop, give, trap, pocket, hide, follow, eat, swallow, drink, chase, capture, hit, break, attack, slay, look, examine, help.

These are fairly mundane verbs. More imaginative choices may in turn suggest novel actions and confrontations to work into your plot. Anyway, all of them are self-explanatory, with the possible exception of the last three.

The Look instruction serves as a request for more information about a particular location, if any exists. Examine performs the same function in respect of an object. A typical

The variables.

L	Location
M	Mine
RO	Row number of octopus
CO	Column number of octopus
R	Row number
C	Column number
SQ	Square currently occupied
RS	Row number stored
CS	Column number stored
M\$	Move
RR	Mine random risk



(listing continued from previous page)

```

240 PRINT"CDIYOU ARE DIVING "
250 SO=L(R,C)+1
260 ON SO GOSUB 270,280,285,290,300,310,320,330,340
GOTO 360
270 PRINT"CDIJOVER CLEAR SEABED." RETURN
280 PRINT"CDIJOVER STONE RUINS" RETURN
285 PRINT"CDIJOVER PINK CORAL." RETURN
290 PRINT"CDIINEAR A SCHOOL OF FISH." RETURN
300 PRINT"CDIINEAR A WHALE SKELETON." RETURN
310 PRINT"CDIINEAR A SHIPWRECK." RETURN
320 PRINT"CDIABOVE THE SPIRE OF"
321 PRINT"ATLANTIS" RETURN
330 PRINT"CDIINEAR A GIANT SQUID" RETURN
340 PRINT"CDIINEAR AN OLD ANCHOR" RETURN
350 REM YOUR MOVE
360 RS=R CS=C
365 PRINT"CDIHOW WILL YOU SWIM"
366 PRINT"N,S,E OR W?"
370 GET M$ IF M$="" THEN 370
380 IF M$="N" THEN R=R-1 GOSUB 480

```

```

390 IF M$="S" THEN R=R+1 GOSUB 480
400 IF M$="E" THEN C=C+1 GOSUB 440
410 IF M$="W" THEN C=C-1 GOSUB 440
420 GOTO 530
430 REM COMPASS ERROR
440 SO=INT(RND(1)*10)+1
450 IF SO>2 THEN RETURN
460 IF SO=1 THEN C=C+1 RETURN
470 C=C-1 RETURN
480 SO=INT(RND(1)*10)+1
490 IF SO>2 THEN RETURN
500 IF SO=1 THEN R=R+1 RETURN
510 R=R-1 RETURN
512 REM OCTOPUS RISK
514 RO=INT(RND(1)*10)+1
515 CO=INT(RND(1)*10)+1
516 IF R=RO AND C=CO THEN PRINT "CDIJOSON THE OCTO
PUS HAS GOT YOU!!!" GOTO 64
520 REM FOUND CROWN?

```

Figure 1.

```

530 IF RCI
540 IF L(R
"VE FOU
GOTO 640
560 GOTO 2
570 PRINT"
580 RR=INT
590 IF RR<
600
610 PRINT"R
620 PRINT"R
640 PRINT"O
550 GET G$
660 IF G$="
670 PRINT"O
685 PRINT"O
690 END
700 DATA 1,
710 DATA 1,

```

● Stone ruins

○ Pink coral

▲ Shoal of fish

/// Whale skeleton

▽ Shipwreck

△ Spire of Atlantis

✕ Crown of Atlantis

◆ Giant squid

▼ Anchor

```
OR R010 OR C01 OR C0 10 THEN 570
C0=9 THEN PRINT "LCL SCR1LUCKY DIVER! YOU
ND THE TREASURE!!!"
```

```
0
CD13YOU ARE OFF-COURSE!"
RND(1)*10)+1
R THEN PRINT"CD13YOU'VE BLOWN IT!" GOTO
```

```
PRINT"CD13YOU NOW RUN A HIGH"
ISK OF EXPLODING THE"
INE - WATCH OUT!!!" GOTO 365
CD13ANOTHER GAME? Y,N?"
IF G#"" THEN 650
" THEN PRINT"CLR SCR1" GOTO 210
CLR SCR1CD23THANKS FOR DIVING."
CD13CHEER TO ME HEARTY!"
```

```
1,3,6,4,2,5,10,10,3,10,9 REM RUIH
5,1,3,4,4,7,9,8,1,3,5 REM CORAL
```

negative response to either might be, from a puppet, I see nothing special.

Finally, Help is a real cry from the heart, to be used only when the player is really stuck. Use of this prompt at any point will usually call up on-screen a clue that will help to make a right next move.

Incidentally, those of you fortunate enough to number a voice synthesiser among your peripherals will readily appreciate the scope for its utilisation as an adjunct to, or substitute for, screen text displays.

The use of puppets

A word about the puppet mentioned earlier. When Scott Adams had completed his first few adventures, he discovered that some players found the practice of having to communicate through a keyboard with what they anyway perceived as a characterless, soulless chip rather too sterile an experience by half.

So the clever fellow hit on the idea of the puppet; an extension of the player — and maybe even of his *alter ego*. The puppet

addresses his master, the player, in the first person, so a puppet version of the last example might read instead:

The castle gate before me is locked.
The ground I'm standing on is soft.
I can see a spade nearby.
What shall I do?

Because the language of puppet screens needs to be a little more human, and can thus be rather text-heavy and byte-hungry by comparison with conventional screens, such programs need to be even more economy-conscious.

But puppets are definitely more fun, especially if you give your puppet character strengths and weaknesses of his own, and have him talking back and complaining, C-3PO fashion, about the mess you have got him into when you have made the wrong response.

Just in case all this talk of verb/noun twinning, data matches, string chopping and insolent puppets puts you off adventuring any further, there are some perfectly respectable and highly entertaining commercial adventures which make use of one or two much simpler techniques — the option menu and C and G, or compass and grid. You can learn them easily and write programs utilising them very simply.

Compass and grid

With the option menu, at every significant stage in the adventure the player is presented with, say, three choices of action — he may pick just one of them. Using again the earlier example, the screen might read:

The castle gate is locked.
The ground is soft.
There is a spade nearby.
Will you

1. Turn back?
2. Take spade and dig?
3. Look around?

The player would respond by simply touching key 1, 2 or 3. In this case, option 1 might get him eaten by the monster he did not notice standing behind him. Option 2 could result in the screen announcing that he has dug his way into a patch of quicksand; while option 3 may reveal that there is also a ladder nearby which will let him climb *over* the gate.

One of the big advantages of the option menu, relying as it does on single-key responses such as 1, 2 or 3, or Y or N, is that, of course, it utilises Get rather than Input statements and thus avoids the need for the player to hit Return after keying in every response — a particular advantage when children are playing.

As we can all be clumsy or careless at times, it is an easy matter to program in a mug-trap that will flash up an error message on-screen and let the Run dwell until a correct key is pressed.

The second, even more fundamental technique and one that can be used together with the menu option, is that of the compass and grid — it is really just a crib from the old battleships game using squared-off paper that some of us played as kids. With this, you actually have a little map of the main location or locations — the cellar of a haunted house, say, or a treasure island.

This hard copy is copied into the program with the use of a simple two-dimensional array — the number of rows in the grid being one of the Dim subscripts, the number of columns being the other — together with read and data statements. The program also holds the



locations on the grid of any special features and, of course, that of the object or whatever is the subject of the search.

Because C and G programs are so simple, even the meanest memory has plenty of bytes left over for embellishments such as graphics and sound effects. There is no reason, for example, why your hard copy of the map should not instead be interpreted as a colourful screen display; while winds can howl and monsters can growl as the game proceeds.

When you hit Run, one of the program's randomising lines will place you on a square in the grid. You do not know which one, but make an educated guess from the clue shown on the screen and from comparing this with your copy of the map.

Each screen will invite you to move N, S, E or W — meaning one square up, one down, one left, or one right. Simply touching one of those four letters on the keyboard completes your move and generates the next screen display — which you hope will contain another clue to your new location and its proximity to the treasure square.

It would hardly be fair to compare a C and G game with a full-blown Scott Adams adventure, but it does make an excellent starting point — an infinitely variable challenge to which you can add all kinds of bells and whistles in the form of interesting graphics, animation and sound — rather than fill up your RAM with overdressed routines or wordy screen displays that may be called into use only once every nth game.

Apart from that, byte-busting adventures that can go on for hours may be all right for the Dungeons and Dragons freaks, who I imagine sprinkle energy pods on their cornflakes, but for newcomers to the genre, and especially kids, their frontiers of boredom are likely to be reached within about 10 minutes.

Further, it always makes sense to start simple — and devising and writing a C and G program allows you to do just that. It will be by no means a wasted exercise, because virtually every new trick you learn and mistake you make will serve as an invaluable template of experience when you come to tackle the writing of a CAG proper.

So for now, you will find here the listing for The Crown of Atlantis — a compass and grid program that will start you playing, and thinking, along the right lines. Although written for a Vic-20/Commodore 64, it will run on computers using almost any other dialect of Basic

(continued on page 72)

REPTILES
SPECTRUM



Monsters
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FAR AWAY AND LONG ago in the mists of the past, or so the legend goes, the Boffin grew weary of the needs of his faceless master. The boffin craved the excitement of strange landscapes and exotic beasts, the challenge of using logic and luck to succeed in a complex and perilous task. So he created the Adventure, transforming himself from a weedy nine stone computerkid to a musclebound warrior or an ancient wizard or a

bold spaceman. Or whatever he wanted. So the legend goes.

The reality is that there is now a plethora of adventure games available for the micro-owners, all descended from this original idea. They all claim to offer you, "in the comfort of your own armchair", the thrill of entering a fantasy world which you can only get out of alive by using a combination of logic and magic.

Adventures require rather more tenacity than the usual game since they are rarely solved in one sitting. The player also needs a high frustration threshold as one of the principles of adventures seems to be W C Fields' motto "Never give a sucker an even break"; you might go back the way you came, but you will not necessarily get back to where you came from.

Level 9's Colossal Adventure, for the BBC

Peter Connor finds a few gold nuggets in the software swamp

ADVENTURE SC



micro, shows how a good adventure should work. It claims to be based on the original mainframe game and, if the loading time from tape is anything to go by, this may well be true. It is worth the wait though. This program demonstrates one of the essentials of an enjoyable adventure; an interesting and detailed topography. There is a great variety of locations and objects, from the picnic area with some tempting sandwiches — should I eat them? — to the room where you find a gilded cage and the magic, but inpronouncable, word XY22Y.

The object of the game, as with so many adventures, is to find and collect a number of hidden treasures. This in itself sounds rather uninteresting, but in Colossal Adventure it can become a compulsive quest as frustration is outweighed by desire to crack the puzzles.

There is even a touch of sarcasm in some of the computer's comments. If, in a blank moment, you decide to kill something — a fancy that seems to come up on most adventure players at some point — you will be admonished "Are you mad? You should only kill your enemies". Suitably chastened, you try once again to summon enough brain-power to find those elusive treasures.

Lack of inventiveness

Also for the BBC, Acornsoft's Countdown to Doom is, unfortunately, not up to the Level 9 level. Anyone who has played Acornsoft's Philosophers Quest, a game of comparable quality to Colossal Adventure, will be very disappointed. There is a lack of inventiveness and wit in Countdown to Doom which makes it just a little bit dull.

Here, you are an astronaut in your crashed spaceship. Your task is to find the wherewithal to repair it and make good your escape. Initially you encounter a blocked door, the

answer to which seems to be the explosive and fuse you see lying on the floor. Once you are outside you encounter a depressingly familiar adventure game landscape; the evil-smelling swamp, the steeply-climbing track, the jungle, the glacier. It is all so uninspiring that you do not really care where you end up next.

Sphinx Adventure, also from Acornsoft, is rather better, but not much. The locations are familiar, but are described in slightly more detail. There is the forest, the sorcerer's lair, the sword chamber, and so on. One or two odd characters make an appearance, such as the axe-throwing dwarf and the bearded pirate, but do not really justify their presence.

There is quite a choice of adventures for the Spectrum, most of them rather uninteresting. One of the better games, but dull nonetheless, is Bug Bytes' The Castle. In this you have been condemned by a nasty old wizard to collect six treasures or remain forever in his domain. Although the locations are not described in any great detail, they are reasonably interesting. There is, for instance, a Black Chapel in which stands a statue of Medusa; a passing acquaintance with Greek mythology should be enough to make you wary of petrification.

Diamond Trail, from Gilsoft, is another tolerable game for the Spectrum. The drawback with this one is the in-joke location; you are in Spectransia and must find the Sinclive Diamond. Once you have got over that the game itself is not bad. The locations are quite interesting — police HQ, a junk shop, a tube station — and there is even a touch of wit; when you are hungry you are tricked into entering the command Eat Cat, to which the computer replies "I wouldn't touch it with a barge pole, let alone eat it!" It is not a great belly-laugh, but in the land of adventures you have to make the most of everything.



Magic Mountain and Pharaoh's Tomb, both from Phipps Associates for the Spectrum, introduce a graphic element into the adventure; each new location is represented by a drawing made before your very eyes. Sadly, the finished drawings are of little interest and take so long to complete that they would have been better forgotten.

You must gather treasure

In other respects, these two programs are straightforward adventures. In Magic Mountain you seek the mystical scroll of wisdom hidden deep in the chambers of the mountain. Fortunately, there are some pleasing moments on the trail. At one point you encounter a dwarf with a stall whose sign says "Scythes sold and Fortunes told". My advice is to buy something and ask a question, despite his disgusting habit of cleaning his nails with a curiously shaped dagger.

Pharaoh's Tomb is a very similar game. This time you have to gather treasure at an oasis. When you want to push a rock, you may

(continued on page 70)

SOFTWARE SURVEY

COMPANY	PROGRAM	MACHINE	PRICE	COMPANY	PROGRAM	MACHINE	PRICE
Level 9 Computing Dept Y, 229 Hughenden Road, High Wycombe, Bucks, HP13 5PG.	Colossal Adventure	BBC	£9.90	Gilsoft, 30 Hawthorn Road, Barry, South Glamorgan	Diamond Trail	Spectrum	£4.95
	Jerusalem Adventure	Dragon	£4.75		Phipps Associates, 99 East Street, Epsom, Surrey.	Magic Mountain	Spectrum
	Williamsburg Adventure	Dragon	£4.75	W. B. Soft, 191 Seamer Road, Scarborough, N. Yorks.	Pharaohs Tomb	Spectrum	£4.95
	Holy Grail	Oric	£6.95		Adventure 1	Spectrum	£5.95
Microdeal, 41 Truro Road, St. Austell, Cornwall.				Anirot, 26 Balcombe Gardens, Horley, Surrey.	Zok's Kingdom	Vic 20 16K	£5.95
Severn Software, 5 School Crescent, Lydney, Glos.				Wintersoft, 30 Uplands Park Road, Enfield, Middx.	Pharaoh's Tomb	Vic 20 16K	£5.95
Pase Software, 213/215 Market Street, Hyde, Cheshire.	Adventureland	Oric	£4.99		The Ring of Darkness	Dragon	£10.00
Bug Byte, Mulberry House, Canning Place, Liverpool.	The Castle	Spectrum	£6.95	Acornsoft, 4a Market Hill, Cambridge, CB2 3NJ.	Countdown to Doom	BBC	£9.95
					Sphinx Adventure	BBC	£9.95



The intense heat has ignited the matches - they have all burnt!
What shall I do now?

(continued from previous page)

be asked "Are you sure you want me to risk having a hernia?"

W B Soft's Adventure 1 is an exceptionally dull program in which Steve Silver has to find and repair his captured spacecraft. There is no detail to the locations, for example, "I'm in a forest". OK, but what kind of forest? I would like to know. Not a hint of humour enlivens this boring game.

Zok's Kingdom and Pharaoh's tomb, two games for the 16K Vic from Anirog, are examples of a recent development in adventure games. Both have a mixture of the usual adventure features and tasks where you have to move your graphically represented player to avoid, or fight with, enemies.

According to Anirog's blurb, these games test your speed and ability to think and plan under pressure. If you had the body and brain of a tortoise they might just do that. By trying to combine the action game and the adventure game Anirog have fallen heavily between stools; what you get is a dull adventure with dull graphics.

Wintersoft's The Ring of Darkness, for the Dragon, suffers from similar drawbacks. It starts like a conventional adventure; "Four Rings the Ancient Wizards forged and cast against the earth. One ring the evil sage called forth from the void . . ." and so on, in sub-Tolkein view. You can choose your character - elf, dwarf, or human - and the skill you want - thief, warrior or wizard.

Then, however, the format changes. A map appears, on which your position is represented by a Z. This you manoeuvre with the cursor keys. With tedious frequency you encounter bandits and evil rangers with whom you must either fight or flee. Little else seems to happen in this so-called enchanted land; you need none of the usual adventure skills of logic or lateral thinking.

Adventures in Jerusalem

Microdeal has a series of adventures on the market for the Dragon. Jerusalem Adventure is set in the ancient biblical city and is, thankfully, a conventional adventure game. No graphics here. You have to find nine hidden treasures while out-manoeuvring Arabs that will kill you if you enter their quarter of the city. This is an unpleasantly racist note in what is otherwise a laudable attempt to put some new life into the adventure game location. You are advised to be religious at the Western Wall. Pray a lot. Say magic words. Some of the objects encountered are lost through a lack of convincing detail of the locations.

The Dragon, of course, is closely modelled

on the American Tandy Colour Computer, and this transatlantic influence is prominent in Microdeal's programs. Williamsburg Adventure will be mystifying to most British players since it relies on a knowledge of, and interest in, American history.

If you do not know or do not care what William and Mary College or Scribner's are then you are not going to have much fun playing this game. This is unfortunate, because Williamsburg Adventure has its moments of wit and interest. But if software houses are going to market American products, they might at least ensure that they are comprehensible to the old world consumer.

Severn Software's Holy Grail for the Oric barely qualifies for inclusion in this review. You are, supposedly, looking for the Holy Grail in the castle. This latter, though, appears on the screen as a grid around which you can move horizontally or vertically. You might get bonuses of gold or wound salve, or you might meet zombies, orcs or wolves; never fight, just run. There is no detail or challenge in this game.

Adventureland is a Pase Software game for the Oric and is, happily, more like the real thing. Although there is again a lack of detail, the game is at least cryptic and intriguing, requiring a certain amount of deductive skill to achieve anything. There are magic words and undiscovered creatures - be careful, they might bite.

Getting a raw deal

You might think that, given the limitations of the machine, it would not be worth writing an adventure for the ZX-81. Bug-Byte has, however, produced the not very originally named Adventure. You must look for the missing three pieces of the Royal Sceptre, put them together and return them to the Emperor. The game is, of course, fairly rudimentary, but when you bear in mind what some of the games for more sophisticated machines are like, it is not so bad.

At the moment adventure game fans are getting a raw deal. Of the programs reviewed here the only one that is wholly admirable is Level 9's Colossal Adventure. Too many games rely on a borrowed scenario without trying to add any original elements. Why so many dwarves and wizards? Why not an adventure set contemporary Britain with cops and robbers or skinheads and greasers? Why not just about anything but the boring old forest, swamp and dungeon? Shabby graphic displays do nothing to better a dull game. What software houses must find now is writers with a little imagination.

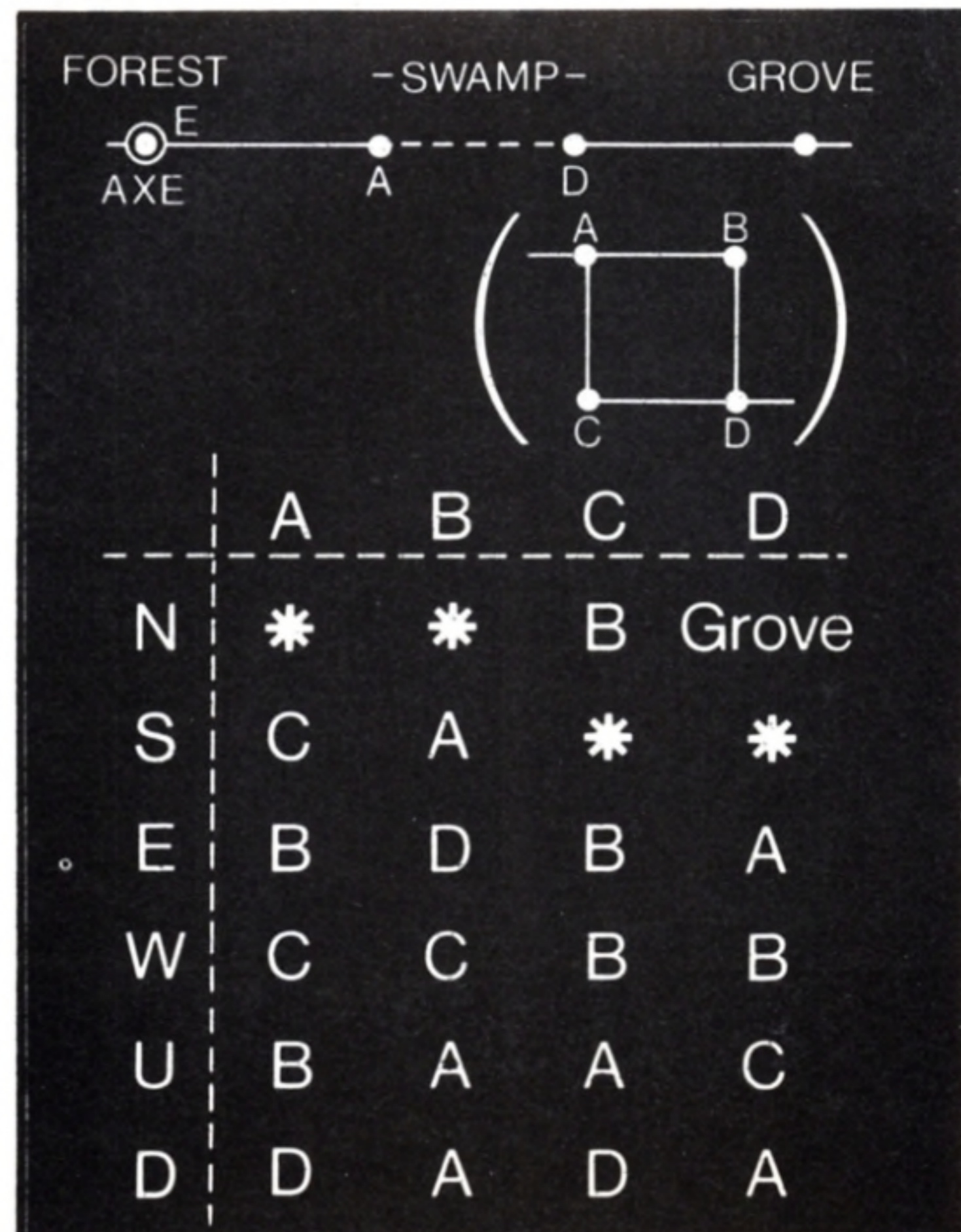
HOW ADVEI

YOU HAVE BEEN STARING at the screen since midnight, the rest of the house has gone quiet and there is nothing but the sound of your black coffee going cold for company. That and the dragon of course.

The dragon's been sitting there eyeing you from behind the television. It has been a steady war of attrition since you stumbled into the cave about an hour ago; before then you did not know about being driven back by scorching flames. You have learnt a lot in the last hour. First you tried throwing in the onion in the hope it would cry out its flames - brilliant! . . . it swallowed the onion . . . The sword then, the sword! . . . it swallowed the sword too. . . . So now you are sitting here glaring across a keyboard at a dragon that has systematically eaten everything you ever owned and wishing that you'd never agreed to swap your old invaders cassette.

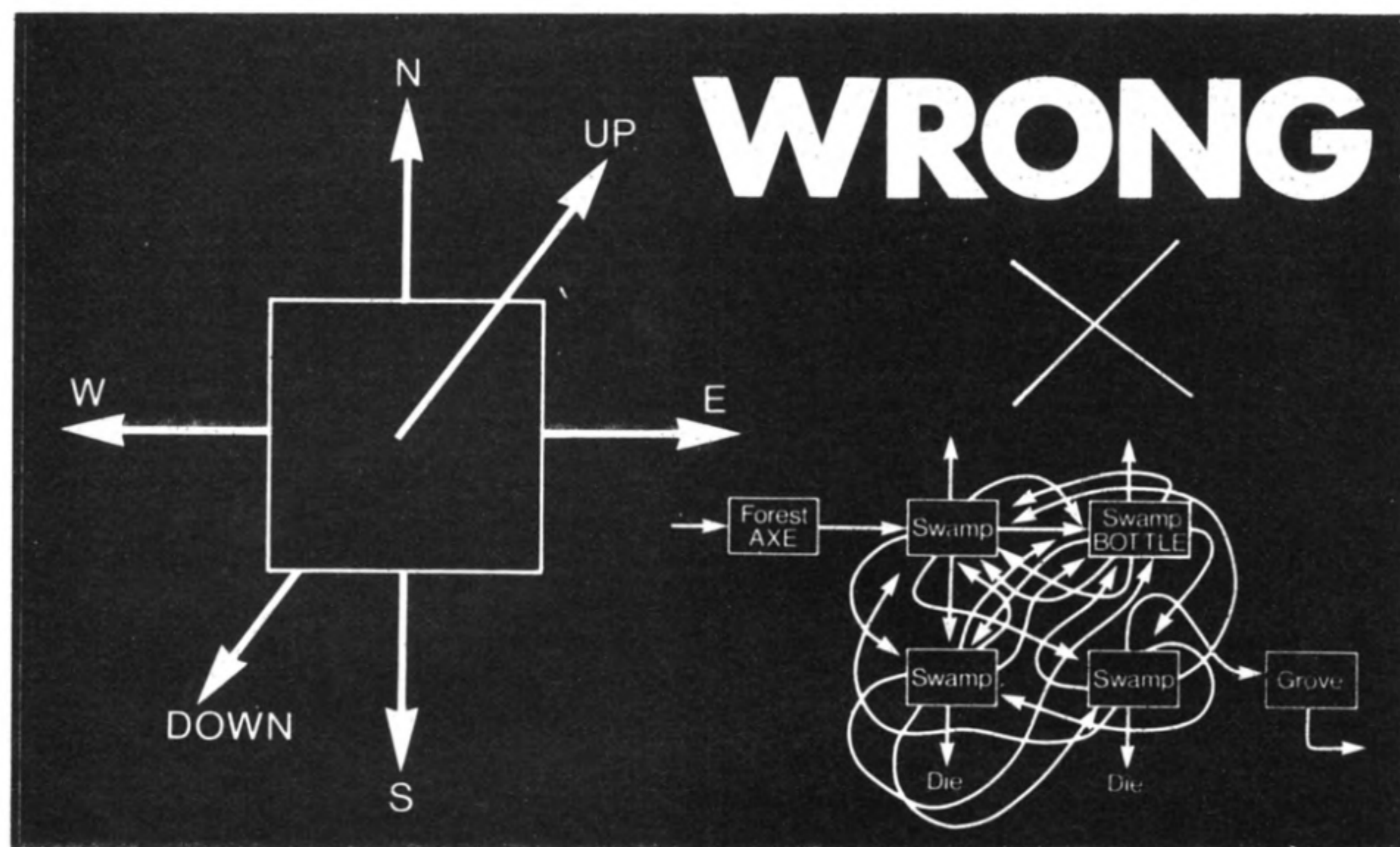
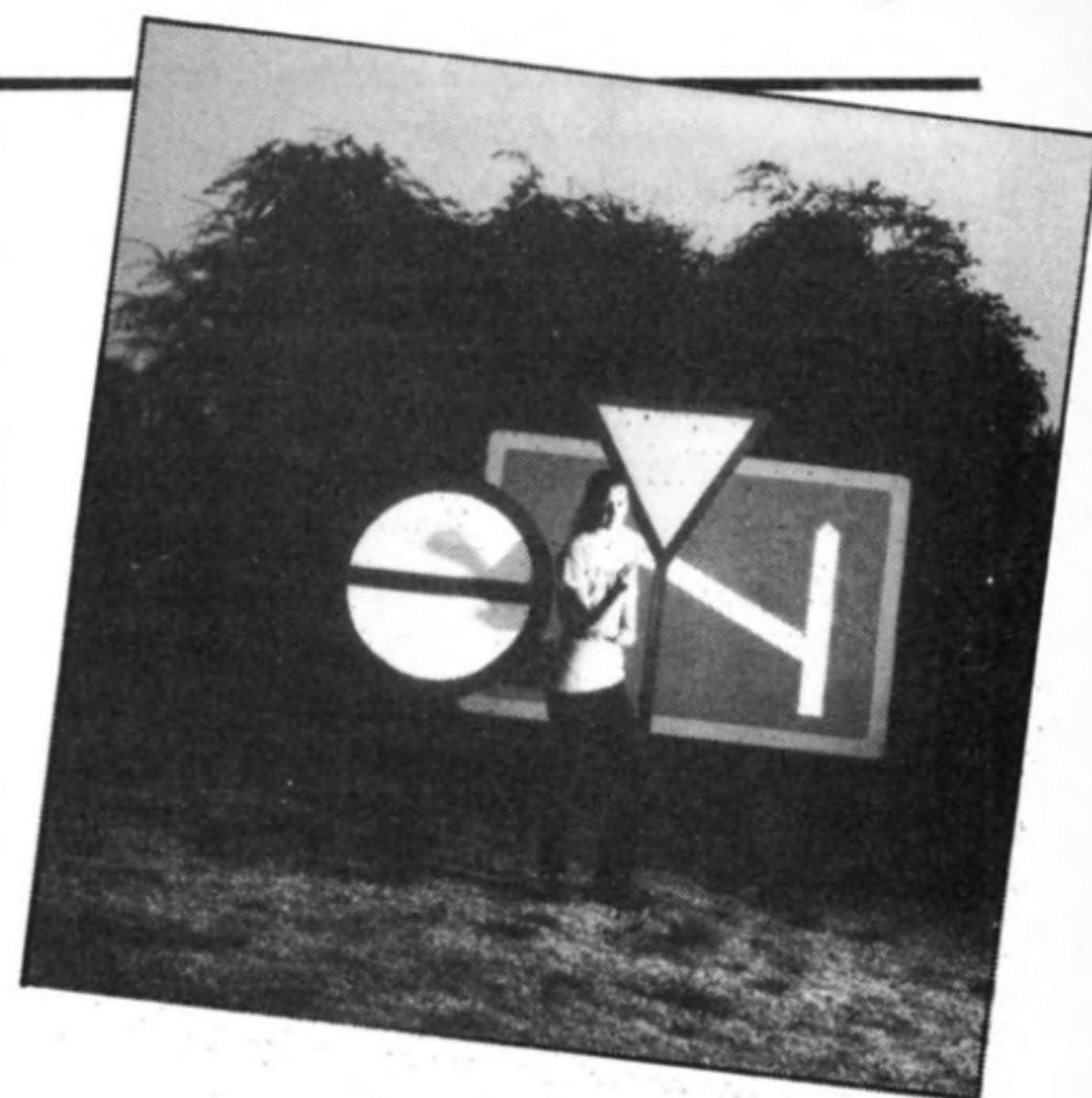
Dealing with the dragons

If someone had not got bored with batch processing on a mainframe it might never have started, but once the first adventure game had been written there was no stopping them or the growing band of addicts patiently awaiting the latest releases. Since they first became available, adventures on micros have become both better at understanding what you type, and larger and more varied in their scope. At the same time writers have been inventing



HOW TO SOLVE ADVENTURE PUZZLES

Nigel Hubbard explains how to cheat the monsters and recover the treasure.



ever more tortuous puzzles to perplex you. So you are quite likely to come to a halt faced with something that you are convinced is impossible. Especially if it is your first adventure.

This is where the fun starts though. When you have woken the house after getting past your first tricky obstacle you'll know what I mean. So that you do not have to learn everything the hard way here are a few tips for dealing with dragons and their friends.

If you often find it hard to retrace your steps, you get lost a lot and you have not got a clue what this place you are wandering around looks like then you are probably a bad mapper. You get them everywhere scribbling on the back of their seventh envelope and scrabbling around for the map of the last room they got killed in. To be a good mapper start by getting some nice big bits of paper, keeping one or two for the total map and the rest for working out what this new area you have just found really looks like. You may need to redraw the whole thing or jump to another part of the sheet when you reach the edge but, obvious though it sounds, you will be surprised how much more fun it is not having to search for scraps of paper and knowing exactly how the whole adventure fits together. If you get into these good habits you will race along until suddenly you are lost in a steaming swamp and directions do not seem to make sense anymore.

Maze mapping rules

At first mazes can seem pretty pointless. You go east then west but you are not back where you started. So you panic and go up, down, in, out, north, east, south and west and you are still lost in a steaming swamp. Do not give up though, there are quite a few tricks to save you from starting at the beginning again and sloshing through by trial and error; and when you have finally cracked the maze it looks very impressive to be able to run through it without giving it a thought.

The first rule is to walk into the maze carrying as much as you can. Wear everything that the computer will let you, put things in your pockets if possible and then just start

dropping one thing in every new place you come to. Now instead of everywhere looking the same you will start to be able to get your bearings. Going east from the bottle takes you to the elephant, going west, to the Lamborghini and so on. If you are drawing a map of a maze like this then you will soon see that there is no point in trying to make sense of the directions themselves. Just put a dot for each location and simply draw one line between each pair that are connected writing the relevant directions at each end. This will be good enough to get you through most mazes.

The real puzzles

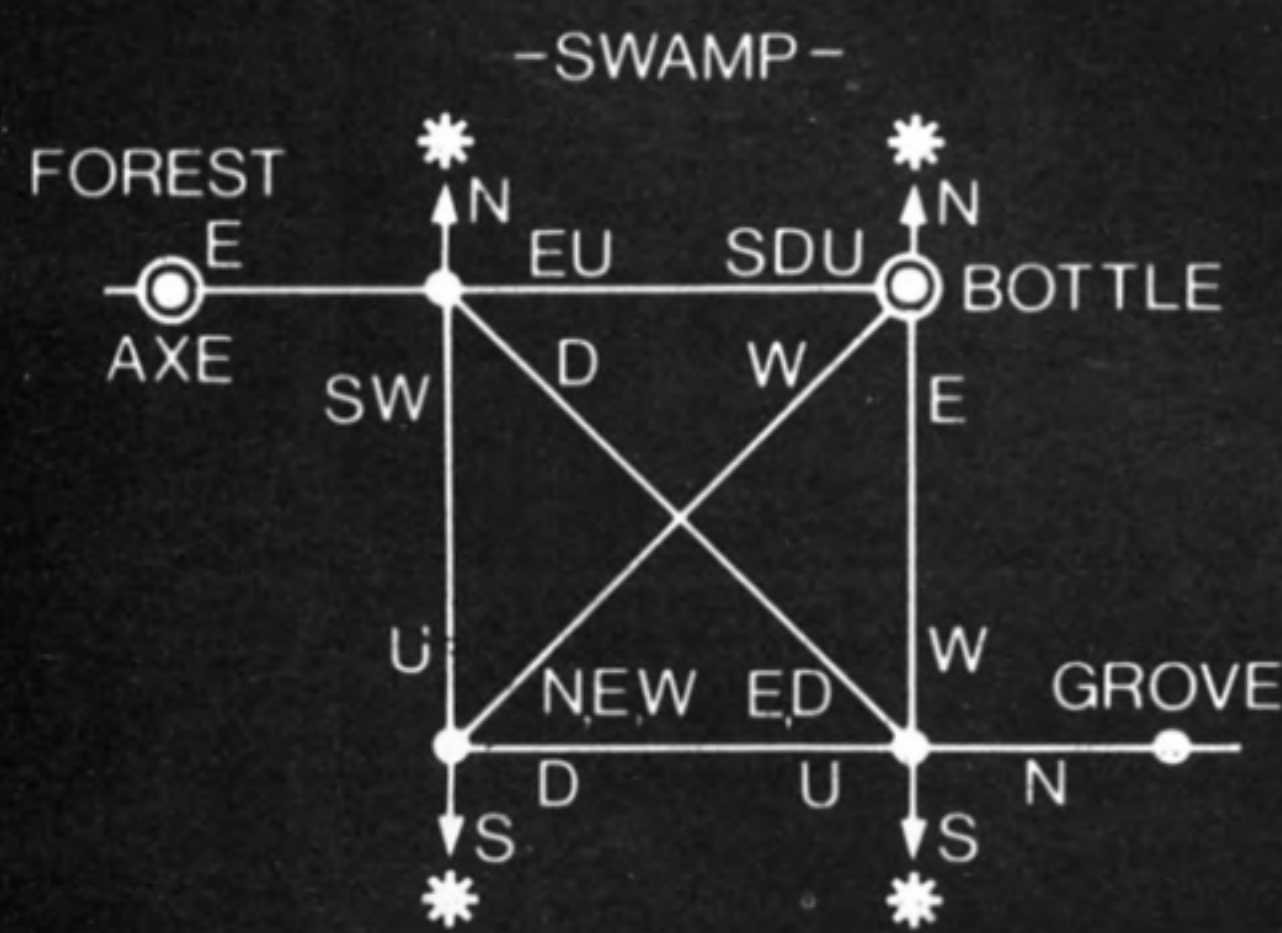
In some mazes a simple map is not enough though, as before long it will start to look decidedly wayward and weblike. The trick here is to draw up a table similar to the one shown here. For each new location that you find, add a new column to the table headed by the object that you have dropped there. Then down the side list all the directions in which it is possible to go. Now it is a simple task to systematically fill in the body of the table with the names of the objects that you reach by going up from the sword say.

You are now in the same position as everybody else when you arrive at the swamp. Beware though! As always, things will never be quite as they seem. The writer may have decided that people are getting a little too complacent and the first thing you will notice is that the golden ball that you were sure you dropped around here has been stolen. Then things start getting tough again and if when you drop your first object it sinks into the swamp with a gurgle and disappears, take a deep breath because you are on your own.

Now that mazes seem altogether less threatening we get back once again to the dragons of adventure games: the real puzzles that they were set for in the first place. If you are expecting me to tell you what to do when your spaceship is rushing towards an asteroid or when your schooner is about to be marooned off Easter Island or simply why you keep dying when you attack the Dobermann Pinscher then you have the wrong idea already. You are the one who is going to solve all of those problems and more before you have finished. If you have a mental block then go and look round another part of the adventure or better still go and make yourself a cup of coffee. Then you will be ready to attack

(continued on page 72)

RIGHT



(continued from previous page)

the problem properly.

Now write down everything you have come across that you cannot explain yet: things and places, remembering that even an object that you have used and broken, such as a bottle that you have had to smash, may have needed to be used elsewhere as well. Now in any good adventure there will be some reason for everything being there. The chewing gum may not look much use, but what about the old dragon, everyone knows you can't swallow chewing gum. So go off and try it, you never know; and even if it does not work it will have been a good idea. Making connections like this, often the obscurer the better, is the key to finding the way to a solution.

If the adventure has been written properly then even if you have finally solved something by trial and error, you ought to look back with a wry smile and wonder why it had not been obvious to you a few minutes ago. A bit of inspiration now and then should be all that you will need. If the overall game or a particular section reminds you of a book then it is worth looking it out and reading what really happened in *The Hunting of the Snark* or how Pooh beat Piglet at poohsticks. Perhaps it suggests a film or even a painting; you never know what the writer might have been alluding to and an extra clue never does any harm. As with the objects that you find lying around do not assume that the description of a room is just there for setting the scene. You never know when someone is trying to tell you something. Keep an eye open for any bad puns as well.

Many games available

If you follow all those ideas you should stay on the move for a bit longer than before and not mind so much when you get stuck. Luckily for us all, there are a lot of games available. In general, with adventures even more so than with video games, you get what you pay for. Buy adventures that exploit the full memory of your machine, that way not only do you get more to explore but the computer is more likely to understand you when you try to do something. Generally the more work that has been put into writing the game the more fun it will be to play; a good one is worth the extra.

Finally, the future is written on disc. The opportunities for writing adventures with plenty to explore, describing everything you see in detail and being able to make the computer far more intelligent at understanding commands, are just too tempting. Never believe people who tell you that they are saving up for drives because they are fed up with loading programs from cassette; the true reason is that they have their eyes on some disc adventures.

Acornsoft among other companies will be expanding its range of adventures to include large games especially written for disc. With the added scope for original ideas that these will offer, the next few years should be an exciting time for players. I hope, at least, you have been tempted now either to start adventuring or to go back and solve the puzzle that had you beaten. You will be glad you did. Good luck with the dragons! ■

WRITE YOUR OWN

(continued from page 65)

with only minor alterations. For example, almost every micro has a slightly different syntax for creating random numbers, and that used in this listing may not work with a Dragon or Spectrum.

To help you get this program up and running fast, the program does not include lines of text on how to play — you may like to add these when you adapt the program and jazz it up with your own refinements. But this is what the game is all about.

In *The Crown of Atlantis*, you are an aqua-lung diver searching a particular area of the Atlantic's seabed beyond the Straits of Gibraltar, for the legendary underwater city and its greatest treasure. You have memorised the grid map shown in figure 1 and therefore know the locations of coral growths, ruins and other notable features, such as a whale's skeleton and the famed Spire of Atlantis, by which you can reckon your position.

You move around the seabed by touching one of the keys N, S, E or W. You will be told whether you are in a clear area or close to one of the features that will help you to get your bearings, and then be invited to move again.

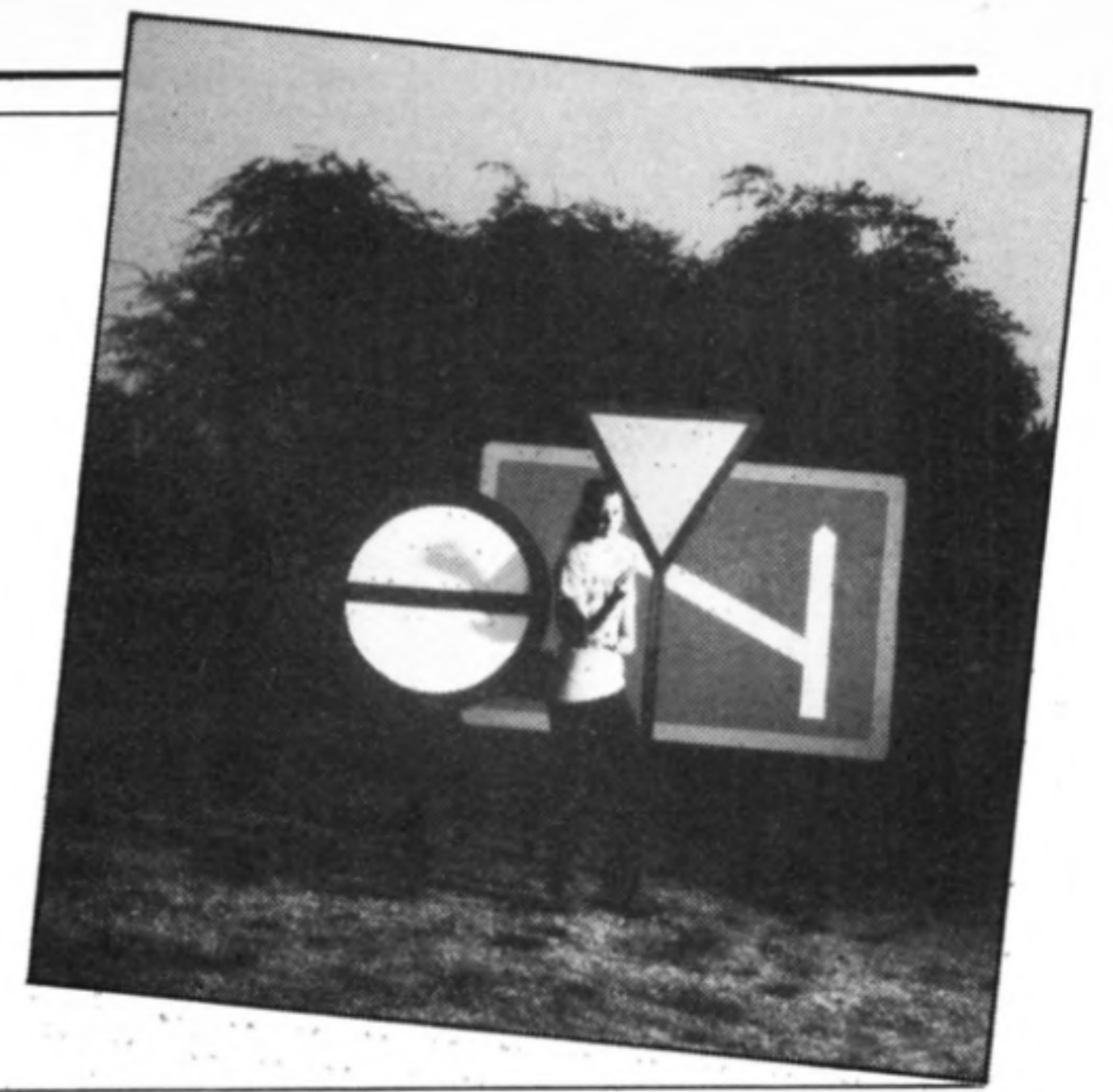
There are, however, three obstacles to the completion of your mission. First, the strong currents may force you in a direction slightly different from that which you intended; this is a random factor and so you can never be completely sure that you are not, in fact, where you hope you are!

Secondly, equally random is the hiding place of a particularly irascible example of the *Octopus Vulgaris*, who will draw you into his ring of tentacles in seconds and from which there is no escape.

Thirdly, you risk overshooting the area of seabed represented by your 10 by 10 square grid, in which case the screen will show a warning to this effect.

But if you do overshoot there is, initially, a one-in-five chance that you will swim straight into an unexploded wartime mine, which will at least provide the octopus with a convenience food. The second time you overshoot, the risk of blowing your mine precisely doubles. The third time you make this error, you have virtually no chance of surviving.

By studying the program, you should be able to work out how to increase, decrease or vary these hazards and factors, or introduce new random elements. If you have a TI\$ or time function, then you can add to the diver's problems by giving him only a fixed amount of



time to find the treasure before his air supply runs out and so on.

You may also choose to make the whole game much more difficult by randomising the location of the actual treasure — just check out the program logic to identify which lines you need to change and how.

When you feel that you have exhausted all the possibilities which *The Crown of Atlantis* offers your micro, why not get to work dreaming up your own idea, using this first program as the bare bones of your own imagination and ingenuity.

Line 10 first reserves a 10 by 10 array representing the playing grid; in future the first subscript in the brackets will signify the row number and the second subscript, the column number.

Lines 30 to 50 fill all 100 positions with an initial value of 0, representing a blank square, or clear seabed. Lines 60 to 90 award a value of 1 to each of the stone ruin locations specified by the data in line 700 — where, for example, the second pair indicates that a stone ruin has to be sited in row 3, column 6. Lines 100 to 130 serve the same purpose in respect of the coral locations, drawing on the data in line 710.

Lines 140 to 190 fill seven more locations, one subscript pair at a time, with other features, including the location of the treasure.

Lines 200 to 210 generate a random row and column for the grid position occupied at the beginning of each game. Screen prompts are triggered by lines 240 to 340, depending on the L or location value acted upon in line 260. Line 360 stores the current row and column for the next update.

Get rather than Input is used in lines 370 to 410 to avoid having to hit Return after choosing every turn. Incidentally, touching any other key will, on the Vic-20 anyway, simply freeze the move and not crash the Run.

The routine in lines 440 to 510 introduces a randomly-occurring deviation in the direction of movement, plus or minus one square. Lines 514 to 516 generate a random position for the octopus and compare this with the player's current location. The off-course message is triggered by line 530 — and may in turn trip lines 580 and 590. Otherwise, line 600 amends the risk factor for the mine set in line 24.

Alternatively, line 540 detects if the current position matches that of the Crown of Atlantis and if so, branches to the play option in line 640. Or if the current position is neutral, line 560 loops back to line 240 for another turn. ■

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AMBASSADOR

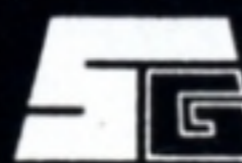
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The Hobbit. More of an experience

"After a very short time I found that 'The Hobbit' was becoming almost a way of life rather than a game, and so when I finished it for the first time I was partly sad because I felt that all the fun and adventure had ended, but I was wrong. Even now I am discovering new things about the game and feel that it will be some time until all of its secrets are revealed to me."

MR. J. STERN, Herts

"I have at last received your 'Hobbit' program and would like to congratulate you on its excellence. After four days of sweat and tears I have completed only 37.5 per cent of the adventure. The program has lived up completely to expectations, and there is no doubt about it being the best production for the Spectrum to date. You have surpassed all others with this program."

"A lot of fun."
COMPUTER

"The excellent graphics... The exciting difference is that it is possible to converse with all the characters, meet and ask their names, and I can recommend this game to Tolkien, or novel authors."
POPULAR COMPUTING

"I am writing to compliment your 'Hobbit'. I think it is one of the most ingenious programs I have had the pleasure to use. It has kept me stumped for months. I think the effort that has gone into writing a program like this must have been enormous. The effects are brilliant to say the least."

JEREMY CHESTER

"The Hobbit takes first place in the new category of quality and value for money."
SINCLAIR USER

"Locations in the Adventure are superb. The excellent graphics. We have completed 7.5 per cent of the adventure. The graphics are superb. The varied plot is superior to any other for the Spectrum."
COMPUTER

"The Misty Mountains game, this game is a great pleasure to play and is No. 1 for fun and excitement."
GORDON DEMPSTER, Scotland

"Thanks again for an excellent game in 'The Hobbit'. I feel I have really got my money's worth out of playing time. Congratulations!"
MR. P. RUSHTON, Leeds

"The most powerful computer game yet invented."
COMPUTER WEEKLY

"Within my circle of friends this game has become something of an obsession. We meet every Friday night at someone's house and spend 3-4 hours on 'The Hobbit'. Friday night would not be the same without 'The Hobbit'."
CHRISTINE VERCHILD, Wilts

"One new Adventure game stands head and shoulders above the rest. It alone almost provides you with a good enough reason to buy a 48K Sinclair Spectrum. Not only does The Hobbit produce drawings of the main scenes, but it also understands proper sentences rather than pairs of words for its commands. It comes with a copy of J.R.R. Tolkien's classic book of the same name. It is the program with the most detailed and best written documentation ever."

WHAT MICRO

"This is an impressively packaged Adventure game which makes good use of the Spectrum's colour graphics. They have not only produced one of the best games for the Spectrum, but given everyone else a lesson in good game design."

PRACTICAL COM

"I am the owner of a copy of 'The Hobbit' which is wonderful entertainment, and very challenging. I have other tapes and publications of yours, all of which are excellent."

MR. D.J. BURGH, Kent

"Having received the most excellent piece of programming I have ever seen, we have had no social life whatsoever. 'The Hobbit' has been dominating our lives since January and many nights have been spent until 3 o'clock trying to conquer it."

SIMON ROGERS, Avon

"I have recently purchased your excellent adventure game 'The Hobbit'. This game has greatly enhanced by the use of colour graphics, its availability in the Spectrum, and the originality of having to play it."



Melbourne House

than a program:

"In my software library, your program 'The Hobbit' takes first place."

DAVID MAXWELL, London

"I am the proud owner of your excellent program 'The Hobbit' and have already spent many happy, restful, relaxing hours trying to solve its puzzles."

"I congratulate you on a most impressive package. I have enjoyed it immensely. I must thank you for producing such a clever product, it was worth every penny of the purchase price."

MRS. J. RYCRAFT, Northampton

"The Hobbit' is a beautifully constructed, frantically-maddening, tortuous, gloriously inconsistent, thoroughly spooky adventure - far better than I could have hoped for and certainly the finest of the dozen or so adventure programs I have. In short, I congratulate the four who sweated for a year and a half to concoct such a super result."

MR. PETER JONES, South Glam

"Nothing is certain in this Adventure, but uncertainty! Add to this the brilliant graphics that are used to describe many of the locations and we have an Adventure that is going to become a classic for the Spectrum."

POPULAR COMPUTING WEEKLY

"I am writing to congratulate you on your excellent program 'The Hobbit' for the Spectrum. I wake up in the middle of the night with an idea and have to load the adventure to try it out."

MR. PHILLIP DARLING, Suffolk

"A most impressive package."

DAILY EXPRESS

"...we are not eating food...we are losing sleep...and it's great! I reckon you can guess why. We are lost, completely and utterly lost, in the Hobbit program."

MR. JOHN HARRIS, Kuwait

"...one of the most complex games for the Sinclair machines I have seen..."

SINCLAIR USER

"I bought for my ZX Spectrum the program you supply called 'The Hobbit'. It is an excellent program and worth the money. I find it very realistic. The graphics are accurate. It sticks to the book, which is a very compelling feature."

JOHN CASSIDY, Essex

"Having recently purchased a Sinclair Spectrum I decided to buy 'The Hobbit' since I have been doing a literature project based on 'The Hobbit' with my class of 10 and 11 year old children. Over the last 10 weeks the children, having read the book, have been attempting the program with my assistance. Let me congratulate you on a most entertaining program."

MR. K. REID AND CLASS 7, Nottingham

"... more of an experience than a program!"

POPULAR COMPUTING WEEKLY

"... the most unique factor of this program is that the user instructs the computer in completely ordinary English sentences. The Hobbit program is capable of very sophisticated communications..."

ZX COMPUTING

"I purchased 'The Hobbit' not long ago and since then I have been engrossed in the game, and I'm beginning to think no-one wants to talk to me as all I talk about is my adventures in, 'The Hobbit'."

DAVID ROWLEY, Stoke-on-Trent

"The use of graphics is one of the features which makes The Hobbit special. The addition of graphics as good as these adds a whole new dimension to the Adventure. It is certainly a marvellous game, which should set the standard for future Spectrum adventures."

ZX COMPUTING



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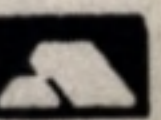
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LIFE IS HARD at the spaceport, especially if you are the pilot of Balloon Hopper. You control a cargo hopper, a small flying transporter capable of lifting one piece of cargo at a time. The hopper is used to load the spacecraft at the top of the screen with any 10 pieces of cargo that can be found at the bottom. Each piece of cargo loaded scores either 50 or 100 points and there is a bonus of 200 points for each ship fully loaded.

Sounds easy? Unfortunately you have picked the wrong day to be the pilot because there is an air-day nearby and stray balloons keep floating in your way and hindering your job.

Each time you hit a balloon the explosion caused by the hydrogen-filled balloons weakens the hopper's force-field. You can survive four hits before your hopper can no longer function.

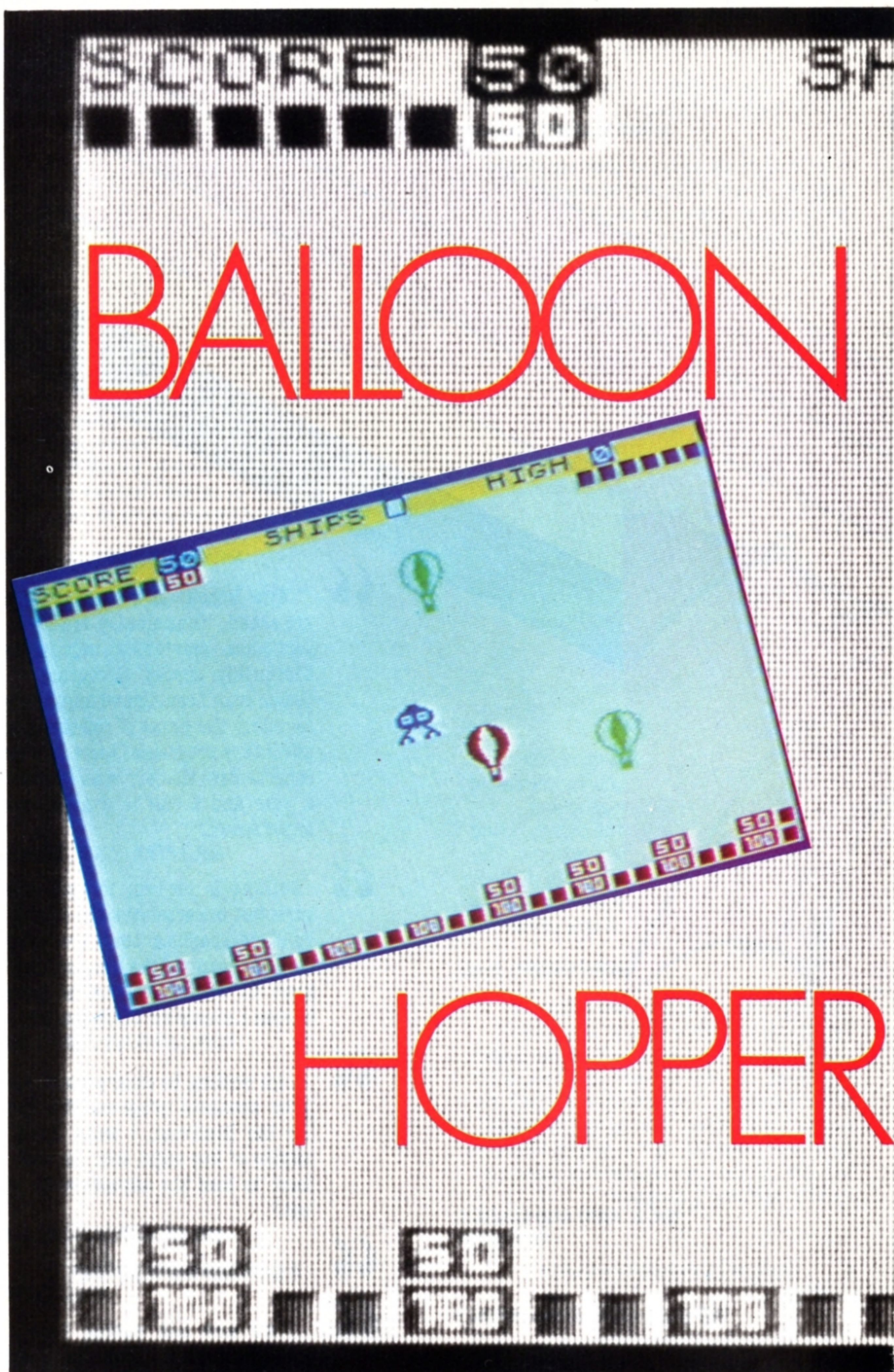
Initially there are three balloons in your way; this increases by one for each starship you load. You move using the cursor keys and you must land on top of a piece of cargo to pick it up. To drop the cargo you simply take it to the top of the screen avoiding the balloons on the way.

The program is written in Basic but contains a machine code routine which is Poked into memory from data statements when the program is first run. The machine code routine moves the balloons making the game much faster than if just using a Basic program. As the data is Poked into the memory the computer compiles a check-sum so, if you have made a typing error in the data statements, the computer should notice and warn you.

The program uses all 21 user-definable graphic characters and these are shown here. Graphics G to L do not appear in the listing because they are only used in the machine code, not the Basic part. The program is set out as follows:

- 5-110 Set up game
- 200-350 Set up screen
- 400-490 Main game routine
- 500-530 Cargo dropped
- 1000-1070 Life lost and end of game
- 2000-2090 Instructions
- 5000-5030 Poking in machine code and UDGs
- 7000-7095 UDG data
- 8000-8050 Machine-code data

To have more balloons at the start change Let Z=3 in line 100 to whatever you want. To have more than one extra balloon appear after a ship is fully loaded change line 527. To change the control keys change line 410.



```

5 CLEAR 30999
10 LET hs=0
30 BRIGHT 0: OVER 0: INVERSE 0
FLASH 0
40 GO SUB 5000
50 GO SUB 2000
90 PAPER 7: INK 1: BORDER 1: C
Ls
100 LET s=0: LET z=3
110 LET z$="■■■■■"
200 LET t$="": DIM a$(3,32)
310 LET a$(2)=""■■■ ■■■ ■■■ ■■■
50 50 50 50
220 LET a$(3)=""■■■ ■■■ ■■■ ■■■ ■■■ ■■■ ■■■ ■■■ ■■■ ■■■
■■■■■ ■■■■■ ■■■■■ ■■■■■ ■■■■■ ■■■■■ ■■■■■ ■■■■■
221 CLS: LET a=32000
225 FOR f=1 TO z
230 POKE a,INT (RND*29+1)
240 POKE a+1,INT (RND*13+4)
250 POKE a+2,INT (RND*3-1)
260 POKE a+3,INT (RND*3-1)
270 IF NOT PEEK (a+2) AND NOT PEEK (a+3) THEN GO TO 250
280 POKE a+4,INT (RND*3+2)+128*(RND*.5)
290 POKE a+5,255
300 LET a=a+5
305 NEXT f
310 PRINT AT 0,0: PAPER 6:"SCORE";TAB 11;"SHIPS";TAB 22;"HIGH";
.1,2: LET bs=cs: LET fl=1: LET a$(y-15,x+1 TO x+2)=""
490 IF fl=0 OR y<>2 THEN GO TO 400
500 LET fl=0: PRINT AT 4,x;" "
505 BEEP .01,4: BEEP .1,0: BEEP .01,2
510 LET t=t+bs: PRINT AT 1,6; INK 2;t$
515 LET s=s+50+50*(bs(1)="■"): PRINT AT 0,6: INVERSE 1;s
520 IF LEN t$<20 THEN GO TO 400
525 FOR f=1 TO 3: FOR g=0 TO 4: BEEP .05,g: NEXT g: NEXT f
526 LET s=s+200
527 LET z=z+1
530 GO TO 200
1000 LET z$=z$(2 TO ): PRINT AT 0,17: INVERSE 1;z$: INK 6;" "
1005 FOR f=5 TO 0 STEP -1: FOR g=0 TO 3: BEEP .07,g+f: NEXT g: N
EXT f
1010 BEEP .1,-1: BEEP .1,-1
1030 IF z$(">") THEN GO TO 221
1040 BEEP 1,0: BEEP 1,-1: BEEP 1,-2
1050 IF s>hs THEN LET hs=s: PRINT AT 0,27: FLASH 1;hs
1060 PRINT AT 10,0: FLASH 1;"GAME OVER "": INVERSE 1;"GANE OVER " "

```

IPS

HIGH

3



On September 19, 1783 curious spectators, including Benjamin Franklin, watched the launch of the first passenger-carrying balloon. There were three passengers — a sheep, a duck and a rooster and the flight lasted for eight minutes. To celebrate the 200th anniversary of this aeronautical feat Andrew Foord details a simple arcade-type game for the Spectrum.



	=MN =OP		=AB =CD =EF
	=QR =U		=ST

User-defined graphics.



```

1070 FOR f=1 TO 500: NEXT f: GO
TO 50
2000 BORDER 7: PAPER 7: INK 0: C
L5
2010 PRINT "This is:" TAB 9; INK
2; "BALLOON HOPPER" TAB 9; INK
1; "© Andrew Foord"
2020 PRINT " In this game you m
ust load the spacecraft at the t
op of screen with 10 pieces of c
argo from thespaceport."
2030 PRINT " Unfortunately it is
air day and balloons will hinder
you."
2040 PRINT " Cargo
- Cargo - Hopper Balloon 50
pts 100pts"
2045 PRINT AT 15,3; INK 1;"▲";A
T 16,3;"▲"
2050 PRINT AT 15,11; INK 3;"▲";
AT 15,11;"▲";AT 17,11;"▲"
2055 PRINT AT 15,19; INK 2;"■"
2060 PRINT AT 18,0;"Controls-"
2070 PRINT " Left Down
Up Right"; INK 2;" 5
6
7"
2080 PRINT #0; PAPER 6;" Pre
ss Any Key To Play"; TAB 0
2085 IF INKEY$="" THEN GO TO 208
5

```

```

2090 RETURN
5000 PRINT AT 10,6;"PLEASE WAIT
A MOMENT"
5005 RESTORE : LET t=0: FOR f=US
R "s" TO USR "u"+7
5010 READ a: POKE f,a: LET t=t+a
: NEXT f
5015 FOR f=31000 TO 31178: READ
a: POKE f,a: LET t=t+a: NEXT f
5020 IF t(>38628 THEN PRINT "Err
or in Data": BEEP 1,0: STOP
5030 RETURN
7000 DATA 7,30,62,124,124,252,24
8,248,224,120,124,62,62,65,31,31
7610 DATA 248,248,248,124,124,60
430,14,31,31,31,62,62,60,120,112
7020 DATA 6,7,2,2,2,3,3,3,96,224
64,64,64,192,192,192
7030 DATA 7,25,33,67,67,131,135,
135,224,152,132,194,194,193,225,
225
7040 DATA 135,135,135,67,67,35,1
7,9,225,225,225,194,194,196,136,
144
7050 DATA 5,7,2,2,2,3,3,3,160,22
4,64,64,64,192,192,192
7060 DATA 0,3,7,31,63,97,109,97,
0,192,224,248,252,134,162,134
7070 DATA 127,63,13,24,48,120,20
4,204,254,252,176,24,12,30,51,51
7080 DATA 127,97,111,97,125,97,1

```

```

27,0,254,134,182,182,182,134,254
48
7090 DATA 127,100,117,117,117,11
5,127,0,254,70,66,66,66,70,254,0
7095 DATA 0,126,126,126,126,126,
126,0
8000 DATA 221,33,0,125,221,126,0
254,255,40,34,95,221,86,1,6,9,6
2,22,215,122,215,123,215,62,30,2
15,62,32,215
8010 DATA 20,16,240,221,35,221,3
5,221,35,221,35,221,35,24,215,20
1,33,0,125,221,126,0,254,255,200
221,134,0,254,255,40,4,254,0,1,0
20,0,221
8020 DATA 126,2,237,68,221,119,2
221,126,1,254,2,40,4,254,17,32,
8,221,126,3,237,68,221,119,3,221
1,26,0,221,134,2,221,119,0,221,1
26,1,221
8030 DATA 134,3,221,119,1,14,144
221,203,4,126,40,10,221,203,4,1
90,62,6,126,79,24,4,221,203,4,25
4,221,126
8040 DATA 4,203,191,195,56,50,14
3,92,221,86,1,6,3,62,20,215,120,
215,221,126,0,215,121,215,12,121
215
8050 DATA 12,20,16,236,221,35,20
1,35,221,35,221,35,221,35,195,70
121

```

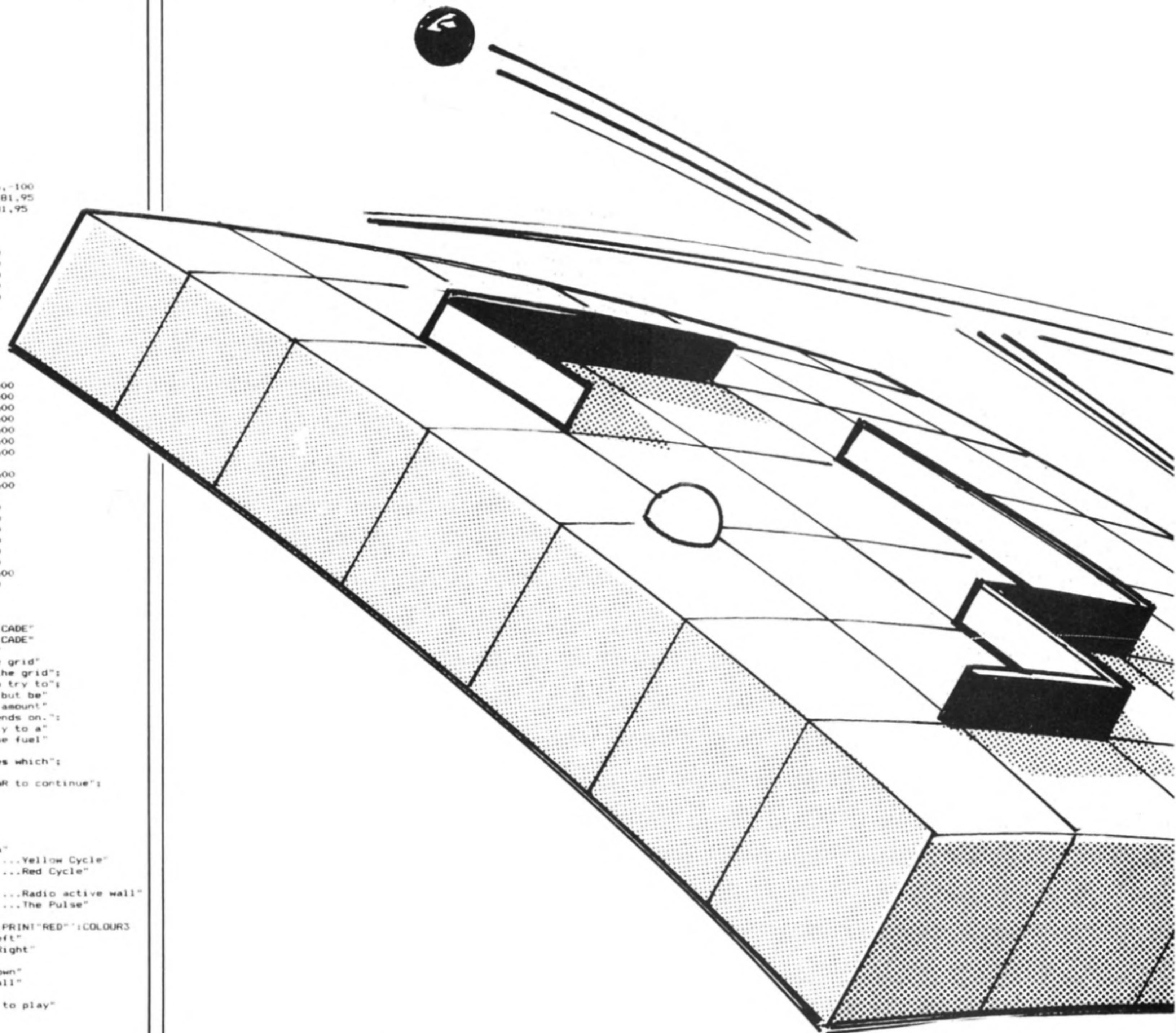
SUPER BARRIC

Program 1.

```

10REM *****
20REM ** SUPER BARRICADE **
30REM * By Shingo Sugiura *
40REM *** (C) JULY '83 ***
50REM *****
60
70PROCenv:PROCchar s
80MODE7:PROCinst
90MODE1:PROCcast
100VDU2B,1,31,30,29
110CHAIN"MAIN"
120
130DEFFPROCenv
140ENVELOPE1,1,0,0,0,0,0,-1,-1,-1,126,-100
150ENVELOPE2,1,96,-96,96,6,16,10,4,2,0,-1,81,95
160ENVELOPE3,1,6,-19,4,5,3,8,120,13,0,-3,81,95
170ENDPROC
180
190DEFFPROCchar s
200VDU23,218,130,130,130,254,226,226,226,0
210VDU23,219,128,128,128,224,224,224,254,0
220VDU23,220,136,136,136,254,226,226,226,0
230VDU23,221,138,138,138,234,234,234,254,0
240VDU23,222,254,128,128,248,224,224,224,0
250VDU23,224,24,66,0,153,153,0,66,24
260VDU23,225,0,0,120,255,255,120,0,0
270VDU23,226,0,0,30,255,255,30,0,0
280VDU23,227,24,60,60,60,60,24,24,24
290VDU23,228,24,24,24,60,60,60,60,24
300VDU23,229,24,24,24,255,255,24,24,24
310VDU23,230,36,36,255,36,36,255,36,36
320VDU23,231,800,866,858,830,830,858,866,800
330VDU23,232,8FE,880,880,8FE,80E,80E,8FE,800
340VDU23,233,8FE,880,880,8E0,8E0,8FE,800
350VDU23,234,8FC,884,884,8FE,8E2,8E2,8E2,800
360VDU23,235,8FE,880,880,8FC,8E0,8E0,8FE,800
370VDU23,236,8FE,88A,88A,8EA,8EA,8EA,8E2,800
380VDU23,237,87C,844,844,8FE,8E2,8E2,8E2,800
390VDU23,238,254,32,32,56,56,56,56,0
400VDU23,239,8FE,8B2,8B2,8E2,8E2,8E2,8FE,800
410VDU23,240,838,80B,80B,838,838,838,800
420VDU23,241,130,130,254,48,48,56,56,0
430VDU23,242,252,128,128,224,238,228,252,0
440VDU23,243,254,130,130,130,226,226,226,0
450VDU23,244,252,132,132,254,226,226,254,0
460VDU23,245,254,130,254,128,224,224,224,0
470VDU23,246,130,130,130,226,226,226,254,0
480VDU23,247,252,130,130,226,226,226,252,0
490VDU23,248,8FE,8B2,8B2,8FE,80E,80E,8FE,800
500VDU23,249,130,130,130,226,226,226,124,0
510ENDPROC
520
530DEFFPROCinst
540PRINTCHR#134;CHR#141TAB(12)"SUPER BARRICADE"
550PRINTCHR#134;CHR#141TAB(12)"SUPER BARRICADE"
560PRINTTAB(10)CHR#133"By Shingo Sugiura"
570PRINT"Control your cycles around the grid"
580PRINT"avoiding the walls or going off the grid";
590PRINT"Release your radio active tail to try to";
600PRINT"force your opponent off the grid but be";
610PRINT"cautious as this uses up a large amount";
620PRINT"of energy on which your life depends on.";
630PRINT"You can replenish your fuel supply to a";
640PRINT"certain degree by driving over the fuel";
650PRINT"pods littered around the grid.";
660PRINT"Of course watch out for the pulses which";
670PRINT"inhabit the grid."
680PRINTCHR#136CHR#131"Press SPACE BAR to continue";
690REPEATUNTILGET=32
700ENDPROC
710
720DEFFPROCcast:VDU19,3,610117,2
730PRINTTAB(13)"SUPER BARRICADE"
740CLOUR1:PRINTTAB(12)"By Shingo Sugiura"
750CLOUR2:PRINTCHR#227;:COLOUR3:PRINT"...Yellow Cycle"
760CLOUR1:PRINTCHR#227;:COLOUR3:PRINT"...Red Cycle"
770PRINTCHR#231"...Fuel pod"
780CLOUR1:PRINTCHR#230;:COLOUR3:PRINT"...Radio active wall"
790CLOUR1:PRINTCHR#224;:COLOUR3:PRINT"...The Pulse"
800PRINT"Controls:-"
810CLOUR2:PRINT"YELLOW"TAB(20);:COLOUR1:PRINT"RED";:COLOUR3
820PRINT"Q Left"TAB(20);: Left"
830PRINT"W Right"TAB(20);: Right"
840PRINT"R Up"TAB(20);:C.RIGHT Up"
850PRINT"D Down"TAB(20);:C.UP Down"
860PRINT"Z Wall"TAB(20);:DEL Wall"
870CLOUR1:PRINT"Or use joysticks."
880CLOUR2:PRINT"Press SPACE BAR to play"
890REPEATUNTILGET=32
900ENDPROC

```



FIRST THE good news. This game is original, fast, and has good graphics and sound. Now the bad news. It only works with O.S. 1.2, is hyper-long, and needs a second player.

The game involves two cycles — no, it is not Tron — on the electric grid. The grid is inhabited by creatures called Pulses and you must avoid these at all costs. At the beginning of each grid each player starts with 300 units of energy. This decreases with each move but there are fuel pods littered around the grid so that energy can be replenished. Each player can also release radio-active walls to gain bonus but this eats up energy and, of course, if you run out of energy you will be vapourised.

Each grid has a time limit and if both players are alive at the end of the time limit they will go onto a harder grid. If they are still alive at the end of five grids they will go onto the Death Grid to battle it out to the end. In this grid, each player will get 100 units of

energy on top of the bonus earned in the previous grids. The radio-active tail is released automatically and continuously so the battle is unlikely to last for more than a few seconds.

The game can be played with keyboard as well as joysticks — ANH01 type is suitable.

Type in the first program then Save it under a name other than Main. Then type in the second program and Save this under the name Main. If you have the disc system simply type it in but do not run it. Save before running. When you want to play the game run the first program and this will reset page and allow the program to run but do not press Break as this will corrupt the program and Old will not bring the program back. Also with the disc system you must make the following adjustments:

```

110 *KEY0PAGE = &1100 MCHAIN"MAIN"
M
120 *FX138,0,128

```

As I said earlier, this program will not work with OS before 1.2 but it is possible to convert the program to run on OS 0.1 if you put a lot of effort into it. Anyway the OS 1.2 is now readily available in shops so there is no excuse for hanging on to your bug-filled OS 0.1.

If you want to play the game but do not want to type in such a long program send a postal order or a cheque made payable to Shingo Sugiura for £3 to 42 Landford Road, Putney, London, SW15 1AG.

The game consists of two programs. The first program sets up the envelopes and defines the characters and prints the instructions. The second program is the game itself.

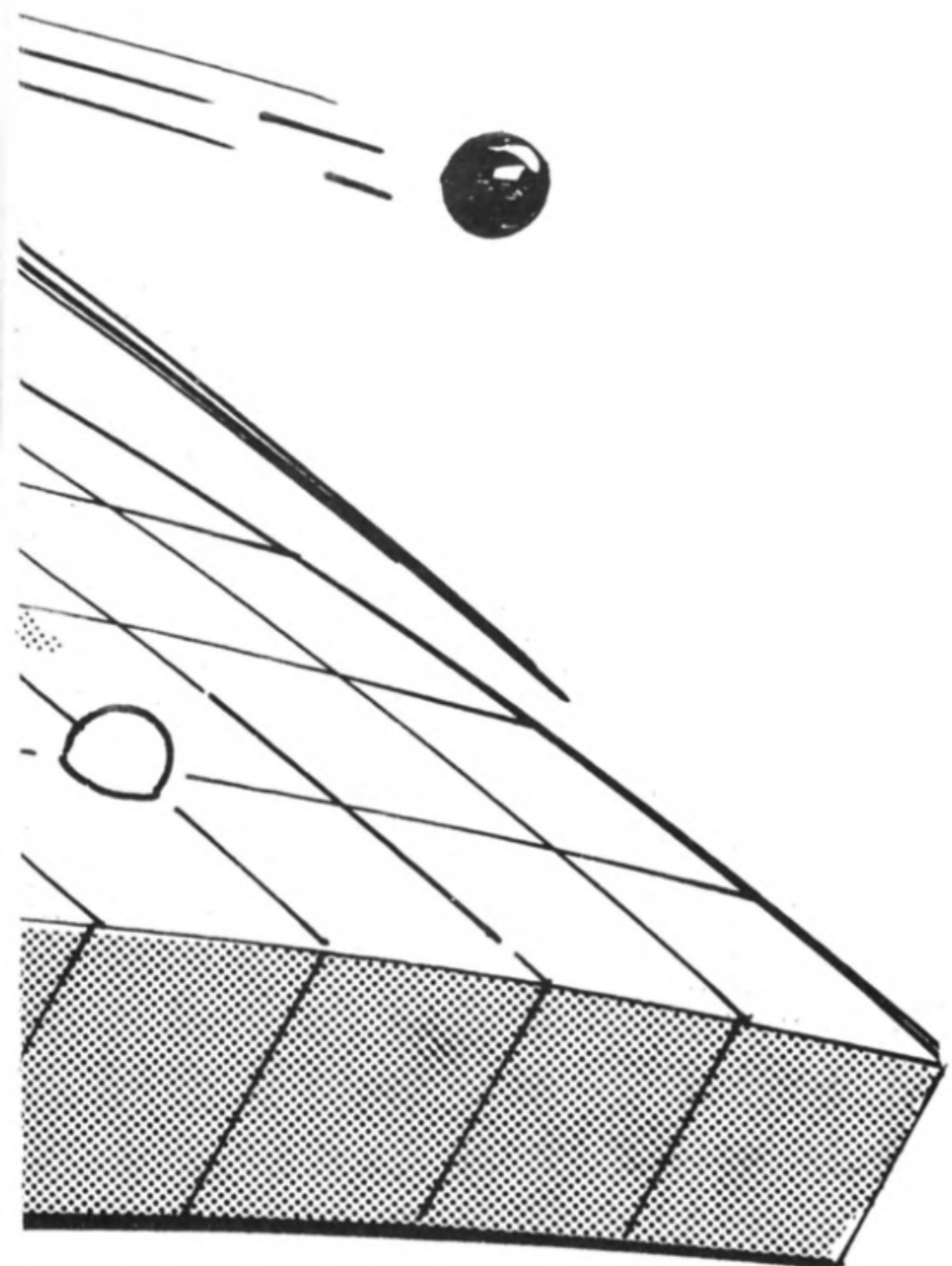
Line 10 Selects mode 1 and asks players if they want joystick control or keyboard control.

Line 20 Calls procedure to assemble short machine-code routine.

Line 30 Let grid equal 1.

CADE

Watch out for the deadly pulses which inhabit the grid of this two-player game by Shingo Sugiura for the BBC Micro. The game can be played with keyboard or joysticks.



- Line 60 Calls procedure to initialise variables.
- Line 70 Calls procedure to print the grid.
- Line 80 Sound at start of each grid.
- Line 90 .. Reset time.
- Lines 100 to 230 Main program.
- Lines 250 to 340 Procedure to initialise variables.
- Lines 360 to 410 Checks keys for yellow cycle.
- Lines 430 to 490 Checks joystick1.
- Lines 510 to 560 Checks keys for red cycle.
- Lines 580 to 640 Checks joystick2.
- Lines 660 to 870 Sets up the screen.
- Lines 820 to 870 Prints an appropriate number of pulses.
- Lines 890 to 970 Prints out the yellow cycle and also decides whether the tail should be printed.
- Lines 990 to 1070 ... Prints the red cycle and

Program 2.

```

5 REM FOR £ READ HASH CHARACTER
10MODE1:PROCoption
20PROCass
30grid=1
40wall1%=0:wall2%=0
50MODE1
60PROCinit
70PROCgrid
80FORA=100TO130: SOUND&01,2,A,1:NEXT
90TIME=0
100REPEAT
110IF A#="2" PROCkeys1:PROCkeys2
120IF A#="1" PROCjoy1:PROCjoy2
130but%=ADVAL(0)AND3
140PROCcheck1:PROCcheck2
150PROCcontrol1:PROCcontrol2
160VDU17,3,31,6,30:PRINT;2000-TIME;" ";
170IF TIME>=2000 THEN time=0
180UNTIL flag1=0 OR flag2=0 OR time=0
190IF time=0 AND grid>4 PROCdeathgrid:GOTO230
200IF time=0 AND grid<=4 PROCnewgrid:GOTO50
210PROCexplode
220PROCnewgame
230GOTO30
240
250DEFPROCinit
260time=TRUE
270flag1=TRUE:flag2=TRUE

280X1=10:Y1=25
290X2=29:Y2=25
300x1inc=0:y1inc=-1
310x2inc=0:y2inc=-1
320energy1%=300:energy2%=300
330VDU23;10,32;0;0;0;
340ENDPROC
350
360DEFPROCkeys1
370IF INKEY(-17) x1inc=-1:y1inc=0:ENDPROC
380IF INKEY(-34) x1inc=1:y1inc=0:ENDPROC
390IF INKEY(-52) x1inc=0:y1inc=-1:ENDPROC
400IF INKEY(-51) x1inc=0:y1inc=1:ENDPROC
410ENDPROC
420
430DEFPROCjoy1
440A1%=ADVAL(1):A2%=ADVAL(2)
450IF A1>=52000 x1inc=-1:y1inc=0:ENDPROC
460IF A1<=12000 x1inc=1:y1inc=0:ENDPROC
470IF A2>=52000 x1inc=0:y1inc=-1:ENDPROC
480IF A2<=12000 x1inc=0:y1inc=1:ENDPROC
490ENDPROC
500
510DEFPROCkeys2
520IF INKEY(-73) x2inc=-1:y2inc=0:ENDPROC
530IF INKEY(-89) x2inc=1:y2inc=0:ENDPROC
540IF INKEY(-122) x2inc=0:y2inc=-1:ENDPROC
550IF INKEY(-58) x2inc=0:y2inc=1:ENDPROC
560ENDPROC

570
580DEFPROCjoy2
590B1%=ADVAL(3):B2%=ADVAL(4)
600IF B1>=52000 x2inc=-1:y2inc=0:ENDPROC
610IF B1<=12000 x2inc=1:y2inc=0:ENDPROC
620IF B2>=52000 x2inc=0:y2inc=-1:ENDPROC
630IF B2<=12000 x2inc=0:y2inc=1:ENDPROC
640ENDPROC
650
660DEFPROCgrid:VDU19,3,6;0,0:COLOUR3
670FOR I=3 TO 25:VDU31,1,I
680PRINTSTRING$(38,CHR$229):NEXT
690FORA=1TO10:PRINTTAB(RND(36)+2,RND(20)+5)CHR$231:NEXT
700VDU17,1,31,13,1,232,246,245,235,234,32,32
710VDU244,237,234,234,240,233,237,247,235
720VDU17,2,31,1,27,235,243,235,234,242,241,58:PRINT;energy1%
730VDU31,1,28,244,239,243,246,232,58:PRINT;wall1%
740VDU17,1,31,20,27,235,243,235,234,242,241,58:PRINT;energy2%
750VDU31,20,28,244,239,243,246,232,58:PRINT;wall2%
760VDU17,3,31,1,30,238,240,236,235,58:PRINT"2000"
770VDU31,20,30,242,234,240,247,32,grid+48
780PROCpulse
790VDU17,2,31,X1,Y1,227,17,1,31,X2,Y2,227
800ENDPROC
810
820DEFPROCpulse:COLOUR1
830FOR pul=1 TO grid*7+RND(grid*3)
840PRINTTAB(RND(36)+2,RND(20)+5)CHR$224
850NEXT
860VDU17,3,31,X1,Y1-1,229,31,X2,Y2-1,229
870ENDPROC
880
890DEFPROCcontrol1
900IFINKEY(-98) OR but%=1 OR but%=3 VDU17,2,31,X1,Y1,230:wall1%=wall1%+3:energ
y1%=energy1%-3:ELSE VDU17,3,31,X1,Y1,229
910VDU17,2:Y1=Y1+y1inc:X1=X1+x1inc
920VDU31,X1,Y1
930IFx1inc=1 VDU226 ELSEIF x1inc=-1 VDU225 ELSE IF y1inc=1 VDU228 ELSE VDU227
940energy1%=energy1%-1:PRINTTAB(8,27);energy1%;" "
950PRINTTAB(7,28);wall1%;
960IF energy1%<=0 flag1=0
970ENDPROC
980
990DEFPROCcontrol2
1000IFINKEY(-90) OR but%=2 OR but%=3 VDU17,1,31,X2,Y2,230:wall2%=wall2%+3:energ
y2%=energy2%-3:ELSEVDU17,3,31,X2,Y2,229
1010VDU17,1:Y2=Y2+y2inc:X2=X2+x2inc
1020VDU31,X2,Y2
1030IFx2inc=1 VDU226 ELSEIF x2inc=-1 VDU225 ELSE IF y2inc=1 VDU228 ELSE VDU227
1040energy2%=energy2%-1:PRINTTAB(27,27);energy2%;" "
1050PRINTTAB(26,28);wall2%;
1060IF energy2%<=0 flag2=0
1070ENDPROC
1080
1090DEFPROCcheck1
1100VDU31,X1+x1inc,Y1+y1inc:CALL code
1110IF ?&70=133 ENDPROC
1120IF ?&70<>135 flag1=0:ENDPROC
1130SOUND&02,2,100,5:energy1%=energy1%+10
1140ENDPROC

```

(listing continued on next page)

also the tail if it should be.
 Lines 1090 to 1140 .. Checks the next position of the yellow cycle.
 Lines 1160 to 1210 .. Checks the next position of the red cycle.
 Lines 1230 to 1300 .. The procedure called at the end of each grid.
 Lines 1320 to 1340 .. Explosion.
 Lines 1360 to 1460 .. Prints out the winner.
 Lines 1480 to 1580 .. Main routine for the death grid.
 Lines 1600 to 1690 .. Prepares players for the death grid.
 Lines 1710 to 1760 .. Sets up variables

necessary for the death grid.
 Lines 1780 to 1850 .. Sets up the screen.
 Lines 1870 to 1960 .. Prints out the yellow cycle.
 Lines 1980 to 2070 .. Prints out the red cycle.
 Lines 2090 to 2110 .. Death routine for the death grid.
 Lines 2120 to 2290 .. Procedure to ask players if they would like joystick control or keyboard control.
 Lines 2310 to 2380 .. Assemble a short machine code routine to find the character at the present cursor position.

(listing continued from previous page)

```

1150
1160DEFPROCcheck2
1170VDU31,X2*x2inc,Y2+y2inc:CALL code
1180IF ?%70<>133 ENDFPROC
1190IF ?%70<>135 flag2=0:ENDPROC
1200SOUND&01,2,0,5:energy2%=energy2%+10
1210ENDPROC
1220
1230DEFPROCnewgrid:PRINTTAB(6,30):"0 "
1240FOR A=0TO80:SOUND&01,3,A,1
1250NEXT
1260grid=grid+1
1270VDU12,17,3,31,10,10,232,246,234,249,240,249,235,247,32
1280VDU242,234,240,247,32,grid+47
1290FOR A=1 TO 4000:NEXT
1300ENDPROC
1310
1320DEFPROCexplode
1330SOUND0,1,100,5
1340ENDPROC
1350
1360DEFPROCnewgame:FOR A=1 TO 3000:NEXT:CLS:#FX15,0
1370VDU31,8,9,238,239,246,242,218,32,219,246,233,220,32
1380IF flag1=0 VDU241,235,219,219,239,221,32,233,241,233,219,235 ELSE VDU234,23
5,247,32,233,241,233,219,235
1390VDU31,8,12
1400IF flag1=0 VDU234,235,247,32,233,241,233,219,235,32 ELSE VDU241,235,219,219
,239,221,32,233,241,233,219,235,32
1410VDU241,239,246,32,221,240,243
1420VDU31,10,15,241,239,246,32,242,239,238,32
1430VDU238,239,32,242,234,240,247,32,grid+48
1440PRINTTAB(6,20)"Press ":
1450VDU232,245,237,233,235,32,244,237,234,32:PRINT"to play"
1460REPEATUNTILGET=32:ENDPROC
1470
1480DEFPROCdeathgrid:PROCinfo
1490PROCinit2
1500PROCfingrid
1510FORA=100TO200:SOUND&01,2,A,1:NEXTA
1520REPEAT
1530PROCkeys1:PROCkeys2
1540PROCcycle1:PROCcycle2
1550UNTIL flag1=0 OR flag2=0
1560PROCdie
1570PROCnewgame
1580ENDPROC
1590
1600DEFPROCinfo
1610PRINTTAB(6,30):"0 "
1620FOR A=0TO100:SOUND&01,3,A,1
1630NEXT
1640VDU12,17,3,31,10,10,232,246,234,249,240,249,235,247
1650VDU32,242,234,240,247,32,grid+48
1660VDU17,2,31,7,20,245,234,235,245,237,234,235,32,222,239,234,32
1670VDU247,235,237,238,218,32,242,234,240,247
1680FOR A=1 TO 4000:NEXT
1690ENDPROC
1700
1710DEFPROCinit2
1720flag1=TRUE:flag2=TRUE
1730X1=10:Y1=25:X2=29:Y2=25
1740x1inc=0:y1inc=-1:x2inc=0:y2inc=-1

```

```

1750energy1%=100+wall1%:energy2%=100+wall2%
1760ENDPROC
1770
1780DEFPROCfingrid:VDU12,19,3,5;0;17,3
1790FOR I=3 TO 25:VDU31,1,1
1800PRINTSTRING$(38,CHR#229):NEXT
1810VDU17,1,31,13,1,247,235,237,238,218,32,242,234,240,247
1820VDU17,2,31,1,27,235,243,235,234,242,241,58:PRINT:energy1%
1830VDU17,1,31,20,27,235,243,235,234,242,241,58:PRINT:energy2%
1840VDU17,2,31,X1,Y1,227,17,1,31,X2,Y2,227
1850ENDPROC
1860
1870DEFPROCcycle1
1880VDU31,X1+x1inc,Y1+y1inc:CALL code
1890IF ?%70<>133:flag1=0:ENDPROC
1900VDU17,2,31,X1,Y1,230
1910X1=X1+x1inc:Y1=Y1+y1inc
1920VDU31,X1,Y1
1930IFx1inc=1 VDU226 ELSEIF x1inc=-1 VDU225 ELSEIF y1inc=1 VDU228 ELSE VDU227
1940energy1%=energy1%-1:PRINTTAB(8,27):energy1%:" "
1950IF energy1%<=0 flag1=0
1960ENDPROC
1970
1980DEFPROCcycle2
1990VDU31,X2+x2inc,Y2+y2inc:CALL code
2000IF ?%70<>133:flag2=0:ENDPROC
2010VDU17,1,31,X2,Y2,230
2020X2=X2+x2inc:Y2=Y2+y2inc
2030VDU31,X2,Y2
2040IFx2inc=1 VDU226 ELSEIF x2inc=-1 VDU225 ELSEIF y2inc=1 VDU228 ELSE VDU227
2050energy2%=energy2%-1:PRINTTAB(27,27):energy2%:" "
2060IF energy2%<=0 flag2=0
2070ENDPROC
2080
2090DEFPROCdie:SOUND0,1,100,5
2100FORA=255TO100STEP-1:SOUND&01,3,A,1:NEXT
2110ENDPROC
2120DEFPROCoption
2130VDU17,1,31,13,1,232,246,245,235,234,32,32
2140VDU244,237,234,234,240,233,237,247,235,17,2
2150PRINT"TAB(12)"By Shingo Sugiura":COLOUR3
2160PRINT"" You have the option of using the"
2170PRINT"keyboard or the ANH01 joysticks to"
2180PRINT"control your cycles."
2190PRINT""If using joysticks, yellow cycle is"
2200PRINT"controlled by joystick1 and the red"
2210PRINT"cycle is controlled by joystick2.":COLOUR2
2220PRINT""1 .Joystick control"
2230PRINT""2 .Keyboard control"
2240COLOUR1:PRINT""Which option? ";
2250REPEAT:A%=INKEY$(10):UNTIL A%="1" OR A%="2"
2260PRINT:A%=COLOUR3
2270PRINT"" Press SPACE BAR to enter grid":
2280REPEAT UNTIL GET=32
2290ENDPROC
2300
2310DEFPROCass:OSBYTE=&FFF4
2320DIM code 10
2330P%=code
2340IOP% 0
2350LDAE135:JSR OSBYTE
2360STX&70
2370RTS:1
2380ENDPROC

```

Spectrum 48k

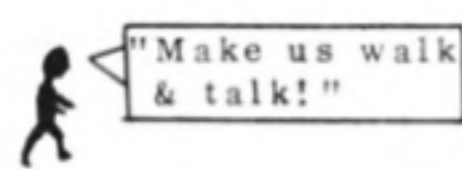
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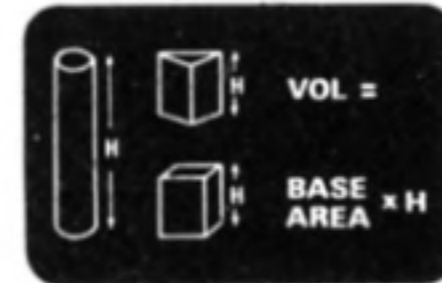
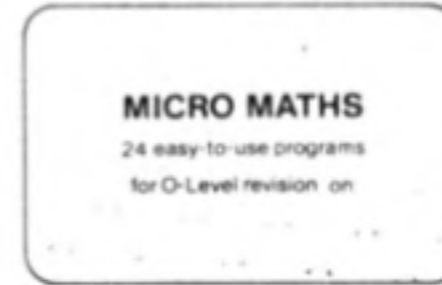
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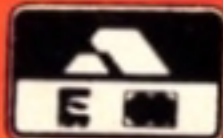
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A bug tracer on your Spectrum can save time and end frustration. Gary Rees explains how to add this feature.



"But how did you deduce that there was a bug in line 400, Holmes?"

DEBUGGING YOUR PROGRAMS

Listing 1.

```

0001 (C) GARRY REES 1983.
MEMORY LEFT, TRACE AND SPEED ROUTINES.
5 FE69 ORG 65129
69 00 NOP
70 00 NOP
71 FF RST 3BH
85 F3 L5: DI

DISABLE FURTHER INTERRUPTS
90 C5 PUSH BC
110 D5 PUSH DE
130 E5 PUSH HL
150 F5 PUSH AF

STACK REGISTER VALUES FOR RETURN
170 01FEBF LD BC, 49150

INITIALISE 'BC' READY FOR KEYBOARD READ
190 ED7B IN A, (C)

READ KEYBOARD
210 FEFC CP OFCH
IS 'ENTER' AND 'L' BEING PRESSED?
230 2B1C JR Z, L2

IF YES THEN GOTO L2

```

```

235 FEFA CP OFAH
IS 'ENTER' AND 'K' BEING PRESSED?
237 2B0A JR Z, ON
238 FEF6 CP OF6H
239 200B JR NZ, TEST

IF 'ENTER' AND 'J' IS BEING PRESSED THEN
SWITCH TRACE FLAG OFF
243 AF XOR A

ZERO THE ACCUMULATOR
245 329DFE LD (FLAG), A
250 1B05 JR TEST
255 3E01 ON: LD A, 1
260 329DFE LD (FLAG), A

SWITCH 'TRACE' FLAG ON
265 CDB5FE TEST: CALL L3

CALL THE MAIN ROUTINE
270 F1 UNSTK: POP AF
290 E1 POP HL
310 D1 POP DE
320 C1 POP BC

RESTORE ORIGINAL REGISTER VALUES.

```

(listing continued on page 85)

USING MACHINE CODE you can add some useful features to your Spectrum but there is often the disadvantage that the routines may have to be called many times using commands like Randomise and USR. One way of overcoming this problem is to use interrupts to call your code automatically.

If you want to use more than one routine, however, there is the problem of switching between routines, that is turning each one off and on as and when desired. This problem can be overcome by using a combination of key presses to switch routines without having to stop any Basic program that may also be running.

I use the Enter key as an extra Shift key. It still works as normal but if it is held down and another key is pressed this will signal the routine which utility I want turned on. I decided to use interrupts to give my Spectrum some of the features found on other computers.

(continued on page 85)

AGF

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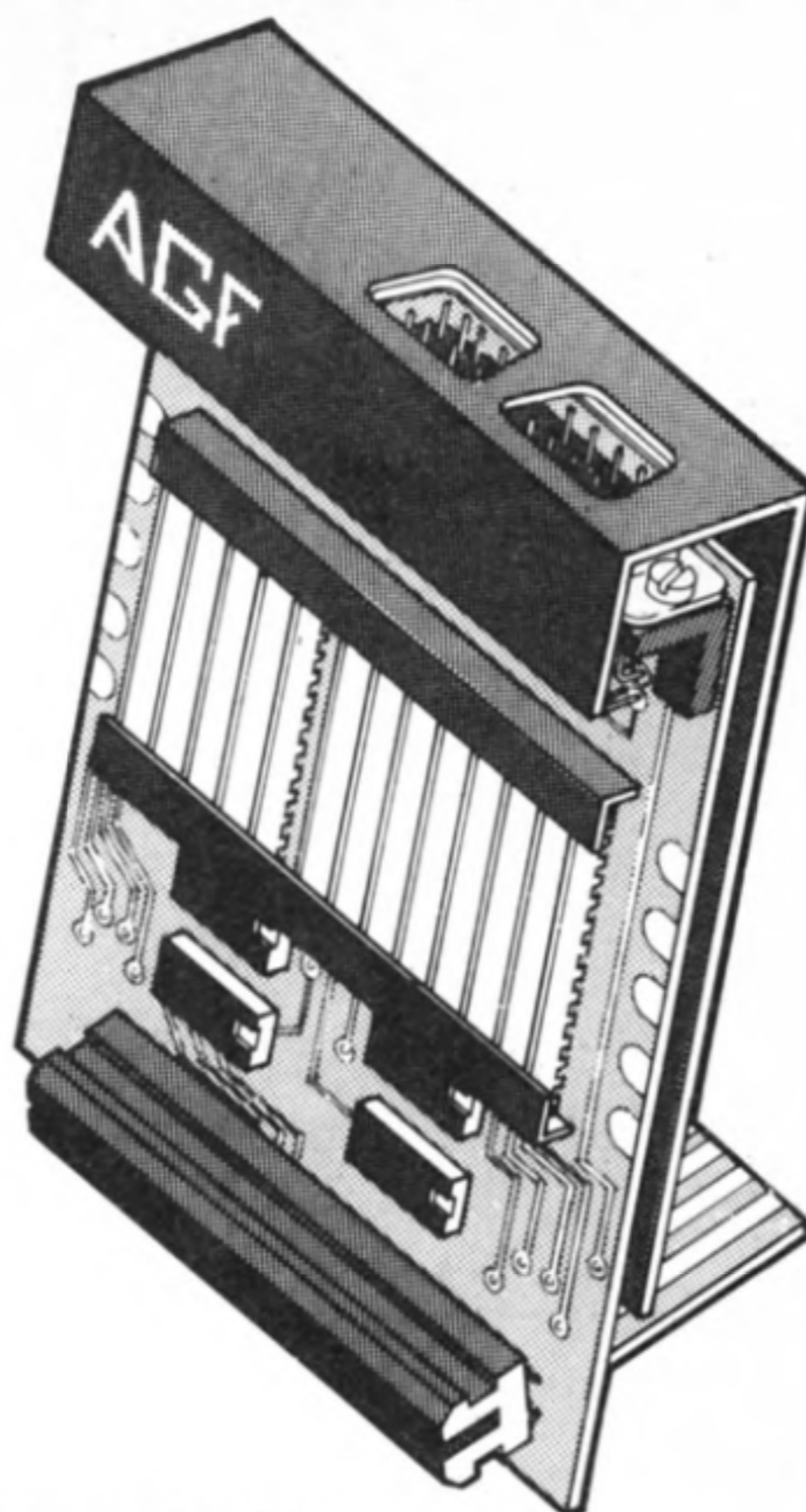
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32768, 810

(listing continued from page 83)

```

350      FB          EI
RE-ENABLE FOR NEXT INTERRUPT.
-----
370      C9          RET
390      CDAAFE L2:  CALL STOP
400      1BF5          JR  UNSTK

SWITCH ROUTINE OFF FROM KEYBOARD.
-----
560      00          NOP
570      00          NOP
610      00          NOP
620      00          NOP
670      3E09          LD   A,9
690      ED47          LD   I,A
710      ED5E          IM2
730      C9          RET

DIVERT INTERRUPTS TO MY ROUTINE.
-----
750      00          NOP
760      00          NOP
770      00          NOP
800      3E3E  STOP:  LD   A,03EH
810      ED47          LD   I,A
820      ED56          IM1
830      C9          RET

RESTORE INTERRUPT VECTOR REGISTER TO NORMAL.
-----
START OF MAIN ROUTINE.
-----
840      00          NOP
850      00          NOP
860          FLAG:  DEFB  00H
990          SCN:   DEFW  20671

ADDRESS OF DISPLAY IN DISPLAY FILE.
-----
1030     EDSB655C L3:  LD   DE,(23653)
1035     21BF50      LD   HL,20671
1036     22B3FE      LD   (SCN),HL

RESTORE DISPLAY FILE ADDRESS.
-----

```

```

1038     3A9DFE      LD   A,(FLAG)
1039     FE01        CP   1
1040     CC25FF      CALL 2,DEL

IF 'TRACE' FLAG ON THEN CALL 'TRACE' AND 'SPEED'.
-----
1042     2005          JR  NZ,L14

OTHERWISE CALL 'MEMORY LEFT' ROUTINE.
-----
1044     2A455C      LD   HL,(23621)
1046     18095       JR  L13
1048     CD051F      L14: LD   HL,(23730)
1056     ED52        SBC  HL,DE

FIND OUT HOW MUCH MEMORY IS LEFT.
-----
1060     01F0DB      L13: LD   BC,-10000
1070     CDF5FE      CALL SR2
HOW MANY 'TEN THOUSANDS' OF BYTES ARE THERE?
-----
1100     0118FC      LD   BC,-1000
1103     CDF2FE      CALL SR2

HOW MANY 'THOUSANDS' OF BYTES ARE THERE?
-----
1105     019CFF      LD   BC,-100
1107     CDF2FE      CALL SR2

HOW MANY 'HUNDREDS' ARE THERE?
-----
1108     01F6FF      LD   BC,-10
1109     CDF2FE      CALL SR2
1110     01FFFF      LD   BC,-1
1111     CDF2FE      CALL SR2

HOW MANY 'TENS' AND 'ONES' ARE THERE?
-----
1113     C9          RET

1115     AF          SR2: XOR  A
1117     09          LA1: ADD  HL,BC
1125     3C          INC  A
1130     38FC        JR   C,LA1
1135     ED42        SBC  HL,BC
1150     3D          DEC  A

THE ABOVE ROUTINE CALCULATES EACH DIGIT
-----
1170     C630          ADD  A,30H

```

```

AND CONVERTS IT TO ASCII
-----
1172     E5          PUSH HL
1175     CD0CFF      CALL SR
1177     21B3FE      LD   HL,SCN
1179     34          INC  (HL)

INCREASE SCREEN ADDRESS READY FOR NEXT DIGIT
-----
1181     2AB3FE      LD   HL,(SCN)
1183     CD19FF      CALL L7
1185     E1          POP  HL
1190     C9          RET

1233     ED4B365C   SR:  LD   BC,(23606)
1250     2600        LD   H,0
1270     6F          LD   L,A
1290     29          ADD  HL,HL
1300     29          ADD  HL,HL
1310     29          ADD  HL,HL
1330     09          ADD  HL,BC
1340     EB          EX   DE,HL
1350     C9          RET

THE ABOVE ROUTINE FINDS THE ADDRESS OF THE
CHARACTER IMAGE IN THE CHARACTER TABLE
-----
1400     0608        L7:  LD   B,B
1410     1A          LB:  LD   A,(DE)
1440     77          LD   (HL),A
1460     24          INC  H
1480     13          INC  DE
1500     10FA        DJNZ LB
1520     C9          RET

THIS WILL 'PRINT' A DIGIT ON THE SCREEN
-----
1600     060A        DEL: LD  B,10
1620     C5          D2:  PUSH BC
1630     01F401      LD   BC,500
1650     210000      LD   HL,0000
1660     110000      LD   DE,0000
1680     EDB0        LDIR
1700     C1          POP  BC
1710     10F1        DJNZ D2
1720     C9          RET

SPEED ROUTINE TO DELAY RETURN
-----
9999          END

```

(continued from page 83)

The first of these is a constant display of how much memory is left, whether you are running a Basic program or just entering a line of Basic.

The current position of RAMtop is of course taken into account and if you are entering a line the free memory can be seen to decrease as each keyword or character is typed. When running a program the free memory decreases as each variable is assigned.

The second feature I decided to add is Trace. This displays the number of the line currently being executed by Basic and is useful for debugging programs and following the program flow.

A slight problem arises here though. The lines of Basic are read and interpreted so quickly that following the program flow becomes difficult for us humans. For this reason I have added a third feature, Speed. This simulates slowing the processor down to one of 256 different speeds and, as well as being useful in this application, can also be used to vary the speed of games to suit personal taste. Note, however, that listings and keyboard reads are slowed.

The speed may be varied by Poking location 65315, on the 48K version, with a number between 1 and 255. A value of 1 slows program execution down only slightly and will be hardly noticeable, a value of 255 is very very slow and should be used with caution as the keyboard is then read only every few minutes and keys will have to be held down until they are read. Poking with zero has a similar effect to Poking with 255.

The program itself starts at 65129 but is switched on initially by entering Randomise USR 65183. This turns on the Memory Left routine. If Enter is held down and K is pressed then Trace and Speed are switched on. This will display 65534 until it is actually used. If Enter and J are pressed then Speed and Trace

are off and Memory Left is on.

The program can be turned off completely by holding down Enter and pressing L or by entering Randomise USR 65193.

Switching on changes the interrupt vector register to point to the machine-code program and the program is then called up to 50 times a second depending upon the value of Speed. The value of Memory Left or Current Line Number is displayed on line 23 of the screen just above the normal K cursor position but this can be changed to any part of the screen if you prefer by Poking locations 65210 and 65211 with the display file address you want. For example, to change the display to 16384 — line 0, column 0:

```

Poke 65211, INT(16384/256).
Poke 65210, 16384 - 256*INT(16384/256)

```

Interrupts are disabled during Loading and Saving and so the machine-code program will stop temporarily but will recommence when the Load etc, is complete.

The program was written for a 48K Spectrum using an assembler and is stored above RAMtop to prevent it being overwritten

by Basic variables. If you have an assembler then simply enter listing 1, Save the object code on tape, type Clear 65128 and re-load the code. On typing Randomise USR 65183 the free memory should appear on line 23. If it does not then check your assembler listing carefully.

For those using 16K and an assembler the following changes have to be made:

```

Line 5 becomes      ORG 32348
Line 670 becomes    LD  A,40

```

If you do not have an assembler enter the appropriate Basic listing. Remember to Save the machine code on tape before switching the routine on, just in case you make a mistake when entering the data.

The 16K version is switched on by typing Randomise USR 32402. The Speed adjuster is at location 32534 and the display position can be altered by Poking locations 32429 and 32430.

```

Save the 16K version with
SAVE "MEM"CODE 32384,203
or the 48K with
SAVE "MEM"CODE 65129,203

```

Listing 2.

```

5  REM © GARRY REES 1983
5  REM 16K VERSION
10 CLEAR 32347
20 FOR F= 32348 TO 32550
30 READ N:POKE F,N
40 NEXT F
50 STOP
110 DATA 0,0,255,243,197,213,2
29,245,1,254
120 DATA 191,237,120,254,252,4
0,20,254,250,40
130 DATA 10,254,245,32,11,175,
50,105,126,24
140 DATA 5,62,1,50,165,126,205,
160,126,241
150 DATA 225,200,193,251,201,2
05,165,126,24,245
160 DATA 0,0,0,0,62,40,237,71,
237,94
170 DATA 201,0,0,0,62,62,237,7
1,237,85
180 DATA 201,0,0,0,191,00,237,
91,101,92

```

```

190 DATA 33,191,00,34,166,126,
50,165,126,254
200 DATA 1,204,21,127,32,5,42,
60,92,24
210 DATA 5,42,170,92,237,62,1,
240,216,205
220 DATA 229,126,1,24,252,205,
229,126,1,155
230 DATA 255,205,229,126,1,246,
255,205,229,126
240 DATA 1,255,255,205,229,126,
201,175,9,60
250 DATA 56,252,237,66,61,190,
40,229,205,255
260 DATA 126,33,166,126,52,42,
166,126,205,12
270 DATA 127,225,201,237,75,54,
92,30,0,111
280 DATA 41,41,41,9,235,201,6,
0,26,119
290 DATA 36,19,16,250,201,6,10,
197,1,244
300 DATA 1,33,0,0,17,0,0,237,1
75,193
310 DATA 16,241,201

```

32768, 809

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DK Tronics	3D Tanx, Meteoroids	Silversoft	Ground Attack, Cyber Rats
Hewson	Maze Chase, Specvaders	Sunshine	Android
Imagine	Zzoom	Ultimate	Cookie
New Generation	Escape, 3D Tunnel, Knot In 3D	Romex	Colour Clash

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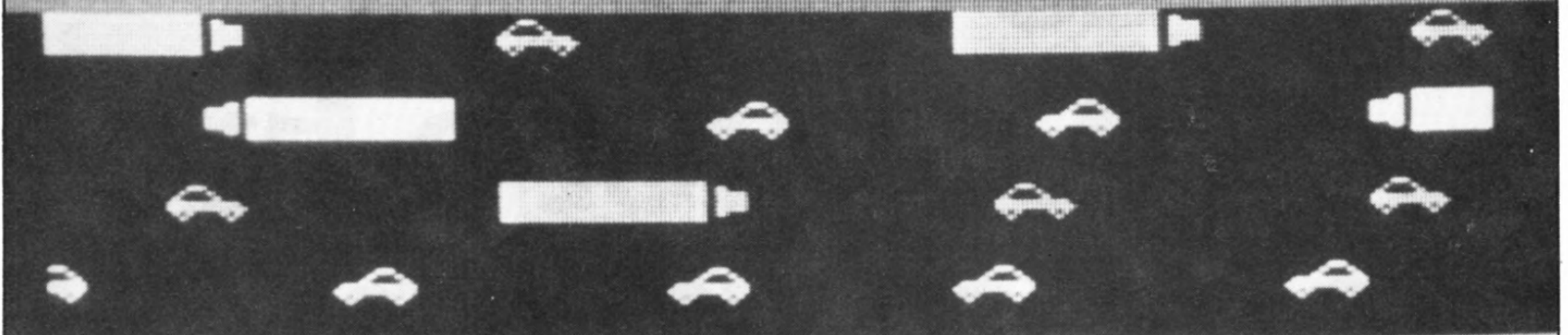
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FROGGER



ORIC

Leap out of trouble with Brian Lewis's Frogger.

SCORE: 0 HI-SCORE: 0 LIVES: 3

THIS GAME IS WRITTEN for the 48K Oric although I see no reason why it should not be run on the 16K machine.

The game follows the normal Frogger scenario. You, the frog, have to work your way up the screen. First, you must dodge oncoming cars and lorries, then you have to jump on the passing logs in the upper part of the display. To move forward press A, to move left press N and to go right press M. Once you reach the top row you must jump into one of the five froggy homes. Once all five homes are filled

you progress to the next sheet. Getting hit by a car or lorry, missing a log, or home will result in one of your three lives being lost.

The colours in the program can be changed by listing lines 20 to 30, and changing the escape characters. The main display may also be altered by listing lines 1000 to 1010. If the user-defined graphics are not to your liking then these are contained between lines 1010 and 2000. The sub-routines 6000 and 7000 check for loss of life and arrival at a home. Lines 80 to 90 keep the logs and vehicles

scrolling smoothly and should not be tampered with. Scoring is as follows: 10 points for every jump forward; 100 points for every screen completed.

If the game becomes too easy then reduce the For-Next loop in line 50 or take out either left or right movement.

The small machine-code sub-routine at the beginning of the program is necessary because of the method of scrolling the logs and vehicles. It was borrowed from the chapter on machine code in the Oric manual.

```

0 LIVES=3:REM FOR £ READ HASH CHARACTER
1 CLS
2 REPEAT
3 READD
4 POKE£400+C,D
5 C=C+1:UNTIL D=£FF
6 DATA£20,£96,£D9,£AC,£FB,£02,£CB,£BC,£69,£02,£A5,£1F,
£A4,£20,£B5,£12,£B4,£13
7 DATA£A9,£3B,£20,£DB,£CF,£4C,£61,£CB,£FF
8 DOKE£2F5,£400
9 GOSUB1000
11 A$(1)="o[[[[p          o[[[[p
o[[[[p
"
12 A$(2)="u[[i          u[[i          u[[i          u[[
li          u
[[i          "
13 A$(3)="          o[[[[p          o[[[[p          o
[[[[p
"
14 A$(4)="u[[[[i          u[[[[i          u[[[[i
[[i"
15 A$(5)="qw          [[[[[[y          qw          [[[[[[y
qw          [
[[[[[[y          "
16 A$(6)="er          er          t[[[[[[          er          er
t[[[[[[          e
r          er"
17 A$(7)="[[[[[[[[y          qw          qw          [[[[[[[[y          qw
qw
[[[[[[[[y"
18 A$(8)="er          er          er          er          er          er
er          er          er          er          er          er"
19 D=30:C=1:C1=1:D1=30:Z=30:Z1=30:V=1:V1=1:A=9:B=23:Z$
=" "
20 !0,3;CHR$(27);"e";MID$(A$(1),D,35);
21 !0,9;CHR$(27);"e";MID$(A$(2),C,35);
22 !0,7;CHR$(27);"e";MID$(A$(3),D1,35);
23 !0,5;CHR$(27);"e";MID$(A$(4),C1,35);
24 !0,13;CHR$(27);"B";MID$(A$(5),Z,35);
25 !0,15;CHR$(27);"C";MID$(A$(6),V,35);
26 !0,17;CHR$(27);"B";MID$(A$(7),Z1,35);
27 !0,19;CHR$(27);"C";MID$(A$(8),V1,35);
28 PLOT1,26,"SCORE:";PLOT7,26,STR$(S)
29 PLOT30,26,"LIVES:";PLOT37,26,STR$(LIVES)
30 PLOT13,26,"HI-SCORE:";PLOT22,26,STR$(HS)
31 IF B<10 THEN Z$=CHR$(SCRN(A,B)) ELSE Z$=" "
32 K$=KEY$
33 IF K$="N" AND A>1 THEN PLOTA,B,Z$:A=A-1
34 IF K$="A" THEN PLOTA,B,Z$:B1=-2:L=1
35 IF K$="M" AND A<37 THEN PLOTA,B,Z$:A=A+1
36 IF B1=-2 THEN S=S+10:PING
39 A=A+1:B=B+1:IF B=1 THEN 6000
40 IF B>12 THEN 47
41 IF B=11 THEN 50
42 IF SCRN(A,B)=32 THEN 7000
43 IF L=1 THEN 50
44 IF B=5 OR B=9 THEN A=A-1:PLOTA,B,"]"
45 IF B=3 OR B=7 THEN A=A+1:PLOTA,B,"]"
46 GOTO50
47 IF B=23 OR B=21 THEN 50
48 IF SCRN(A,B)<>32 THEN 7000
24 FORN=1TO2:PLOTA,B,"]":NEXTN
50 FORN=1TO2:PLOTA,B,"]":NEXTN

```

(continued on page 89)

(continued from page 87)

```

60 IF A<=2 OR A>=37 THEN 6001
80 D=D-1:C=C+1:D1=D1-1:C1=C1+1:Z=Z-1:Z1=Z1-1:V=V+1:V1=
V1+1
82 IF D=5 THEN D=27
83 IF C=15 THEN C=1
84 IF D1=5 THEN D1=25
85 IF C1=23 THEN C1=5
86 IF Z=5 THEN Z=28
87 IF Z1=5 THEN Z1=34
88 IF V=30 THEN V=2
89 IF V1=35 THEN V1=4
90 B1=0:A1=0:L=0:GOTO20
1000 LORESO:PAPER0:INK7:POKE618,10:CLS
1001 FORA=0T07:POKE46080+A+(8*ASC("(")),63:NEXTA
1002 FORT=0T01:PRINT"[[[ [[[[ [[[[ [[[[ [[[[
[[[" :NEXTT
1003 FORN=1T09:PRINTCHR$(27);"T":NEXTN
1004 FORN=1T02:PRINTCHR$(27);"Q":NEXTN
1005 FORT=1T08:PRINT:NEXTT
1006 FORT=0T02:PRINTCHR$(27);"U":NEXTT:IF K=1 THEN RET
URN
1007 FORA=0T07:READD:POKE46080+A+(8*ASC("q")),D:NEXTA
1008 DATA0,7,8,16,63,63,20,8
1009 FORA=0T07:READD:POKE46080+A+(8*ASC("w")),D:NEXTA
1010 DATA0,0,32,16,62,63,10,4
1011 FORA=0T07:READD:POKE46080+A+(8*ASC("e")),D:NEXTA
1012 DATA0,0,1,2,31,63,20,8
1013 FORA=0T07:READD:POKE46080+A+(8*ASC("r")),D:NEXTA
1014 DATA0,56,4,2,63,63,10,4
1015 FORA=0T07:READD:POKE46080+A+(8*ASC("t")),D:NEXTA
1016 DATA0,6,62,~2,62,62,6,0
1017 FORA=0T07:READD:POKE46080+A+(8*ASC("y")),D:NEXTA
1018 DATA0,24,31,31,31,31,24,0
1019 FORA=0T07:READD:POKE46080+A+(8*ASC("u")),D:NEXTA
1016 DATA3,7,9,9,9,9,7,3
1021 FORA=0T07:READD:POKE46080+A+(8*ASC("i")),D:NEXTA
1022 DATA0,32,48,48,48,48,32,0
1023 FORA=0T07:READD:POKE46080+A+(8*ASC("p")),D:NEXTA
1024 DATA48,56,36,36,36,36,56,48
1025 FORA=0T07:READD:POKE46080+A+(8*ASC("o")),D:NEXTA
1026 DATA0,1,3,3,3,3,1,0
1027 FORA=0T07:READD:POKE46080+A+(8*ASC("j")),D:NEXTA
1028 DATA0,12,30,45,63,12,30,33
1999 RETURN
6000 IF SCRN(A-1,B)<>91 AND SCRN(A+1,B)<>91 THEN 6010

```

```

6001 IF B=1 THEN Z$=CHR$(SCRN(A,B-1)) ELSE Z$=" "
6002 PLOTA,B,"J":WAIT50
6004 PLAY7,0,0,0:GOTO7001
6010 PLOTA-1,B,"[[[" :ZAP:B=23
6011 A=RND(1)*34+2
6020 H=H+1:IF H=5 THEN H=0:GOTO10000
6025 GOTO20
7000 PLAY7,0,0,0:PLOTA,B,"J":Z$=" "
7001 FORN=12T01STEP-1
7002 MUSIC1,1,N,15
7003 MUSIC2,2,N,15
7004 MUSIC3,3,N,15
7005 WAIT10:NEXTN
7006 PLAY0,0,0,0
7007 LIVES=LIVES-1
7008 PLOT30,26,"LIVES:" :PLOT37,26,STR$(LIVES)
7009 PLOTA,B,Z$:B=23:A=RND(1)*34+2:Z$=" ":K$=" ":IF LI
VES<>0 THEN 2
0
7011 CLS
7012 PRINT"YOU SCORED:";S
7013 IF HS<S THEN ZAP:WAIT50:GOTO9000
7014 PRINT"HIGH SCORE HELD BY:";B$
7015 PRINT"WITH A GREAT SCORE OF:";HS
7016 PRINT"ANOTHER GO ?"
8000 K$=KEY$:IF K$="" THEN 8000
8096 GOTO9009
8002 END
9000 CLS
9001 PRINT
9002 PRINTCHR$(4);CHR$(27);"Q";CHR$(27);"N A NE
W HIGH SCORE
!"
9003 PRINTCHR$(4)
9004 PRINTCHR$(6);CHR$(17)
9005 INPUT"ENTER IN YOUR NAME ";B$
9006 IF LEN(B$)>7 THEN PRINT"TOO LARGE !":GOTO9005
9007 PRINT"OK ";B$;" ANOTHER GO ?"
9008 K$=KEY$:IF K$="" THEN 9008
9009 IF K$="Y" THEN LIVES=3:K=1:HS=S:S=0:GOTO9
9010 END
10000 FORT=0T01:PLOT1,T,"[[[ [[[[ [[[[ [[[[ [[
[[ [[[" :NEX
TT
10001 S=S+100:FORN=0T02
10002 ZAP:WAIT5:NEXTN
10003 GOTO20

```

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VIC GOLF CH

Ray and Stephen Nolan tee off our golf double with a game for the Vic-20 with 8K or 16K expansion. Vikki Allsop follows through with her version of the game for an unexpanded Vic.

AT LAST HERE is a game for the Vic-20 with 8K/16K expansion, although only 6.5K long, it could therefore be converted for the +3K system. This game does not tie your fingers in knots but gives you time to think before making mistakes! Ideal for the fair weather golfer or non-player, it provides a full choice of clubs and options of fade or draw — right or left swings — for long shot positioning to avoid the random generated traps of bunkers, trees and water hazards.

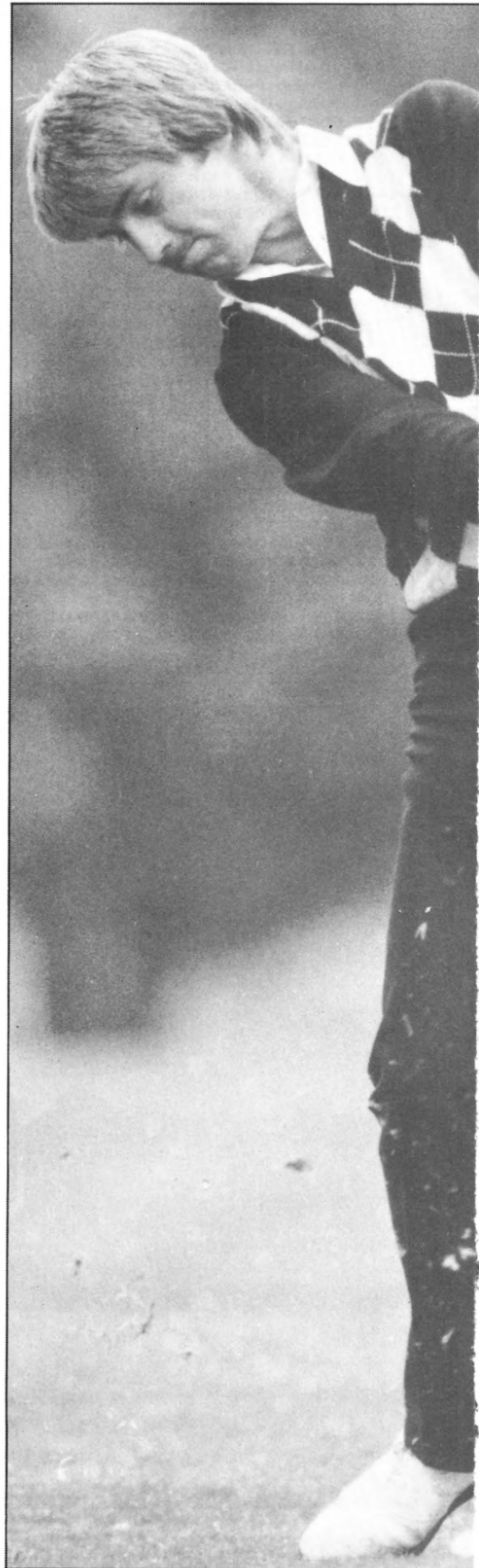
Although the 18 hole course is provided each hole is randomly generated to give a new design each round. The clubs are selected to achieve distance as follows:

Keys 1 to 4 for woods 1 to 4 for distance

11 to 16 for irons 1 to 6 for distance
17 to 19 for irons 7 to 9 for distance
0-100 yards

Clubs 1 and 2 can be played off line by entering F or D, and the strength of 3 entered as a percentage. Putting is self explanatory by entering any decimal number between 1 and 13.

Initially the player can select his or her own handicap and one fault which may affect the run of play. Extensive use of the pre-defined key graphics is made and further colour refinements can be added but for use on a monochrome monitor a clear contrast is used for the graphic display.



Expanded golf game listing.

```

10 POKE36879,59
20 PRINT"VIC GOLF"
30 PRINT"VIC GOLF"
40 PRINT"VIC GOLF"
50 PRINT"VIC GOLF"
60 PRINT"VIC GOLF"
70 PRINT"VIC GOLF"
80 PRINT"VIC GOLF"
90 PRINT"VIC GOLF"
100 Z$="" FOR I=1 TO 21 Z$=Z$+" " NEXT
110 N$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
120 DEFN(X)=INT(X*3.14159/3.14159)
130 DEFN(X)=INT(X*3.14159/3.14159)
140 PRINT"VIC GOLF"
150 PRINT"VIC GOLF"
160 PRINT"VIC GOLF"
170 PRINT"VIC GOLF"
180 PRINT"VIC GOLF"
190 PRINT"VIC GOLF"
200 PRINT"VIC GOLF"
210 PRINT"VIC GOLF"
220 INPUT"VIC GOLF"
230 PRINT"VIC GOLF"
240 POKE36879,108 PRINT"VIC GOLF"
250 PRINT"VIC GOLF"
260 PRINT"VIC GOLF"
270 PRINT"VIC GOLF"
280 PRINT"VIC GOLF"
290 PRINT"VIC GOLF"
300 INPUT"VIC GOLF"
310 PRINT"VIC GOLF"
320 PRINT"VIC GOLF"
330 POKE36879,238 PRINT"VIC GOLF"
340 PRINT"VIC GOLF"
350 PRINT"VIC GOLF"
360 PRINT"VIC GOLF"
370 PRINT"VIC GOLF"
380 PRINT"VIC GOLF"
390 PRINT"VIC GOLF"
400 PRINT"VIC GOLF"
410 PRINT"VIC GOLF"
420 PRINT"VIC GOLF"
430 PRINT"VIC GOLF"
440 GOSUB2480 GOSUB1410 GOSUB2480
450 REM GENERATE HOLE
460 Z$="" FOR I=1 TO 21 Z$=Z$+" " NEXT
470 FOR I=1 TO 18 PRINT"VIC GOLF"
480 PRINT"VIC GOLF"
490 PRINT"VIC GOLF"
500 T$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
510 POKE36879,108 PRINT"VIC GOLF"
520 U$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
530 IF S<40 THEN S=S+1 GOTO520
540 T$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
550 S$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
560 D$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
570 POKE36879,108 PRINT"VIC GOLF"
580 U$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
590 IF S<40 THEN S=S+1 GOTO580
600 T$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
610 FOR I=1 TO 18 PRINT"VIC GOLF"
620 S$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
630 IF PEEK(5)=32 THEN POKES,87
640 NEXT I
650 POKE36879,108 PRINT"VIC GOLF"
660 X$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
670 IF D<40 THEN D=D+1 GOTO670
680 IF RND(1)>.5 THEN I=1
690 PRINT"VIC GOLF"
700 GOSUB1510
710 PRINT"VIC GOLF"
720 INPUT"VIC GOLF"
730 IF C<40 THEN C=C+1 GOTO730
740 PRINT"VIC GOLF"
750 GOTO700
760 G$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
770 PRINT"VIC GOLF"
780 INPUT"VIC GOLF"
790 PRINT"VIC GOLF"
800 B$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
810 IFL=2 THEN B$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
820 GOSUB1530 REM DISTANCE
830 M$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
840 M$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
850 A$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
860 IF RND(1)>.5 THEN I=1
870 D$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
880 IFF=2 THEN U$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
890 D$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
900 IF V<40 THEN V=V+1 GOTO900
910 IF V<40 THEN V=V+1 GOTO900
920 T$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
930 U$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
940 V$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
950 TR=1
960 IF X<40 THEN X=X+1 GOTO960
970 S$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
980 U$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
990 IF C<40 THEN C=C+1 GOTO990
1000 IF C<40 THEN C=C+1 GOTO990
1010 POKE36879,108 PRINT"VIC GOLF"
1020 FOR I=1 TO 9 POKES,0 FOR J=1 TO 99 NEXT J
1030 POKES,0 FOR J=1 TO 99 NEXT J
1040 GOSUB1530 IF V<40 THEN V=V+1 GOTO1040
1050 IF G=160 THEN G=43 THEN I=140
1060 IF G=160 THEN G=43 THEN I=140
1070 IF G=87 THEN I=240
1080 IF G=193 THEN I=400
1090 IF G=174 THEN I=240
1100 L=1 GOTO700
1110 U$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
1120 IF PEEK(22)=1 THEN U$=U$+264 T$=1 GOTO1140
1130 NEXT
1140 FOR I=1 TO 12 POKES,0 FOR J=1 TO 12 NEXT
1150 C$="" FOR I=1 TO 12 NEXT
1160 IF RND(1)>.5 THEN C=C+7 U$=1
1170 FOR I=1 TO 12
1180 POKES,0 FOR J=1 TO 12 NEXT
1190 C$="" FOR I=1 TO 12 NEXT
1200 IF D<40 THEN D=D+1 GOTO1200
1210 IF D<40 THEN D=D+1 GOTO1200
1220 IF D<40 THEN D=D+1 GOTO1200
1230 IF D<40 THEN D=D+1 GOTO1200
1240 IF D<40 THEN D=D+1 GOTO1200
1250 GOSUB1510
1260 PRINT"VIC GOLF"
1270 PRINT"VIC GOLF"
1280 GOSUB1530
1290 PRINT"VIC GOLF"
1300 GOSUB1510
1310 PRINT"VIC GOLF"
1320 PRINT"VIC GOLF"
1330 GOTO970
1340 PRINT"VIC GOLF"
1350 INPUT"VIC GOLF"
1360 IF A$="" THEN A$=""
1370 IF A$="" THEN A$=""
1380 GOTO800
1390 PRINT"VIC GOLF"
1400 PRINT"VIC GOLF"
1410 POKE36879,59 PRINT"VIC GOLF"
1420 PRINT"VIC GOLF"
1430 PRINT"VIC GOLF"
1440 PRINT"VIC GOLF"
1450 PRINT"VIC GOLF"
1460 PRINT"VIC GOLF"
1470 PRINT"VIC GOLF"
1480 PRINT"VIC GOLF"
1490 PRINT"VIC GOLF"
1500 PRINT"VIC GOLF"
1510 PRINT"VIC GOLF"
1520 PRINT"VIC GOLF"
1530 FOR I=1 TO 2000 NEXT I
1540 PRINT"VIC GOLF"
1550 IF RND(1)>.5 THEN I=1 GOTO1550
1560 IF RND(1)>.5 THEN I=1 GOTO1550
1570 PRINT"VIC GOLF"
1580 PRINT"VIC GOLF"
1590 K$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
1600 GOSUB1530 GOSUB1510
1610 FOR I=1 TO 22 Z$=Z$+" " NEXT
1620 POKE36879,108 PRINT"VIC GOLF"
1630 POKE36879,108 PRINT"VIC GOLF"
1640 D$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
1650 IF D<40 THEN D=D+1 GOTO1650
1660 POKE36879,108 PRINT"VIC GOLF"
1670 PRINT"VIC GOLF"
1680 PRINT"VIC GOLF"
1690 INPUT"VIC GOLF"
1700 C$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
1710 IF C<40 THEN C=C+1 GOTO1710
1720 PRINT"VIC GOLF"
1730 E$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
1740 FOR I=1 TO 22 Z$=Z$+" " NEXT
1750 FOR I=1 TO 22 Z$=Z$+" " NEXT
1760 POKES,0 POKES,0
1770 IF S<40 THEN S=S+1 GOTO1770
1780 NEXT I
1790 IF D<40 THEN D=D+1 GOTO1790
1800 IF S<40 THEN S=S+1 GOTO1800
1810 GOSUB1530 GOSUB1510 GOTO1810
1820 GOSUB1530 REM PUTTING
1830 PRINT"VIC GOLF"
1840 ON A$ P+3 GOTO1840,1870,1360,1910,1910
1850 PRINT"VIC GOLF"
1860 PRINT"VIC GOLF"
1870 PRINT"VIC GOLF"
1880 IFF=2 THEN I=1 GOTO1880
1890 PRINT"VIC GOLF"
1900 PRINT"VIC GOLF"
1910 PRINT"VIC GOLF"
1920 P1=P1+A$ A$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
1930 A$="" FOR I=1 TO 22 Z$=Z$+" " NEXT
1940 PRINT"VIC GOLF"
1950 PRINT"VIC GOLF"
1960 GOTO1960
    
```

CHAMPIONSHIPS



```

1970 PRINT "XO LEVEL PAR AFTER",N," HOLES
1980 PRINT "XOOO": GOSUB2498
1990 IF= "XOOO"
2000 IFN<18THEN450
2010 PRINT "X *** GAME OVER ***XOOO"
2020 ONINT((A1-P1)/5+2)GOTO2150,2120,2080
2030 PRINT "YOU'VE HACKED YOUR WAY"
2040 PRINT "ROUND BADLY, BEST TAKE"
2050 PRINT "SOME LESSONS BEFORE YOU"
2060 PRINT "DIG UP THIS COURSE AGAIN"
2070 GOTO2180
2080 PRINT "AN AVERAGE ROUND-YOU"
2090 PRINT "SHOULD IMPROVE NEXT TIME"
2100 PRINT "SEE THE CLUB PRO(RPT) FOR A"
2110 PRINT "FEW TIPS" GOTO2180
2120 PRINT "CONGRATULATIONS! YOU P"
2130 PRINT "LAVED A GOOD ROUND I LI"
2140 PRINT "KE YOUR STYLE" GOTO2180
2150 PRINT "AN UNDER PAR ROUND!!"
2160 PRINT "NEXT TIME YOU PLAY TRY "
2170 PRINT "A HIGHER HANDICAP"
2180 END
2190 REM ROUGH
2200 GOSUB1510 IFABS(Y-17)>10THEN2220
2210 AA=.75 PRINT "IN LIGHT ROUGH" GOTO2230
2220 AA=.5 PRINT "YOU ARE IN HEAVY ROUGH"
2230 GOSUB1530 GOTO700
2240 GOSUB1510 REM TRAP
2250 PRINT "X BUNKERED X" GOSUB1530
2260 GOSUB1510
2270 INPUT "WHICH CLUB",C: C=VAL(C)
2280 IFC>11ANDC<20THEN2320
2290 PRINT "YOU WON'T GET OUT WITH "
2300 PRINT "THAT": GOSUB1530
2310 GOSUB1510 GOTO2270
2320 INPUT "AGE SWING": B: B=VAL(B)
2330 M=60+FNH(17)-(19-C)*5-(100-B)*.4
2340 IFF=4THENM=.7
2350 IFRND(1)<.4THENM=1/3
2360 IFM>25THENM=0: B=1 GOTO840
2370 GOSUB1510
2380 PRINT "YOU FLUFFED IT" GOSUB1530
2390 AA+1 GOTO2240
2400 REM TREES
2410 GOSUB1510 PRINT "IN THE TREES"
2420 PRINT "YOU CAN ONLY HACK OUT SIDWAYS"
2430 TR=0 GOSUB1530 GOTO700
2440 REM WATER
2450 GOSUB1510 PRINT "X SPLASH !!! X"
2460 PRINT "IN THE STREAM-LOST BALL"
2470 GOSUB1530 GOSUB1510 GOTO1270
2480 PRINT "HIT A KEY TO CONTINUE"
2490 GET# IF#=""THEN2490
2500 RETURN
2510 DATA367,4,445,4,314,4,189,3,520,5
2520 DATA331,4,468,4,375,4,177,3,424,4
2530 DATA562,5,336,4,208,3,447,4,296,4
2540 DATA543,5,385,4,478,4
    
```

UNEXPANDED

THIS IS A program for the unexpanded Vic-20. The first part, Golf Chars, contains the title, instructions and data for special characters. This must be entered and run first and should be Saved on cassette before typing New and entering the second part, Golf Game. The program uses nearly all the available memory, so do not add any spaces when typing in. Some of the lines are very long and must be entered using the standard abbreviations.

The game consists of a series of nine holes, which will be different every time. The object is, of course, to get the ball into each hole in as few strokes as possible. The fairway is shown in plain green, the bunker in yellow and the

water hazard in blue. The hole is marked by a flag in the centre of the green. The ball can be hit in any direction, including diagonally, but only when the man is next to it. The direction of the hit is determined by the relative positions of man and ball, the latter moving directly away from the man.

When the man is in the position you want, press T and then enter the required club size, which will be a number from 1 to 9. Numbr 1 will hit the ball furthest. If the ball is in the rough it will not move as far as it would on the fairway and if you try to use your putter — number 9 — from the rough it will not move at

(continued on page 93)

Listing 1. Unexpanded golf game.

```

1 PRINT "XOOO THE VIC OPEN XOOO": PRINT "XOOO 9-HOLE GOLF GAME"
3 PRINT "XOOOXXXXXXXXXXXX"
5 PRINT "XOOO COPYRIGHT V. ALLSOPP X 1983"
10 V=36878: POKEV,15
11 READN,D: IFN=-1THENPOKEV,0: POKEV-2,0: POKEV-3,0: GOTO20
12 POKEV-3,N: POKEV-2,N: FORT=1TOD: NEXT: GOTO11
15 DATA195,200,207,200,215,600,0,200,195,200,215,200,209,600,0,200
16 DATA215,400,207,400,195,400,175,400,-1,-1
20 POKE51,0: POKE52,28: POKE55,0: POKE56,28: CB=7168
25 READA: IFA=-1THEN40
30 FORN=0T07: READB: POKECB+N+8*A,B: NEXT
35 GOTO25
40 PRINT "XOOO DO YOU REQUIRE XINSTRUCTIONS? (Y/N)"
50 GETA$: IFA$=""THEN50
55 IFA$="Y"THEN70
60 IFA$="N"THENPRINT "XOOO.K. PLEASE TYPE 'NEW' AND LOAD AND RUN XGOLF GAME"
65 PRINT "XOOO GOOD LUCK!": END
70 PRINT "XOOO MOVE THE MAN TO THE XBALL USING KEYS:-"
75 PRINT "XA - UP Z - DOWN XN - LEFT M - RIGHT"
80 PRINT "XK THE BALL WILL MOVE XDIRECTLY AWAY FROM THE XMAN WHEN HIT.>"
85 PRINT "XOOO PRESS SPACE TO CONT."
90 GETA$: IFA$<>" "THEN90
95 PRINT "XOOO WHEN MAN IS IN CORRECT XPOSITION, PRESS 'T'. XYOU WILL BE ASKED TO"
100 PRINT "XENTER CLUB SIZE (A NO. XFROM 1 TO 9). 1 IS THE XHEAVIEST CLUB AND 9 IS"
105 PRINT "A PUTTER WHICH ONLY XMOVES THE BALL ONE X SQUARE."
110 PRINT "XOOO PRESS SPACE TO CONT."
115 GETA$: IFA$<>" "THEN115
120 PRINT "XOOO TRY TO KEEP THE BALL XON THE FAIRWAY AND XAVOID THE HAZARDS."
122 PRINT "XPAR FOR THE COURSE IS X36 STROKES."
125 PRINT "XOOO NOW TYPE 'NEW' AND XLOAD AND RUN XGOLF GAME": PRINT "XOOO GOOD LUCK": END
1010 DATA0,0,0,0,24,24,0,0,0
1020 DATA28,16,24,28,30,16,16,16,16
1030 DATA35,24,24,60,90,90,60,36,102
1040 DATA36,24,60,126,255,255,126,60,24
1050 DATA37,24,24,24,24,24,24,24,24
1060 DATA26,255,255,255,255,255,255,255,255
1070 DATA1,3,15,63,63,127,127,255,255
1080 DATA2,192,240,252,252,254,254,255,255
1090 DATA3,255,255,254,254,252,252,240,192
1100 DATA4,255,255,127,127,63,63,15,3
1110 DATA32,17,34,68,136,17,34,68,136
1120 DATA5,252,126,126,63,63,126,126,252,-1
    
```

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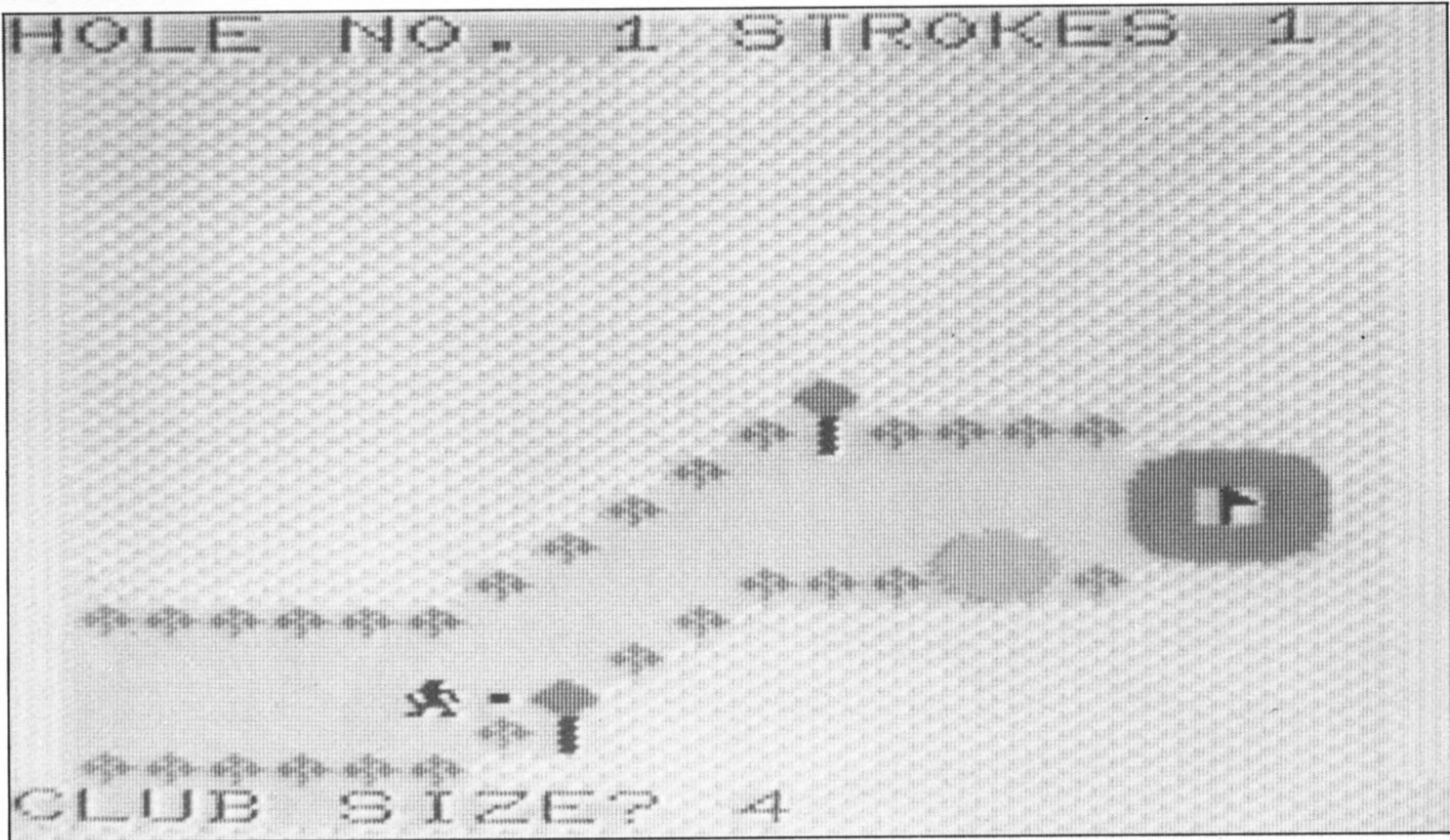
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Listing 2. Expanded golf game.

```

0 REM FOR "B" READ INVERSE POUND SIGN
1 REM GOLF GAME
2 REM COPYRIGHT
3 REM V. ALLSPORT 1983
10 POKE36873,217:PRINT"Q" :H=0:SR=0:C=30720
40 POKE36869,255:AND(0)
50 PRINT"Q" :SC=0
60 A=INT(RND(1)*5)+1:B=INT(RND(1)*9):D=14-A-B:H=H+1:POKE198,0:IF(0)THENGOSUB500
0:GOTO600
61 IFB<STHENZ=7790:V=23:V=0:GOTO70
65 Z=9010:V=21:V=2
70 FORW=0TO9:W=Z+X:POKEW+1,216:POKEW+1+W,5
75 POKEW+23,160:POKEW+45,160:POKEW+67,160
80 POKEW+89,216:POKEW+99,W,5:NEXT
89 IFB=0THEN110
90 FORX=1TOV*WSTEPV:WZ=V+X:POKEW,216:POKEW+W,5
95 POKEW+22,160:POKEW+44,160:POKEW+66,160
100 POKEW+88,W,5:216:POKEW+99,W,5:NEXT
110 FORW=0TO9:WZ=V+X:POKEW+2,216:POKEW+2+W,5
115 POKEW+24,160:POKEW+46,160:POKEW+68,160:NEXT
120 FORX=0TO9:WZ=V+X:POKEW+89,216:POKEW+99+W,5:NEXT

```

(continued from page 91)
all. It can also hit trees, get stuck in the bunker or lost in the water but it cannot be hit off the screen, nor will it scroll around the sides. The man cannot stand on the trees or the flag or in the water.

Program structure.

Lines	Title
1 to 5	Copyright
10 to 16	Initialise variables and set up screen
20	Keyboard scan
25 to 35	Subroutine to move man
40 to 125	Subroutine to move ball
1010 to 1120	Subroutine to print score
400 to 420	Subroutine for ball in water
1000 to 1030	Subroutine giving scores for nine holes

```

130 F=Z+62+(V-1)*B:POKEF,28:POKEC+F,0
140 POKEF-1,26:POKEF+1,26:POKEF-22,26:POKEF+22,26
145 POKEC+F-1,5:POKEC+F+1,5:POKEC+F-22,5:POKEC+F+22,5
150 W=Z+22*Y+A:POKEW+25,37:POKEC+25+W,2:POKEW+3,36:POKEC+3+W,5
160 W=Z+A+V*B:POKEW+2,37:POKEC+2+W,2:POKEW-20,36:POKEC-20+W,5
170 POKEF-23,1:POKEF-21,2:POKEF+21,4:POKEF+23,3
175 POKEC+F-23,5:POKEC+F-21,5:POKEC+F+21,5:POKEC+F+23,5
176 IFR>2THEN180
177 POKEF-2,5:POKEF+C-2,6:POKEF-24,5:POKEF+C-24,6:POKEF+20,5:POKEF+C+20,6
180 W=Z+(V-1)*B:POKEW+80,1:POKEC+80+W,7:POKEW+81,2:POKEC+81+W,7
190 POKEW+102,4:POKEC+102+W,7:POKEW+103,3:POKEC+103+W,7
193 FORX=7680TO8098STEP22:POKEW,230:NEXT:FORX=7701TO8119STEP22:POKEW,230:NEXT
200 PRINT"Q" :HOLE NO. "H
210 B=Z+45:BC=B+C:POKEB,0:M=7724:MC=M+C:POKEM,35:POKEMC,2:POKEBC,0
220 N=230:NC=1:Q=160:QC=1:V=36878
400 P1=PEEK(197):IFP1=17THENDM=-22:GOSUB1000
405 IFP1=33THENDM=22:GOSUB1000
410 IFP1=28THENDM=-1:GOSUB1000
415 IFP1=36THENDM=1:GOSUB1000
420 IFP1=50THENGOSUB2000
430 POKE198,0:IFP=28THENP=0:GOTO50
440 GOTO400
600 FORX=1TO6000:NEXT:POKE36869,240:PRINT"Q" :END
1000 IF(M+DM)<7702OR(M+DM)>8185THENDM=0:RETURN
1010 P2=PEEK(M+DM):IFP2=0ORP2=36ORP2=37ORP2=28ORP2=5THENDM=0:RETURN
1020 POKEM,N:POKEMC,NC:N=PEEK(M+DM):NC=PEEK(MC+DM):POKEV,15:POKEV-2,200:POKEV-2
0:POKEV,0
1030 M=M+DM:POKEM,35:MC=M+C:POKEMC,2:RETURN
2000 DB=B-M:IFDB=10RDB=-10R(DB)>-24ANDDB<-20)OR(DB>20ANDDB<24)THEN2004
2001 RETURN
2004 POKE198,0:INPUT"Q" :CLUB SIZE";CL:PRINT"Q" :IFCL<10RCL>9
THEN2004
2005 IFQC=247ORQC=231ORQC=167ORQC=70ORQC=39ORQC=23ORCL=9THENR=1:GOTO2009
2008 R=10-CL+INT(RND(1)*(12-CL)/2)
2009 IFQ=32THENR=R-1
2012 SC=SC+1:PRINT"Q" :STROKES";SC
2014 W=B+R*DB
2015 P=PEEK(W):IFP=36ORP=37THENW=W-DB:GOTO2015
2020 IFW<7724ORW>8163THENW=B:RETURN
2023 FORX=BTOWSTEPDB:P=PEEK(X):IFP=230THENW=X-DB:GOTO2025
2024 NEXT:P=PEEK(W)
2025 IFW=MTHEN:W=W-1
2026 POKEV,15:FORX=1TO2:POKEV-1,240:NEXT:POKEV-1,0:FORX=0TO200:NEXT
2027 FORX=220TO220-10*WSTEP-2:POKEV-2,X:NEXT:POKEV,0:POKEV-2,0:IFP=5THENGOSUB45
00
2028 IFW=MTHEN:W=W-1
2029 IFP=28THENGOSUB4000:RETURN
2030 POKEB,Q:B=W:Q=PEEK(B):POKEB,0:POKEBC,QC:BC=B+C:QC=PEEK(BC):POKEBC,0:RETURN
4000 POKEV,15:POKEV-1,240:FORX=1TO2:NEXT:POKEV,0
4005 PRINT"Q" :HOLE NO. "H"COMPLETED MIN"SC;"STROKES":SR=SR+SC
4010 PRINT"Q" :TOTAL "SR"STROKES":FORX=1TO5000:NEXT:RETURN
4500 PRINT"Q" :IN THE WATER - LOSE A STROKE";SC=SC+1:W=W-1
4502 IFW=F+19THENW=W-22
4505 POKEB,Q:B=W:Q=PEEK(B):POKEBC,QC:BC=B+C:QC=PEEK(BC)
4510 FORX=1TO3000:NEXT:PRINT"Q" :S"
4515 PRINT"Q" :STROKES";SC:RETURN
5000 PRINT"Q" :YOU HAVE COMPLETED 9 HOLES WITH A TOTAL OF SR" STROKES"
5010 IFSR>36THENPRINT"Q" :THIS IS "SR-36"STROKES":PRINT"Q" :OVER PAR"
5020 IFSR=36THENPRINT"Q" :THIS IS PAR FOR THE COURSE"
5030 IFSR<36THENPRINT"Q" :THIS IS "36-SR"STROKES":PRINT"Q" :UNDER PAR"
5040 RETURN

```

CBM 64

SYNTH

Duran Duran do it. Depeche Mode do it. Yazoo do it. Now you can do it too. Make beautiful music with Stephen Watson's simple synthesiser program.

WEIRD AND WONDERFUL sounds — anything from a banjo to an ondes martenot — can be made to emanate from the CBM 64 by using this simple program. It has been written in straightforward Basic to enable beginners to grasp the methods used, making it easy for them to butcher the program to their own requirements. It also contains graphic sections to aid the user in defining his own instruments.

Synth-sound 64 allows the user to play the computer like a synthesiser. It has the facility to define 12 separate instruments, four of which are already defined within the program — piano, banjo, xylophone and woodwind. It is possible to change waveforms while playing by pressing the f keys on the right-hand side of the keyboard; octaves can be selected by pressing the numerical keys 1 to 4 on the top left-hand side of the keyboard. Key 1 is the highest octave.

The program should be run and listed in the lower case mode. You will be presented with a menu showing the 12 different instrument options and asking if you wish to redefine. You can select the piano option, for example, by keying in the £ sign: when the £ sign appears on the screen, depress the plus sign — the £ sign disappears. Your keyboard is now "live", meaning that it will play the sound

designated as piano when you hit the right keys. These are shown on-screen, and a mock keyboard on the screen display shows you where this would fall on a real keyboard.

If you want to break new ground in avant-garde music by defining the sound of a goat in a room, the death throes of a neutron star, or a mighty ship ascending, press the left arrow followed by a nine and you will be asked what instrument you wish to examine out of the eight programmable ones. Once you have made your selection, the options presented are:

Attack/decay 0-255
Sustain/release 0-255
Wave-form S,T,M or P

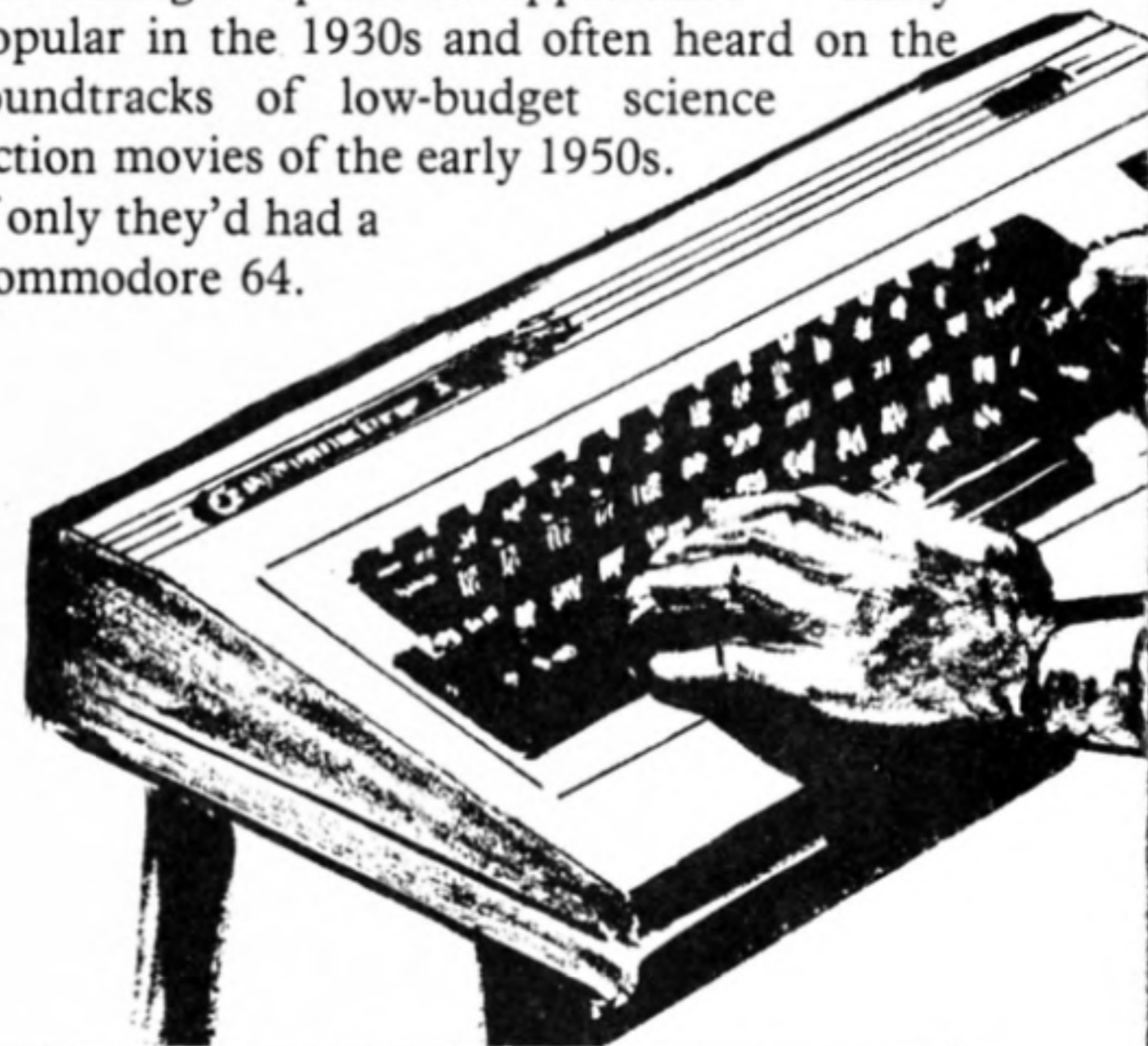
Having defined the fundamental sound you will be returned to the menu. Key in the left arrow plus the number of the sound you just defined and your keyboard will be "live" again. Together with the four waveform keys and the four octave keys previously mentioned, you can achieve anything from a Vivaldi-type harpsichord to a drum sound worthy of Echo and the Bunnymen. Special effects, such as steam trains and gunshots are also possible.

If, while defining an instrument, you wish to leave a setting the same, just press Return only and the computer will skip over leaving

the contents of that particular value unaltered and move to the next setting. While playing you can silence the voices by pressing CLR Home — unshifted — but remember that you cannot use the pulse waveform — f7 — on an instrument that has Hi and Lo pulse rates set at zero. Flags are displayed on the screen to show the user which instruments he can call on.

And, for those of you who may still be wondering, an ondes martenot is an old-fashioned electronic musical instrument resembling a spinet in appearance — fairly popular in the 1930s and often heard on the soundtracks of low-budget science fiction movies of the early 1950s.

If only they'd had a Commodore 64.



```

1 REM SYNTH SOUND - FOR "£" READ INVERSE POUND SIGN
2 REM ** WRITTEN BY S.A. WATSON **
3 AD=12:SR=12:W=33:HP=0:LP=0:POKE54296,15
4 GOSUB 1000:GOSUB 3000
5 REM *****
6 REM * VOICE ROUTINE *
7 REM *****
8 REM *****
9 REM
10 GET K$:IF K$="" THEN 10
11 GOSUB 100
12 IF K$="" THEN 10
13 POKE 54276,0
14 POKE54277,AD
15 POKE54278,SR
16 POKE54279,HP:POKE54274,LP
17 POKE54276,W
18 POKE54273,A:POKE54272,B
20 GET K$:IF K$="" THEN 20
21 GOSUB 100
22 IF K$="" THEN 20
23 POKE54283,0
24 POKE54284,AD
25 POKE54285,SR
26 POKE54282,HP:POKE54281,LP
27 POKE54283,W
28 POKE54280,A:POKE54279,B
30 GET K$:IF K$="" THEN 30
31 GOSUB 100
32 IF K$="" THEN 30
33 POKE54290,0
34 POKE54291,AD
35 POKE54292,SR
36 POKE54289,HP:POKE54288,LP
37 POKE54290,W
38 POKE54287,A:POKE54286,B
39 GOTO 10
40 REM
41 REM *****
42 REM * OCTAVE 1 TABLE *
43 REM *****
44 REM
100 IF 0=2 THEN 200
101 IF 0=3 THEN 300
102 IF 0=4 THEN 400
103 IF K$="£" THEN POKE54276,0:POKE54283,0:POKE54290,0:
K$="" :RETURN
105 IF K$="2" THEN 0=2:K$="" :RETURN
106 IF K$="3" THEN 0=3:K$="" :RETURN
107 IF K$="4" THEN 0=4:K$="" :RETURN
112 IF K$="Z" THEN A=28:B=214:RETURN
113 IF K$="X" THEN A=32:B=94:RETURN
114 IF K$="C" THEN A=34:B=75:RETURN
115 IF K$="V" THEN A=38:B=126:RETURN
125 IF K$="B" THEN A=43:B=52:RETURN
130 IF K$="N" THEN A=45:B=138:RETURN
135 IF K$="M" THEN A=51:B=97:RETURN
140 IF K$="," THEN A=57:B=172:RETURN
145 IF K$=";" THEN A=64:B=168:RETURN
150 IF K$="/" THEN A=68:B=149:RETURN
151 REM
152 REM ** SHARPS **
153 REM

```

```

154 IF K$="S" THEN A=30:B=141:RETURN
155 IF K$="F" THEN A=36:B=85:RETURN
160 IF K$="G" THEN A=40:B=200:RETURN
161 IF K$="J" THEN A=48:B=127:RETURN
165 IF K$="K" THEN A=54:B=111:RETURN
170 IF K$="L" THEN A=61:B=126:RETURN
175 IF K$=";" THEN A=72:B=169:RETURN
189 IF K$="+" THEN GOSUB 600
190 IF K$="\" THEN GOSUB 600
191 IF K$="|" THEN W=33:K$="" :RETURN
192 IF K$="|" THEN W=17:K$="" :RETURN
193 IF K$="|" THEN W=129:K$="" :RETURN
194 IF K$="|" THEN W=65:K$="" :RETURN
195 K$="" :RETURN
196 REM
197 REM *****
198 REM * OCTAVE 2 TABLE *
199 REM *****
200 IF K$="2" THEN POKE54276,0:POKE54283,0:POKE54290,0:
K$="" :RETURN
201 IF K$="1" THEN 0=1:K$="" :RETURN
202 IF K$="3" THEN 0=3:K$="" :RETURN
203 IF K$="4" THEN 0=4:K$="" :RETURN
212 IF K$="Z" THEN A=14:B=107:RETURN
213 IF K$="X" THEN A=16:B=47:RETURN
214 IF K$="C" THEN A=17:B=37:RETURN
215 IF K$="V" THEN A=19:B=63:RETURN
225 IF K$="B" THEN A=21:B=154:RETURN
230 IF K$="N" THEN A=22:B=227:RETURN
235 IF K$="M" THEN A=25:B=177:RETURN
240 IF K$="," THEN A=28:B=214:RETURN
245 IF K$=";" THEN A=32:B=94:RETURN
250 IF K$="/" THEN A=34:B=75:RETURN
251 REM
252 REM ** SHARPS **
253 REM
254 IF K$="S" THEN A=15:B=70:RETURN
255 IF K$="F" THEN A=18:B=42:RETURN
260 IF K$="G" THEN A=20:B=100:RETURN
261 IF K$="J" THEN A=24:B=63:RETURN
265 IF K$="K" THEN A=27:B=56:RETURN
270 IF K$="L" THEN A=30:B=141:RETURN
275 IF K$=";" THEN A=36:B=85:RETURN
289 IF K$="+" THEN GOSUB 600
290 IF K$="\" THEN GOSUB 600
291 IF K$="|" THEN W=33:K$="" :RETURN
292 IF K$="|" THEN W=17:K$="" :RETURN
293 IF K$="|" THEN W=129:K$="" :RETURN
294 IF K$="|" THEN W=65:K$="" :RETURN
295 K$="" :RETURN
296 REM
297 REM *****
298 REM * OCTAVE 3 TABLE *
299 REM *****
300 IF K$="2" THEN POKE54276,0:POKE54283,0:POKE54290,0:
K$="" :RETURN
301 IF K$="1" THEN 0=1:K$="" :RETURN
302 IF K$="3" THEN 0=2:K$="" :RETURN
303 IF K$="4" THEN 0=4:K$="" :RETURN
312 IF K$="Z" THEN A=7:B=53:RETURN
313 IF K$="X" THEN A=8:B=23:RETURN
314 IF K$="C" THEN A=8:B=147:RETURN

```

```

315 IF K$="V" THEN A=9:B=159:RETURN
325 IF K$="B" THEN A=10:B=205:RETURN
330 IF K$="N" THEN A=11:B=114:RETURN
335 IF K$="M" THEN A=12:B=216:RETURN
340 IF K$="," THEN A=14:B=107:RETURN
345 IF K$=";" THEN A=16:B=47:RETURN
350 IF K$="/" THEN A=17:B=37:RETURN
351 REM
352 REM ** SHARPS **
353 REM
354 IF K$="S" THEN A=7:B=163:RETURN
360 IF K$="F" THEN A=9:B=21:RETURN
361 IF K$="G" THEN A=10:B=60:RETURN
365 IF K$="J" THEN A=12:B=32:RETURN
370 IF K$="K" THEN A=13:B=156:RETURN
375 IF K$="L" THEN A=15:B=70:RETURN
376 IF K$=";" THEN A=18:B=42:RETURN
389 IF K$="+" THEN GOSUB 600
390 IF K$="\" THEN GOSUB 600
391 IF K$="|" THEN W=33:K$="" :RETURN
392 IF K$="|" THEN W=17:K$="" :RETURN
393 IF K$="|" THEN W=129:K$="" :RETURN
394 IF K$="|" THEN W=65:K$="" :RETURN
395 K$="" :RETURN
396 REM
397 REM *****
398 REM * OCTAVE 4 TABLE *
399 REM *****
400 IF K$="2" THEN POKE54276,0:POKE54283,0:POKE54290,0:
K$="" :RETURN
401 IF K$="1" THEN 0=1:K$="" :RETURN
402 IF K$="3" THEN 0=2:K$="" :RETURN
403 IF K$="4" THEN 0=3:K$="" :RETURN
412 IF K$="Z" THEN A=3:B=155:RETURN
413 IF K$="X" THEN A=4:B=12:RETURN
414 IF K$="C" THEN A=4:B=73:RETURN
415 IF K$="V" THEN A=4:B=208:RETURN
425 IF K$="B" THEN A=5:B=103:RETURN
430 IF K$="N" THEN A=5:B=185:RETURN
435 IF K$="M" THEN A=6:B=108:RETURN
440 IF K$="," THEN A=7:B=53:RETURN
445 IF K$=";" THEN A=8:B=23:RETURN
450 IF K$="/" THEN A=8:B=147:RETURN
451 REM
452 REM ** SHARPS **
453 REM
454 REM
455 IF K$="S" THEN A=3:B=210:RETURN
456 IF K$="F" THEN A=4:B=139:RETURN
460 IF K$="G" THEN A=5:B=25:RETURN
461 IF K$="J" THEN A=6:B=16:RETURN
465 IF K$="K" THEN A=6:B=206:RETURN
470 IF K$="L" THEN A=7:B=163:RETURN
475 IF K$=";" THEN A=9:B=21:RETURN
489 IF K$="+" THEN GOSUB 600
490 IF K$="\" THEN GOSUB 600
491 IF K$="|" THEN W=33:K$="" :RETURN
492 IF K$="|" THEN W=17:K$="" :RETURN
493 IF K$="|" THEN W=129:K$="" :RETURN
494 IF K$="|" THEN W=65:K$="" :RETURN
495 K$="" :RETURN
496 RETURN
594 REM

```



```
595 REM *****
596 REM * INSTRUMENT CHANGE ROUTINE *
597 REM *****
600 REM
602 PRINT "*****";TAB(34);"[ \]"
605 GET Q$:IF Q$="" THEN 605
608 PRINT "*****";TAB(34);" "
610 IF Q$="+" THEN AD=12:SR=12:W=33:HP=0:LP=0:K$="":RETURN
620 IF Q$="-" THEN AD= 9:SR= 0:W=65:HP= 2:LP=255:K$="":RETURN
630 IF Q$="@" THEN AD=24:SR=15:W=17:HP=0:LP=0:K$="":RETURN
640 IF Q$="*" THEN AD=135:SR=15:W=17:HP=0:LP=0:K$="":RETURN
641 RETURN
642 REM
643 REM *****
644 REM * DEFINABLE INSTRUMENT CHANGE *
645 REM *****
650 PRINT "*****";TAB(34);"*****"
651 GET X$:IF X$="" THEN 650
652 PRINT "*****";TAB(34);"*****"
655 IF X$="9" THEN GOSUB 800
660 IF X$>"8" OR X$<"1" THEN RETURN
662 X=VAL(X$)
670 AD=AD(X):SR=SR(X):HP=HP(X):LP=LP(X):W=W(X)
671 K$="":RETURN
800 PRINT "WHAT INSTRUMENT DO YOU WISH TO EXAMINE"
810 INPUT " "
820 IF DE>8 OR DE<1 THEN 810
830 PRINT "THE INSTRUMENT YOU WISH TO EXAMINE IS:-"
840 PRINT " "
850 PRINT "ITS SETTINGS ARE AS FOLLOWS:-"
860 PRINT "*****"
870 PRINT "ATTACK/DECAY "AD(DE);TAB(31);"*****"
871 PRINT " "
872 PRINT "SUSTAIN/RELEASE "SR(DE);TAB(31);"*****"
873 PRINT " "
874 PRINT "WAVEFORM "W(DE);TAB(31);"*****"
875 PRINT " "
876 PRINT "HIGH PULSE RATE "HP(DE);TAB(31);"*****"
877 PRINT " "
878 PRINT "LOW PULSE RATE "LP(DE);TAB(31);"*****"
879 PRINT "*****"
880 INPUT "DO YOU WISH TO REDIFINE(Y/N)?"
885 IF T$="Y" THEN PRINT "*****";GOSUB 2010
886 IF T$="N" THEN 895
895 GOSUB 3000
900 RETURN
990 REM
991 REM *****
992 REM * PROGRAM INTRODUCTION *
993 REM *****
998 REM
1000 POKE53280,0:POKE53281,0
1010 PRINT "HELLO AND WELCOME TO"
1020 PRINT " "
1030 PRINT "WITH THIS PROGRAM, YOU CAN PLAY ANY ONE"
1040 PRINT "OF FOUR OCTAVES. YOU CAN CHANGE OCTAVES"
1050 PRINT "AT ANY TIME WHILE YOU'RE PLAYING BY"
1060 PRINT "PRESSING KEYS 1, 2, 3 OR 4. HERE ARE"
1070 PRINT "ALSO TWELVE SETS OF SOUNDS THAT CAN BE"
1080 PRINT "USED. EIGHT OF THESE ARE USER DEFINABLE"
1090 PRINT "AND CAN BE SET UP AT THE START OF THE"
1100 PRINT "PROGRAM, OR REDEFINED WHILE THE PROGRAM"
1110 PRINT "IS RUNNING BY PRESSING KEY 'E' & '9'"
1120 INPUT "ENTER INSTRUMENT NUMBER 1 TO 4 ";D
1125 PRINT " "
1130 IF D>4 OR D<1 THEN 1120
1140 RETURN
2000 REM
2001 REM *****
2002 REM * DEFINABLE INST' SET UP *
2003 REM *****
2004 REM
2010 PRINT "*****";TAB(34);"*****"
2020 INPUT "ENTER NAME FOR INSTRUMENT NUMBER ";DE
2030 INPUT "ENTER ATTACK/DECAY LEVEL(0-255)";AD(DE)
2035 IF AD(DE)>255 OR AD(DE)<0 THEN PRINT "WRONG";AD(DE);" IS OUT OF RANGE":GOTO 2030
2040 INPUT "ENTER SUSTAIN/RELEASE LEVEL(0-255)";SR(DE)
2045 IF SR(DE)>255 OR SR(DE)<0 THEN PRINT "WRONG";SR(DE);" IS OUT OF RANGE":GOTO 2040
2050 INPUT "ENTER WAVEFORM REQUIRED (0-1-2 OR 3)";W$(DE)
2060 IF W$(DE)="1" THEN W(DE)=17:GOTO 2990
2065 IF W$(DE)="2" THEN W(DE)=33:GOTO 2990
2070 IF W$(DE)="3" THEN W(DE)=129:GOTO 2990
2075 IF W$(DE)="0" THEN W(DE)=65:GOTO 2100
2080 PRINT "WRONG";W$(DE);" NOT UNDERSTOOD":GOTO 2050
2100 INPUT "ENTER THE H PULSE RATE(0-15)";HP(DE)
2110 IF HP(DE)>15 THEN PRINT "WRONG, PULSE RATE TOO HIGH":GOTO 2100
2120 IF HP(DE)<0 THEN PRINT "WRONG, PULSE RATE TOO LOW":GOTO 2100
2130 INPUT "ENTER THE L PULSE RATE(0-255)";LP(DE)
2140 IF LP(DE)>255 THEN PRINT "WRONG, PULSE RATE TOO HIGH":GOTO 2130
2150 IF LP(DE)<0 THEN PRINT "WRONG, PULSE RATE TOO LOW":GOTO 2130
2990 RETURN
2995 REM
2996 REM *****
2997 REM * KEYBOARD/SETTINGS DISPLAY *
2998 REM *****
2999 REM
3000 PRINT "*****"
3010 PRINT "*****"
3020 PRINT "*****"
3040 PRINT "*****"
3050 PRINT "*****"
3060 PRINT "*****"
3100 PRINT "*****"
3105 PRINT "*****"
3110 PRINT "TRIANO \ + ***** -IRST 1 *****"
3120 PRINT "TRIANJO \ - ***** -ECOND 2 *****"
3130 PRINT "TRIVLOPHONE \ @ ***** -HIRD 3 *****"
3140 PRINT "TRIOODWIND \ * ***** -OURTH 4 *****"
3160 FOR I=1 TO 8
3165 IF IN$(I)="" THEN IN$(I)="/OT /SED"
3170 PRINT "I";IN$(I);TAB(14);" ";I;TAB(19);"*****"
3180 NEXT I
3190 PRINT "*****"
3200 PRINT "*****"
3210 PRINTTAB(19);"*****"
3220 PRINTTAB(19);"*****"
3230 PRINTTAB(19);"*****"
3240 PRINTTAB(21);"TRAWTOOTH F1"
3250 PRINTTAB(21);"TRIRANGLE F3"
3260 PRINTTAB(21);"TRIOISE F5"
3270 PRINTTAB(21);"TRIJULSE F7"
3280 PRINT "PRESS 'E' THEN '9' TO RE-DEFINE."
3400 RETURN
```

DOWNSWAY

NEW ADD-ON MEMORIES FROM DOWNSWAY

All in smartly styled injection-moulded ABS plastic cases for extra rigidity, finished to match the computers, and built to the highest standards for guaranteed performance and reliability.

64K MEMORY for ZX81 — Switchable Redesigned ultra-slim memory measuring only 82X58X22 mm, with tight fitting gold-plated edge connector. Needs no extra power supply — 8-16K portion of memory map can be switched out to permit use of other accessories. **Only £59.95.**



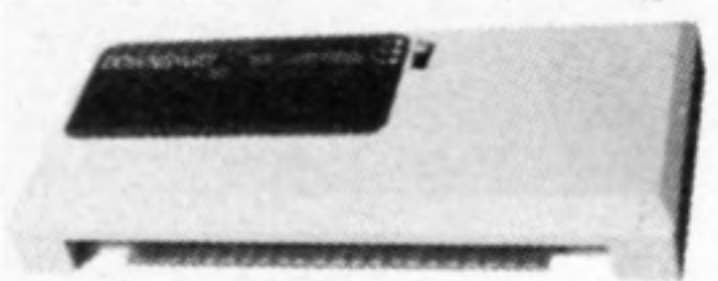
16K RAM Pack — same size and finish as 64K — **Just £24.95** including **free NODROG** maze adventure game

NEW 48K MEMORY for Jupiter Ace Gives a full 51K of RAM — light, snug-fitting unit with all the outstanding features of other Downsway memories — finished to match the new Jupiter case. **Only £59.95**



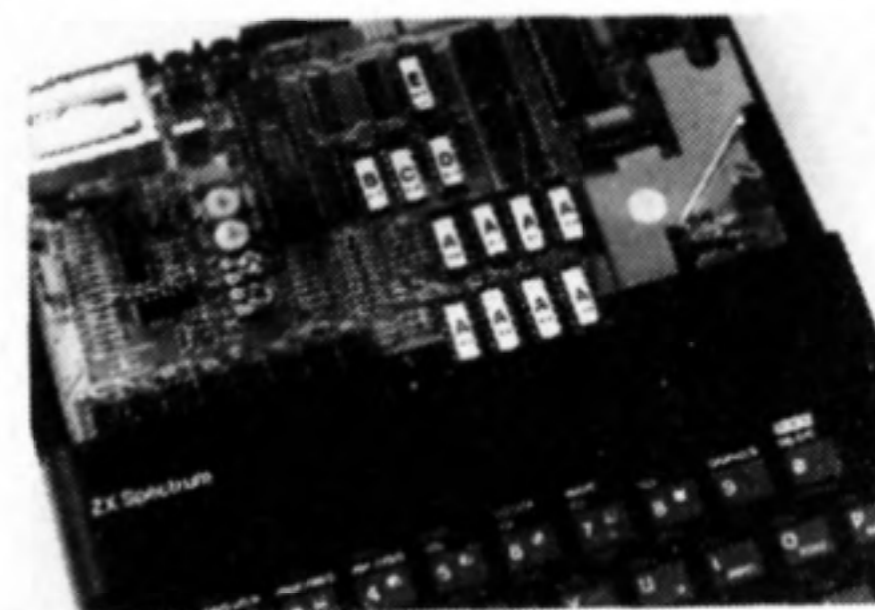
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16K RAM CARTRIDGE for VIC 20 Switchable for 3, 8 or 16K operation, giving up to 20K of RAM. Plugs directly into the rear expansion port, fully compatible with appropriate accessories. **Only £37.50**



Naturally Downsway add-on memories are fully tested and guaranteed but should you be dissatisfied for any reason, just return the memory within 14 days for a full refund.

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A full 48K of memory for the 16K Spectrum — simply D.I.Y. installation by just undoing 5 screws and plugging in!

For Issue One machines (with light grey keys) — a RAM board of advanced design, using "state-of-the-art" technology — **only £42.50.**

For Issue Two machines (with dark grey keys) — a simple plug-in kit of I.C.s which fit straight in to the sockets already provided — **only £32.50.**

Both come with fully detailed, illustrated instructions.

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BETA BASIC

ENHANCED BASIC FOR THE
ZX SPECTRUM 16/48K

26 NEW KEYWORDS — 10 NEW
FUNCTIONS — MANY EXTRA FEATURES

Keywords include:

- ALTER — allows extensive manipulation of the attributes file.
- AUTO — for automatic entry of line numbers.
- CLOCK — controls a digital clock with alarm and alarm-initiated GOSUB facility.
- DELETE — any block of lines.
- DO — DO...LOOP structure, with WHILE, UNTIL and EXIT IF.
- DPOKE — double POKE.
- EDIT — a specified line number.
- ELSE — used with IF...THEN.
- GET — waits for keyboard entry; doesn't use ENTER.
- KEYWORDS — shifts between new keywords and normal graphics mode.
- ON — GOSUB or GO TO a line number from a list of line numbers.
- ON ERROR — allows trapping of most reports; has available ERROR, LINE and STAT variables.
- POP — removes data from BASIC's stack.
- PROC — named procedures, with DEF PROC and END PROC.
- RENUM — renumber part or whole program with specified start line and increment. Handles GO TO, GOSUB, ON, etc.
- ROLL — pixel movement of part or whole screen in any direction, with wrap-round.
- SCROLL — as ROLL, but without wrap-round.
- SORT — sorts part or all of string or numeric arrays according to specified substring or column. SORT INVERSE sorts in reverse order. One hundred strings can be sorted in about one-fifth of a second!
- TRACE — allows display of line and statement numbers as a program is running. Display of selected variables, single stepping, and reduced speed are also possible.
- USING — used with PRINT; formats numbers.

Functions provide:

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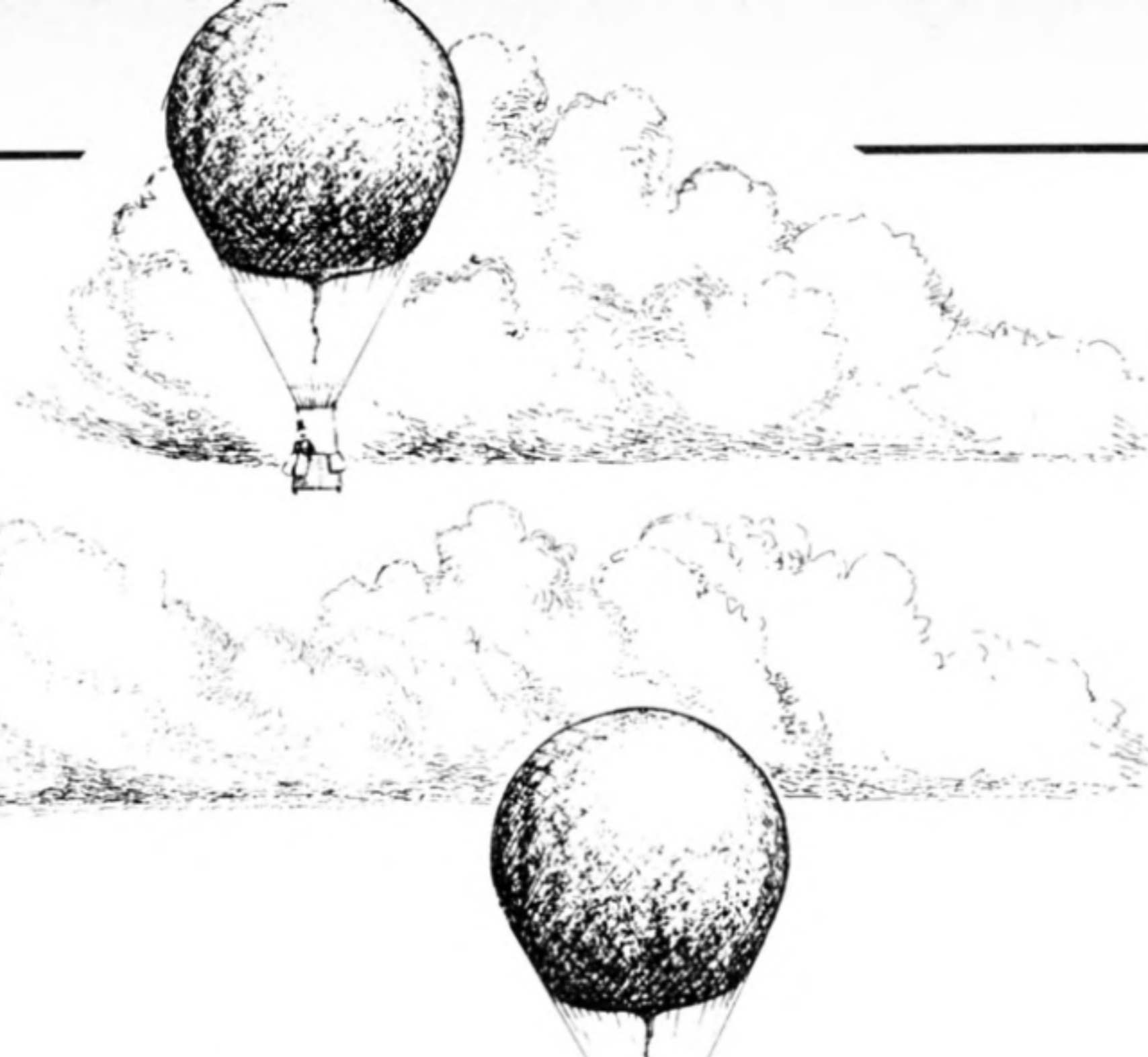
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Chris Melville looks at two pieces of BBC hardware which enable the user to create sprites.



SOME HOME COMPUTERS have hardware which provides the use of sprites. The concept of a sprite can differ from one implementation to another but in general it is a user-definable shape which, once defined and positioned on the screen, can be forgotten about until you want to move it — the hardware looks after it in the sense that it handles interaction with other graphics on the screen.

It may or may not, depending on the foreground/background priority of the sprite, allow the sprite to be drawn over — thus the sprite can be made to move in front of or behind other objects on the screen. If you imagine a sprite as being a sticker/transfer which you can stick at will on the front of your screen and subsequently peel it off and reposition it, then you have a fair idea of the nature of sprites.

Some systems allow you to define the sprite's screen velocity. This means that you define its shape, position and velocity and the machine hardware takes it from there. Your sprite will continue to move of its own accord across the screen, passing in front of or behind other graphics in the prescribed manner. Imagine how useful this facility is when writing a space invaders program — define an invader and set it moving, then you can forget about it, unless it reaches the side of the screen or gets hit of course.

The BBC micro was, regrettably, not given the necessary hardware to implement full sprite usage, but that does not mean that all is lost.

The colour palette can be used to make a user-defined shape appear to move in front of or behind selected colours already on the screen. Use will be made here of EOR — exclusive or — printing. The word printing does not imply that the character will only appear at text positions since use will be made of VDUs to link graphics and text cursors and enable the character to appear anywhere on the screen.

The user 6522 VIA will be used to provide regular interrupts, the handler of which will be responsible for providing the automatic moving of the above character. If you are not familiar with 6522s, interrupts or handlers Rodney Zaks has written an excellent book *Programming the 6502*.

We will be working in mode 2 — 20K and 16 colours — as we need the full 16-colour palette so you will need a Model B, also the user 6522 VIA does not exist on Model A. This is the main reason why some Acornsoft games do not work on As since they make use of the 6522's

Figure 1. The Mode 2 colour palette

Number	Physical colour	Logical colour
0	Black	Black
1	Red	Red
2	Green	Green
3	Yellow	Yellow
4	Blue	Blue
5	Magenta	Magenta
6	Cyan	Cyan
7	White	White
8	Flashing Black/White	Should be redefined as required
9	Flashing Red/Green	
10	Flashing Green/Magenta	
11	Flashing Yellow/Blue	
12	Flashing Blue/Yellow	
13	Flashing Magenta/Green	
14	Flashing Cyan/Red	
15	Flashing White/Black	

SPRITES

timers as described later in the article.

MOS issue 0.1 should work since the programs and method deal with 6522 hardware directly, which precludes the use of Tube systems. We could have done the job using the

concept of Events rather than interrupts but would have restricted issue 0.1 owners.

Each person's needs are different and it is impossible to provide self-contained bolt-on
(continued on next page)

Listing 1.

```

1REM DEMO1
10CLS:PRINT"this program shows a simple example of
"relative movement using EOR graphics""A coloured (r
ed/green) circle is drawn""on the screen and you move
a white ball""about using the cursor keys.""One of
two things may happen:"
20PRINT"The ball will only appear in the inner""ci
rcle (hit 'I') or it will thread between the sectors (
hit 'S') passing in""front of green on the outside an
d behind it in the inner circle.""Hit 'I' or 'S'..."
30
40REPEAT:XS=GET$:UNTIL XS="S" OR XS="I"
50
60REM determine which of the available reds will be
used.
70IF XS="S" OUTRED=14:INRED=10 ELSE OUTRED=10:INRED
=14
80MODE2
90REM. On the outer circle the white ball will pass
in front of red and behind green (which we will defin
e as colours 10,11 for convenience).
100REM On the inner circle (here the red is 14 and th
e green 15) it will be the other way round. One way of
allocating the logical colours to attain these results
is:
110REM white=7,13,8
120REM red 10,14,9
130REM green 11,12,15
140 REM this is now set up:
150
160VDU19,13,7:0:19,8,7:0:
170VDU19,10,1:0:19,14,1:0:19,9,1:0:
180VDU19,11,2:0:19,12,2:0:19,15,2:0:
190
200REM define a 4-character ball.
210VDU23,240,3,15,31,63,127,127,255,255

```

```

220VDU23,241,255,255,127,127,63,31,15,3
230VDU23,242,255,255,254,254,252,248,240,192
240VDU23,243,192,240,248,252,254,254,255,255
250
260 REM draw the circles
270VDU5:PROCCIRCLES
280XX=500:YZ=500:VZ=500:WZ=500:GCOL3,7:PROCBALL(500,
500)
290*FX4,1
300IF INKEY(-122) XZ=XZ+16
310IF INKEY(-26) XZ=XZ-16
320IF INKEY(-58) YZ=YZ+16
330IF INKEY(-42) YZ=YZ-16
340IF INKEY(-129) GOTD 300
350XZ=(XZ+1280)MOD1280:YZ=(YZ+1024)MOD1024
360PROCBALL(VZ,WZ):PROCBALL(XZ,YZ)
370VZ=XZ:WZ=YZ:GOTD300
380
390
400DEF PROCCIRCLES
410LOCAL IX,JX
420FOR RX=500 TO 200 STEP -300
430MOVE640+RX,512
440FOR IX=0 TO 340 STEP 20
450FOR JX=IX TO IX+10 STEP2
460MOVE640,512:IFRX=200 GCOL0,OUTRED ELSE GCOL0,11
470PLOT85,640+RX*COBRAD(JX),512+RX*BINRAD(JX)
480NEXT JX
490FOR JX=IX+10 TO IX+20 STEP2
500MOVE640,512:IFRX=200 GCOL0,INRED ELSE GCOL0,15
510PLOT85,640+RX*COBRAD(JX),512+RX*BINRAD(JX)
520NEXT JX
530NEXT IX
540NEXT RX
550ENDPROC
560
570DEF PROCBALL(XZ,YZ)
580MOVEXZ,YZ:VDU240,243
590MOVEXZ,YZ-32:VDU241,242
600ENDPROC

```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	← Y
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Figure 2. An EOR evaluator for funding X EOR Y
1	1	0	3	2	5	4	7	6	9	8	11	10	13	12	15	14	
2	2	3	0	1	6	7	4	5	10	11	8	9	14	15	12	13	
3	3	2	1	0	7	6	5	4	11	10	9	8	15	14	13	12	
4	4	5	6	7	0	1	2	3	12	13	14	15	8	9	10	11	
5	5	4	7	6	1	0	3	2	13	12	15	14	9	8	11	10	
6	6	7	4	5	2	3	0	1	14	15	12	13	10	11	8	9	
7	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8	
8	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7	
9	9	8	11	10	13	12	15	14	1	0	3	2	5	4	7	6	
10	10	11	8	9	14	15	12	13	2	3	0	1	6	7	4	5	
11	11	10	9	8	15	14	13	12	3	2	1	0	7	6	5	4	
12	12	13	14	15	8	9	10	11	4	5	6	7	0	1	2	3	
13	13	12	15	14	9	8	11	10	5	4	7	6	1	0	3	2	
14	14	15	12	13	10	11	8	9	6	7	4	5	2	3	0	1	
15	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
▲ X																	

Listing 2.

```

10 REM DEMO PROGRAM 2
20 REM FOR E READ HASH CHARACTER
30:OPTO
40\ this program is intended to show how the timer2
in the model B user 6522VIA can be harnessed to provi
de regular interrupts
50\ and how the user can set up a routine to servic
e these interrupts via the machine operating system.
60\ In this example program it is the generating of
the interrupts which is illustrated. The handler will
function only to make a short beep so that the user ca
n tell that interrupts are occurring.
70\ The next program will show how the handler can
be made to move a 'sprite' around automatically.
80\ IF you time the intervals between the beeps you
may notice a slight deviation in regularity. This is du
e to the clashing of our interrupts with system ones a
nd could be smoothed out by giving our interrupt handl
er first priority.
100]
130 PROCinitialise
150 ?(timer2_high)=10000 DIV256
160 ?(timer2_low)=10000 MOD256
180CLS:PRINT""The interrupts are now occurring as yo
u will be able to tell by the pips"
190PRINT"Try using your machine in the normal way eg
.save the program to tape, list it, type commands etc."
200PRINT"Unless you take action which results in the
overwriting of the interrupt handler (in which case t
he machine will crash) the beeps should continue regar
dless."
230 END
270DEF PROCinitialise
280 ACR=&FE6B :REM auxilliary control register
290 timer2_high=&FE69

```

```

300 timer2_low=&FE68
310 IER=&FE6E :REM interrupt enable register
320 INFR=&FE6D :REM interrupt flags register
350 REM initiate the VIA, create a subroutine that p
roduces a short beep (to be called from the handler), a
nd prepare the handler.
360 PROCVIA_setup
370 PROCbeep_setup
380 PROCchandler_setup
400 REM set the operating systems "user-interrupt"
vector to point to the handler.
410 ?(&206)=handler MOD 256
420 ?(&207)=handler DIV 256
450ENDPROC
490DEF PROCVIA_setup
500 REM this procedure sets up various flags so tha
t the 6522 can start timing away as soon as timer2 is
written into.
520 REM first enable only timer interrupts (both ti
mers are enabled).
530 ?(IER)=&1F
540 ?(INFR)=&E0
550 ?(IER)=&E0
570 REM now put timer two into "one-shot" mode.
580 ?(ACR)=?(ACR) AND &BF
600 ENDPROC
630DEF PROCbeep_setup
640 REM this procedure assembles code that will pro
duce a short beep when called with "JSR beep".
650 REM first set up the parameter block needed for
the OSWORD call with A=7
670 param =&70
680 !(param)=&FFF10011
690 !(param+4)=&100CB
710 REM now assemble the code.
720 DIM beepspace 15
730 P%=beepspace

```

```

740 [:OPTO
750 .beep
760 LDX Eparam MOD 256
770 LDY Eparam DIV 256
780 LDA E7
790 JSR MFFF1
800 RTS :]
820ENDPROC
870DEF PROCchandler_setup
880 REM this procedure sets up the interrupt handle
r by defining storage bytes (and initialising them), ass
embling the handler code .
900 REM first define variable space
910 count=&7B :every=&79
920 ?(count)=0:?(every)=0
940 REM now assemble the code
950 DIM handler_space 100,X 0,Y 0
960 FOR pass=0 TO 2 STEP 2
970 P%=handler_space
980 [OPT pass
990 .handler STX X:STY Y \Save registers
1000 LDA count \See if the correct numbe
r of interrupts has occurred
1010 CLC:ADC E1
1020 STA count
1030 CMP every \This location specifies
how many interrupts should occur between beeps
1040 BNE ret
1050 JSR beep
1060 .ret
1070 LDA E10000 MOD 256 \Reset the timer.
1080 STA timer2_low
1090 LDA E10000 DIV 256
1100 STA timer2_high
1110 LDX X:LDY Y:LDA MFC:RTI :]
1120 NEXT
1140ENDPROC

```

(continued from previous page)

procedures to suit every scheme. I will endeavour to spell out the methods that should be used and I give examples to illustrate the potential but it is up to you to apply the technique to your own programs. The submitted examples are well-documented so there should be no problem there.

Colour palette is the name used to describe the relationship between the 16 — in mode 2 — logical colours and the 16 physical colours. Imagine a painter's palette as being a wooden board with 16 pots labelled from black through to flashing black/white. This corresponds to the BBC's set of logical colours. The painter, however, has the choice of what actual paint colours he fills these pots with, and this corresponds to the physical colours on the BBC.

The default is that each paint colour — physical colour — goes into the pot labelled for its logical colour, but this can be changed by VDU19, the syntax of which should be known. Figure 1 serves as a reminder of the 16 colours.

In practice the flashing colours are not used much and we will selectively use VDU19 to replace them so that the steady colours will have alternative numbers that can be used in a GCol statement instead of the usual ones — the reason is EOr plotting.

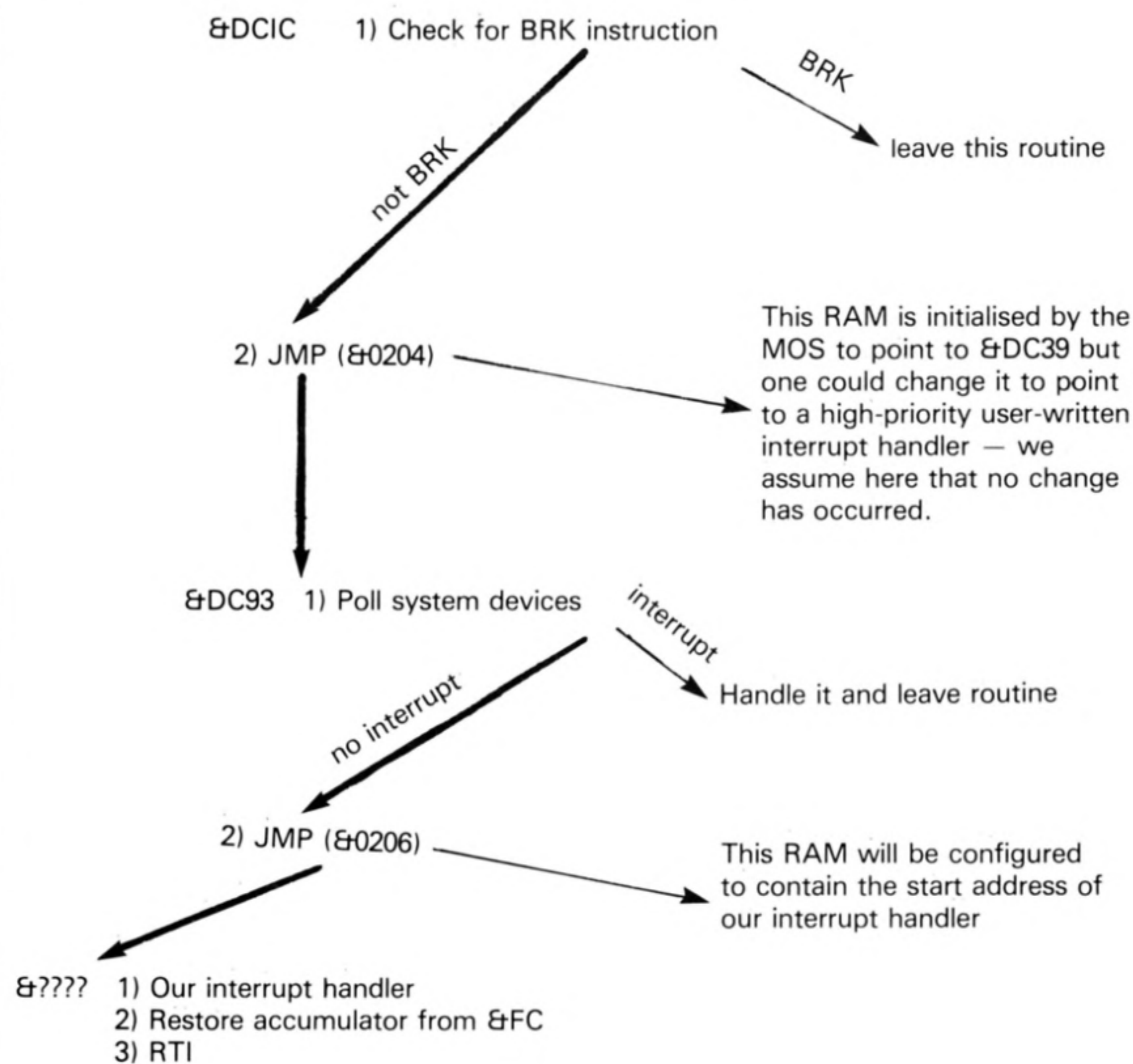
EOr printing: The bitwise logic is amply covered in other issues so I will not repeat it here. Suffice to say that EOr is used because it has the property that, for any two numbers X and Y:

$$(X \text{ EOR } Y) \text{ EOR } Y = X$$

that is, a number when EOr'd twice in succession with another number returns to the original value. When applied to graphics — Y is then the logical colour of some printed thing and X is the logical colour it is being printed onto — this has the effect that printing a figure once makes it appear in whatever colour happens to correspond to logical colour number X EOr Y and printing it again at the same place makes it disappear, since all the pixels revert to their original colour numbers.

When animating, the second or erasing step is modified. Instead of printing the same thing at the same place it is shifted a few pixels and, after a bit of arithmetic to compensate for the shift, is printed. Note that the word printing in this context takes for granted that the printing is not the usual superimposing type done under VDU5 but EOr printing. This is selected by choosing the printing colour with the

Figure 3. Summary of how MOS issue 1-2 handles interrupts — IRQ.



The dark arrows show the chain of events leading to the movement of the sprite via an interrupt from user VIA Timer 2.

command GCol3 rather than GCol0.

This results in the movement being made smoother but, because the interrupt handler that we will write to move our character must be as short as possible, we will not use the shifted method but stick with the print-twice-at-the-same-place method.

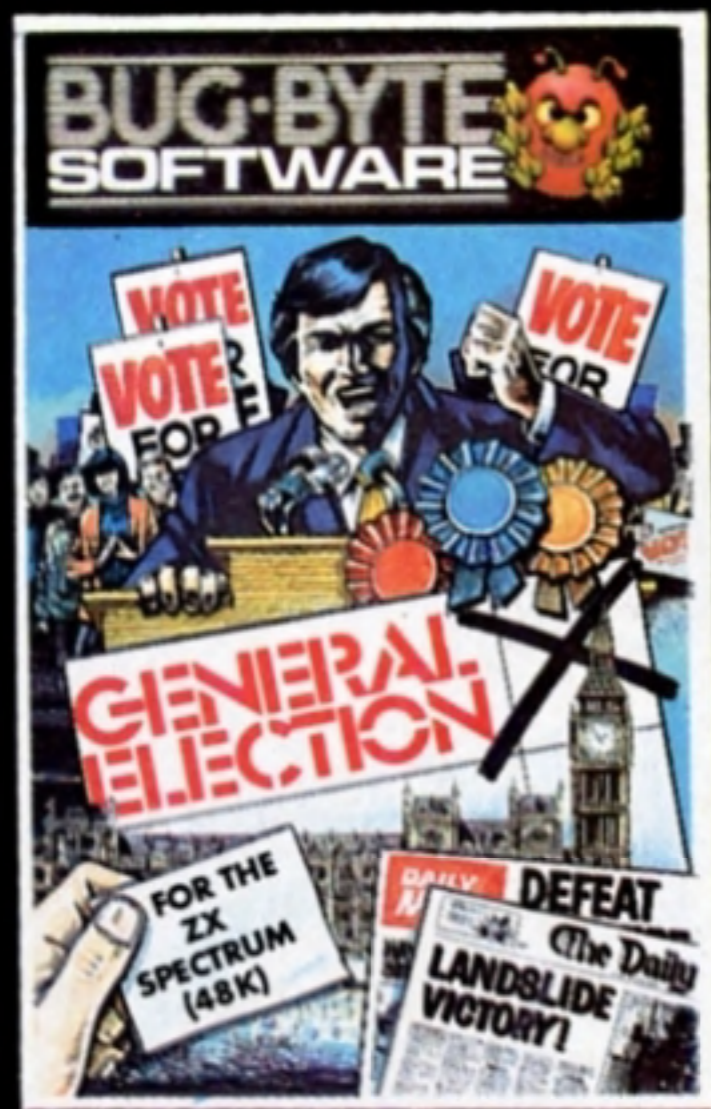
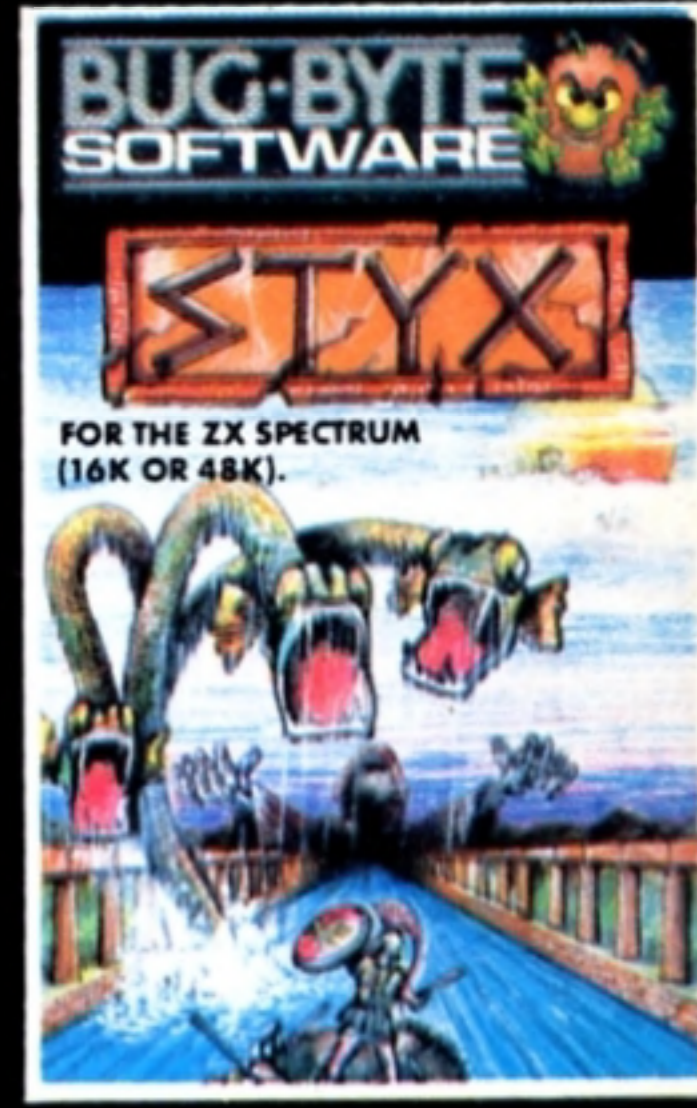
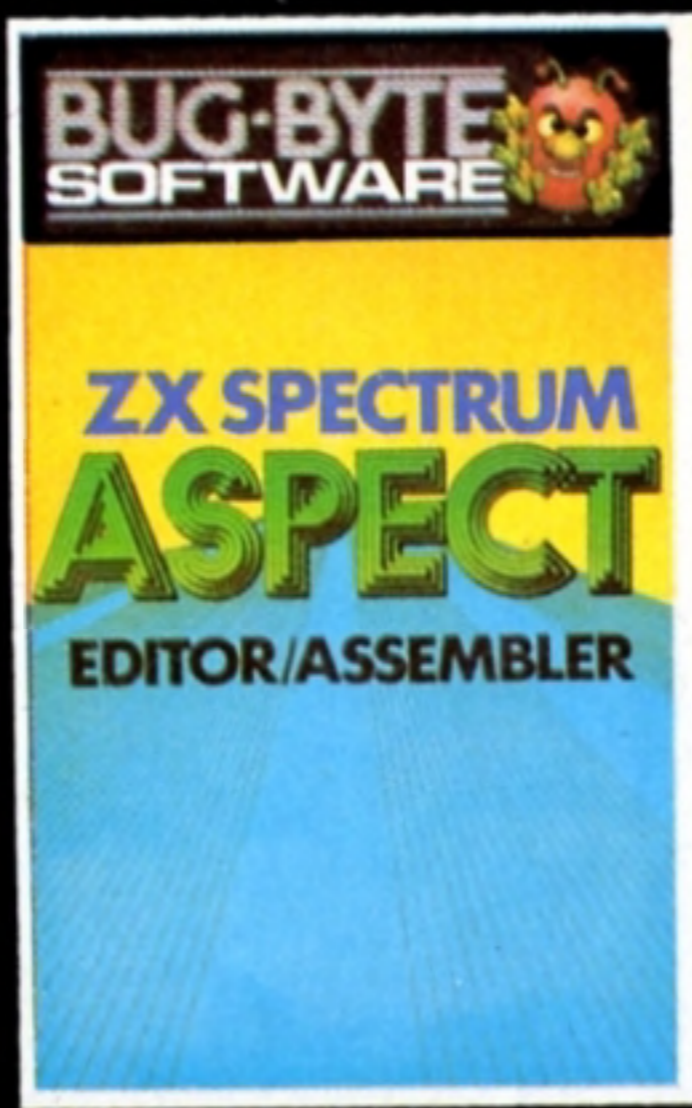
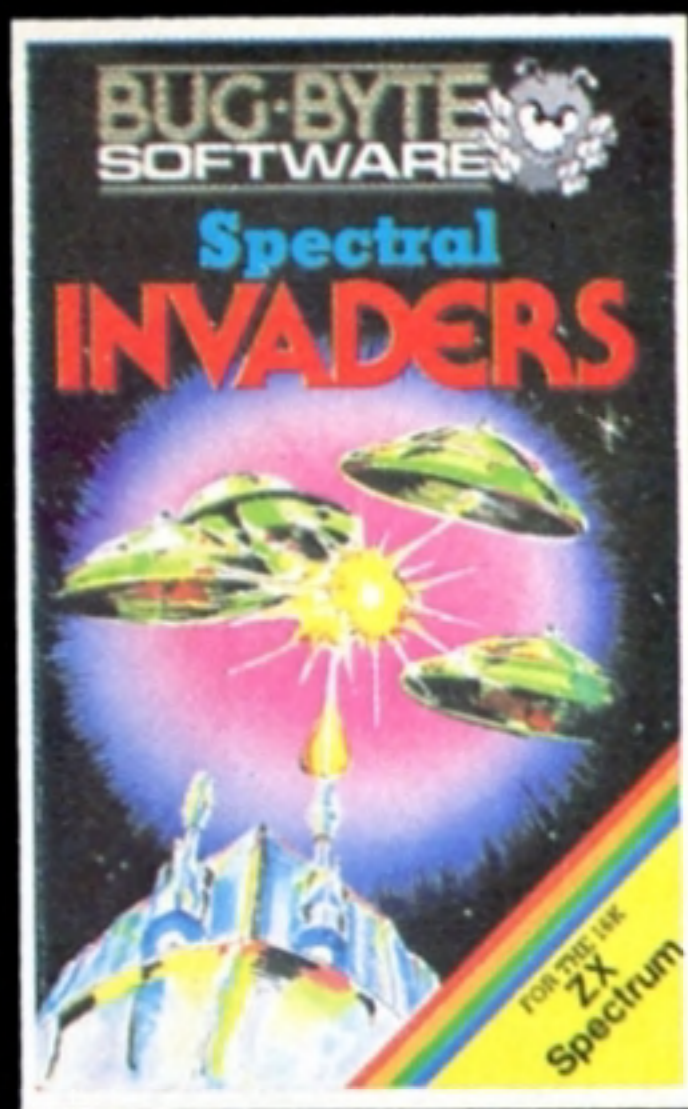
Suppose we have a character which has logical colour X — so when we print it we select the colour with GCol3,X — and there are three logical colours A,B,C already on the screen, we need to know what colour will appear as a result of the EOr action when colour X is printed on each of these colours. Take colour A as an example. If it is true that A EOr X=A then the character will simply not appear when it is printed on anything with colour. This is the basis of having our character moving behind an object. On the other hand suppose that A EOr X = X. Then the character would appear in its required colour and we have foreground motion. It is obviously more

likely that A EOr X will be neither A nor X so how can we fiddle this?

The answer is to manipulate the colour palette so that it does work as required. Take a real example; suppose we want a red character — red=physical colour 1 — to pass in front of a yellow region — yellow=physical colour 3. It can be seen, using figure 2, that 3 EOr 1=2, which is the physical colour number of green, is not what we want. So we perform the preliminary steps:

- Define logical colour 8 as red using VDU19,8,1;0;
- Observe that 8 EOr3=11 so also define colour 11 as red by VDU19,11,1;0;
- Print the character in colour 8 by doing GCol3,8 first, it will then appear in colour 11 (8 EOr 3=11) which we have just defined as red. We have thus fiddled the required result, and the character will still disappear when printed again because 8 EOr 11=3 is

(continued on page 101)



CLOUD NINE

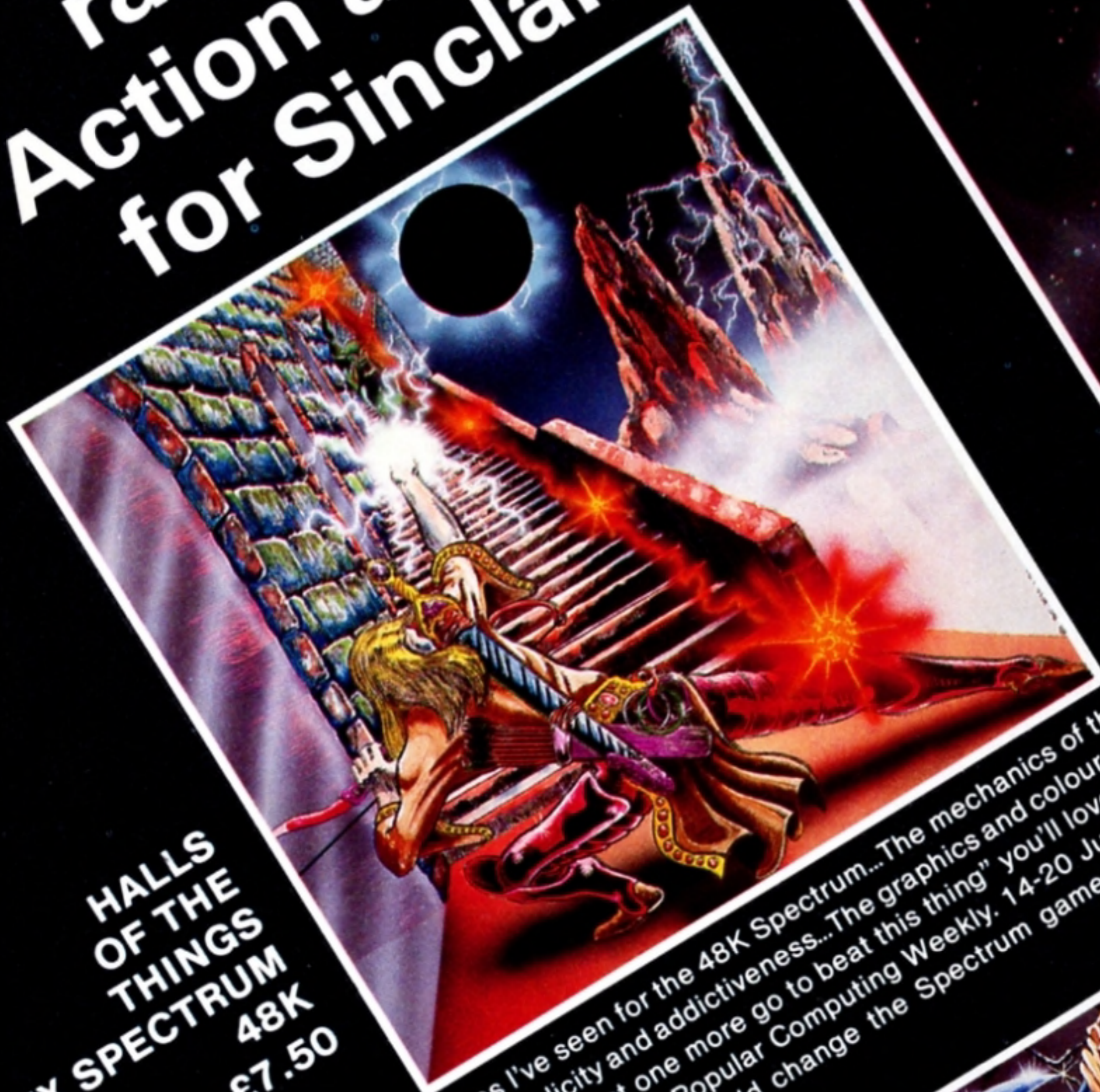
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...ZX Computing (Aug/Sept 1983).



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(continued from page 98)

the original background colour.

We could have picked other numbers to redefine rather than 8 and 11. For example 9 and 10 would do since 9 EOR 3=10. The choice of numbers should be made according to which palette numbers are still unused, bearing in mind that you will probably want your red character to move in front of other colours as well and also behind some colours. The 16 possible palette colours of mode 2 means that you do this. You will find figure 2 invaluable when choosing your palette numbers.

Interesting results

Although the above is relatively simple, some interesting results can be obtained as in the demonstration programs. Once you have mastered this technique your future space invaders will have the power to move behind cover for added protection.

The next section deals with the automatic movement of characters using the user 6522 VIA timers to generate regular interrupts and must therefore get a little technical.

As previously mentioned, not all MOS issues support the ability to generate events every few fractions of a second. It is necessary, therefore, to get right down to the hardware and start using the hardware timers on the user 6522 VIA.

If you are already familiar with the workings of the 6522 you can skip the following description, albeit brief.

The 6522 VIA or Versatile Interface Adapter, is a chip specifically intended for use with 65** series chips, of which the 6502 microprocessor is a member. It provides the microprocessor with facilities it does not have on-board such as two interval/pulse timers, a shift

register, I/O ports with handshaking, etc. The BBC MOS has one for its own exclusive use, for example, the interfacing of the 6502 to system hardware such as the keyboard. There is also a user-dedicated one.

It is our objective to use one of the two timers on the user 6522 to generate an interrupt every-so-often. We will set up the interrupt handler to move our sprite by a certain number of pixels in the x,y directions every time an interrupt occurs. The first thing we have to know, then, is how the BBC Computer deals with interrupts of the IRQ variety — NMIs should be avoided.

The 6502 microprocessor, on receipt of a low-active IRQ and assuming these are not disabled, will finish what it is doing, Save various things on the stack and then vector via &FFFE, &FFFF. In the BBC this is part of the MOS ROM and for issue 1.2 MOS the address held at these locations is &DCIC. So the net effect of an IRQ is a jump to &DCIC, where the MOS's handling routine begins.

The action then taken is as shown in figure 3. We will change the vector at &0206 to point to our handler so that, on receipt of an interrupt it does not recognise — which the one from the user 6522 is — the MOS causes its execution.

Check for spurious IRQs

Our handler must begin by checking for spurious IRQs just to be on the safe side. It does this by examining the relevant bit in the 6522's Interrupt Flag Register — at &FE6D as in figure 4 — which indicates if the timer was the cause of the interrupt. Thus, having decided how the timer's interrupts will be handled, we now need to get it to generate them in the first place. The first step is to enable timer 2's interrupts by setting the appropriate

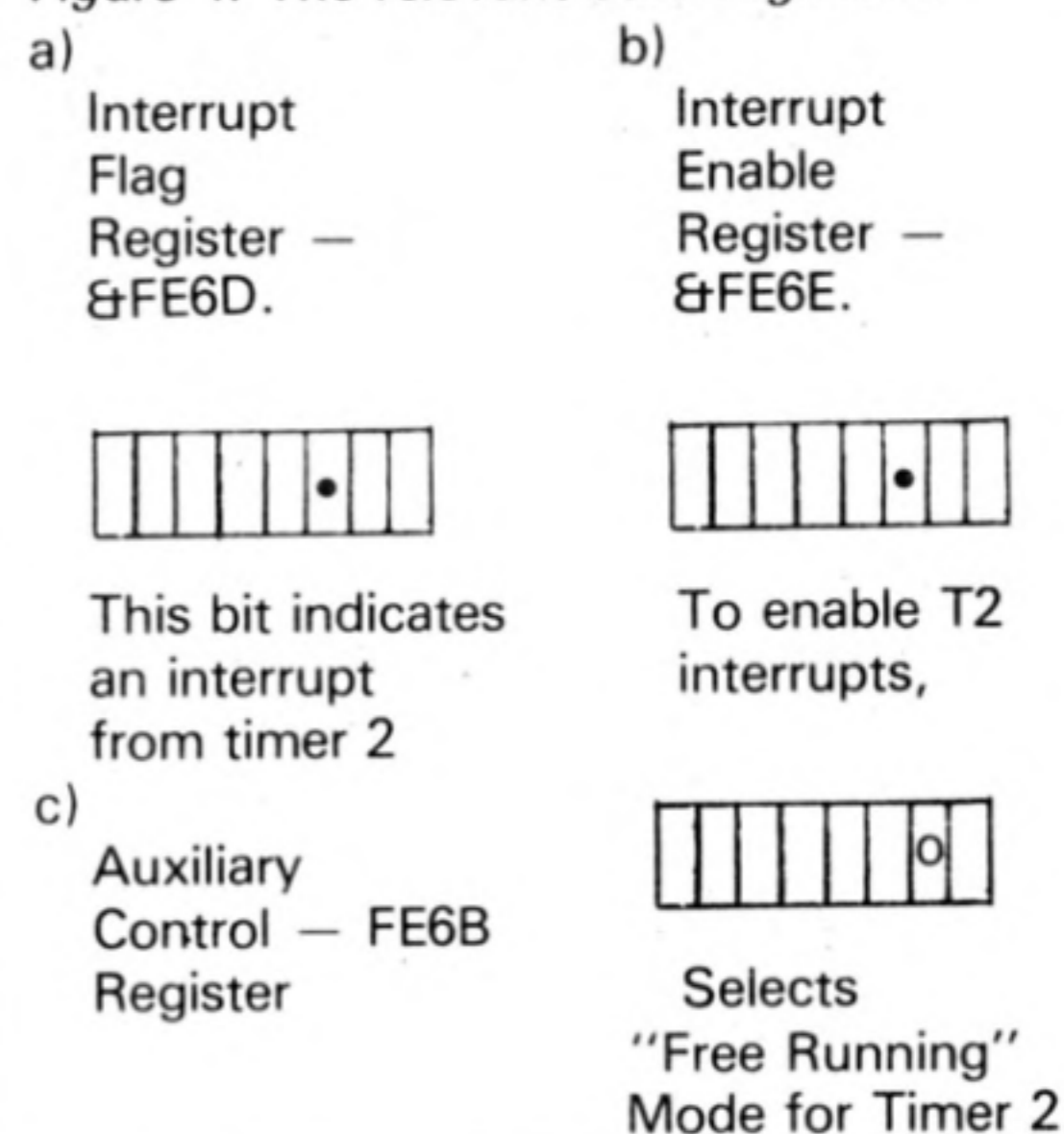
bit in the 6522's interrupt enable register — see figure 4 part b. We want to use timer 2 — the simplest of the two timers — in one-shot clocked mode. This means that once you set it going — which occurs automatically when you write a start value into it — it counts down clock pulses until it reaches zero. It then generates an interrupt, indicating this by setting the bit in the Interrupt Flag Register. It is left to the handler to restart the timer. This also cancels the IFR's flag.

Timer is two bytes wide

We can configure timer 2 to the one-shot clocked mode by setting bit five of the 6522's Auxiliary Control Register.

Note that the timer is only two bytes wide and, since it decrements at clock frequency, can only time very short intervals. For this reason the interrupt handler will not move the sprite every time it is entered but only every so often.

Figure 4. The relevant 6522 registers.



Listing 3.

```

10 REM DEMO PROGRAM 3
30OPTO
40\ this program is intended to show how the timer2
in the model B user 6522VIA can be harnessed to provi
de regular interrupts
50\ and how the user can set up a routine to servic
e these interrupts via the machine operating system.
60\ In this example, these interrupts will be respon
sible for moving a character across the screen. The scr
een will be split into two windows, the character movem
ent will take place in the top window and the text cur
sos will be in the lower.
70\ The user can continue to use the facilities offe
red by the computer without it affecting the 'sprite'
movement.
80\
100 MODE 2
110 PROCinitialise
130PRINT "Now play with the computer, eg write a small
program or SAVE this one. You will see that it behaves
as if nothing was happening unless you try to scroll
the screen in which case it will crash."
140PRINT "This is due to the software scrolling and t
he graphics above interacting."
160 ?(timer2_high)=13000 DIV256
170 ?(timer2_low)=13000 MOD256
210 END
250DEF PROCinitialise
260 ACR=&FE6B :REM auxiliary control register
270 timer2_high=&FE69
280 timer2_low=&FE68
290 IER=&FE6E :REM interrupt enable register
300 INFR=&FE6D :REM interrupt flags register
330 REM initiate the VIA, create a subroutine that w
ill move the sprites (to be called from the handler), a
nd prepare the handler.
340 PROCVIA_setup
350 PROCmove_setup
360 PROCchandler_setup
380 REM set the operating systems "user-interrupt"
vector to point to the handler.
390 ?(&206)=handler MOD 256
400 ?(&207)=handler DIV 256
420 REM SET UP THE SCREEN ETC.
430 PROCsetscreen
450ENDPROC
490DEF PROCVIA_setup
500 REM this procedure sets up various flags so tha
t the 6522 can start timing away as soon as timer2 is
written into.
520 REM first enable only timer interrupts (both ti
mers are enabled).
530 ?(IER)=%1F
540 ?(INFR)=%E0
550 ?(IER)=%E0
570 REM now put timer two into "one-shot" mode.
580 ?(ACR)=?(ACR) AND &BF
600 ENDPROC
670DEF PROCchandler_setup
680 REM this procedure sets up the interrupt handle
r by defining storage bytes (and initialising them), ass
embling the handler code .
700 REM first define variable space
710 count=&7B :every=&79
720 ?(count)=0 : ?(every)=3
740 REM now assemble the code
750 DIM handler_space 100
760 FOR pass=0 TO 2 STEP 2
770 PX=handler_space
780 OPT pass
790 .handler PHA:TXA:PHA:TYA:PHA :Save registers
800 LDA count :See if the correct numbe
r of interrupts has occurred
810 CLC:ADC E1
820 STA count
830 CMP every :This location specifies
how many interrupts should occur between beeps
840 BNE ret:LDA E0 :STA count
850 JSR move
860 .ret
870 LDA E13000 MOD 256 :Reset the timer.
880 STA timer2_low
890 LDA E13000 DIV 256
900 STA timer2_high
910 PLA:TAY:PLA:TAX:PLA:RTI:}
920 NEXT
930ENDPROC
960DEF PROCsetscreen
970 REM this procedure sets up a mode 2 screen, toget
her with necessary EOR colour definitions so that the
interrupt handler can move a sprite on it.
980
990REM first do the colour definitions according to
the following scheme:
1000REM 1) The screen will be in cyan/blue stripes.
1010REM 2) There will be two sprites of colours red
(a slow mover) and yellow (faster). These will move ov
er the stripes as follows:
1020REM a) The red moves over the cyan stripes and
behind the blue ones.
1030REM b) The yellow moves over the blue stripes a
nd behind the cyan ones.
1040REM This is achieved by redefining the palette th
us (use your EOR table to check):
1050REM BLUE-logical 4,10
1060REM CYAN-logical 8,11
1070REM YELLOW-logical 3,9
1080REM RED-logical 5,14
1090
1100VDU19,10,4:0;
1110VDU19,11,6:0;
1120VDU19,8,6:0;
1130VDU19,9,3:0;
1140VDU19,5,1:0;
1150VDU19,14,1:0;
1170REM define a walking man character in three walki
ng positions
1180VDU 23,240,28,28,8,8,28,8,8,8
1190VDU 23,241,28,28,8,8,28,8,20,20,20
1200VDU 23,242,28,28,8,8,127,8,20,34,65
1220REM now set up the screen.
1230FOR I%=0 TO 1280 STEP 128
1240 IF I%MOD256=0 GCOL0,10 ELSE GCOL0,11
1250 MOVE I%,768
1260 MOVE I%,1024
1270 PLOT85,I%+128,1024
1280 MOVE I%+128,768
1290 PLOT85,I%,768
1300NEXT
1310VDU23,11,0:0:0:0:COLOURS
1320VDU4,28,0,31,19,8
1330VDU24,0:0:1280:750;
1340 ENDPROC
1370DEF PROCmove_setup
1380DIM room 400
1390REM also reserve room for the variables that are
needed (it is necessary for the interrupt handler to r
emember the characters positions)
1400DIM rx1 0,rxh 0,yxh 0,yx1 0
1410?(rx1)=0:?(rxh)=5:?(yxh)=5:?(yx1)=0
1420im=&7A:rem=&7B :REM zero_page variables
1430?(im)=240 :REM the first man to be printed
1440OSWRCH=&FFEE
1450FOR pass=0 TO 2 STEP 2:PX=room
1460OPT pass
1470
1480\ First join graphics and text cursors and work o
ut which of the three man-positions is to be printed n
ext.
1490.move LDA E5 :JSR OSWRCH
1500 LDA im :STA nm:CLC:ADC E1
1510 CMP E243 :BNE m1
1520 LDA E240
1530.m1 STA im
1540
1540\ now do a GCOL and then move the graphics c
ursor to where the last green man was.
1550 LDA E18:JSR OSWRCH
1560 LDA E3:JSR OSWRCH
1570 LDA E14:JSR OSWRCH
1580 LDA E25:JSR OSWRCH
1590 LDA E4:JSR OSWRCH
1600 LDA rx1:JSR OSWRCH
1610 LDA rxh:JSR OSWRCH
1620 LDA E182:JSR OSWRCH
1630 LDA E3:JSR OSWRCH
1640
1640\ now work out new x-position of man
1670 LDA rx1:CLC:ADC E8:STA rx1
1680 BCC m2
1690 LDA rxh:CLC:ADC E1:STA rxh
1700 CMP E6:BNE m2 :check for end of line
1710 LDA E0:STA rxh
1730.m2 LDA nm:JSR OSWRCH :overwrite last man
1740 LDA E25:JSR OSWRCH
1750 LDA E4:JSR OSWRCH
1760 LDA rx1:JSR OSWRCH
1770 LDA rxh:JSR OSWRCH
1780 LDA E182:JSR OSWRCH
1790 LDA E3:JSR OSWRCH
1810 LDA im :JSR OSWRCH
1820\ NOW REPEAT ALL OF THE ABOVE CODE FOR THE SECOND
(YELLOW) CHARACTER, LOOPING IS NOT USED FOR REASONS OF
SPEED.
1840 LDA E18:JSR OSWRCH
1850 LDA E3:JSR OSWRCH
1860 LDA E3:JSR OSWRCH
1870 LDA E25:JSR OSWRCH
1880 LDA E4:JSR OSWRCH
1890 LDA yx1:JSR OSWRCH
1900 LDA yxh:JSR OSWRCH
1910 LDA E82:JSR OSWRCH
1920 LDA E3:JSR OSWRCH
1930 LDA yx1:CLC:ADC E16:STA yx1
1940 BCC n2
1950 LDA yxh:CLC:ADC E1:STA yxh
1960 CMP E6:BNE n2
1970 LDA E0:STA yxh
1980.n2 LDA nm:JSR OSWRCH
1990 LDA E25:JSR OSWRCH
2000 LDA E4:JSR OSWRCH
2010 LDA yx1:JSR OSWRCH
2020 LDA yxh:JSR OSWRCH
2030 LDA E82:JSR OSWRCH
2040 LDA E3:JSR OSWRCH
2050 LDA im:JSR OSWRCH
2080 LDA E4:JSR OSWRCH :return to cursors separate
mode
2090 RTS
2100:}NEXT
2110ENDPROC

```

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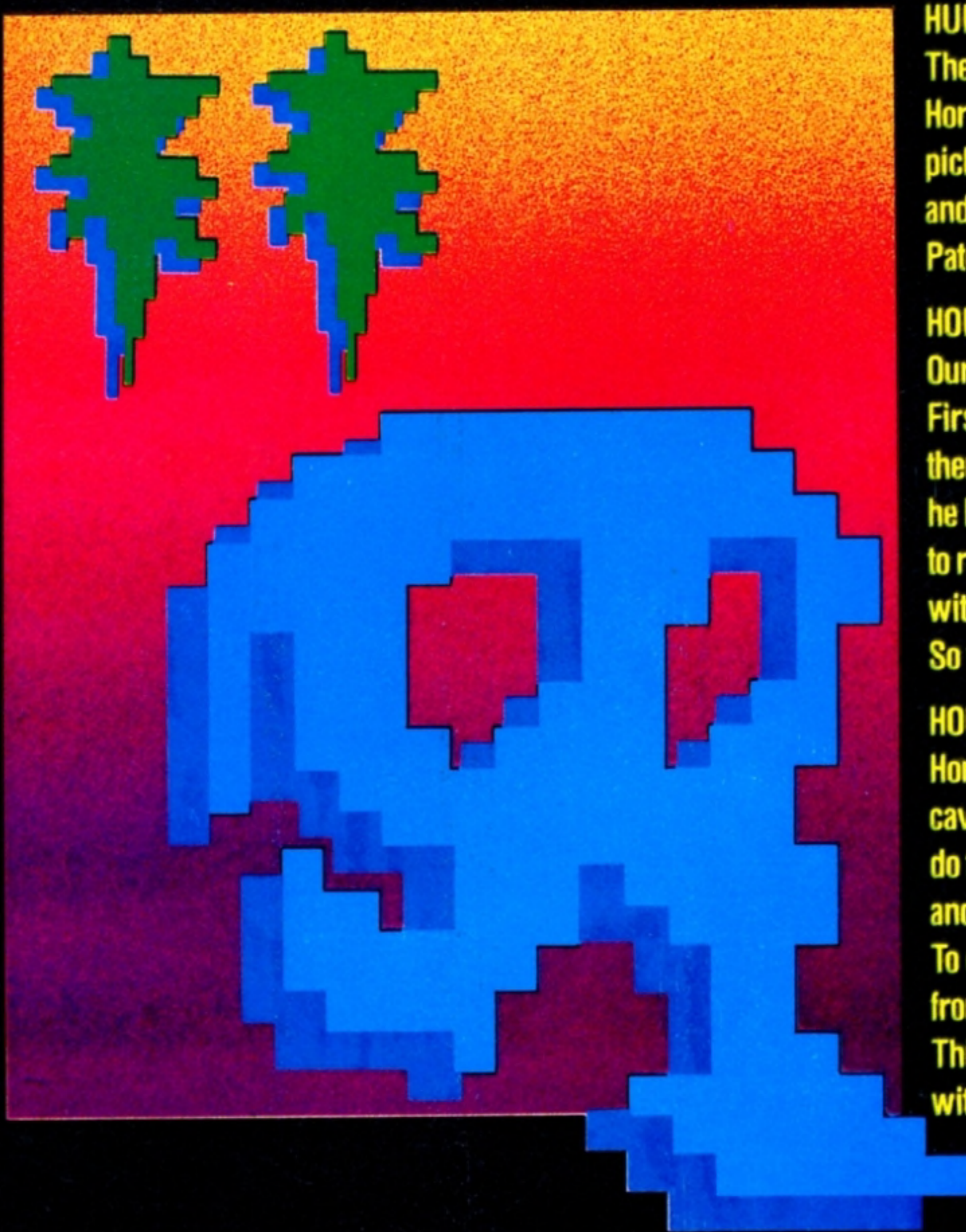
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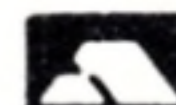
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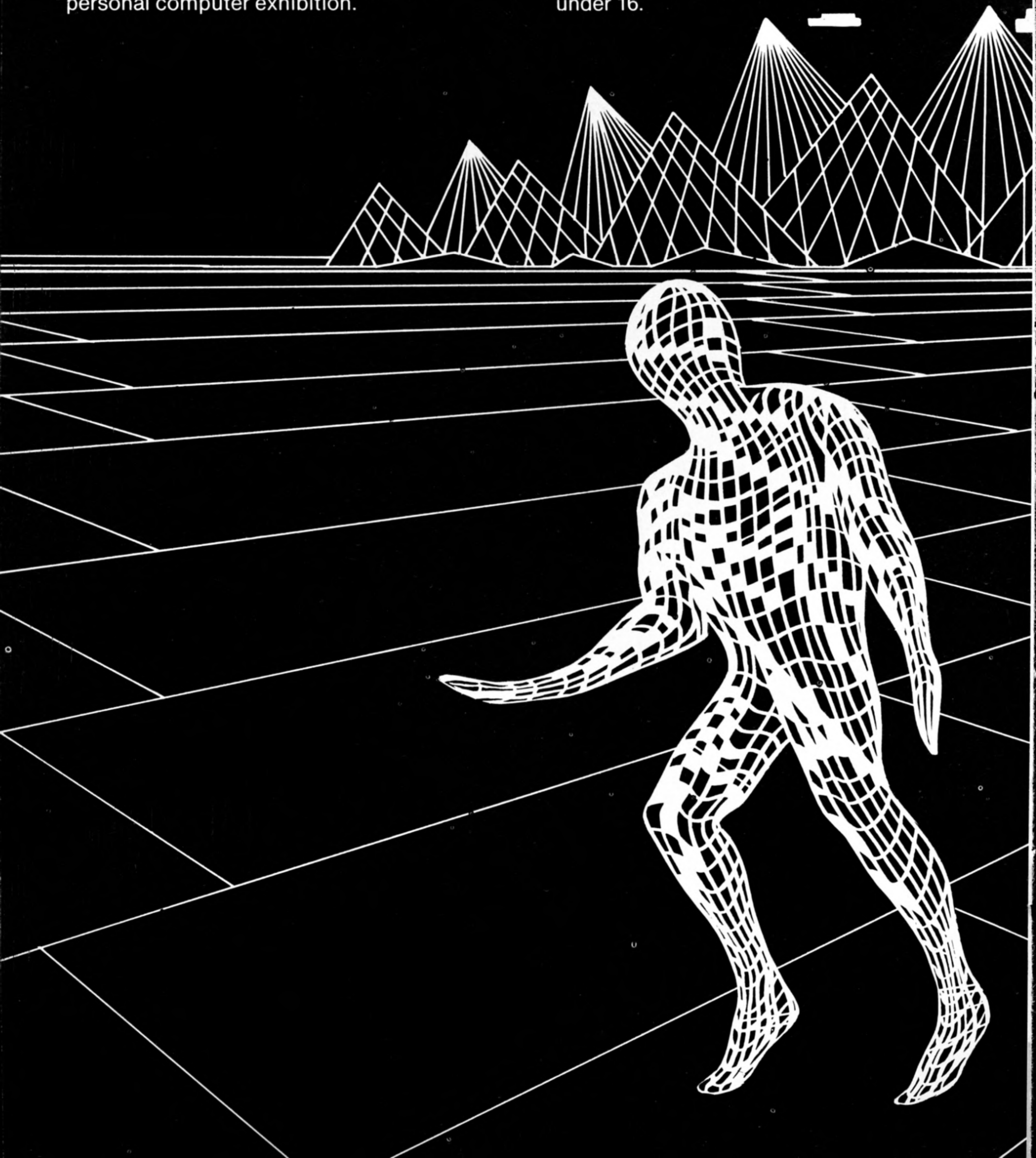
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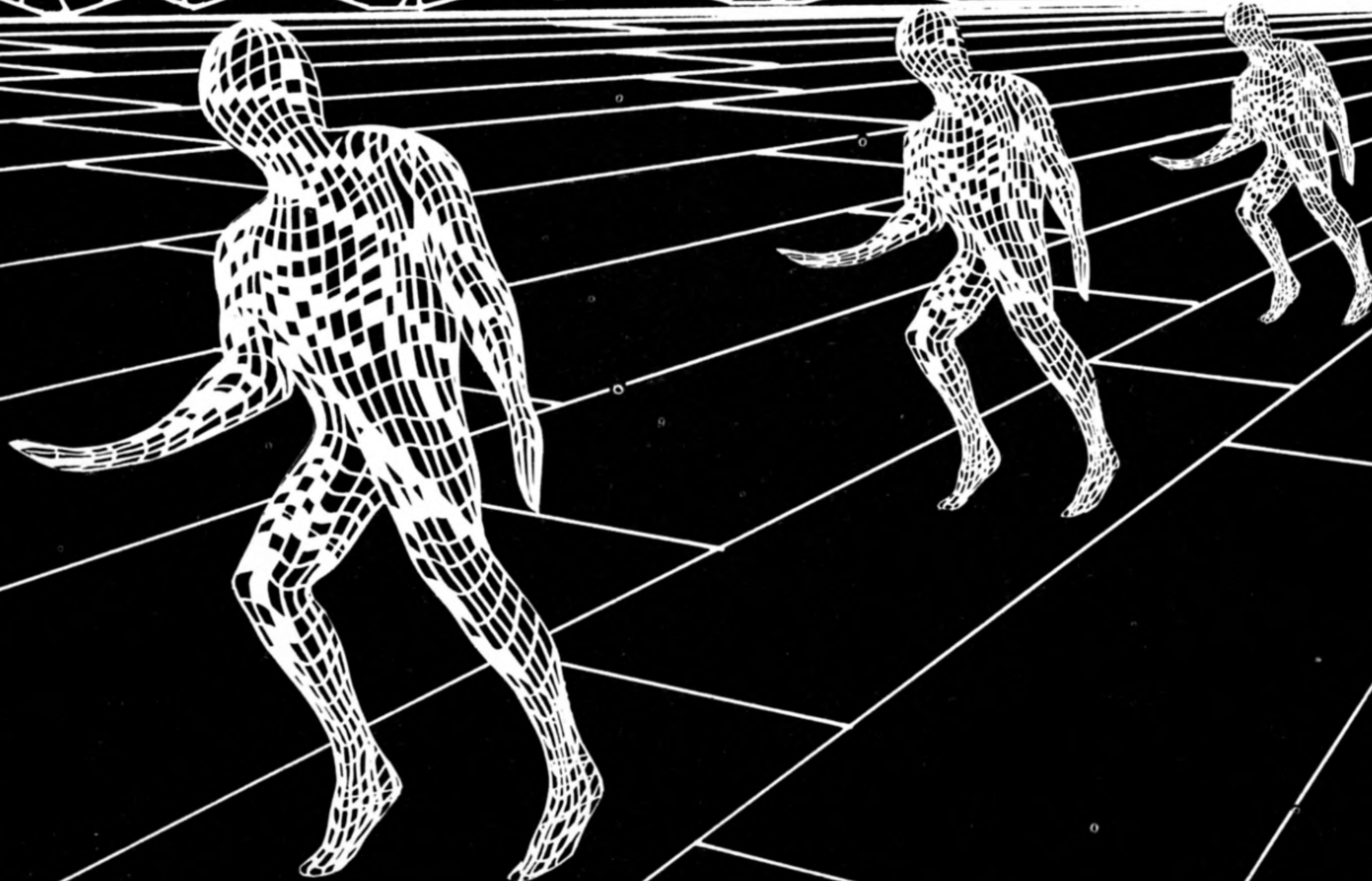


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SLIDING PUZZLE

THE DRAGON HAS an excellent range of graphics commands, which makes it possible to produce quite elaborately coloured pictures with the minimum of programming. Unfortunately, these have been under-used in most published programs. There are two main reasons for this: the difficulty of mixing text with high-resolution graphics, and the slow speed at which some of the graphics commands, particularly the Paint command, are executed.

This program, which is the Dragon version of a children's sliding tile puzzle, uses virtually all the high-resolution graphics commands to produce a very colourful game. There is a choice of three different puzzle designs; a small guide picture is shown as well as the main puzzle picture, and the player's input — row letter and column number — and number of moves taken are also shown on screen. All this in just 180 lines of program.

The program starts with a short title sequence — lines 50 to 150 — the letters of the word Sliding slide into position from the right-hand edge of the screen, then Picture and Puzzles are printed underneath against a blue background. This is followed by the selection of the puzzle to be used — lines 170 to 190. The instructions come after this so that the first line of the instructions can be selected to match the puzzle chosen.

Strings are defined near the start of the program — lines 280 to 310 — to Draw the digits 0 to 9. This has to be done before the program branches to draw the appropriate puzzle picture, as the digits are used for the number puzzle.

All three puzzles are drawn in Pmode 3 using the green/yellow/blue/red colour set, against a yellow background with red lettering. The designs have all been planned so that when they are divided up into four rows of four squares, the top left-hand square will be plain blue. This square represents the empty tile position.

The first puzzle is drawn in lines 1060 to 1190 and shows a yellow house, with red roof and door, against a blue sky and green grass. The outlines of the picture are drawn using the string, HS, defined in line 1080. This string is used for both the main picture and the small guide picture, with different scale factors — S16 and S4 — in the Draw command.

The smoke coming out of the chimney of the house is Drawn separately for the two pictures, as a simplified version is used for the small picture. The squares containing the

Amuse yourself and your kids with sliding puzzles by Margaret Norman.

pictures are both initially Painted green, as the picture contains more pieces in green than in any other colour; the curtains at the windows of the house are green. The other coloured pieces are Painted after the outlines have been drawn.

For the second puzzle — the number puzzle — the two squares are initially Painted blue, then the picture squares are divided up into small squares, using the Line command, and alternate small squares are Painted red. The numbers 1 to 15 are then Drawn on these squares in yellow. The pre-defined strings are used to Draw the numbers 1 to 9, but the numbers 10 to 15 are Drawn separately — lines 1320, 1330 and 1370 — as they can only just be made to fit in the squares in the small picture without becoming illegible.

The final puzzle is of a yellow Humpty Dumpty, with green hat and trousers, sitting on a red wall. Humpty's body is drawn with the Circle command, with a 1:3 height-to-width ratio — lines 1440, 1530. The Circle command is also used for Humpty's mouth, but here only half the ellipse is drawn — line 1480. Circles are also used for the eyes in the big picture, but Pset is used instead in the small picture — line 1570 — as circles with small radii look like crosses.

The arms and legs are Drawn and Painted in detail in the big picture, but are just represented by lines in the small one. The bricks on

The number puzzle.

	1	2	3
4	5	8	7
8	9	10	11
12	13	14	15

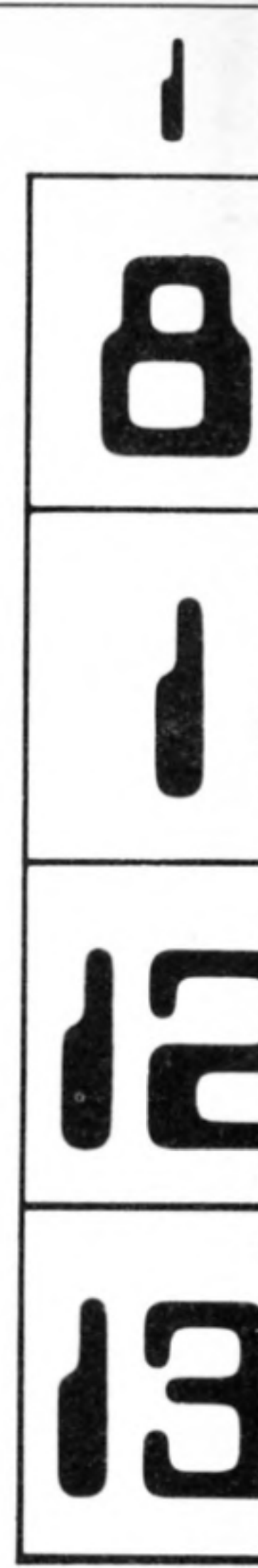
ROW C
COL. ?
MOVES
03

A

B

C

D



the wall have only been drawn in the big picture.

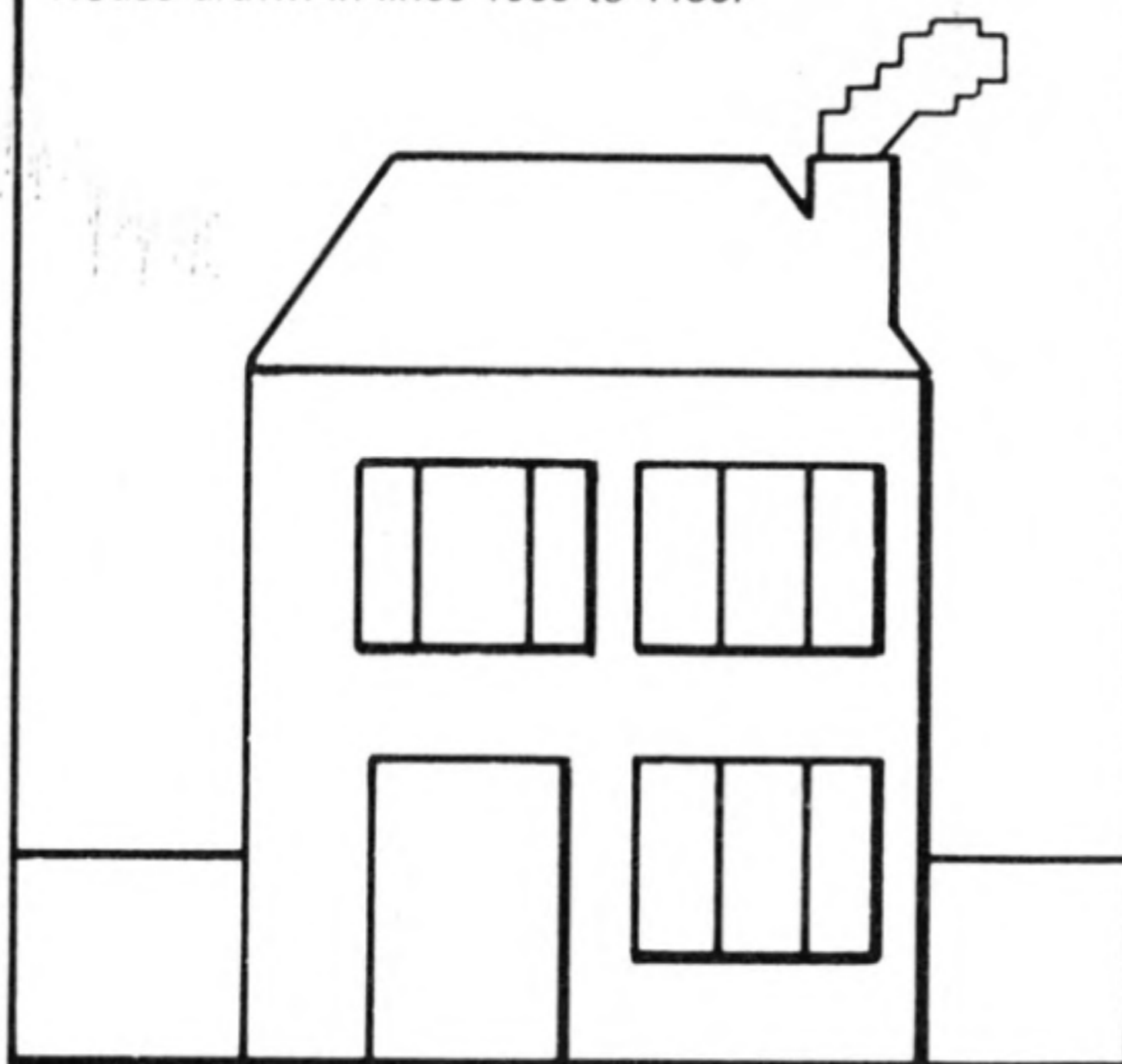
The screen is not set until after the puzzle has been drawn, so that the picture will appear all at once instead of bit-by-bit. A Please Wait message is displayed on the screen while the puzzle is being drawn — line 270. If you would prefer to see the picture being drawn, change line 270 to:

```
270 PMODE3,1:PCLS2:SCREEN1.0
and omit lines 1070, 1210 and 1410. If you would prefer the picture not to appear until it has been shuffled by the computer, delete line 370 and insert
```

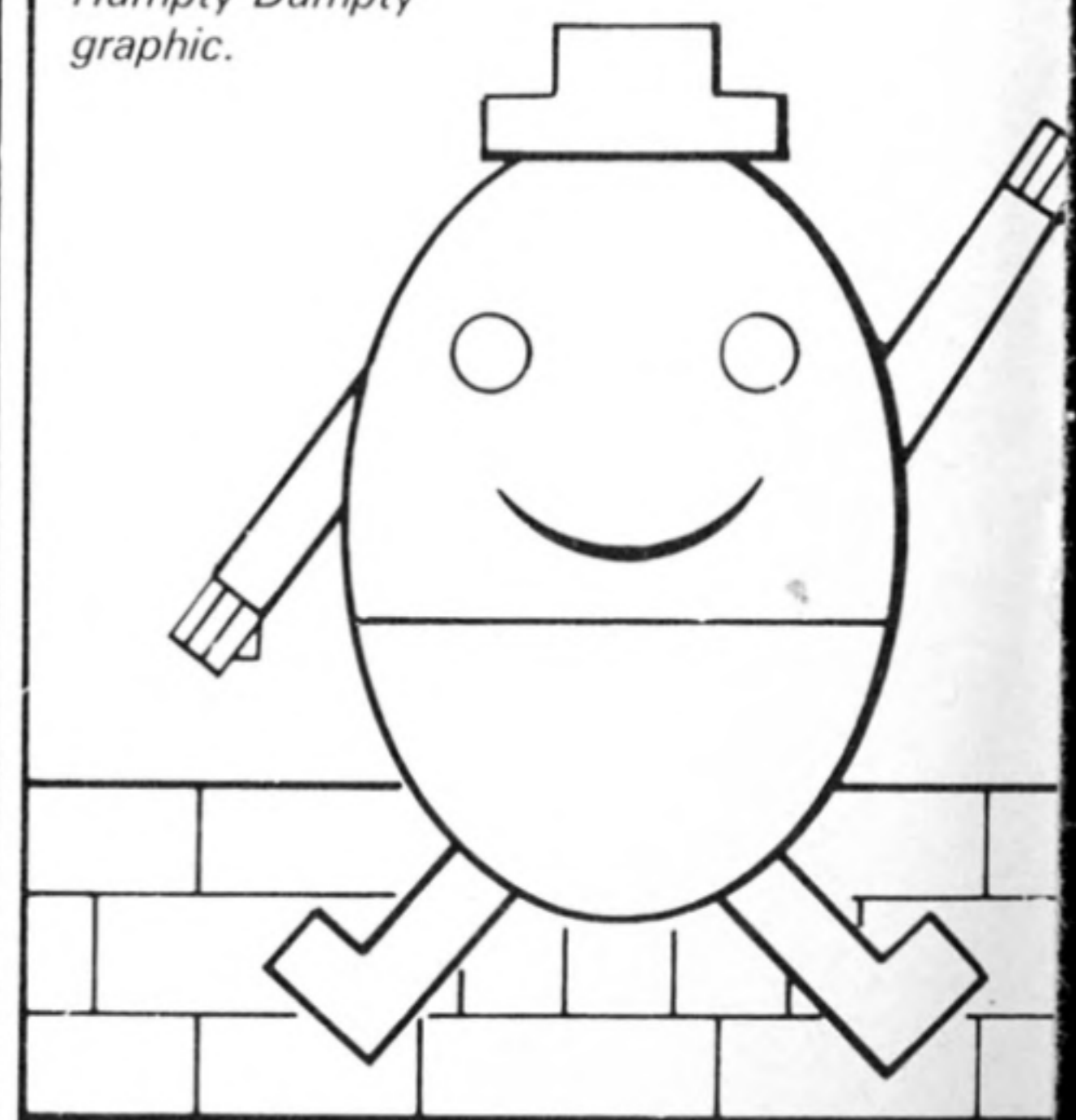
```
495 SCREEN1,0
```

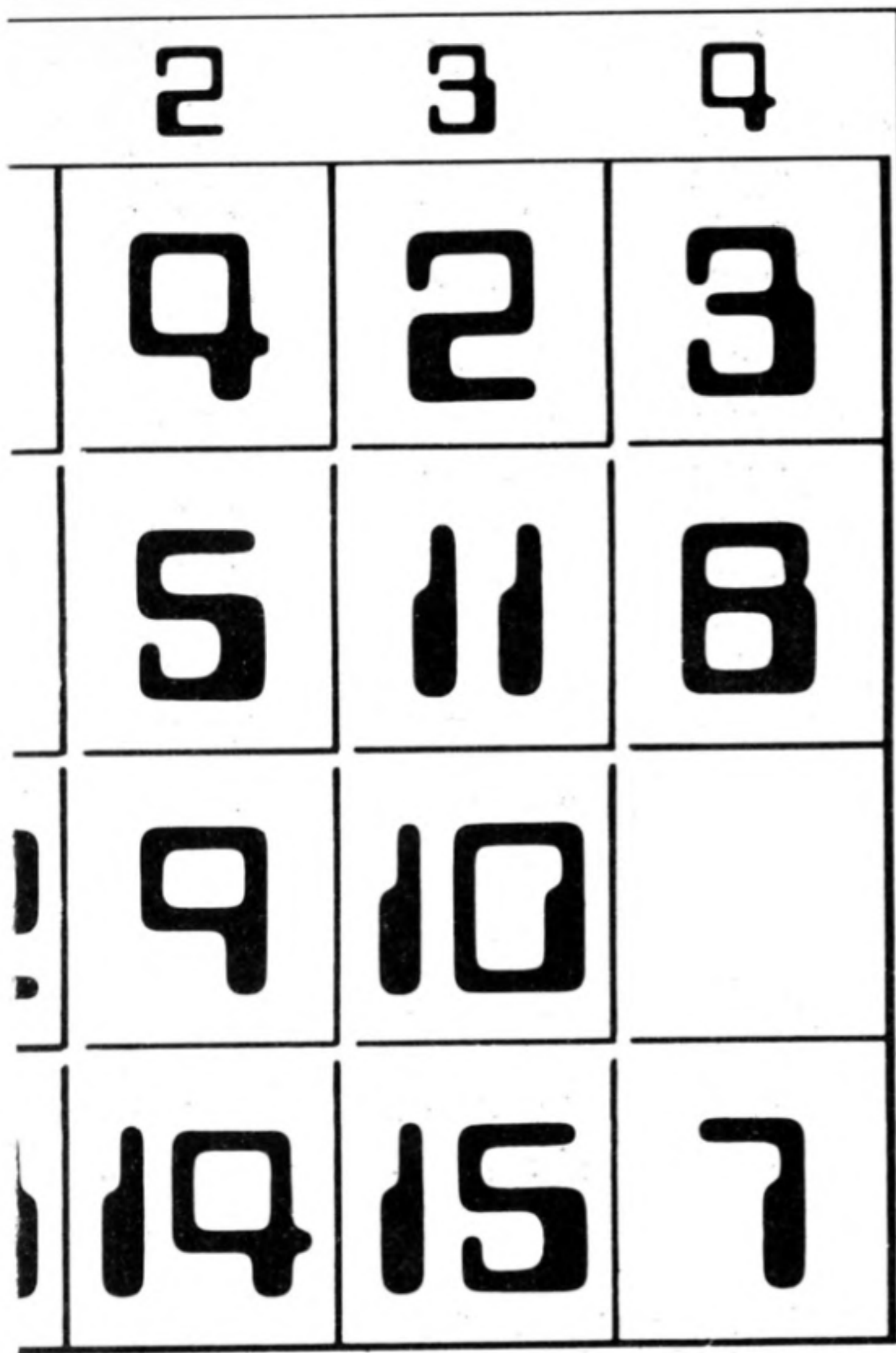
The Get and Put commands are used to move the puzzle pieces. The plain blue square is held in array B, and the picture piece being moved in array A. Note that these are both one-dimensional arrays; two dimensional arrays, as described in the Dragon manual, are not necessary. To calculate the array size

House drawn in lines 1060 to 1190.



Humpty Dumpty graphic.





DRAGON

needed to Get(X1,Y1)-(X2,Y2) in this Pmode, use the formula $(X2-X1)*(Y2-Y1)/8$.

The number of moves made by the computer depends on the level of difficulty selected. At the lower levels of difficulty, the computer may occasionally shuffle the picture back to where it started. If this happens you must move one piece out of position then back again, as the computer does not check to see if the puzzle is complete until after the player has made a move. At level five the picture should be pretty well mixed up.

When the player is required to input a row letter or column number, a question mark will appear after the word Row or Col on the screen. Get and Put are used here too, for the question mark and the blank array BQ — which is also used to blank out the number of moves — but the numbers and letters are Drawn using previously defined strings. The number of moves the player can make is limited to 100, mainly because the subroutine which Draws the number — lines 1000-1050 — can only handle two-digit numbers.

The puzzle picture is copied before the game starts — in line 380 — so that it need not be re-drawn for subsequent games. If you want to change to a different puzzle, you must stop the program and run it again. If you would like to leave more memory space to add other pictures of your own, then omit line 380, change the 8 in line 30 to 4, omit line 830 and change line 900 to End. You will then only be asked if you want another game if you have successfully solved the puzzle.

Anyone trying to adapt this program to run on a different computer may hit problems because so many of the graphics commands used are specific to the Dragon.

List of variables.

- Q(I): array used for question mark
- BQ(I): array used to blank out question mark
- B(I): array used for blank blue square
- A(I): array used for picture square
- Z: counter used for sounds in title sequence
- I,J: loop counters
- A\$: letter to be Poked onto screen
- A: ASCII value of letter
- DL: delay loop counter
- K: indicates puzzle chosen
- L: level of difficulty
- N\$(I): strings to Draw digits
- P(I,J): number of picture piece in square (I,J)
- BC,BR: column and row nos. of blank piece
- W,W1: used to select piece to be moved by computer
- C,R: column and row nos. of piece to be moved
- M: number of moves taken
- F: flag indicating whether puzzle was completed
- XA,YA: X and Y co-ordinates of corner of piece to be moved
- XB,YB: X and Y co-ordinates of corner of blank piece
- D1,D2: digits in M
- H\$: string to Draw house
- L\$(I): strings to Draw letters A-D

```

10 REM SLIDING PICTURE PUZZLE
20 REM BY MARGARET NORMAN
30 CLEAR 500:FCLEAR B
40 DIM Q(10),BQ(20),B(200),A(200)
50 CLS3
60 Z=200
70 FOR I=1 TO 7
80 READ A$:A=ASC(A$)
90 FOR J=1 TO 10:IF B(J)=A THEN GOTO 110
100 POKE (1024+254-J),175:POKE (1024+253-J),A
110 NEXT J
120 SOUNDZ,1:Z=Z-5
130 NEXT I
140 PRINT@268,"PICTURE":PRINT@300,"PUZZLES":
150 DATA 5,L,1,D,1,N,G
160 FOR DL=0 TO 1500:NEXT
170 CLS:PRINT@40,"PUZZLES AVAILABLE":PRINT@98,"(1) H
OUSE":PRINT@162,"(2) NUMBERS":PRINT@226,"(3) HUMPTY
DUMPTY"
180 PRINT:INPUT"WHICH WOULD YOU LIKE (1,2 OR 3)":K
190 IF K<1 OR K>3 THEN 180
200 ON K GOTO 210,220,230
210 CLS:PRINT:PRINT"REARRANGE THE PIECES TO FORM A PI
CTURE OF A HOUSE":GOTO 240
220 CLS:PRINT:PRINT"ARRANGE THE NUMBERS IN THE ORDERSH
OWN IN THE SMALL PICTURE":GOTO 240
230 CLS:PRINT:PRINT"CAN YOU PUT HUMPTY TOGETHER AG
AIN?"
240 PRINT:TO MOVE A PIECE ADJACENT TO THE EMPTY (PLAIN
BLUE) POSITION, TYPE THE ROW LETTER THEN THE CO
LUMN NUMBER."
250 PRINT:INPUT"LEVEL OF DIFFICULTY (1-5)":L
260 IF L<1 OR L>5 THEN 250
270 CLS:PRINT@265,"PLEASE WAIT"
280 REM NUMBERS
290 N$(0)="R6DBL6UBBR10":N$(1)="BR2R2DBL2R4BR4BUB":N$(
2)="R6D4L6D4R6BR4BUB"
300 N$(3)="R6D4NL6D4L6BR10BUB":N$(4)="D6R4NU2ND2R2BR4B
U6":N$(5)="NR6D4R6D4L6BR10BUB"
310 N$(6)="DBR6U4L6BR10BUB":N$(7)="R6DBBR4BUB":N$(8)="
R6D4NL6D4L6UBBR10":N$(9)="NR6D4R6U4DBBR4BUB"
320 ON K GOTO 1060,1200,1400
330 FOR I=1 TO 4:FOR J=1 TO 4
340 P(I,J)=1+(J-1)*4
350 NEXT J,I
360 BC=1:BR=1
370 SCREEN1,0
380 PCOPY 1 TO 5:PCOPY2 TO 6:PCOPY3 TO 7:PCOPY4 TO 8
390 REM SHUFFLE PICTURE
400 FOR I=1 TO (L*10)
410 W=RND(4):IF (W=1 AND W1=2) OR (W=2 AND W1=1) OR (W=
3 AND W1=4) OR (W=4 AND W1=3) THEN 410
420 W1=W :ON W1 GOTO 430,440,450,460
430 C=BC:IF BR=1 THEN R=BR+1:GOTO 470 ELSE R=BR-1:GOTO
470
440 C=BC:IF BR=4 THEN R=3:GOTO 470 ELSE R=BR+1:GOTO 47
0
450 R=BR:IF BC=1 THEN C=2:GOTO 470 ELSE C=BC-1:GOTO 47
0
460 R=BR:IF BC=4 THEN C=3 ELSE C=BC+1
470 GOSUB 910
480 NEXT I
490 SOUND200,5
500 REM START GAME
510 PUT (56,80)-(76,88),BQ,PSET
520 PUT (56,100)-(76,108),BQ,PSET
530 PUT (56,80)-(66,88),Q,PSET
540 R$=INKEY$:IF R$="" THEN 540
550 R=ASC(R$)-64:IF R<1 OR R>4 THEN 540
560 PUT (56,80)-(76,88),BQ,PSET
570 DRAW"BMS6,80;XL$(R)":
580 PUT (56,100)-(66,108),Q,PSET
590 C$=INKEY$:IF C$="" THEN 590
600 C=VAL(C$):IF C<1 OR C>4 THEN 590
610 PUT (56,100)-(76,108),BQ,PSET
620 DRAW"BMS6,100;XN$(C)":
630 IF (R=BR AND ABS(C-BC)=1) OR (C=BC AND ABS(R-BR)=1)
THEN GOSUB 910:GOTO 650

```

```

640 GOTO 510
650 SOUND200,2
660 M=M+1:IF M>99 THEN 870
670 GOSUB 1000
680 REM CHECK FOR PUZZLE COMPLETE
690 FOR I=1 TO 4
700 FOR J=1 TO 4
710 IF P(I,J)<>1+(J-1)*4 THEN 500
720 NEXT J,I
730 REM PUZZLE COMPLETE
740 FOR I=1 TO 3:SOUND170,2:SOUND200,4:NEXT I:FOR DL=0
TO 500:NEXT
750 CLS:PRINT@235,"WELL DONE!"
760 PRINT@291,"YOU SOLVED IT IN":M:"MOVES"
770 PRINT@354,"(IT WAS SHUFFLED)":L*10:"TIMES"
780 PRINT@425,"ANOTHER GO (Y/N)":INPUT O$
790 IF O$="N" THEN 860
800 CLS:INPUT"LEVEL OF DIFFICULTY (1-5)":L
810 IF L<1 OR L>5 THEN 800
820 PMODE3,1:SCREEN1,0
830 IF F=1 THEN PCOPY 5 TO 1:PCOPY 6 TO 2:PCOPY 7 TO 3
:PCOPY 8 TO 4:BR=1:BC=1:F=0
840 M=0:GOSUB 1000
850 GOTO 390
860 END
870 REM FAIL
880 SOUND50,3:FOR DL=0 TO 300:NEXT
890 CLS:PRINT@229,"SORRY - YOU FAILED TO SOLVE THE PUZ
ZLE IN 100 MOVES"
900 F=1:GOTO 780
910 REM SLIDE PIECE(R,C)
920 XA=40+40*C:YA=16+(R-1)*40
930 GET(XA,YA)-(XA+40,YA+40),A,G
940 XB=40+40*B:YB=16+(R-1)*40
950 PUT(XB,YB)-(XB+40,YB+40),A,PSET
960 PUT(XA,YA)-(XA+40,YA+40),B,PSET
970 P(BR,BC)=P(R,C):P(R,C)=1
980 BR=R:BC=C
990 REM WRITE NO. OF MOVES
1000 REM WRITE NO. OF MOVES
1010 D1=INT((M+0.01)/10)
1020 D2=M-10*D1
1030 PUT(25,155)-(45,163),BQ,PSET
1040 DRAW"BM25,155;XN$(D1):XN$(D2)":
1050 RETURN
1060 REM DRAW PICTURE
1070 PMODE3,1:PCLS2
1080 H$="R6U4NL6U1BE10RBF4U4R4DBH4F6NL2BD18NR6D6L1BU10
LD10R6L10U16BR4U6R2ND6R4ND6R2D6LBBR12U6R2ND6R4ND6R2D6
LBB6R2ND6R4ND6R2D6LBU6"1090 LINE(16,16)-(56,56),PSET,
B:PAINT(18,18),1,4
1100 DRAW"BM16,56;XN$(BM44,22):U2R4U2R4D4LB2"
1110 PAINT(18,18),3,4:PAINT(24,40),2,4:PAINT(28,50),4,
4
1120 PAINT(40,30),4,4:PAINT(46,24),4,4:PAINT(46,20),2,
4
1130 PAINT(30,40),3,4:PAINT(42,40),3,4:PAINT(42,50),3,
4
1140 LINE(80,16)-(240,176),PSET,B:PAINT(82,18),1,4
1150 DRAW"BM80,176;S16;XN$(S4):BM196,40;U4E4R4E4R4E4R4F
4D4L4G4L8G4:BM136,152;R4D4L4U4"
1160 PAINT(82,18),3,4:PAINT(112,160),2,4:PAINT(160,50)
,4,4
1170 PAINT(200,50),4,4:PAINT(198,38),2,4:PAINT(128,160)
,4,4
1180 PAINT(136,100),3,4:PAINT(184,100),3,4:PAINT(184,1
50),3,4
1190 GOTO 1610
1200 REM DRAW NUMBER PUZZLE
1210 PMODE3,1:PCLS2
1220 LINE(16,16)-(56,56),PSET,B:LINE(80,16)-(240,176),
PSET,B
1230 PAINT(18,18),3,4:PAINT(82,18),3,4
1240 FOR I=1 TO 4
1250 LINE(16+10*I,16)-(16+10*I,56),PSET:LINE(16,16+10*
I)-(56,16+10*I),PSET
1260 LINE(80+40*I,16)-(80+40*I,176),PSET:LINE(80,16+40
*I)-(240,16+40*I),PSET:NEXT I

```

```

1270 FOR I=1 TO 2:FOR J=1 TO 2
1280 PAINT(8+20*I,20*J-2),4,4:PAINT(20*I- 2,8+20*J),4,
4
1290 PAINT(50+80*I,80*J-60),4,4:PAINT(80*I+10,80*J-20)
,4,4
1300 NEXT J,I
1310 DRAW"BM28,18;C2"+N$(1)+N$(2)+N$(3)+"BM18,28;"+N$(
4)+N$(5)+N$(6)+N$(7)+"BM18,38"+N$(8)+N$(9)
1320 DRAW"BM38,38;D6BR4U6R4D6L4BRBU6BR4D6"
1330 DRAW"BM18,54;U6BR2R4D3L4D3R4BR4U6BR2R4D3NL4D3L4BR
BU6BR2D4R2NU2ND2R2BR4D2U6BR2NR4D3R4D3L4"
1340 DRAW"BM124,20;S16"+N$(1)+N$(2)+N$(3)
1350 DRAW"BM86,60;"+N$(4)+N$(5)+N$(6)+N$(7)+"BM86,100;
"+N$(8)+N$(9)
1360 DRAW"BM164,102;D6BR3U6R4D6L4BRBU6BR4D6"
1370 DRAW"BM84,166;U6BR3R4D3L4D3R4BR3U6BR3R4D3NL4D3L4B
R7U6BR3DAR2NU2ND2R2BR3U4D6BR3R4U3L4U3R4"
1380 DRAW"84;C4"
1390 GOTO 1610
1400 REM DRAW HUMPTY
1410 PMODE3,1:PCLS2
1420 LINE(80,16)-(240,176),PSET,B
1430 LINE(80,125)-(240,125),PSET
1440 CIRCLE(160,96),50,4,1,3
1450 DRAW"BM125,140;C4;G16H8GBF16E24;BM195,140;F16E8FB
G16H24"
1460 PAINT(85,170),4,4:LINE(110,110)-(210,110),PSET:L1
NE(120,125)-(200,125),PSET:PAINT(160,125),1,4
1470 PAINT(123,143),1,4:PAINT(197,143),1,4:CIRCLE(140,
70),7,3:PAINT(140,70),3,3:CIRCLE(180,70),7,3:PAINT(180
,70),3,3
1480 CIRCLE(160,85),20,4,0,5,0,0,5
1490 DRAW"BM112,80;G22NF7BSF2NESF2NESF2E3D2R2U3E15;BM2
02,74;E2ONF7ESF2NGSF2NGSF2G3R2D2L3G22"
1500 PAINT(82,18),3,4:PAINT"BM140,40;C1;U5R5U10R30D10R5
D5L40":PAINT(160,30),1,1
1510 DRAW"BM80,145;C2;R10ND20R10NU20R10ND10R10U14;BM20
0,145;NU14R10ND10R10NU20R10ND20R10;BD20;L20ND15L4BL12L
4ND15L10NU13L10ND15L10NUBL10ND15L10NUBL10ND15L10NU3L1
0ND15L4BL12L4ND15L20;C4"
1520 LINE(16,16)-(56,56),PSET,B
1530 CIRCLE(36,36),12,4,1,3
1540 LINE(16,42)-(26,42),PSET:LINE(46,42)-(56,42),PSET
1550 PAINT(18,54),4,4:LINE(24,38)-(52,38),PSET:PAINT(3
6,40),1,4:PAINT(18,18),3,4
1560 DRAW"BM28,46;C1;GAH4;BM44,46;F4E4"
1570 PSET(33,30),3:PSET(33,31,3):PSET(41,30,3):PSET(41
,31,3)
1580 DRAW"BM33,34;C4;F2R4E2"
1590 DRAW"BM24,35;C2;G5;BM48,35;E5"
1600 DRAW"BM30,24;C1;R2U4R10D4R2L14;C4":PAINT(36,22),1
,1
1610 REM NUMBERS
1620 DRAW"BM98,3;XN$(1);BM137,3;XN$(2);BM177,3;XN$(3);
BM217,3;XN$(4)":
1630 REM SQUARES
1640 FOR I=1 TO 3
1650 LINE(80+40*I,16)-(80+40*I,176),PSET
1660 LINE(80,16+40*I)-(240,16+40*I),PSET
1670 NEXT I
1680 REM LETTERS
1690 L$(1)="NDBR6D4NL6D4":L$(2)="NDBR4F2G2NL4F2G2L4"
:L$(3)="NR6DBR6":L$(4)="R4F2D4G2L4UB"
1700 DRAW"BM70,30;XL$(1);BM70,70;XL$(2);BM70,110;XL$
(3);BM70,150;XL$(4)":
1710 REM ROW,COL.,MOVES
1720 DRAW"BM16,80;NDBR6D4L6R2F4BR4UBR6DBL6BR10UBUD6F2E
2F2E2U6;BM16,100;NR6DBR6BR4R6UBL6DBR10NUBR6BR4U2;BM16
,140;NDBF4E4DBR4R6UBL6DBR10UBUD4F4E4U4BR4NR6D4NR6D4R
6BR4R6U4L6U4R6"
1730 REM?
1740 DRAW"BMS6,80;R4D4L2D1B2D1"
1750 GET(56,80)-(66,88),Q,G
1760 GET(56,80)-(76,68),BQ,G
1770 PUT(56,80)-(76,88),BQ,PSET
1780 REM BLANK PIECE
1790 GET(80,16)-(120,56),B,G
1800 GOTO 330

```

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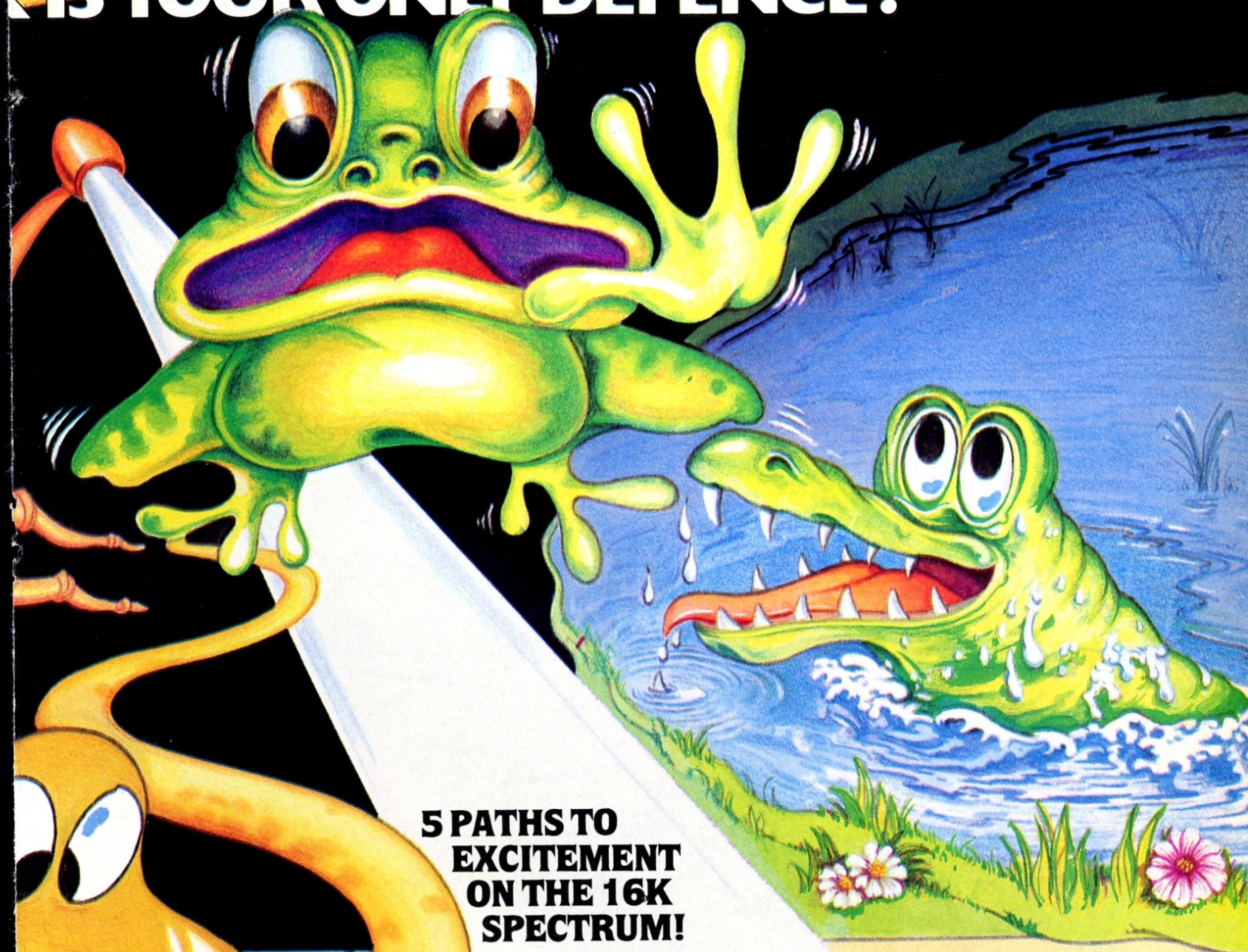


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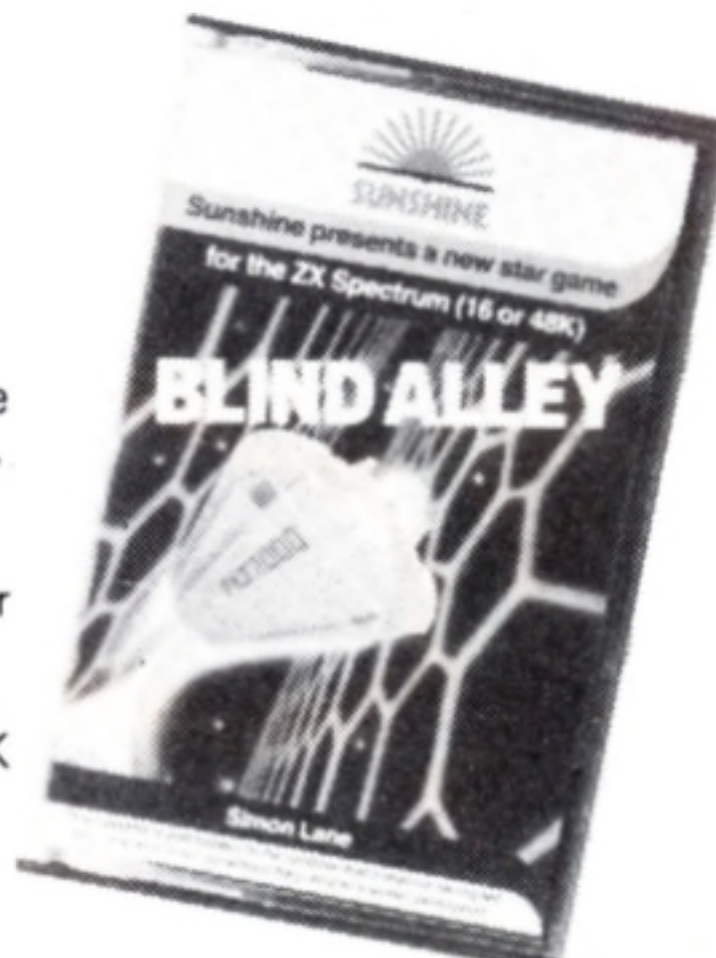
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HIGH-RESOLUTION graphics on the Vic are an obscure subject to many users and nobody seems to be able to use them to any effect. This may be because there is a well-circulated myth that high-resolution plotting is impossible without the super expander cartridge. This is true for those of you with unexpanded Vics, because there is no user-RAM left available after the high-resolution screen is initialised and the plotting routines are installed.

However, if you have a Vic with 8K expansion RAM, it is possible to use high-resolution graphics effectively. At power-up, your Vic displays the message 11,775 Bytes Free, which if you subtract the 3.5K needed for the graphics screen, still leaves you with a nice big lump of something like 8K of free RAM.

The theory behind the use of high-resolution graphics is simple — the practice is not. This is because the whole of the memory map for Basic storage etc., is rearranged.

As all the RAM before 8192, and after 15872 is used for graphics, and routines, the Basic user-space must be reallocated to between these addresses. This can be done by entering this line:
POKE 641,0: POKE 642,32: POKE 643,0: POKE 644,62: SYS 64824

Do not worry, the Vic was supposed to do a cold start. As the more observant of you will have noticed, you have lost 4K of RAM. The power up message should now read:
7679 BYTES FREE

or something near this figure.

What has happened is that the top and bottom of user RAM locations have been changed in order to stop the graphics screen overwriting your Basic program.

For the more technically minded, the high-resolution screen has to be stored at 4096, as this is the only place at which the VIC — Video Interface Chip can access it.

Now that Basic has been relocated you can load the graphics routines which you must have previously saved. Programming in Basic or assembler code can now be carried out in the normal way.

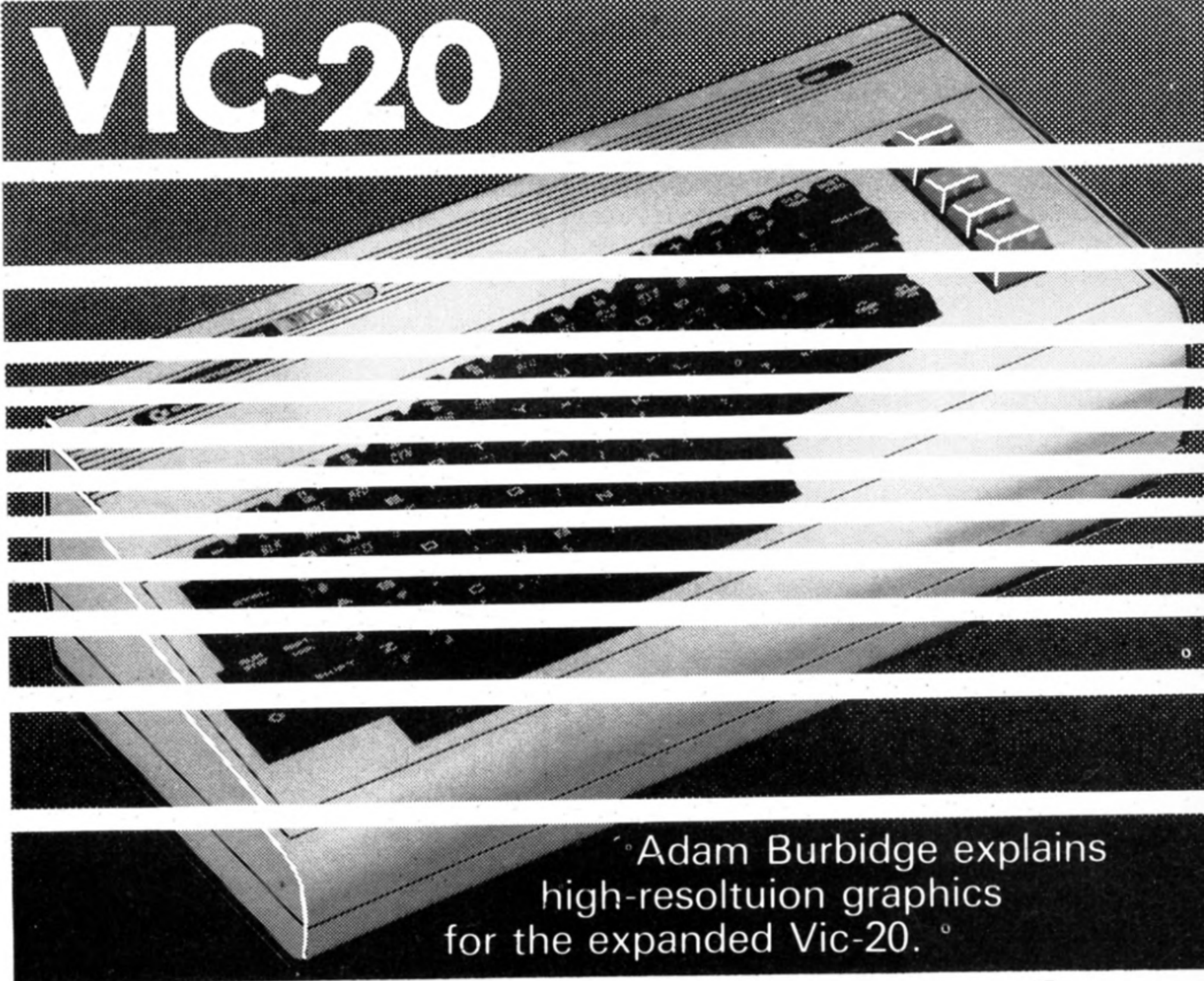
The high-resolution graphics on the Vic work by means of the definable-character facility with the character definitions stored in the address 4096 to 7650, or thereabouts.

However, the Vic only has 256 user-available definable characters and there are 506 screen locations. Therefore, a function called double height characters mode must be used. This sets the character definition grid of 8 by 8 to a double height 8 by 16 matrix. This is done by altering the contents of the VIC chip register at 36867.

Demo 1.

```
10AC=5
20POKE 36867,20
30 POKE 36878,16*AC
40 POKE 36879,8
50SYS 16282
60POKE 864,10:SYS16048
70POKE 835,4
80FOR Y=0 TO PI*2 STEP 0.1
90POKE 833,COS(Y)*60+70
100POKE 832,SIN(Y)*60+70
110SYS 15904
12ONEXT
130WAIT 197,192,64
```

VIC-20



Adam Burbidge explains high-resolution graphics for the expanded Vic-20.

GRAPHICS

Now that double-height characters are installed we can set up the screen as follows:

```
character numbers
0 10 . . . 210
↓ ↓ ↓
9 19 . . . 219
```

But, as the screen starts at 4096 it must also be relocated back to 7680. This is done by a small part of the set-up machine-code routine. The entire character set is set to blanks and the high-resolution screen is set up.

To calculate which byte to Poke with the newly plotted point, we need several equations. The byte to be Poked is calculated by:

$$\text{Byte} = 4096 + 16 * (\text{INT}(X/8) * 10 + \text{INT}(Y/16)) + ((Y/16) - \text{INT}(Y/16)) * 16$$

The bit to be changed can be calculated by:

$$\text{Bit} = 7 - ((X/8) - \text{INT}(X/8)) * 8$$

When the bit to be changed has been calculated, then a single bit mask will be calculated. This is a binary number with only one bit set, ie:

```
1 — 00000001
2 — 00000010
4 — 00000100
8 — 00001000
16 — 00010000
32 — 00100000
64 — 01000000
128 — 10000000
Bit No. — 76543210
```

In order to set a point, the bit mask is logically Ored with the contents of the byte being changed. This is then repoked back into the byte.

In order to reset a point, the bit mask is

logically Eored — exclusively Ored — with 255, and then Anded with the contents of the byte.

For example let the contents of the byte to be changed be 10110101. To set bit 3:

```
10110101
OR 00001000
—————
10111101
```

To reset Bit 0:

```
00000001
EOR 11111111
—————
11111110
AND 10110101
—————
10110100
```

Multi-colour mode is a state in which the VIC chip will recognise four separate coloured points. This is, however, impossible with only one bit as we have used up until now, so we have to use pairs of bits. Unfortunately this means sacrificing half of our current resolution.

You can think of multi-colour mode bytes as blocks of four pairs of two bits each, like this:

```
00 00 00 00
```

As you can see, we now have four possible types of point:

```
00, 01, 10, 11
```

These represent the following colours:

```
00 — screen colour*
01 — character colour
10 — Border colour*
11 — Auxiliary colour
```

Asterisk, * indicates that these depend on the contents of 36879.

(continued on next page)

(continued from previous page)

A point set to the screen colour, is invisible, and thus equivalent to a reset point.

The character colour can be set by Poking 864 with the colour required, and called the Clear routine, by typing:

SYS 16048

To use multicolour mode, the colour is Poked as normal, except 8 is added to the value. For example, to clear the screen white:

POKE 864,9:SYS 16048

This is because bit 3 of the character memory byte indicates whether the corresponding screen byte is multi-coloured, or normal.

To use the Basic loader program simply type in the appropriate program and then Save it onto tape or disc. It can then be loaded and run as a normal Basic program after you have typed in the Pokes in figure 1.

This program will destroy itself when run, so Save it before you run it for the first time. Also, as lengthy conversions are carried out, the program takes several minutes to run.

To demonstrate this, set up the routines in memory and type in the program — Demo 1. Run this, and a circle should be drawn in the colour set by the variable AC, on a black background.

There are three visible colours available with which to plot; these are border, character, and auxiliary colour. They are set up as follows:

Border colour is set by Poking 36879 with the screen colour. To get cyan border on a red screen we must Poke 36879 with $32+8+3=43$. Thus we have eight possible border colours.

Character colour is normally the colour of the print on the screen, but can easily be changed by using the standard clear routine included at 16048. As multi-colour mode is

used, we must add 8 to the value of the colour we want. For example, to make the character colour green, Poke 864,13 and SYS 16048 which is the Clear routine.

Auxiliary colour is the most versatile plot colour as it has 16 different variations. To set this, we Poke 36878 with $16*$ the colour.

For example, to set the auxiliary colour to pink, Poke 36867,160 ($10*16$).

Colour code	Colour
0	black
1	white
2	red
3	cyan
4	purple (magenta)
5	green
6	blue
7	yellow
8	orange
9	pale orange
10	pink
11	pale cyan
12	pale purple
13	pale green
14	pale blue
15	buff

Colour codes	Call address	Routine
	16282	Setup
	16080	Plotcalc
	16048	Clear (colour in 864)
	16016	Set*
	15984	Reset*
	15904	Colplot* (colour in 835)

* = x in 832, Y = 833

Figure 1. Loading and running the programs: First, Poke 641,0:Poke 642,32:Poke 643,0:Poke 644,62:sys 64824 then load Basic loader. Next Run and then load "DEMO-1" and Run.

```

Basic loader program.
1 B$="0123456789ABCDEF"
10 FORZ=15904 TO 16383
20 READA$
30 A1$=LEFT$(A$,1):A2$=RIGHT$(A$,1)
40 FORT=0 TO 16
50 X$=MID$(B$,T+1,1)
60 IFX$=A1$ THEN A1=T
70 IFX$=A2$ THEN A2=T
80 NEXTT
90 POKEZ,A1*16+A2
95 NEXTZ
100 REM DATA
110 DATA 40,03,29,FE,8D,40,03,AE,43,03,E0,00,D0,09,20,70,3E,EE,41,03,20,70,3E,
E0,01,D0
120 DATA 09,20,70,3E,EE,40,03,20,90,3E,E0,03,D0,09,20,90,3E,EE,40,03,20,70,3E,E0
,04,D0,09
130 DATA 20,90,3E,EE,40,03,20,90,3E,60,00,FF,00,FF,00,FF,20,FF,00,FE,00,FF,00,FF
,00,FB,20
140 DATA 03,8E,3C,03,49,FF,2D,3C,03,AE,3E,03,AC,3F,03,8E,88,3E,8C,89,3E,8D,AF
,12,60,00
150 DATA 00,00,00,20,D0,3E,8E,3C,03,0D,3C,03,AE,3E,03,AC,3F,03,8E,A6,3E,8C,A7
,3E,8D,AF
160 DATA 12,60,00,00,00,00,00,00,AD,60,03,A2,00,9D,00,96,E8,D0,FA,9D,00,97,E8
,D0,FA,60
170 DATA 00,00,00,00,00,00,00,00,00,00,AD,40,03,A0,00,C9,09,10,05,A9
,00,48,90
180 DATA 17,38,E9,08,C8,C9,08,B0,F8,EA,8C,3C,03,98,A0,09,6D,3C,03,88,D0,FA,48,EA
,AD,41,03
190 DATA C9,10,30,0A,A0,00,38,C8,E9,10,C9,10,10,F8,68,8D,50,03,98,6D,50,03,8D,50
,03,AD,41
200 DATA 03,A0,00,E9,10,C8,C9,10,B0,F9,8D,42,03,A9,10,8D,3F,03,A9,00,8D,3E,03,A0
,00,A2,10
210 DATA AD,3E,03,18,6D,50,03,90,03,EE,3F,03,CA,D0,F4,18,6D,42,03,90,03,EE,3F,03
,8D,3E,03
220 DATA AD,40,03,18,29,07,EA,8D,3D,03,A9,07,38,ED,3D,03,8D,3C,03,EA,AE,3C,03,A9
,01,E0,00
230 DATA F0,05,18,0A,CA,D0,FA,AE,3F,03,8E,79,3F,AE,3E,03,8E,78,3F,AE,AF,12,60,00
,00,00,00
240 DATA 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
,00,00,C0
250 DATA 20,EC,3F,AD,03,90,09,01,8D,03,90,A9,FC,8D,05,90,A9,00,85,01,A9,10,85,02
,A9,00,A0
260 DATA 00,91,01,C8,C0,FF,D0,F9,91,01,A0,00,A6,02,E8,86,02,E0,1E,D0,EC,A9,00,8D
,3C,03,A2
270 DATA 00,A0,00,9D,00,1E,18,69,0A,C8,E8,C0,16,D0,F4,EE,3C,03,AD,3C,03,A0,00,E0
,DC,D0,E8
280 DATA 60,AD,02,90,09,80,8D,02,90,A9,1E,8D,88,02,A5,93,20,D2,FF,60,02

```

The purpose of Setup is to set up the high-resolution screen ready for plotting. There are no parameters. Call address: 16282.

This will clear the screen, and set up high-resolution mode. Several lines of jibberish will remain at the bottom of the screen — these may be removed by typing:

POKE 36867,20

The purpose of Plotcalc is to calculate the part of memory, and a single bit mask, in which a point occurs. Parameters: X position is in 832 and Y position is in 833. Call Address: 16080.

If this routine is called on its own, then nothing will seem to occur. This is because Plotcalc only sets up the address and bit mask for other routines. However, it is useful in itself, as it consists of four separate parts: Charcalc, Rowcalc, Bytcalc and Bitcalc. These routines use parts of memory for variable storage, as follows:

Location	Name	Function
848	Char	Stores the character number within which the current point falls.
834	Row	The current row in the character in which the point lies
830-831		LSB and MSB respectively of the byte which was calculated as the one in which the current point lies.

With some cunning programming, it could easily be rigged so that the character colour — or normal colour if plotting is not in multi-colour mode — is selectively set for each point plotted. The big snag with this is that any other points within the boundary of the character colour changed will also change colour. Therefore only one character colour is possible per group of 16 by 8 points — the double-height character size.

The purpose of Clear is to set the screen character colours to a specified choice. The character colour is in 864. Call Address: 16048.

This does not affect the contents of the actual high-resolution screen so this routine can be called during a display without ruining the picture on the screen.

The purpose of Set is to set a high-resolution point — not multi-colour. Parameters: X is in 832 and Y is in 833. Call Address: 16016.

This routine will call Plotcalc and then set the point calculated from this address.

Reset's purpose is to clear a high-resolution point — not multi-colour. Parameters: X is in 832 and Y is in 833. Call Address: 15984.

This routine also calls Plotcalc and then resets the point calculated from this address.

Colplot sets a multi-colour mode-point. Parameters: X is in 832 and Y is in 833. Colour is in 834. Call Address: 15904.

The set and reset routines are called, according to the colour of point to be set, as detailed in the theory section.

When using graphics, the following procedure must always be observed:

- Call the Set-up routine.
- Set the character colour with the Clear routine.
- Set the screen and border colour, by Poking 36879.
- Set the auxiliary colour by Poking 36878. Plotting can then be done as normal. ■

Sinclair Special

3



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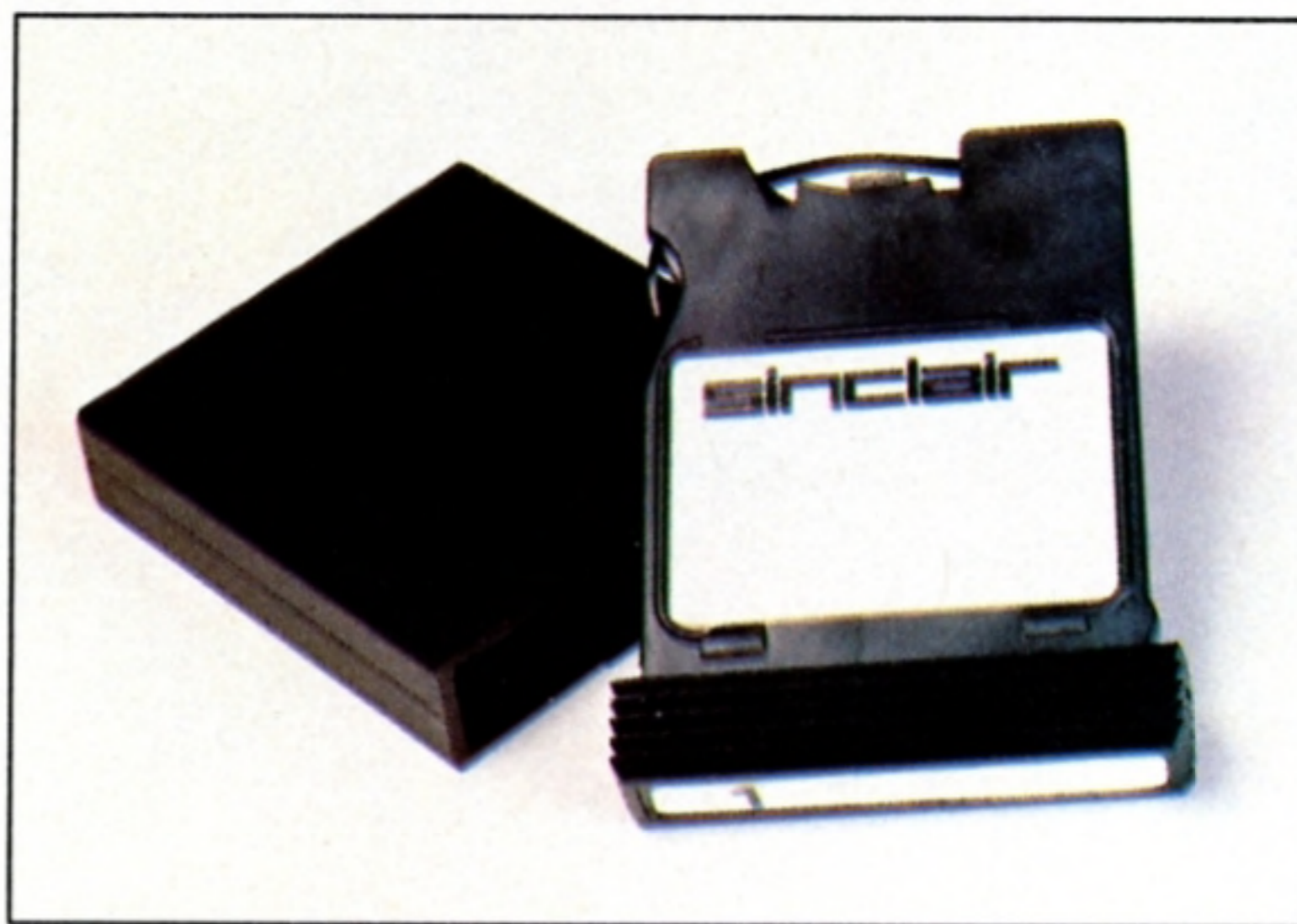
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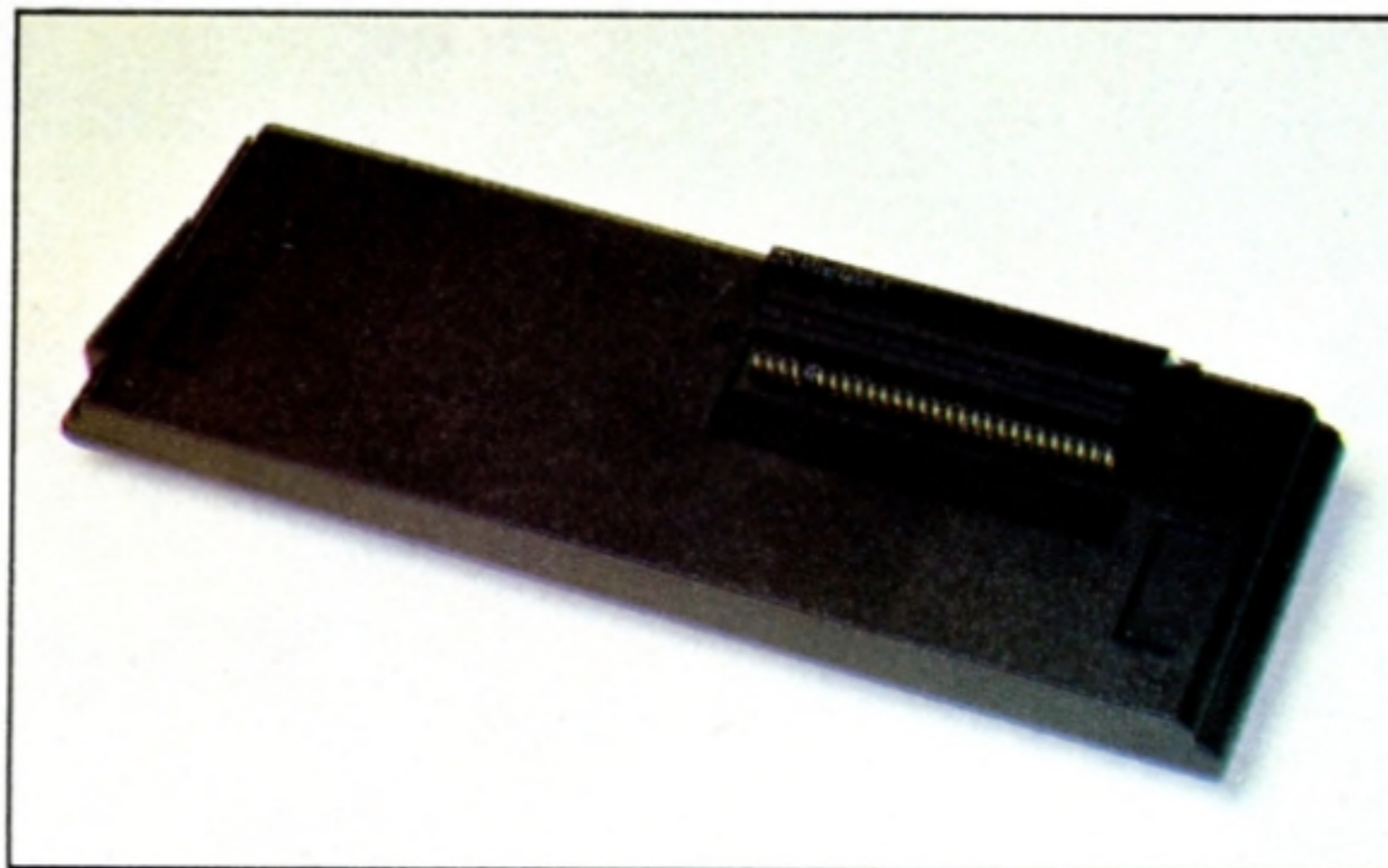
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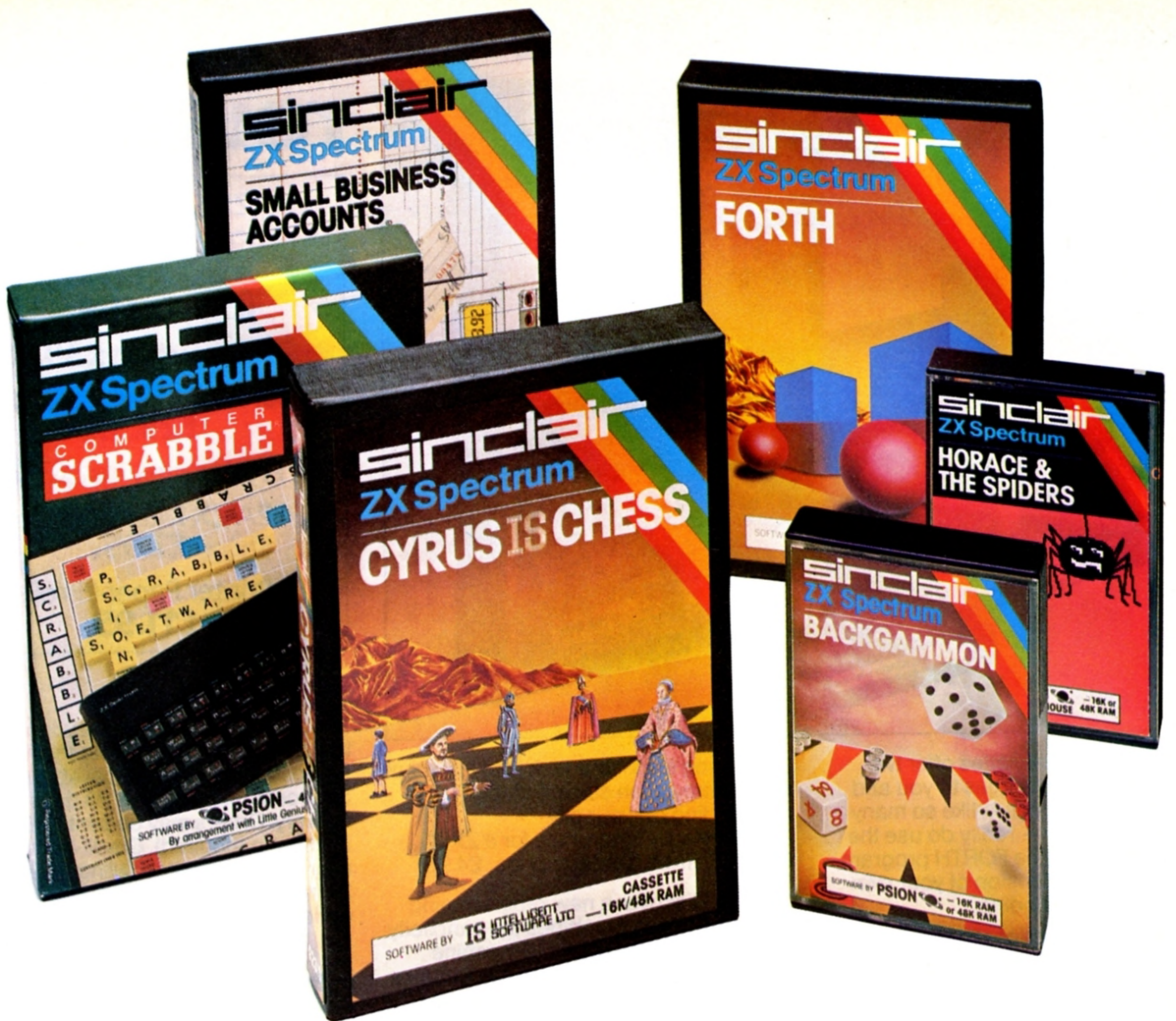
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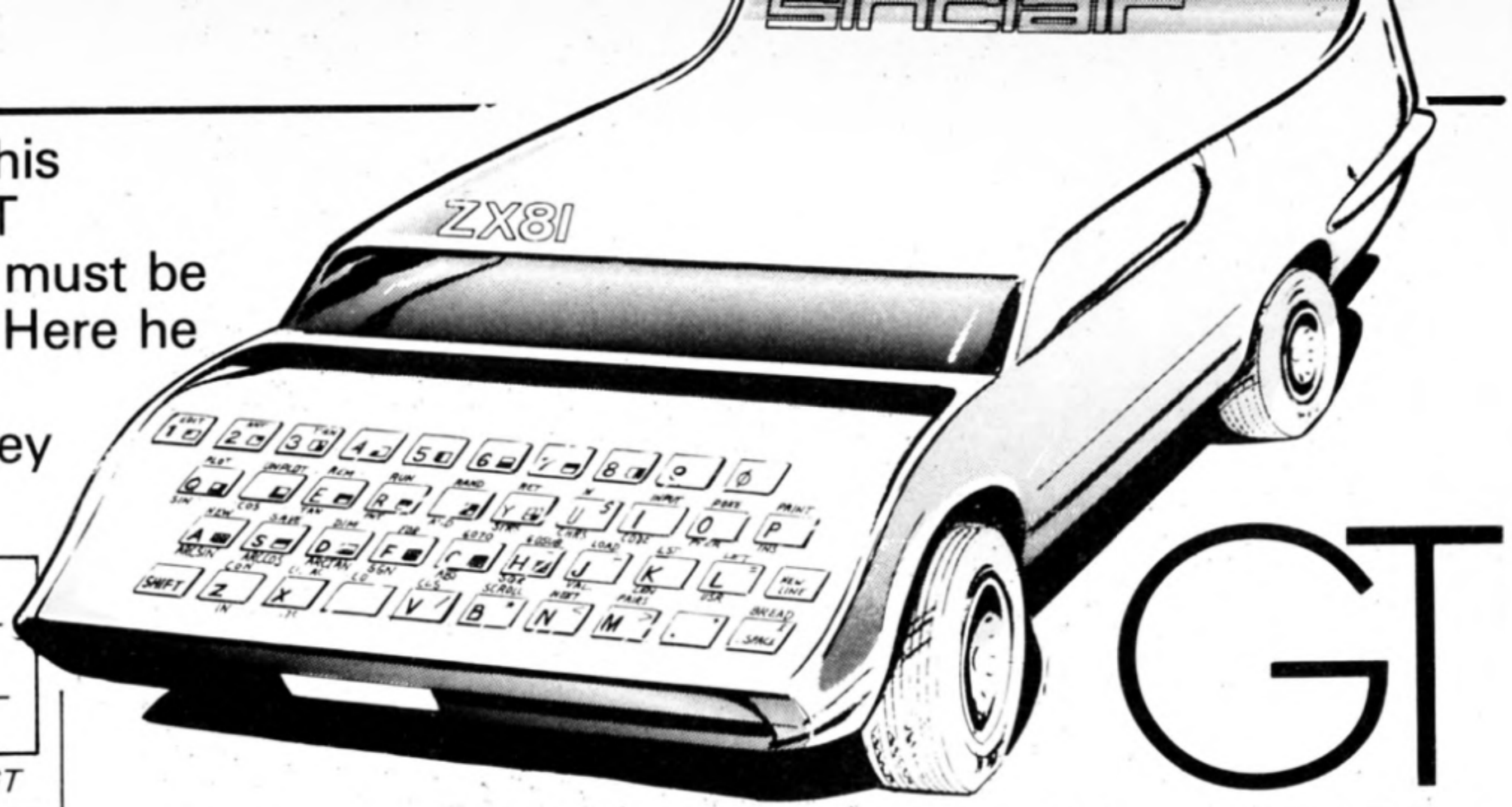
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David Threlfall continues his insight into how the ZXGT compiler works and what must be considered in the design. Here he looks at the compiler's shortcomings and how they have been overcome.



ZXGT COMPILER

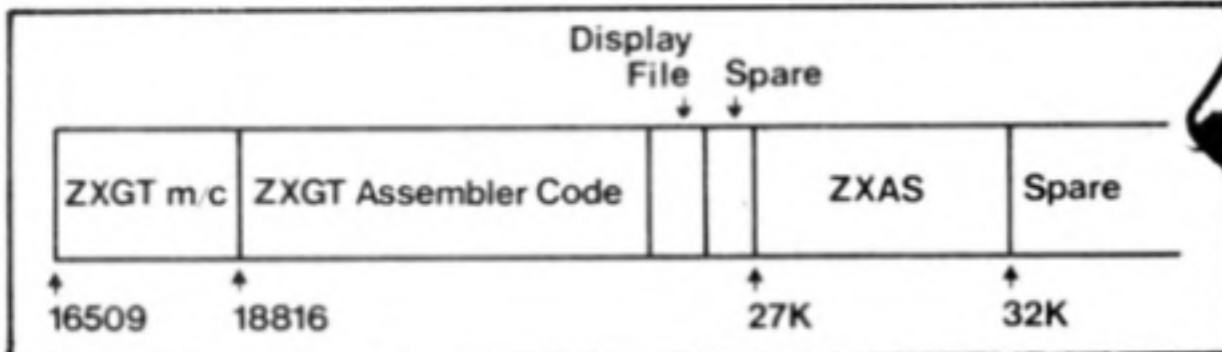


Figure 1a: Memory map during work on ZXGT

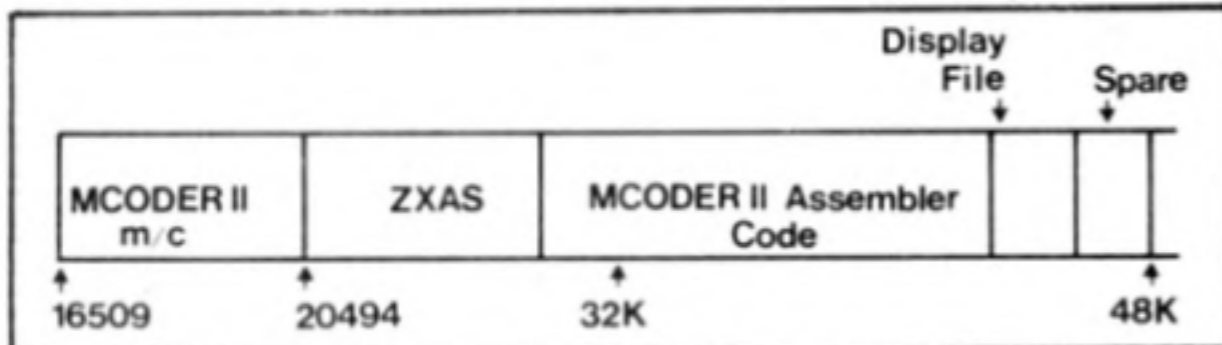


Figure 1b: Memory map during work on MCode II

A FEW MONTHS after ZXGT had been put on the market as MCode a few of its shortcomings became apparent. As it stood it worked extremely well, was very fast and far exceeded its original specification, but there are several areas where improvements would be welcome. Problem areas include;

- No strings — this can be circumvented but string handling would make more a much more versatile compiler.
- Only 25 variables — programs written for ZXGT were getting larger and this restriction was proving a major handicap to writing understandable code. Multi-character names were necessary, not even two-character names as on the Pet could be considered.
- Only one numeric array — the array was added as an afterthought primarily to help fulfil the role of data logger on scientific experiments. A full 26 arrays, even if one dimensional, would be very useful.

- Printing was not *à la Basic* — each number was printed with a leading space and “,” did not tabulate.
- Lprint was not supported.
- No Boolean algebra at all — a little would be useful.
- Input was totally non-standard, it appears on the main screen not on the input area and there is no rubout. Input at the bottom of the screen with the ability to correct mistakes was necessary.
- At about 56 times faster than Basic it was not slow but work on the Spectrum version had shown that more speed was possible — the final version is almost 70 times faster than Basic.
- Brackets are necessary except in Let — this is compatible with Basic but annoying.
- Last but still relevant was size. The original ZXGT had been aimed at 2K bytes and only just ran over but most users gave the

impression that to obtain the items above they would sacrifice a little more space and longer loading time. 4K was felt to be optimum if all these features could be added.

■ Floating point. Slight consideration was given to full floating-point arithmetic. However, work with Microsoft's compiler on a larger machine had shown that a speed up of only five or so could be expected particularly as Sinclair's ROM routines are very slow. Put another way the balance between interpretation and evaluation is heavily on evaluating. For this reason primarily it was decided to stay with integer arithmetic on all the compilers for Sinclair computers.

Readers may wonder why these features were not implemented in ZXGT. ZXGT was not written directly in machine code but in assembler, a listing of which has been appearing in parallel with this text. It is hard
(continued on next page)

```

The Sinclair functions are
examined here and code
appropriate to each is
generated.
PEEK ?
L16:  CP 211
      JK NZ,L161
      CALL L108
      LD HL,#6F7E
      CALL L36
      LD HL,#0026
      JP L36

USR ?
L161: CP 212
      JR NZ,L152
      CALL L108
      LD HL,L163
      JP L39
L163: LD BC,L160
      PUSH BC
      PUSH HL
      RET
L160: LD H,B
      LD L,C
      RET

CODE INKEY# ?
L162: CP 196
      JP NZ,L168
      CALL L240
      CP 65
      JP NZ,L252
      LD HL,L53
      CALL L39
      LD A,38
      LD HL,#6F00
      JP L38

RND ?
L168: CP 64
      JP NZ,L172
      LD HL,L117
      JP L39

ABS ?
L172: CP 210
      JR NZ,L201
      CALL L108
      LD HL,#7CCB
      CALL L36
      LD A,196
      LD HL,L231
      JP L38

INT ?
L201: CP 207
      JP NZ,L252
      JP L108
L244: CALL L108
Get a pair of arguments and
generate the code
ld hl,nnnn or ld hl,(nnnn)
push hl
ld hl,nnnn or ld hl,(nnnn)
pop de
CALL L248
PUSH AF
LD A,229
CALL L241
CALL L108
LD A,209
CALL L241
POP AF
RET
Work out what the next thing is.
Is it a variable, a number or a
function?
L108: CALL L240
L102: CP 22
      PUSH AF
      CALL Z,L240
      CP 16
      JR Z,L218
      CP 64
      JR NC,L97
      CP 38
      CALL NC,L245
      CALL C,L86
L98:  POP AF
      CALL Z,L230
      RET
L97:  CALL L16
      JR L98
L218: CALL L200
      JR L98
Generate negation code.
L230: LD HL,L231
      JR L39
Actually do the negation.
L231: LD A,H
      CPI
      LD H,A
      LD A,L
      CPL
LD L,A
INC HL
RET
11
Get variable then code is
generated for ld hl,(nnnn).
L245: CALL L37
      CP 100
      JP Z,L234
      LD A,42
      JP L38
Get integer then code generated
for ld hl,nnnn.
L86:  CALL L81
      LD A,33
      JR L38
STOP statement seen
L110: CALL L96
      POP HL
      LD BC,(16507)
      RET
CLS statement seen. Generate a
call to the ROM.
L52:  LD HL,#A2A
      JR L39
SCROLL statement seen. Generate
a call to the scroll routine.
L130: LD HL,L131
      JR L39
A routine to save either HL as
code, HL and A as code or to
generate a call to the number
presently in HL.
L39:  LD A,205
L38:  CALL L241
L36:  LD A,L
      CALL L241
      LD A,H
      JP L241
POKE , get the two arguments and
make sure that a comma separates
them.
L141: CALL L244
      CALL L107
      LD HL,#73EB
      JR L36
Check that the char in A is a
comma, if not error.
L107: CP 26
      JP NZ,L252
      RET
FOR statement seen. Generate
code to load the variable with
the first number and keep the
second number incremented by one
in the next location.
L100: CALL L240
      CALL L37
      PUSH HL
      PUSH HL
      CALL L240
      CALL L244
      LD A,35
      CALL L241
      LD HL,#53ED
      CALL L36
      POP HL
      CALL L36
      LD A,34
      INC HL
      INC HL
      CALL L38
      POP HL
      LD DE,(16507)
      CALL L170
      RET
NEXT statement. Find the
variable name and generate code
to increment it and test if we
have reached the end. See Text.
L101: CALL L240
      CALL L37
      PUSH HL
      PUSH HL
      LD A,42
      CALL L38
      LD HL,#2223
      CALL L36
      POP HL
      CALL L36
      INC HL
      INC HL
      LD A,237
      CALL L241
      LD A,91
      CALL L38
      LD A,167
      LD HL,#52ED
12

```

(listing continued on next page)

(listing continued from previous page)

```

CALL L38
LD A,250
POP HL
CALL L171
EX DE,HL
CALL L38
RET
13
Get a number from the code
skipping over the floating point
form which follows it.
L81: LD HL,0
JR L83
L85: CALL L240
CP 126
JR Z,L84
PUSH AF
LD DE,10
CALL L112
POP AF
L83: CP 38
JP NC,L252
CP 28

```

```

JP C,L252
SUB 28
LD B,0
LD C,A
ADD HL,BC
JR L85
PUSH HL
L84: LD HL,(16406)
LD DE,5
ADD HL,DE
LD (16406),HL
POP HL
RET
INPUT statement. Find the
variable and generate a call to
read the keyboard and then code
to put the result in the slot
reserved for that variable.
L75: LD HL,L80
CALL L39
CALL L240
CALL L37
JP L105
PLOT statement. Find the pair of
arguments and then generate a

```

```

call to the Plotting routine.
L60: LD A,#9B
L61: PUSH AF
CALL L244
CALL L107
LD HL,#454B
CALL L36
LD A,#3E
CALL L241
POP AF
CALL L241
LD A,#32
LD HL,#4030
CALL L38
LD HL,L113
JP L39
14
UNPLOT statement. Much like PLOT
but with a different argument
generated.
L65: LD A,#A0
JR L61
RAND statement. Gets number and
puts it into location 16436.
L31: LD A,42

```

```

LD HL,16436
CALL L38
LD A,34
LD HL,16434
JP L38
IF tests start here. Arrive with
DE=first argument, HL=second and
A=operation. Result is carry set
if condition true.
L180: CP 221
JR Z,L182
CP 20
JR Z,L184
RRA
JR NC,L181
EX DE,HL
L181: RLA
AND A
SBC HL,DE
SCF
RET M
RLA
RET NC

```

(listing continued on page 123)

(continued from previous page)

to write very compact machine code mainly because changes and corrections are nearly impossible so space is always left just in case.

However, it is impossible to fit an assembler, the target code and the source for more than 1.5K of machine code in a 16K machine. That is why the code was written in two longish sections — figure 1a. This left two options — write the code in more than two sections — two were hard to manipulate, three or more would be devilish — or bootstrap from Basic.

The concept of bootstrapping is to write a small compiler with features that allow you to write a larger one. At least one Algol compiler has been written that way. Just a kernel of machine code is necessary to get started and this already existed in ZXGT.

This route was avoided since the code generated by ZXGT is 16-bit integer and therefore would not be suited to the mainly eight-bit character handling of a compiler. Perhaps someone would like to write an eight-bit version of ZXGT — it would be even faster.

Now, you are probably asking why I did not buy a 32K or larger memory pack. The answer is that I had one but that ZXAS — the assembler I had — sat in the 27 to 32K slot so stopping Basic from crossing the 32K word boundary. For those who do not already know, it is quite permissible for Basic code — not just variables and arrays — to cross this boundary but at no time must the display file straddle the line, either side is equally alright. Also, you cannot run machine code which sits above 32K.

Salvation finally came when DCode arrived on the market. DCode is a disassembler but more important it is a relocater so it was possible to relocate ZXAS to sit above the compiler machine code — figure 1b.

Relocatable code is code which may be put and run anywhere in the machine. It is easy to write relocatable sub-routines but whole programs are harder. Suffice to say that neither ZXAS or ZXGT are relocatable.

So a relocater is a smart disassembler which can spot which jumps and calls are to within the code to be moved and change them appropriate to the new location. This does not make the relocated code relocatable but merely changes where it will run. The twist to this story is that DCode was written independently by someone using MCode — alias ZXGT.

The third major limitation was the Sinclair tape interface. I have rarely had any trouble

with this but by the time MCode II was completed 32K bytes of code had to be run back in each time the machine crashed. With the standard tape interface that takes about 15 minutes. This time the remedy was QSave which records 32K bytes in a little under one minute onto a standard tape recorder.

The final piece in the jigsaw, which arrived when MCode II was nearly complete, was Ian Logan's ROM disassembly for the ZX-81. This allowed several new features to be added by using ROM routines to save space. ROM routines were only used where time was not critical eg. in EPrint. It also explained some of the clever but slow features of Sinclair's Basic.

In this section problem areas will be discussed in detail.

■ Strings: The major difficulty with strings was to avoid garbage collection when the string was lengthened or shortened. Eventually this was solved by decreeing that all strings would have a maximum length of 32 bytes. This length is held in a location that is known to the user so that it may be Poked from Basic.

The value is reset to 32 when the compiled program is run and must be Poked from your program. By this means the maximum length for individual strings can be set as the string is used for the first time. Thereafter the length of that string cannot be increased beyond that limit. There are no string arrays.

All strings — and numeric arrays for that matter — are allocated space at run-time and so sizes need not be preset. These strings/arrays are stored above Stkend. Consider this short program:

```

1 INPUT N
2 DIM A(N)
3 LET B$="QWERTYUIOP"
4 LET C$="BROWN FOX"
5 DIM X(N+N)

```

The program would prompt for N, allocate the array A — 2*N bytes to be zeroed — allocate B\$ and C\$ and finally allocate the array X of length 2N. Note the use of addition rather than multiplication to form 2N. Multiplication takes 10 times longer than addition and division 50 times longer. The result is the memory map shown in figure 2.

To concatenate strings, and that includes CHR\$, INKEY\$ or "string", it is necessary to form the new string elsewhere than its final resting place in case a string appears both on the left and right hand side of the assignment. For example:

```

LET A$ = A$(1 TO 3) + A$(6) + CHR$
128 + B$ + "*"

```

results in the new A\$ being built above Last —

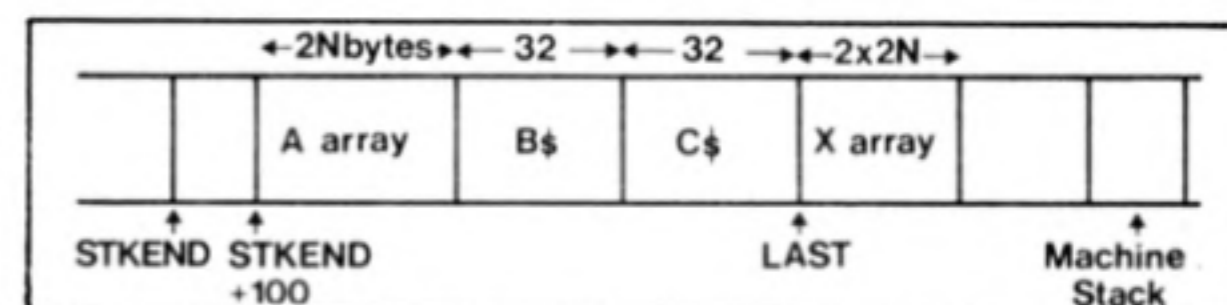


Figure 2: Dynamic allocation of space.

see figure 3 — and then locations Last to End are copied into A\$. The length of the string is simply the number of bytes between Last and End

Printing strings is a similar process except that the final copy is to the screen. A more difficult task is to compare two strings, for example:

```
IF A$ <> B$ THEN PRINT "NOT EQUAL"
```

A copy of A\$ is made above Last — which is reset first — and a copy of B\$ is made above End. Each is terminated with the code 255. With HL pointing to A\$ and BC to B\$, incrementing and comparing and using the results flags it is possible to do all six standard comparisons with one short routine.

■ Full variable names: Sinclair Basic is rare in allowing variable names of any length which may contain spaces if desired. Apart from disallowing spaces this is fully implemented in MCode II. The variable names are stored as shown in figure 4. The names are entered downwards from just below the machine stack — actually 256 bytes clear of RAMtop — and the last letter is stored in inverse video, ie., bit seven is set.

For strings the names are considered to be A\$ to Z\$ and for arrays A< to Z< thereby differentiating between the three sorts of variable. An example might be to store the names Fred, A\$, One and an array C, these would be stored down from just below the stack thus:

- F
- R
- E
- Inverse D
- A
- Inverse \$
- O
- N
- Inverse E
- C
- Inverse <
- 0

The zero on the bottom marks the end of the list. There can only be 255 variables as a single byte is used to store the number of variables. A careful note should be kept during compilation of the maximum number of concurrent variables together so that space may be reserved for them at the end of the compiled code.

In Basic the command Clear removes all the

(continued on page 123)

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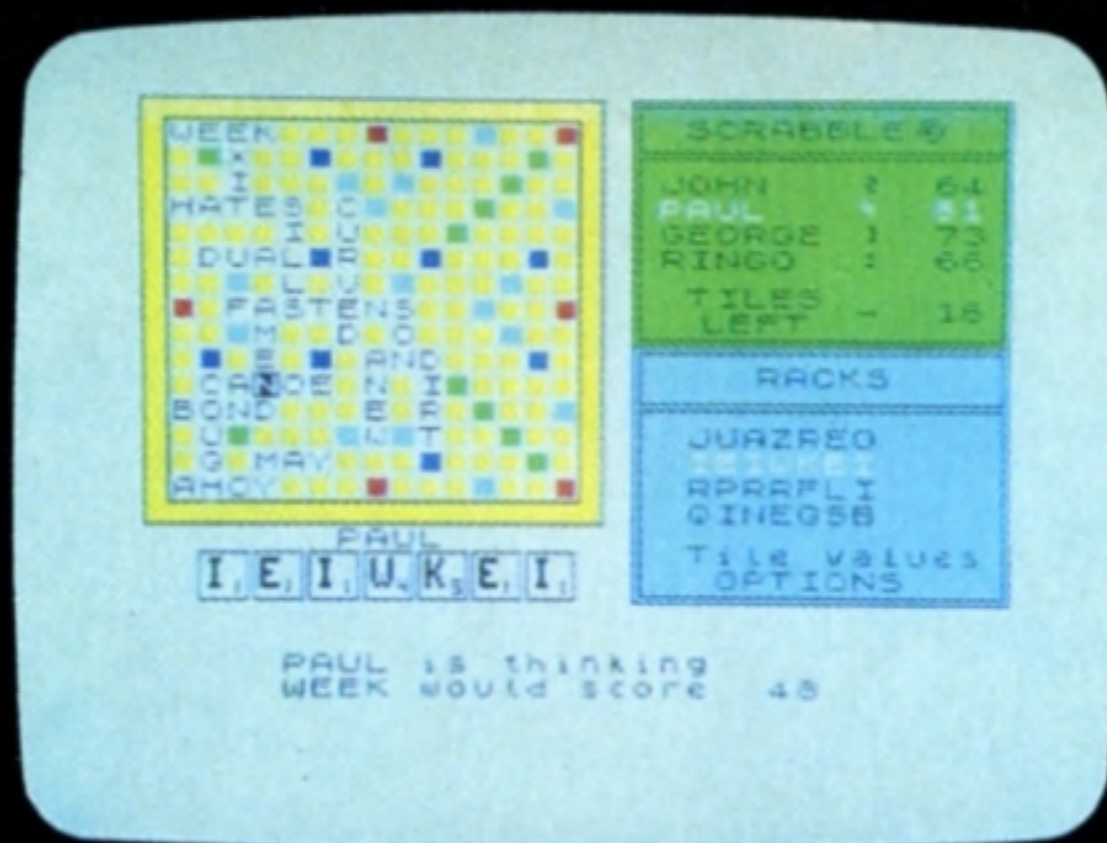
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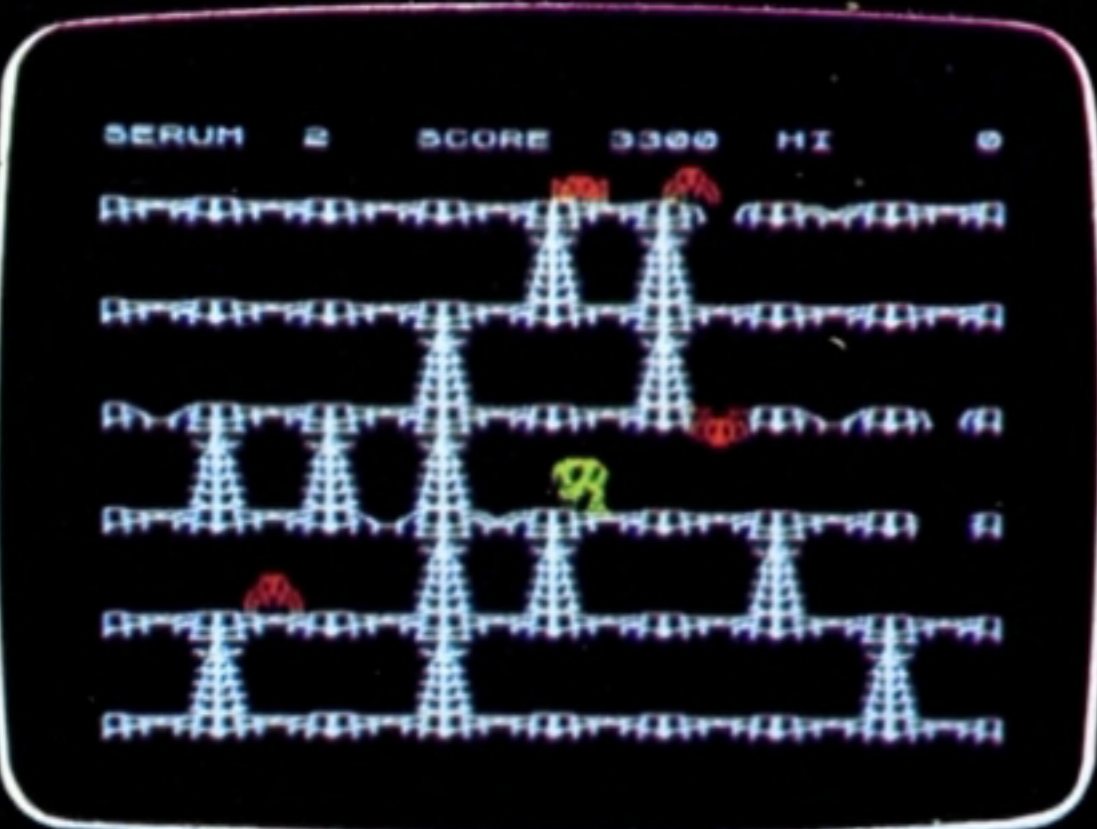
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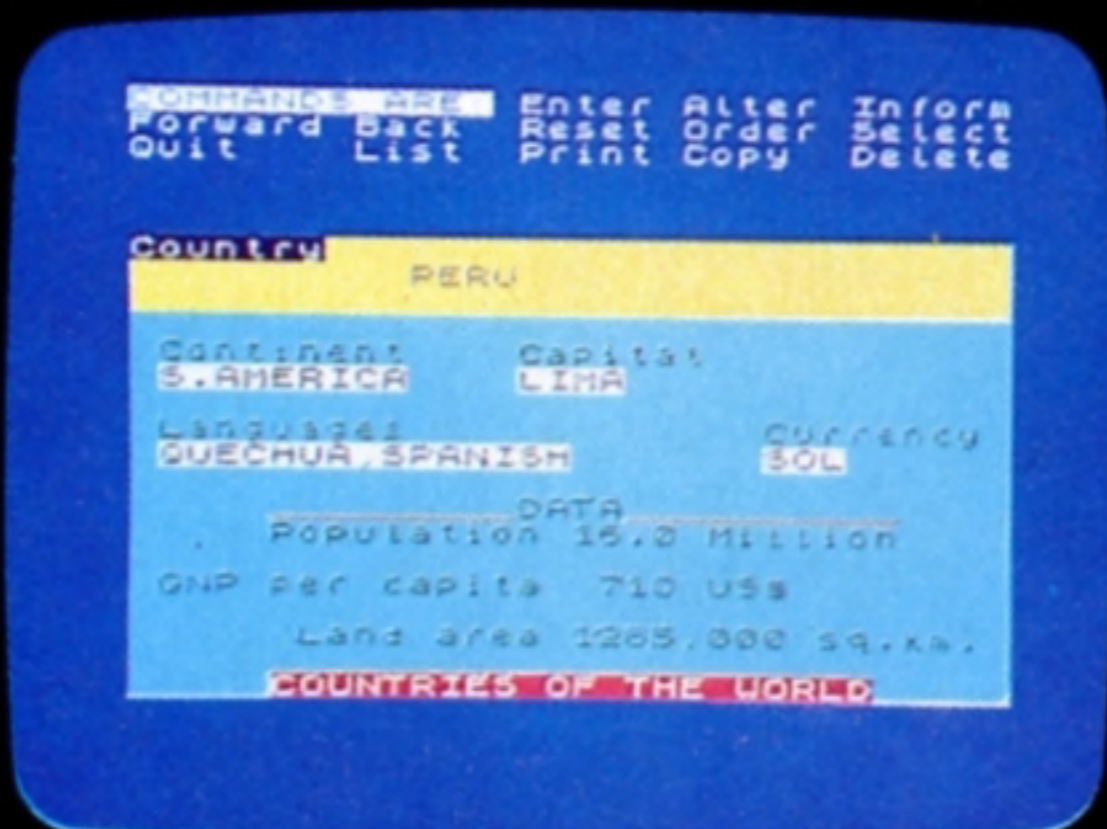
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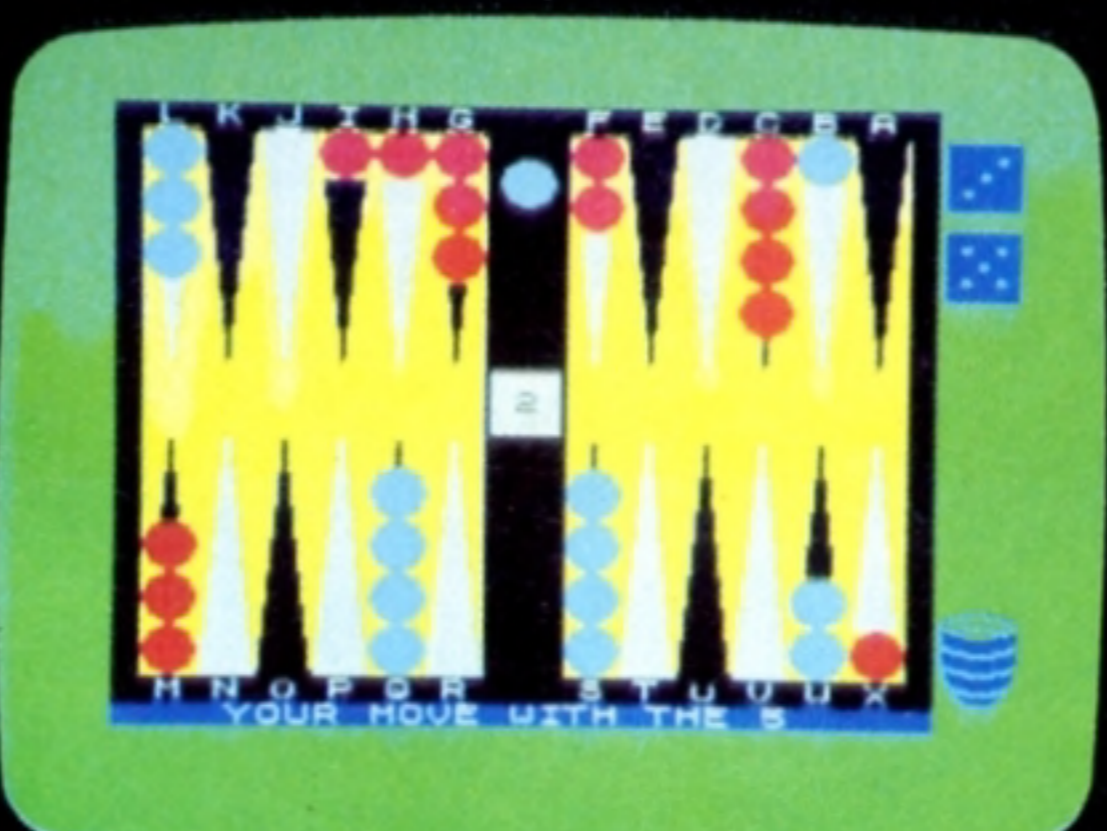
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(continued from page 120)

variables, but in MCoder the command merely zeroes all the variables used in the program. Zeroing the locations reserved for a string variable actually zeroes the pointer to the string implying that it has not yet been allocated.

■ **Numeric arrays:** As the DIM statement for an array is encountered by the compiler, code is generated to load the HL register pair with the length of the array — always one dimensional — and a call is generated to the "allocate space and zero" routine. This generates and stores a pointer to where the array is to be put and then zeroes the array as follows:

```
LD HL, where array is to be put (=LAST)
LD, BC, length of array*2
LD D, H
LD E, L
INC DE
LD (HL), 0
LDIR
LD (LAST), DE
```

If the array already exists then the old one is forgotten and a new one created. This failure to collect old, unused space can be wasteful but is not considered too detrimental.

Array elements are accessed by calculating the index, doubling it — two bytes per element — and adding this number to the base address of the array. No array bound checking is done as the code is assumed to be fully tested under Basic.

■ **Printing to the screen:** To attain the same result as Basic is really only a matter of attention to detail. However, the Tab command may be of some interest. Sinclair stores the column number where printing is to take place next but stores it backwards. The actual column number stored is 33 — the number the user inputs. For example Tab 5 makes the system variable S_POSN (16441) take the value 28 and Tab 25 yields the value 8.

■ **Printing to the ZX printer:** If printing to the screen is clear, but perverse, consider Lprint. The printer buffer is in locations 16444 to 16476. Tab 5 makes PR_CC take the value 69 and Tab 25 makes it 89, these numbers being the lower byte of the address in the buffer. Otherwise the change from Print to Lprint commands requires only that bit one of location 16385 be set and then Sinclair's routines for Print, Tab, At etc may be used.

■ **Boolean operations:** Only two Boolean operations have been made available in MCoder II:

B AND C which is true if B and C are non zero
B OR C which is true if either B or C or both are non zero.

These are only implemented in the If statement using routines for Or and And which are called with HL containing one 16 bit argument and DE the other. They return a set carry flag if the result is true.

```
AND: LD A,H ;test if
      OR L ;HL is zero
      RET Z ;return if it is

      LD A,D ;now do DE
      OR E
      RET Z
      SCF ;set carry flag
      RET ;return

OR: LD A,H ;test if HL zero
     OR L
     JR Z, +2 ;jump on if it is
     SCF ;HL non zero, set carry
     RET
     LD A,D
     OR E
     RET Z ;both HL and DE zero
     SCF
     RET
```

■ **Input:** This had to be completely rewritten to be like Basic. For simplicity of coding input is limited to 31 characters plus the prompt so that it all fits on one line. This avoids the problem of compressing the display file. Invalid characters will not print, incorrect ones may be rubbed out, but you cannot step over characters using the cursors.

The screen is used as the input buffer and a string input is copied directly to the space reserved for the variable. The length can be ascertained from the position of the cursor. At the end the buffer is cleared using part of the array zeroing routine described above.

■ **Speed:** In ZXGT the particular If test to be carried out was decided at run-time. This resulted in very short code for the six functions. In MCoder II code is generated at compile time. As before HL and DE contain the two operands in the general form.

IF operand1 operator operand2 THEN
and the code generated is:
LD HL,operand1 ;this may be the result of an evaluation

```
PUSH HL
LD HL,operand2
POP DE
AND A ;clear carry flag
SBC, HL, DE ;subtract the two operands from each other
JP 'flag', NEXT ;code to be executed if the
```

condition
;is true
NEXT: ;next statement after IF
where 'flag' depends on the operator. For example <> requires the use of the zero flag. This results in considerably quicker code than in ZXGT, often by almost 50 per cent.

■ **Brackets:** Originally an arithmetic expression was terminated either by the end of line character — 118 — or by a right bracket. The change required to evaluate an expression where brackets are not necessary — ie, like Basic — turned out to be very easy but needed the logic to be stood on its head. The expression is now not terminated by the four operators +, -, /, * and everything else means that the end has been reached, be it with a comma, semicolon, bracket etc.

Sinclair makes a distinction between the way that various functions decide where their arguments stop. For instance Peek 16388+1 means (Peek 16388)+1 not Peek (16388+1) but Poke 16388+1,n means the same as Poke 16389,n.

It seemed as if all the functions just picked up the next item, enclosed in brackets if necessary, while statements such as Poke, Plot etc., took expressions treating the comma or end of line as terminator. However, all was not so simple as Tab, which seems to be a function, takes the whole expression up to the next delimiter eg., Tab 5+3 means Tab 8.

■ **Size:** The final size of MCoder II at 3980 bytes is considerably larger than ZXGT/MCoder showing how expensive in space the refinements proved but it is a much easier program to use and its versatility is greatly enhanced.

I hope that this short series has given some insights into the way that a compiler works and what it is necessary to consider in the design.

ZXGT is marketed by Personal Software Services, 452 Stoney Stanton Road, Coventry CV6 5DG.

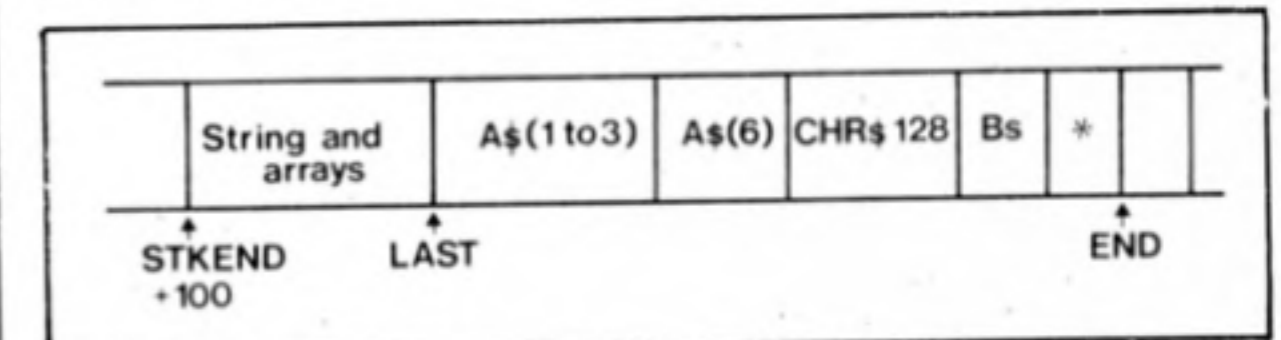


Figure 3: Forming a concatenated string.

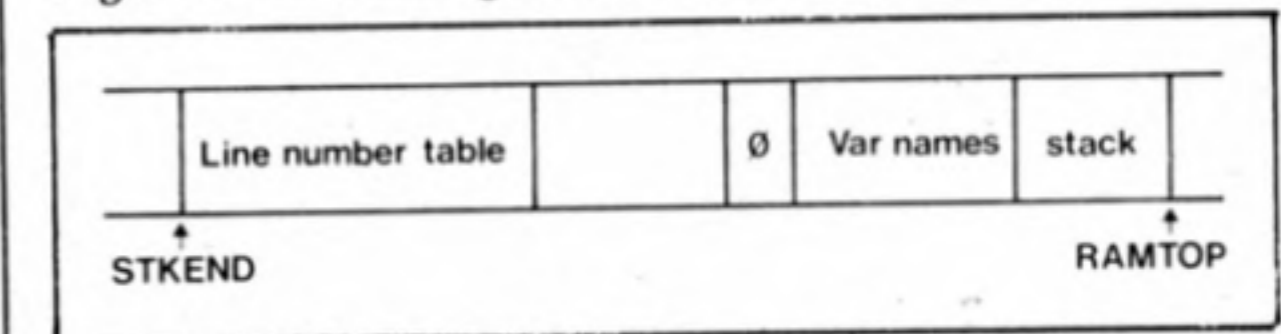


Figure 4: Storage of variable names.

(listing continued from page 120)

```
JR L188
L182: SBC HL,DE
L183: SCF
      RET NZ
      JR L185
L184: SBC HL,DE
L188: SCF
      RET Z
L185: CCF
      RET
IF statement. Generate code to
get the two operands to be
compared and put operation in A
register. Generate call to * If
tests*. On return test carry and
jump to next line of code if its
not set.
L186: CALL L244
      LD H,A
      LD L,62
      CALL L36
      LD HL,L188
      CALL L39
      LD HL,(16394)
      INC HL
      CALL L91
      EX DE,HL
      CALL L171
```

```
EX DE,HL
LD A,218
CALL L38
CALL L248
CP 222
JP NZ,L252
RET
FAST and SLOW statements.
Because the direct calls to the
ROM moved in the new ROM some of
the ROM code is duplicated here.
L48: LD HL,L183
     JP L39
L183: CALL #02E7
      LD HL,#483B
      RES 6,(HL)
      RET
L38: LD HL,L184
     JP L39
L184: LD HL,#483B
      SET 6,(HL)
      JP #207
Get address of next line. Enter
with HL pointing to the length
of the present line. Return with
HL pointing to the new line.
L58: LD C,(HL)
     INC HL
     LD B,(HL)
     ADD HL,BC
```

```
INC HL
LD A,(16396)
SBC A,L
RET NZ
LD A,(16397)
SBC A,H
RET
DIM statement. Make sure
argument is only single
dimensional. The size is ignored
as there is only one array. Note
that the array is not zeroed.
L236: CALL L248
      CP 63
      JP NZ,L252
      CALL L188
      XOR A
      RET
These last two routines are used
in calculating the location of
an array element. Basically the
subscript is doubled and added
to the contents of STKEND
(16412).
L233: CALL L188
      LD HL,#48ED
      CALL L36
      LD HL,16412
      CALL L36
```

```
LD HL,#929
JP L36
L234: CALL L233
      LD A,#D5
      CALL L241
      LD HL,L171
      CALL L39
      LD HL,#D1EB
      JP L36
Finally a jump list which links
to the jump list at the start of
the first section. Although
relatively expensive in space
this method is pretty fool proof
if any code is moved.
L151: JP #488B;PRNT
L131: JP #488B;SCROLL
L51: JP #488E;GETK
L53: JP #4891;TESTK
L111: JP #4894;PAUSE
L112: JP #4897;MULT
L113: JP #489A;PLOT
L114: JP #489D;RST18
L115: JP #48A8;#B6B
L116: EX DE,HL
      JP #48A3;DIV
      JP #48A6;RND
L88: JP #48A9;GETNUM
L187: JP #48AC;REM
L241: JP #48AF;SAVE
```


Figure 1a.

```
10 PMODE4:PCLS:SCREEN1,1
20 FORN=1536 TO 7679:POKE,N,192:NEXT
```

Figure 1c.

00100		ORG	32250
00110	INIT	LDA	#192
00120		LDX	#1536
00130	LOOP	STA	,X+
00140		CMPX	#7679
00150		BHS	OUT
00160		BRA	LOOP
00170	OUT	RTS	
00180		END	

Figure 2.

00100		ORG	32250
00105	START	LDU	#100
00110	INIT	LDA	#192
00120		LDX	#1536
00130	LOOP	STA	,X+
00140		CMPX	#7679
00150		BHS	OUT
00160		BRA	LOOP
00170	OUT	LEAU	-1,U
00180		CMPU	#0
00190		BEQ	FINISH
00200		BRA	INIT
00210	FINISH	RTS	
00220		END	

Figure 3.

00100		ORG	32000
00110	SSTART	LDY	#32512
00120		LDX	#4639
00130	STLOOP	LDA	,X
00140		STA	,Y+
00150		LEAX	32,X
00160		CMPX	#7679
00170		BEQ	STDONE
00180		BRA	STLOOP
00190	STDONE	LDX	#7679
00200	MLOOP	LDA	,-X
00210		LEAY	1,X
00220		STA	,Y
00230		CMPX	#4608
00240		BEQ	RSTART
00250		BRA	MLOOP
00260	RSTART	LDY	#32512
00270		LDX	#4608
00280	RELOOP	LDA	,Y+
00290		STA	,X
00300		LEAX	32,X
00310		CMPX	#7648
00320		BEQ	REDONE
00330		BRA	RELOOP
00340	REDONE	RTS	
00350		END	

Figure 4d.

```
1 REM MACHINE CODE DECIMAL LOADER
2 REM PUT THE CODES INTO DATA STATEMENTS, AS MANY AS YOU NEED, BETWEEN LINES 10
- 49.
3 REM THEN RUN THE PROGRAM AND ANSWER THE PROMPTS.
4 REM FOR THE FIRST BLOCK OF MACHINE CODE FOR THE FLIGHT SIMULATOR, S WOULD BE 3
2256, AND N WOULD BE 182.
5 REM SET THE PARTITION BEFORE YOU START, E.G. CLEAR1000,32250
10 DATA20,FF,7F,40,etc.
20 DATAetc.
50 INPUT"STARTING ADDRESS DECIMAL:";S:S=S-1
60 INPUT"NUMBER OF CODES, DECIMAL";N
70 FORX=1 TO N:READA#:POKE(S+X),VAL("&H"+A#):NEXTX
71 REM TO LOAD DECIMAL CODES, LINE 70 WILL BE: FORX=1 TO N:READA#:POKE(S+X),A:NEX
TX
80 CLS:PRINT"COMPLETE. NOW SAVE IT AS A","M/C TAPE FILE AND THEN ERASE ". "THIS B
ASIC PROGRAM"
```

Figure 1b

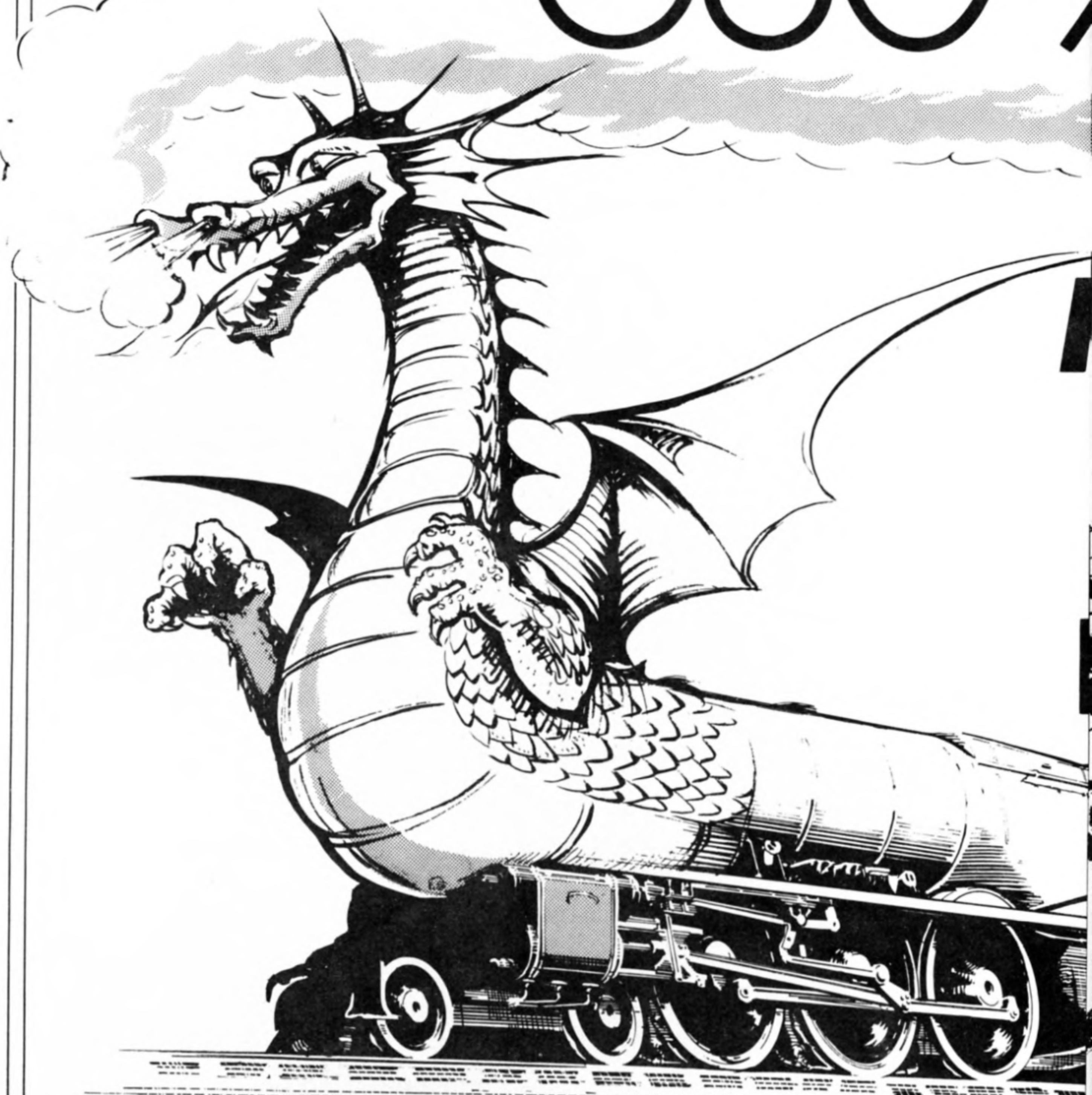
FORTH PROGRAM TO FILL SCREEN WITH STRIPES

```
: FILLSCREEN 7680 1536 DO 192 C! LOOP ;
: SWITCHON 0 65475 C! 0 65477 C! 0 65479 C! 255 65314 C! ;
: REVERT 7 65314 C! ;
: TEST SWITCHON FILLSCREEN REVERT ;
```

Comment- switchon Puts display into hires. and revert goes back to text.

All aboard the Dragon
express with John
Nash for speed and
economy.

68009



THE DRAGON is a fast computer by current standards, and much of the credit for this must go to its excellent processor, the 6809E. The Basic is also one of the fastest available in a home micro. So why use machine code? And when do you need to use it?

There are two principal reasons for using machine code: speed and efficiency. First, speed. Consider the programs in figure 1, which all fill the high-resolution screens with stripes. This is done by Poking 192 to every address from 1536 to 7679. In Basic this takes 41 seconds, in Forth, 1.17 seconds, and in machine code, 0.11 seconds. So the interpreted language, Basic, is nearly 400 times slower than machine code, and even the

Figure 4e.

```
10 REM STRIPE TEST
20 PMODE3:PCLS:SCREEN1,1
30 EXEC32250
40 GOTO40

10 REM LATERAL SCROLL TEST
20 PMODE4:PCLS:SCREEN1,1
30 CIRCLE(128,96),95
40 EXEC32000
50 GOTO50
```

EXPRESS

MACHINE CODE FOR THE DRAGON



compiled language, Forth, is 10 times slower. Why the difference?

Imagine you are on holiday in France, and do not speak any French. You would have to look up every word in the dictionary. This is what Basic has to do when it runs. Unlike you, however, it does not learn, and so will not improve with practice.

You might, alternatively, use a phrase book, which would be quicker. This is analogous to Forth, in which you compile your "words" before running the program. The best method, however, would be to learn fluent French, and this would provide the fastest communication of all. This is what you are doing with machine code — talking the machine's own language.

Second, efficiency. Machine code takes up far less space than Basic because the instructions are more compact, and the storage of numbers or variables also takes far less space for most applications. The saving in space can be very important if you want to keep most of the Dragon's memory free for data storage in, say, a file or word-processor program.

You could ambitiously start writing arcade games in machine code, but I would advise gaining some experience on simpler programs first. As a start, if any repetitive procedure in Basic is too slow, put it in machine code and then call it from your Basic program. This will give a staggering improvement in graphics games, as well as text handling programs. Machine-code programs can be called from Basic using the Exec (address) instruction.

Machine-code programming is much faster and easier if you have an assembler. In fact, if you intend to do any serious machine-code programming, an assembler will be essential. They are available in both tape and cartridge versions, the cartridge ones being more convenient and using less memory, but usually at a higher cost. As an example, I shall describe Tandy's Edtasm, which is the one I use.

Really intended for the Color Computer, this cartridge nevertheless works well with the Dragon, although ROM differences prevent a few of the system commands from working. This is not serious, as there are simple alternative ways of achieving the same ends. I include details of how to do this in an appendix at the end of this article. It is a superb system, from Microsoft, and sits in the 8K cartridge area of memory.

It enables you to enter, edit and assemble programs in 6809 mnemonics, and direct the code to anywhere in the RAM. Good error messages are produced, and the package includes the standard Microsoft Editor, and many other functions such as renumber. A separate program, also in the cartridge, called Zbug, enables you to alter or inspect memory or 6809 registers, run programs with breakpoints or by single-stepping, and many other debugging functions. It also contains a useful decimal to hexadecimal and octal converter, as well as a calculator.

The assembler uses the RAM addresses

from 600h onwards, and the program listing starts at 800h. This area of memory is the high-resolution screens, which can of course be overwritten by graphics programs. Thus it is usually best to assemble machine-code subroutines to the end of memory, say 7E00h. It is also essential to store a copy of the assembler text program on tape before running or returning to Basic. Returning to Basic clears the assembler text buffer, but conversely, the assembler will not corrupt the Basic unless you are handling an enormous program which reaches beyond 7680 decimal — 1E00 hexadecimal — which is the usual starting address for the Basic program, with the default setting of PClear4. Thus, machine code and Basic programs can coexist in the machine, and using the assembler need not destroy your Basic. Fitting programs into the memory will be covered in more detail in a later article.

Many useful machine-code routines, and indeed many programs, have the general form:

- Do something
- Increment counter
- Check to see if you have reached limit
- If so, stop: if not, repeat procedure

In Basic, this is the For-Next loop. Another frequently-used one is the conditional test:

- Do procedure
- Test some parameter
- If it = A then go elsewhere
- If it = B then repeat

These two general forms embrace quite a high proportion of programs or subroutines. They are fairly easy to code in machine code — the only real difficulty is stating the problem clearly. See for example, figure 1 again. The left-hand column contains the symbols or labels which are used for your convenience. The assembler will convert them to numbers representing addresses as necessary.

The next column contains the commands. These are the actual machine-code instructions. The third column contains the operands: the numbers on which the instructions will operate, which may represent numerical data, or addresses.

The last column is for comments — ignored by the assembler. Line numbers are also provided by the system monitor; these two are ignored by the assembler.

Now to dissect the routine in detail:

LDA #192: This loads the eight-bit A register with 192d, # indicates immediate addressing,

(continued on page 129)

Figure 4a.

```

7DFA      00100      ORG      32250
INE AT ADDR. 32250
7DFA 86 C0      00110 INIT    LDA    #192
7DFC 8E 0600   00120      LDX    #1536
7DFF A7 80      00130 LOOP    STA    ,X+
7E01 8C 1DFF   00140      CMPX  #7679
7E04 24 02      00150      BHS   OUT
7E06 20 F7      00160      BRA  LOOP
7E08 39          00170 OUT    RTS
          00180      END
00000 TOTAL ERRORS
INIT 7DFA      LOOP 7DFF      OUT 7E08
    
```

Figure 4b.

```

7DFA      00100      ORG      32250
INE AT ADDR. 32250
7DFA CE 0064   00105 START  LDU    #100
7DFD 86 C0      00110 INIT    LDA    #192
7DFF 8E 0600   00120      LDX    #1536
7E02 A7 80      00130 LOOP    STA    ,X+
7E04 8C 1DFF   00140      CMPX  #7679
7E07 24 02      00150      BHS   OUT
7E09 20 F7      00160      BRA  LOOP
7E0B 33 5F      00170 OUT    LEAU  -1,U
7E0D 1183 0000  00180      CMPI  #0
7E11 27 02      00190      BEQ  FINISH
7E13 20 E8      00200      BRA  INIT
7E15 39          00210 FINISH RTS
          00220      END
00000 TOTAL ERRORS
FINISH 7E15      OUT 7E0B
INIT 7DFD      START 7DFA
LOOP 7E02
    
```

Figure 4c.

```

7D00      00100      ORG      32000
7D00 108E 7F00  00110 SSTART LDY    #32512
7D04 8E 121F   00120      LDX    #4639
7D07 A6 84      00130 STLOOP LDA    ,X
7D09 A7 A0      00140      STA    ,Y+
7D0B 30 88 20  00150      LEAX  32,X
7D0E 8C 1DFF   00160      CMPX  #7679
7D11 27 02      00170      BEQ  STDONE
7D13 20 F2      00180      BRA  STLOOP
7D15 8E 1DFF   00190 STDONE LDX    #7679
7D18 A6 82      00200 MLOOP LDA    ,X
7D1A 31 01      00210      LEAY  1,X
7D1C A7 A4      00220      STA    ,Y
7D1E 8C 1200   00230      CMPX  #4608
7D21 27 02      00240      BEQ  RSTART
7D23 20 F3      00250      BRA  MLOOP
7D25 108E 7F00  00260 RSTART LDY    #32512
7D29 8E 1200   00270      LDX    #4608
7D2C A6 A0      00280 RELOOP LDA    ,Y+
7D2E A7 84      00290      STA    ,X
7D30 30 88 20  00300      LEAX  32,X
7D33 8C 1DE0   00310      CMPX  #7648
7D36 27 02      00320      BEQ  REDONE
7D38 20 F2      00330      BRA  RELOOP
7D3A 39          00340 REDONE RTS
          00350      END
00000 TOTAL ERRORS
MLOOP 7D18      SSTART 7D00
REDONE 7D3A      STDONE 7D15
RELOOP 7D2C      STLOOP 7D07
RSTART 7D25
    
```

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(continued from page 127)

i.e., a number.

LDX #1536: this loads the 16-bit X register with 1536d — the start of hi-res screens We have now initialised, and are about to enter the looping part of the program.

STA ,X+: this is a useful instruction which takes advantage of the auto-index facility of the X register. Do not worry about the details at the moment: addressing will be covered in a future article. What this instruction does is to store the contents of A, 192, in the register 1536 whose address is in the X register, then increment X by one, making it 1537.

CMPX #7679: compares the contents of X, 1537, with the number 7679 and sets a flag to indicate the result.

BHS OUT: checks the flag, and branches to Out if X was the same as or higher than 7679.

BRA LOOP: if we had not finished, we would not branch to Out and so reach this instruction — Branch Always to Loop.

Finally, if we reached Out, we encounter **RTS**, which is simply Return From Subroutine. Note that, when running programs from the monitor cartridge, you may need **SWI** — software interrupt — instead. See your own assembler manual.

END: this is an instruction to the assembler that it has finished and can now relax. End is not compiled as a machine-code instruction.

Now look at figure 2. This routine uses the 16-bit U register as an additional counter to repeat the loop 100 times. **LDU #100** is fairly straightforward, but what is the **LEAU -1,U** doing? This is an example of the Load Effective Address or **LEA** instruction, to be discussed in more detail in a future article. It

subtracts 1 from the value in the U register.

BEQ is another branch instruction: Branch on Equal. This only branches when the two values being compared are equal.

Finally, look at figure 3. This is a program to scroll part of the screen one byte at a time, laterally. This could be useful in a program of the scramble type, for example, to move the ground. See if you can work out how it works; hint — it stores the value of the end byte of each line before scrolling, and puts these back to the opposite end of the screen to achieve wrap around.

What if you do not have an assembler? You will find programming more difficult, as you cannot use labels, and all branch instructions have to be converted to relative addressing. You would also be well advised to stick to hexadecimal numbers, as this will save errors in conversion and other misunderstandings.

If you do not understand hexadecimal numbers, you will find useful sections on base arithmetic in most school maths textbooks. Another concept you will need to grasp is two's complement arithmetic, which is needed for calculating relative addresses for branch instructions.

As this applies to eight-bit arithmetic, you can find the two's complement of a decimal number by subtracting it from 256, and then converting to h. Thus the largest positive eight-bit or 2c number is 127 — 7F — and the largest negative number is — 128 — 80 h.

For the present, however, I have given the full assembly listings of the programs in the article, in figure 4. The extra three columns of the assembler listing in figure 4 are, left to

right, address, command, operand — all in h. To enter these codes, use the short Basic program also shown in figure 4d. This is the standard machine-code loader, and can be used for loading either d or h codes by modifying line 70 as shown. When loaded, the routines can be run from Basic using an Exec or Address command.

The most important Edtasm functions which do not match up with the Dragon ROM are Q — quit, to Basic — and tape saving. I have found the following methods suitable: to return to Basic, get into Zbug and type GB400. This restarts the Basic system, but also clears your Basic program. GB4AA will also restart Basic and leave your Basic program intact which saves time.

This address, however, does not restart Basic quite properly, because the first RAM operation will give an OM error. Just carry on, and you will find that the system is then back to normal. I usually purge this error by typing 7E as part of the restart procedure.

To Save files to tape, I first use Zbug's U or block transfer function to make a copy of the file at a safe address: 16000 is suitable. I copy the addresses from 600h to about 0C00 for a short program, or 1400h for a long one. Once the copy is made, I return to Basic as above, and immediately tape the file using Basic's CSaveM function in the usual way, copying the block from 16000d onwards. To reload, I reverse the procedure, first loading the tape file to 16K onwards, then starting up Edtasm with Exec 49152, then using the U function to copy the file from 16000 back to the editing/assembling area starting at 600h. ■

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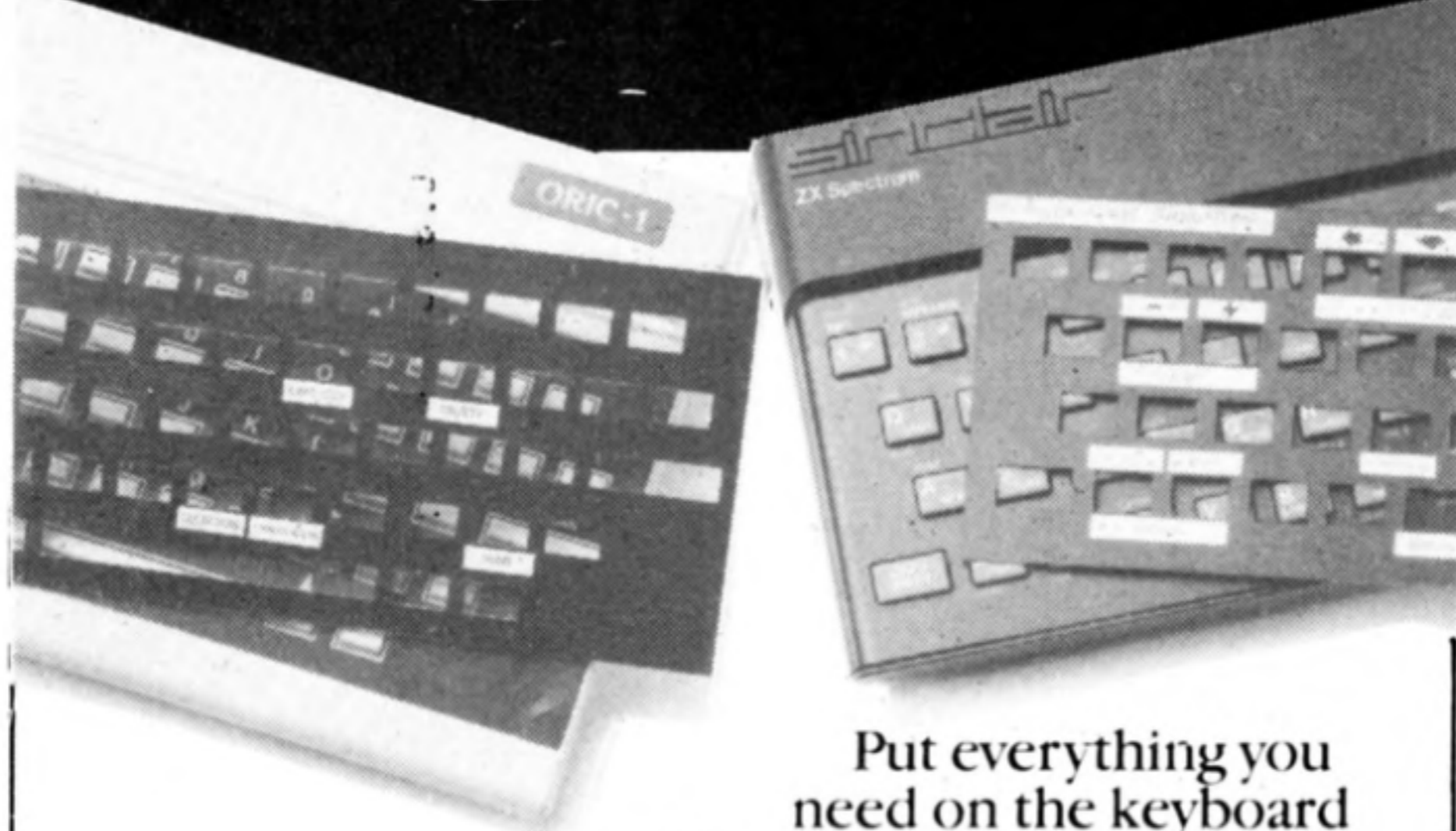
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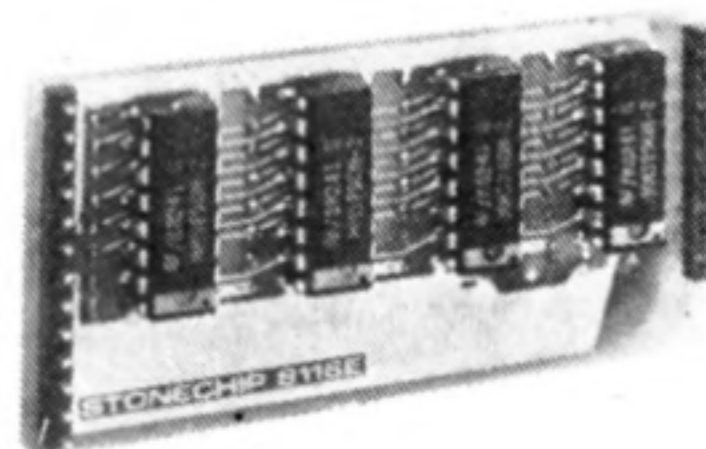
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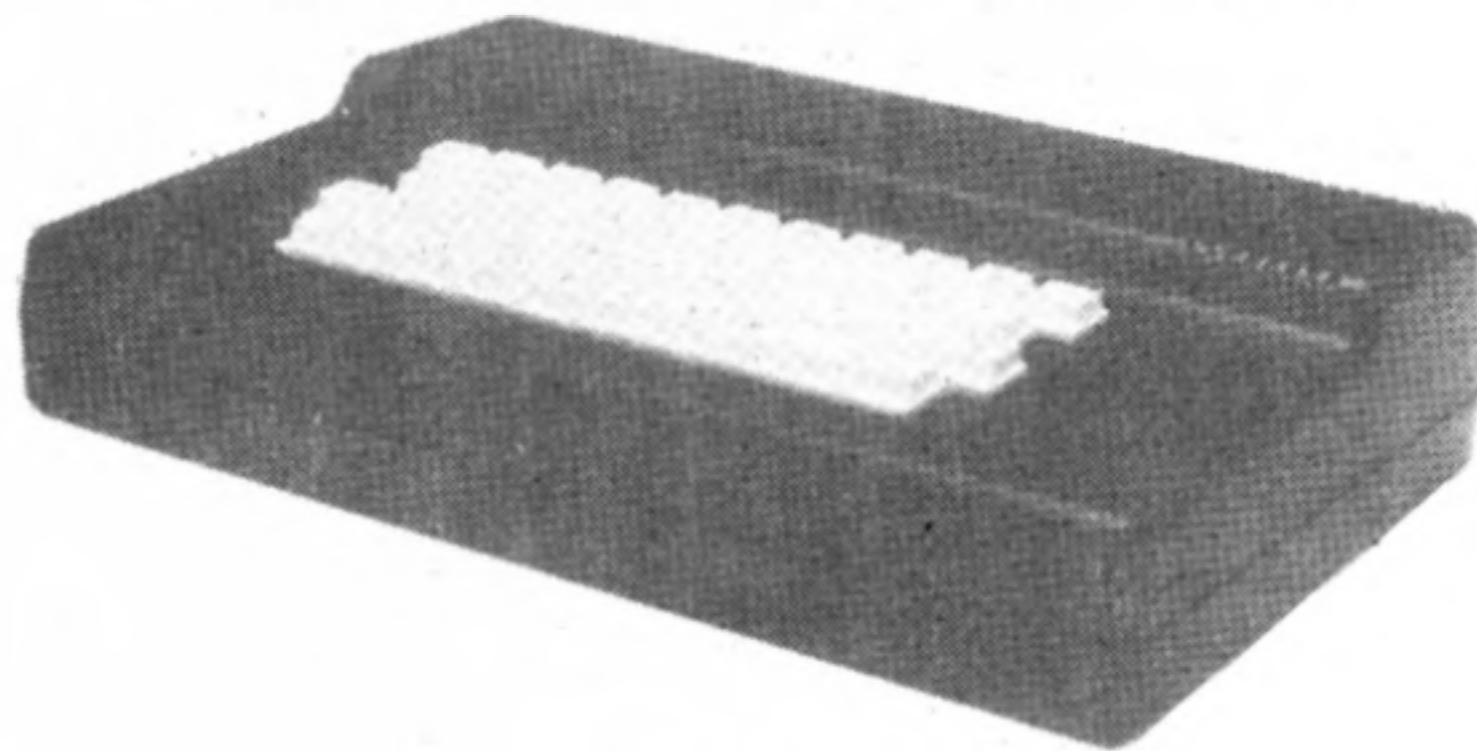
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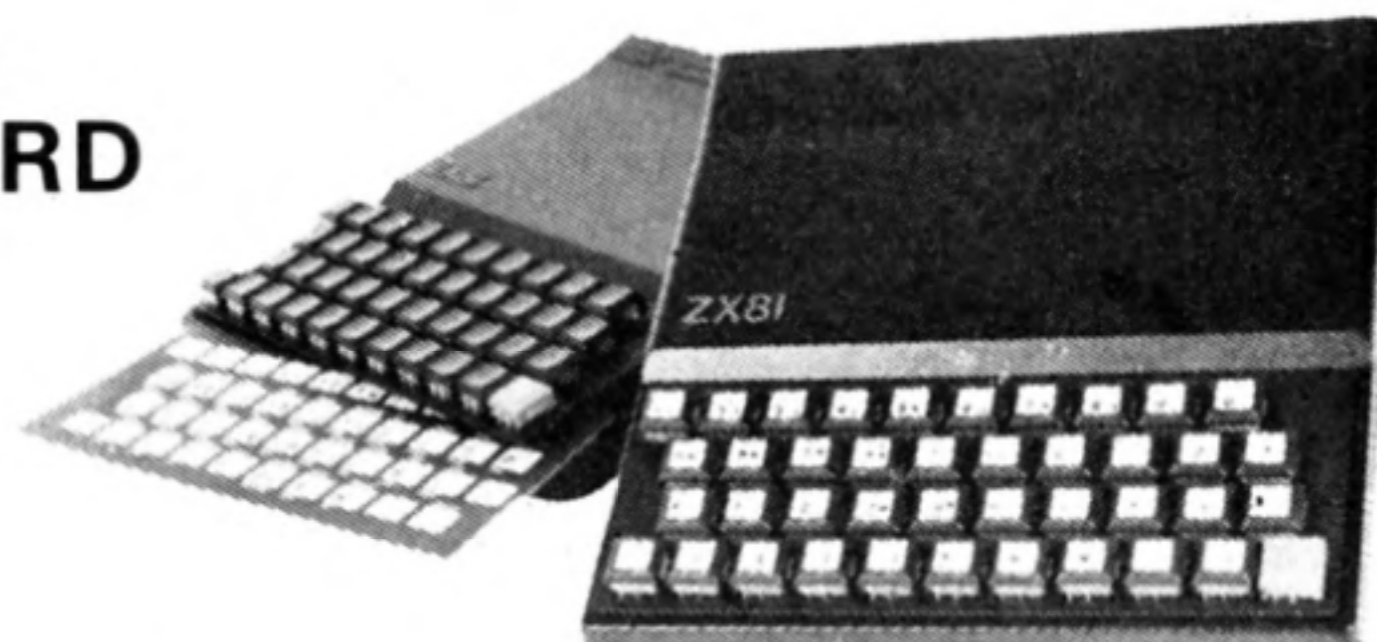


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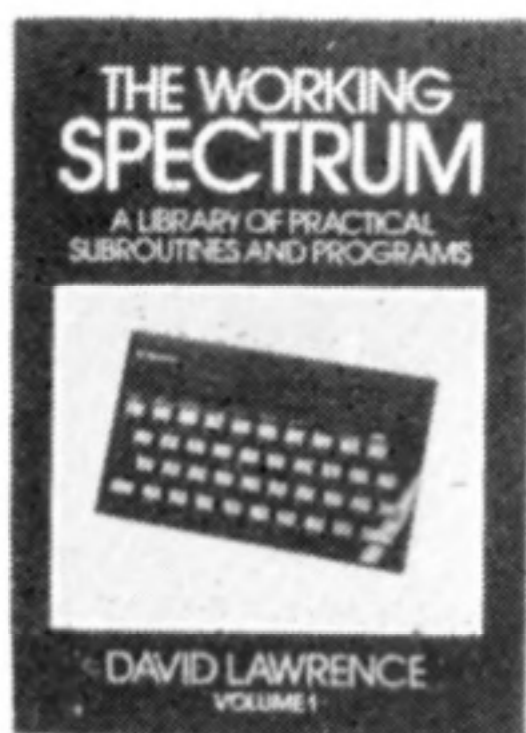
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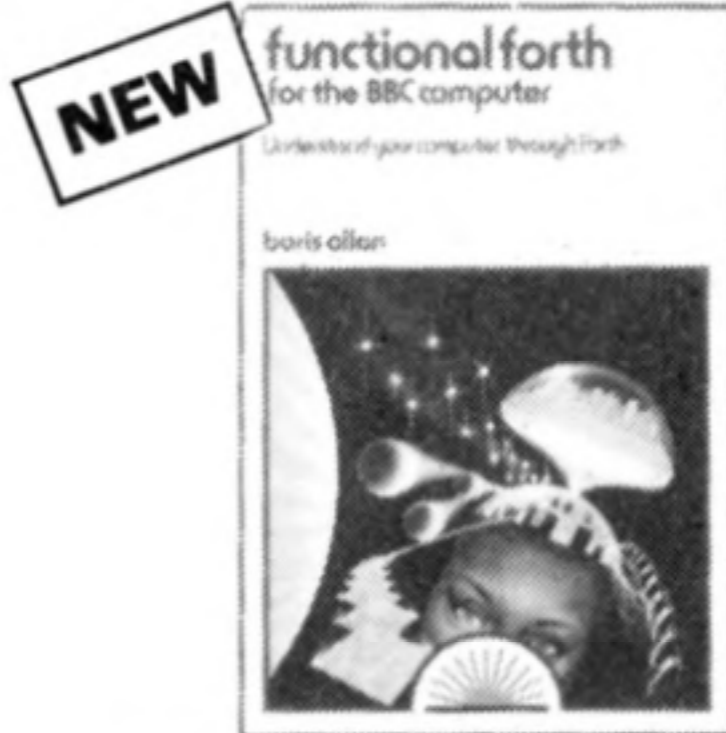
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"SEARCH FOR ACUPUNCTURE" I said to the operator. She typed in ACUPUNCTURE and a couple of other instructions and we waited for perhaps 10 or 15 seconds. Half a dozen references appeared on the screen of the VDU. One of the books, *Birch's Medical Emergencies*, is found usually in accident and emergency departments — hardly the place for a description of acupuncture techniques or effects I thought.

"Let me look at that" I said and after another 10 or 15 seconds up came the paragraph in *Birch's Medical Emergencies* in which acupuncture is mentioned as one cause of a penetrating wound of the chest wall. The reference is so slight that it might well not appear in the formal index to the book but Colleague, a new medical information retrieval service, had found it from among thousands of millions of stored characters and words.

At present, the Colleague system run by Bibliographic Retrieval Services is based in the USA, just north of New York. The system uses sophisticated software to map the position of keywords in books and journals such as the *New England Journal of Medicine* and the *Lancet* which allows the use of the database in real time. It is so fast that Colleague can be useful to a doctor or research worker while they are carrying out a task.

The first great advance made by Colleague is to present not just the titles of papers or books but the whole text. When you have found the relevant paragraph in a book you can move forwards or backwards through the text. The second major advance is Colleague's ability to present high-resolution colour pictures or diagrams in the right place in relation to the text on a separate colour monitor or television.

To enjoy this facility you need a video disc player beside your terminal or microcomputer and the information sent from New York State contains control codes that will select any one of 40 or 50 thousand high-resolution pictures

MODEM



Sinclair's Interface 1 will allow hundreds of thousands of Spectrum owners to communicate with each other in groups of up to 64. Next year the big news will be communication between micros anywhere in Britain, suggests John Dawson.

ON LINE TO 1984

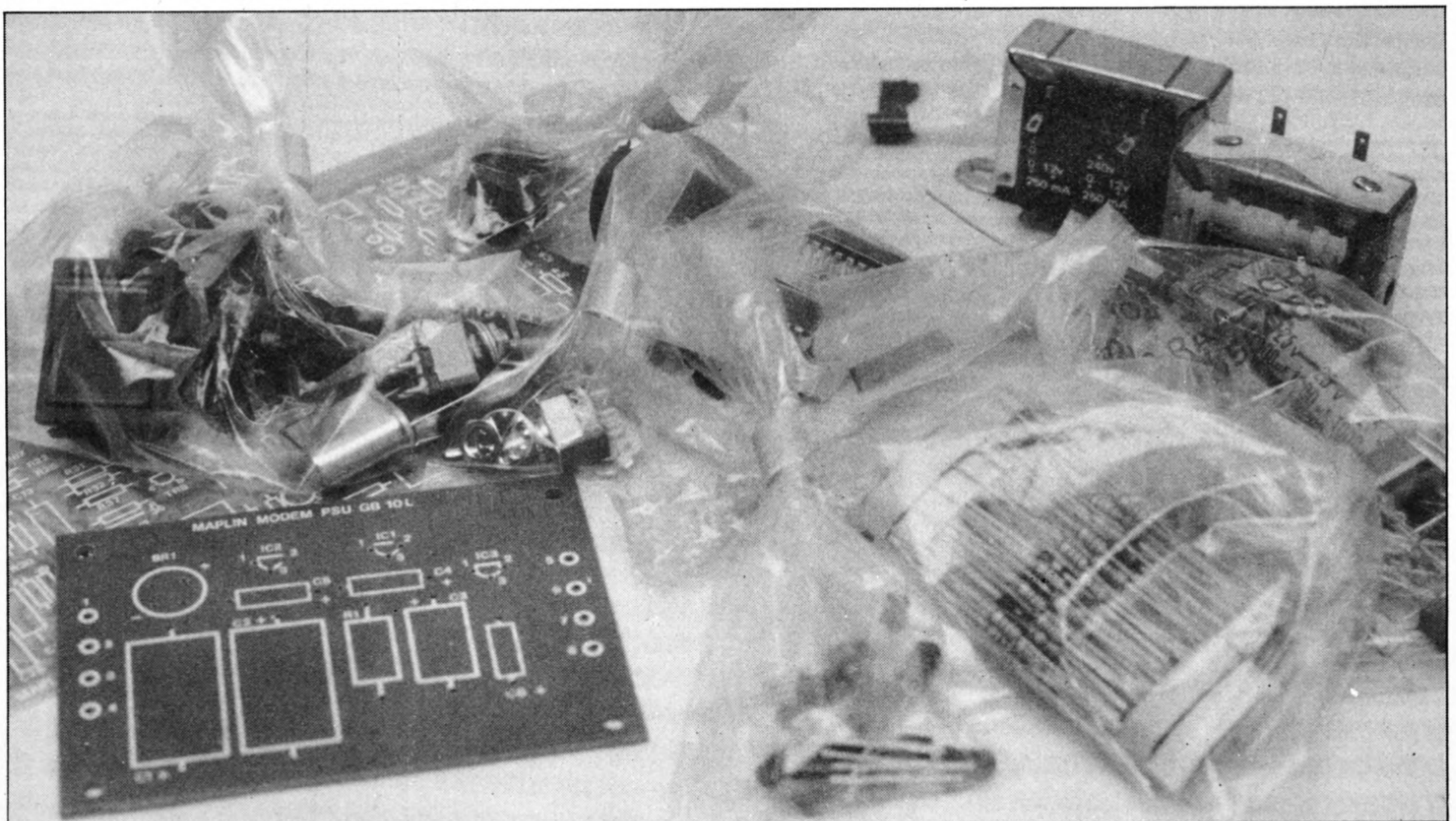
stored on the disc at the correct point in the text. Colleague will work with a dumb terminal or a microcomputer — the BBC Micro would be an obvious choice — and is an enormously powerful system that can help to provide better health care or to facilitate medical research.

But how does all that information get from just north of New York to a microcomputer like your own? Down an ordinary telephone line is the short answer. In order to get digital

information from one place to another it must be turned into a form that is suitable for long distance transmission and will be recognisable to the machine at the far end.

Remember that the operator had to ask for the search that I wanted on the collection of information that makes up Colleague's database so the transfer of information is a two-way flow. However, and this is an important point

(continued on page 135)



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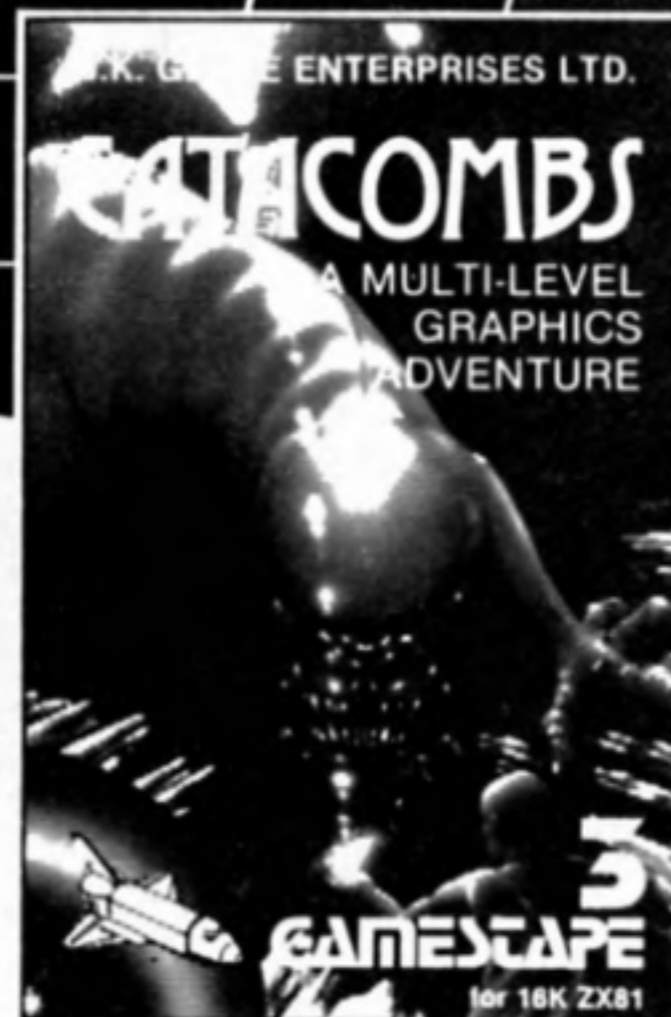


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(continued from page 133)

when you think about Prestel, the flow is unequal — there is comparatively little information going from me to the computer and a great deal coming back from the computer to my visual display unit.

Within a computer, data is transmitted along parallel or serial buses in digital form, so the signal is either on or off. The standard RS-232C protocol was intended originally to connect one part of a computer to another, a line printer, for example, to the central processor unit. The RS-232C protocol is fairly robust in operation — I have used a printer connected directly to a Televideo 950 terminal by 50 metres of cable at 2400 Baud without any difficulty — but it was never intended to span the Atlantic and would fail before you had crossed the low water mark of a Cornish beach.

Modems are pieces of equipment that turn the digital electrical signals used by computers into analogue signals suitable for transmission over long distances. The term Modem is contracted from the two words modulator and demodulator because the purpose of the equipment is to impose the digital signals from the computer on to a carrier signal — to modulate the carrier — while the digital information is recovered at the far end by the opposite process of demodulation.

Microcomputers almost invariably use a form of transmission known as asynchronous communication. Asynchronous communication is transmission in which each information character is individually synchronised by the use of start and stop elements because the interval of time between characters can vary. Synchronous transmission is used more often between large computers because the equipment and software exists to hold the elements of the computer rigidly in time with each other. Information can also be transmitted more rapidly as there is no need to add start and stop bits to the front and end of every character.

The actual rate of transmission may be very fast using a synchronous protocol — hundreds of thousands or millions of characters per second. Asynchronous protocols such as that used by Prestel or Colleague, or any system utilising the Public Switched Telephone Network, or PSTN, work more slowly. Prestel takes information from the user at about 7.5 characters per second and transmits information at about 120 characters per second. Colleague will adjust itself automatically to the equipment of the user and can accommodate up to 120 characters per second. That is the practical limit for an ordinary telephone line and often 30 characters per second, which corresponds to 300 Baud, is the fastest rate that will get a message down a line without disabling corruption.

Special telephone lines will handle faster data transmission rates but, in return, you lose portability because the equipment is effectively fixed to the end of the special line and the rental costs rise considerably.

Amateur or domestic microcomputer users in the USA are well ahead of their British counterparts in terms of connecting Modems to their microcomputers, although the British Prestel system has the largest number of users of any videotext system in the world. The previous attitudes of the GPO, now British Telecom, contributed significantly to the lack of progress

in this country. Modems have to be approved by the Post Office or BT and that used to be a long drawn out and frustrating procedure.

Renting a Post Office Modem was expensive and the installation delays were enough to make many people consider the advantages of carrier pigeons. These attitudes are changing and may be expected to continue to become more customer friendly as microcomputer users start to explore outside the limited applications that are possible using an isolated system.

Networking was one of the buzz-words of last year or the year before, but it is true that the ability to communicate with other machines is a key element in the development of information technology. The Colleague system would be impossible to implement without Modems and the ordinary, familiar telephone in your office or home.

Commercial Modems are still quite expensive although some acoustic couplers — devices that use the telephone handset to transmit and receive the tones that form the modulated carrier signal rather than making direct electrical connection to the telephone line — have become cheaper in the last year.

Maplin Electronic Supplies has produced a direct connection Modem as a kit and a number of interface boxes that will connect the Modem to a range of domestic microcomputers. The Maplin Modem is cheap and, according to research workers and doctors who are using it, highly satisfactory.

The photograph on page 133 shows the components of the Modem as it arrived for this review. The main board is a single sided glass fibre board of good quality. The tracks are all tinned and there is no additional gold-plating on the connections to the plug from which wires lead to the power supply and the isolating transformer. This is really not necessary, however, as you are unlikely to plug and unplug the board from the socket on more than a few occasions.

The components are all of a high standard and many of the resistors are rated as one per cent accurate using the new four-band colour codes. The Modem transmits and receives at the single speed of 300 Baud and uses standard

European CCITT tones. One of the chips used in the Modem kit can be configured to generate American tones although this is not mentioned further in the excellent construction notes. The Modem uses a British Telecom approved isolating transformer and may be submitted after construction to the appropriate local BT office for official clearance.

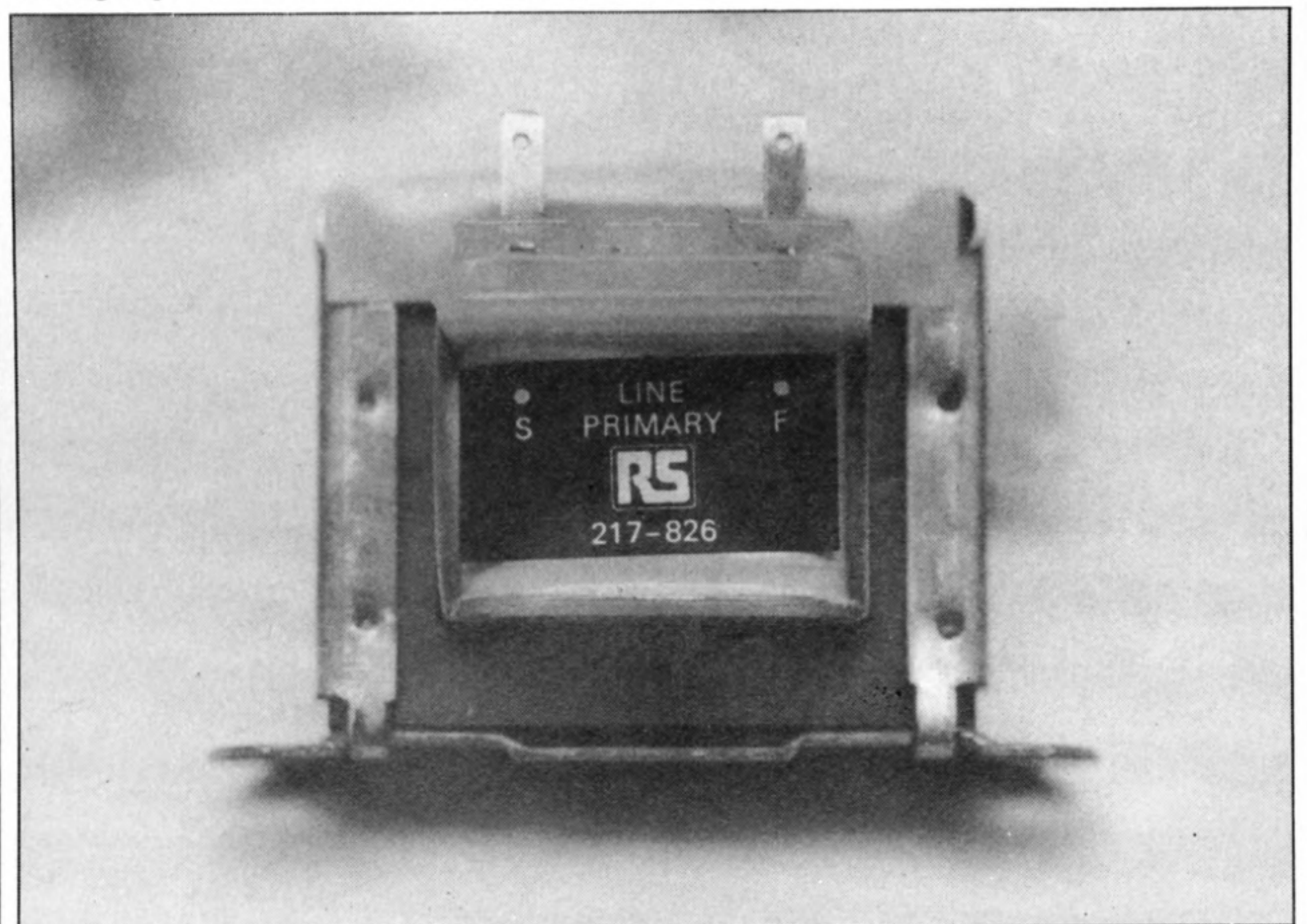
The kit contains between 80 and 90 resistors and it took me some time to locate the position for each of these as the board does not follow an obvious left to right plan for the component numbering. However, the silk screened component layout is clear and you should have no difficulty in completing the construction of the board provided you do not rush.

Many of the resistors' values have had to be synthesised from two components to match the calculated values for the bandpass filters. Incorrect assembly will degrade the performance of the filters — these are the key elements of the Modem design.

The construction notes suggest that you will need an oscilloscope to complete the setting up procedure and I cannot see any way of avoiding those stages other than by pure luck. The procedure is not hard to follow but you will require access to an oscilloscope and a voltmeter for routine voltage checking. The kit of parts contained a slip correcting some errors in the construction notes and one replacement resistor which has been substituted for a different value in the original design was wrapped in a separate plastic bag. This degree of attention to detail is unusual among kit suppliers and indicates a welcome concern by Maplin Electronics that you should succeed in building and operating the Modem.

Maplin, incidentally, is sufficiently sure of the quality of the Modem to have started Cashtel, a computerised shopping service. You can dial 0702 552941 and access the Maplin computer which will give you details of any item in the Maplin catalogue, including the quantity currently in stock. Using a credit card number and a special Maplin shopper's number you can then order what you want.

Remember that a Modem is a piece of hard-
(continued on page 137)



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SINCLAIR USER FEBRUARY 1983

➔ *Although I'm no great football fan, I really enjoyed playing this game — excellent use is made of colour and user-defined graphics. The game is very logically put together, so that the development of strategy and tactics has a real effect. For example, one of my teams got through to the fourth round of the F.A. Cup where it was beaten by a second division side. This upset morale and meant that our promotion bid failed. Perhaps I should have given up the F.A. Cup run and held some good players back — the possibilities are endless. Brian Clough had better watch out!*
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REMEMBER . . . time is all important—so!

(continued from page 135)

ware that extends the electrical connections you can make with your microcomputer. The software that will program the computer to make use of the Modem is another matter. Prestel software is well suited to some jobs and not to others. The Colleague software is enormously sophisticated and is far more suitable for many information retrieval purposes.

Both of these systems demand almost no machine intelligence at the user's terminal; Prestel requires only a numeric keypad as the minimum input capability and Colleague will work quite adequately with a dumb alphanumeric terminal. For some tasks you will need programs to transfer information from disc to the Modem or vice versa.

The PIP, or Peripheral Interface Program, in CP/M can be used to set up a serial port as the chosen input and output device and I have seen two RML 380Z computers connected through two Maplin Modems and sharing files after less than 20 minutes work configuring PIP.

The social and political effects of such a simple device as a Modem are far-reaching and should not be dismissed. Research workers in university medical departments have complained loudly and with justification about the effects of cuts on medical staffing. However bad that situation is, there is no doubt that many professors are even more worried about staffing levels among technical and clerical staff. If a department is unable to keep its filing up to date then after a few years there will be no working reference system and research staff will be unable to read about work in progress at similar centres in other countries and the

MODEM



quality of UK research will suffer immeasurably.

If a professor or senior lecturer spends time doing his or her own filing then other work does not get done and that is a grossly uneconomic way to spend a senior lecturer's salary. Colleague may be the way out of this impasse. If the full text of the original papers you need is available on demand, and if it is easier to find because your own alternative is a card index or a simple electronic equivalent on a microcomputer, then Colleague looks very attractive.

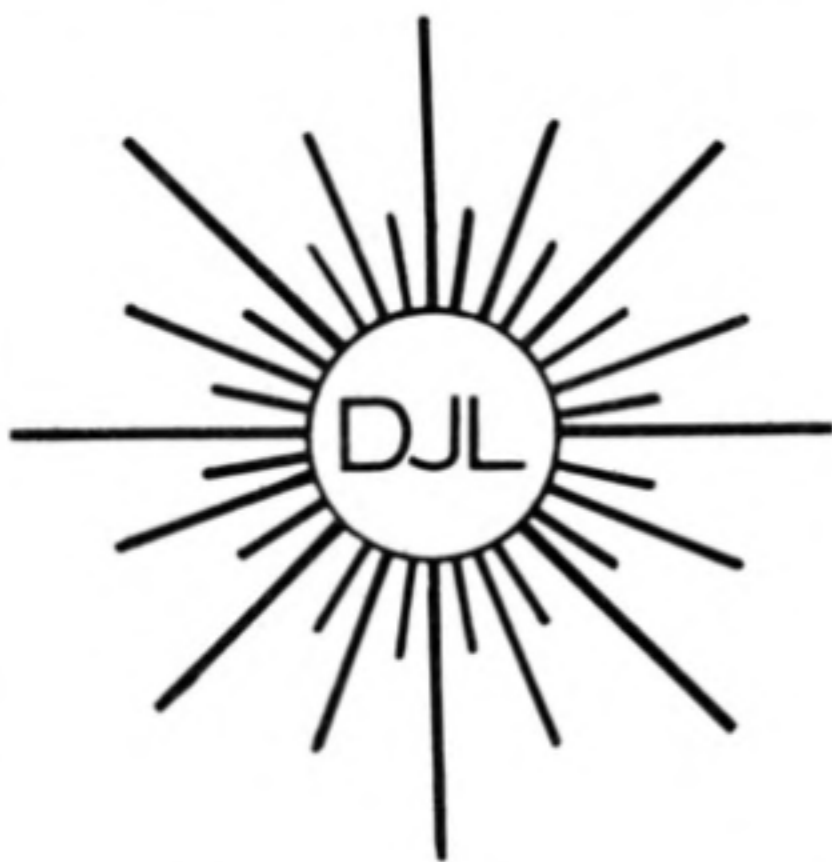
But without a paper hard copy of the original how can you guarantee that it is as the author wrote it? Do you remember Winston Smith's job in George Orwell's *1984*? He worked for the Ministry of Information "rectifying" inaccuracies in *The Times* and other newspapers:

"times 17.3.84 bb speech malreported africa

rectify" said the internal Ministry of Information memorandum. "The messages he had received referred to articles or news-items which for one reason or another it was thought necessary to alter . . . it appeared . . . that Big Brother, in his speech of the previous day, had predicted that the South Indian front would remain quiet but that a Eurasian offensive would shortly be launched in North Africa . . . It was therefore necessary to rewrite a paragraph of Big Brother's speech . . . when any particular number of *The Times* had been assembled and collated, that number would be reprinted, the original copy destroyed, and the corrected copy placed on the files in its stead . . . Day by day and almost minute by minute the past was brought up to date."

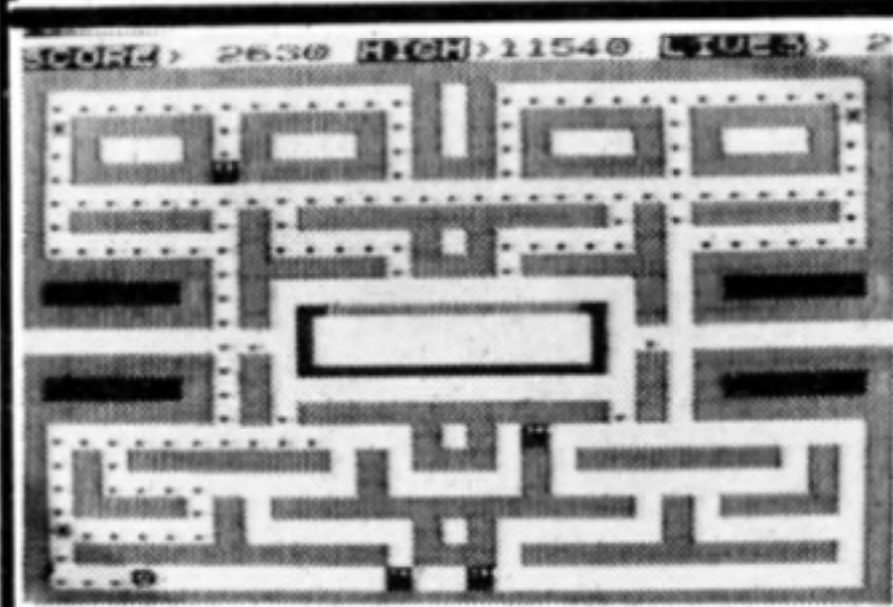
Now 1984 is only four months away and who needs all those staff to collate and reprint and file paper copies when it can all be stored on cheap magnetic and video discs, accessed instantly and "rectified"? Would it not be convenient to modify something personally or politically inconvenient just a little bit. Even in research there must be a temptation to rewrite the conclusions of an old paper in the light of subsequent experience — change the emphasis here or there to reflect or foreshadow later knowledge.

Unless this technology is managed consciously we shall all be the losers to expediency and opportunism. Electronic communication between machines is an enormously important step — swapping games programs may be trivial but there are many good and serious applications. Choosing those applications and rejecting those that will, or may, cause social or political damage is hard work. ■



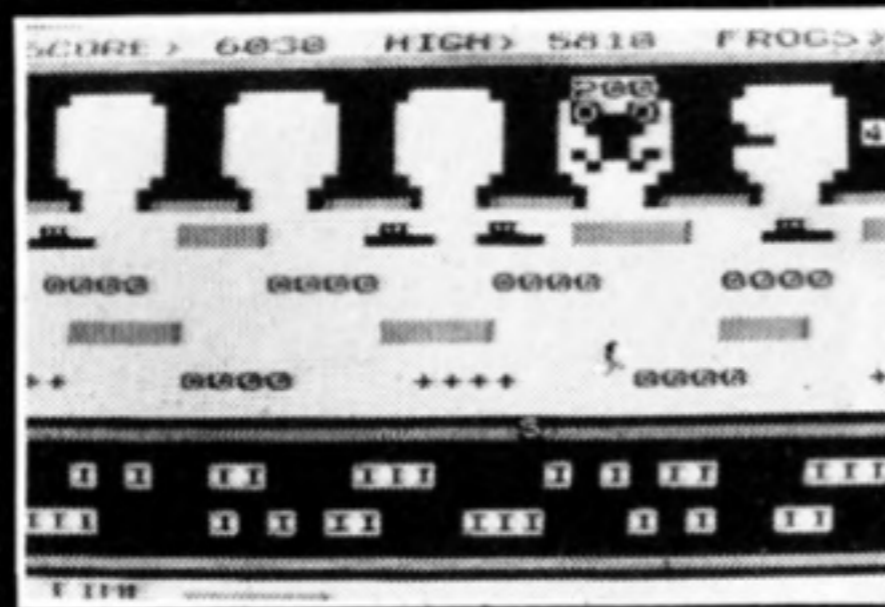
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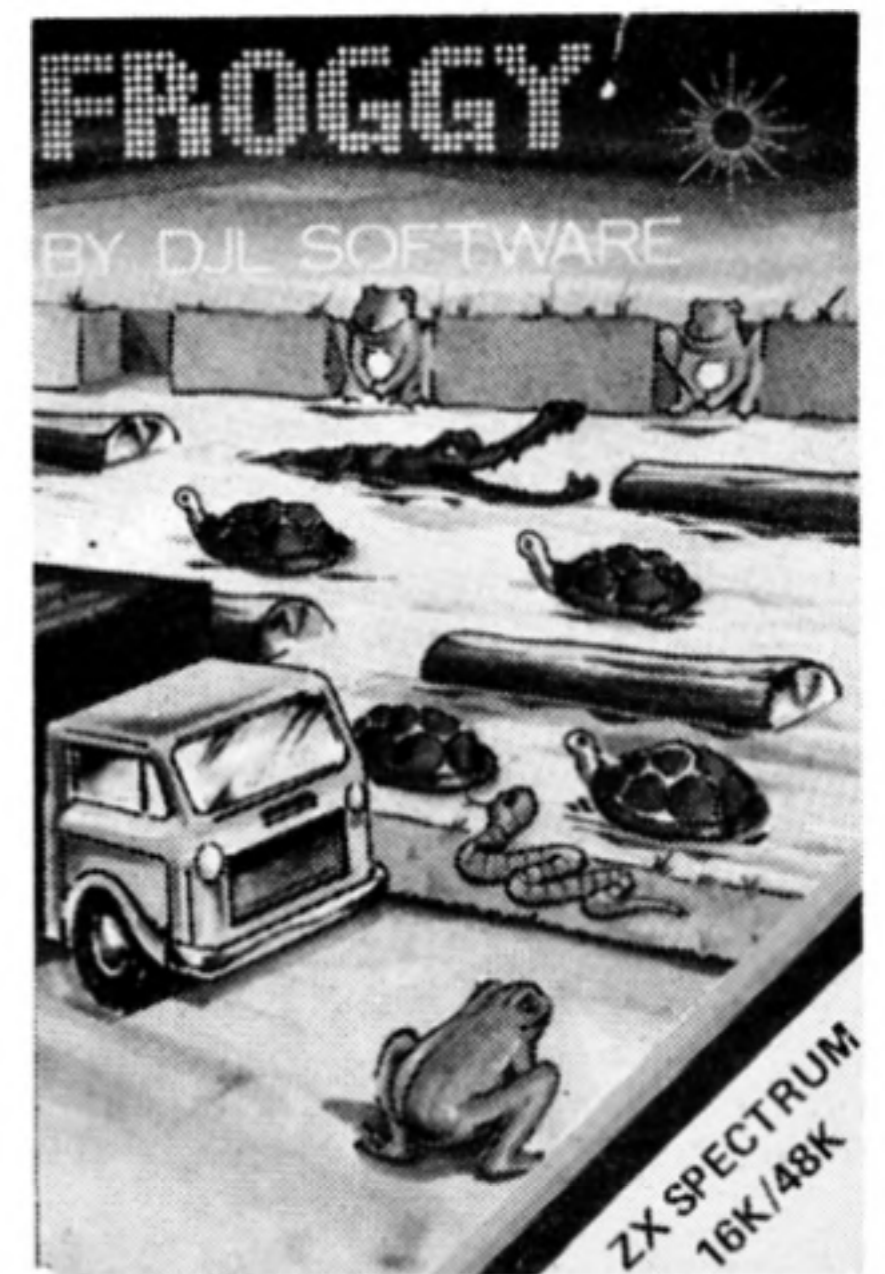
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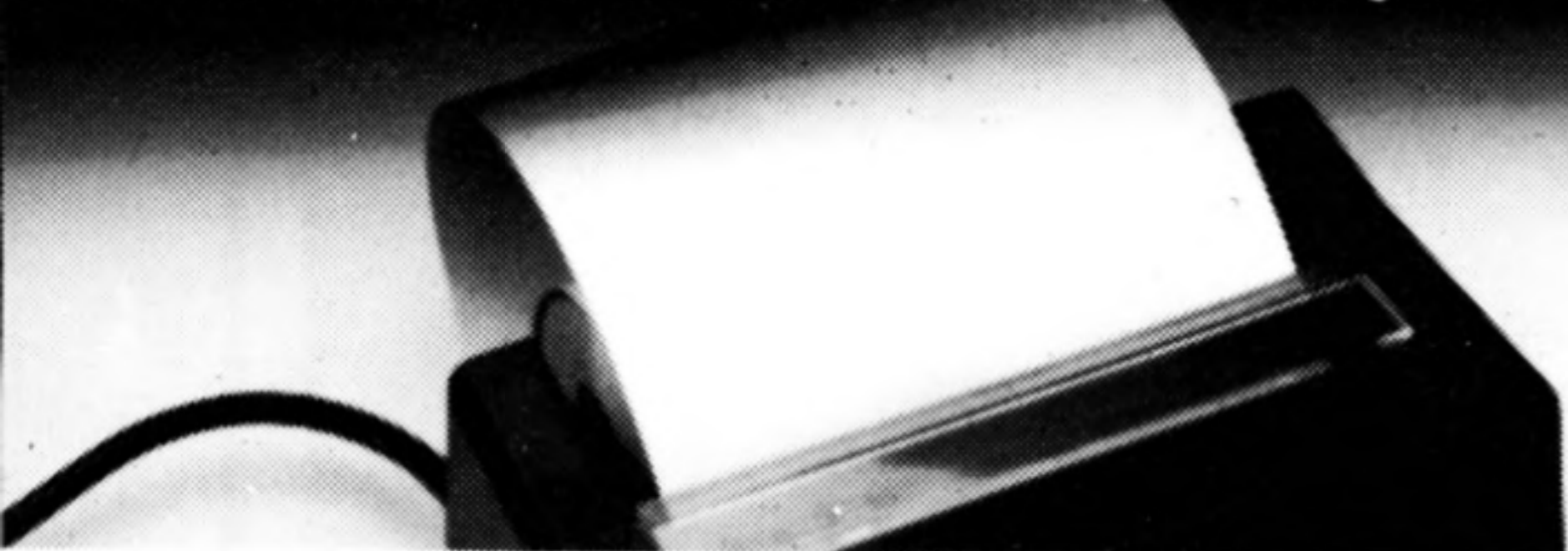
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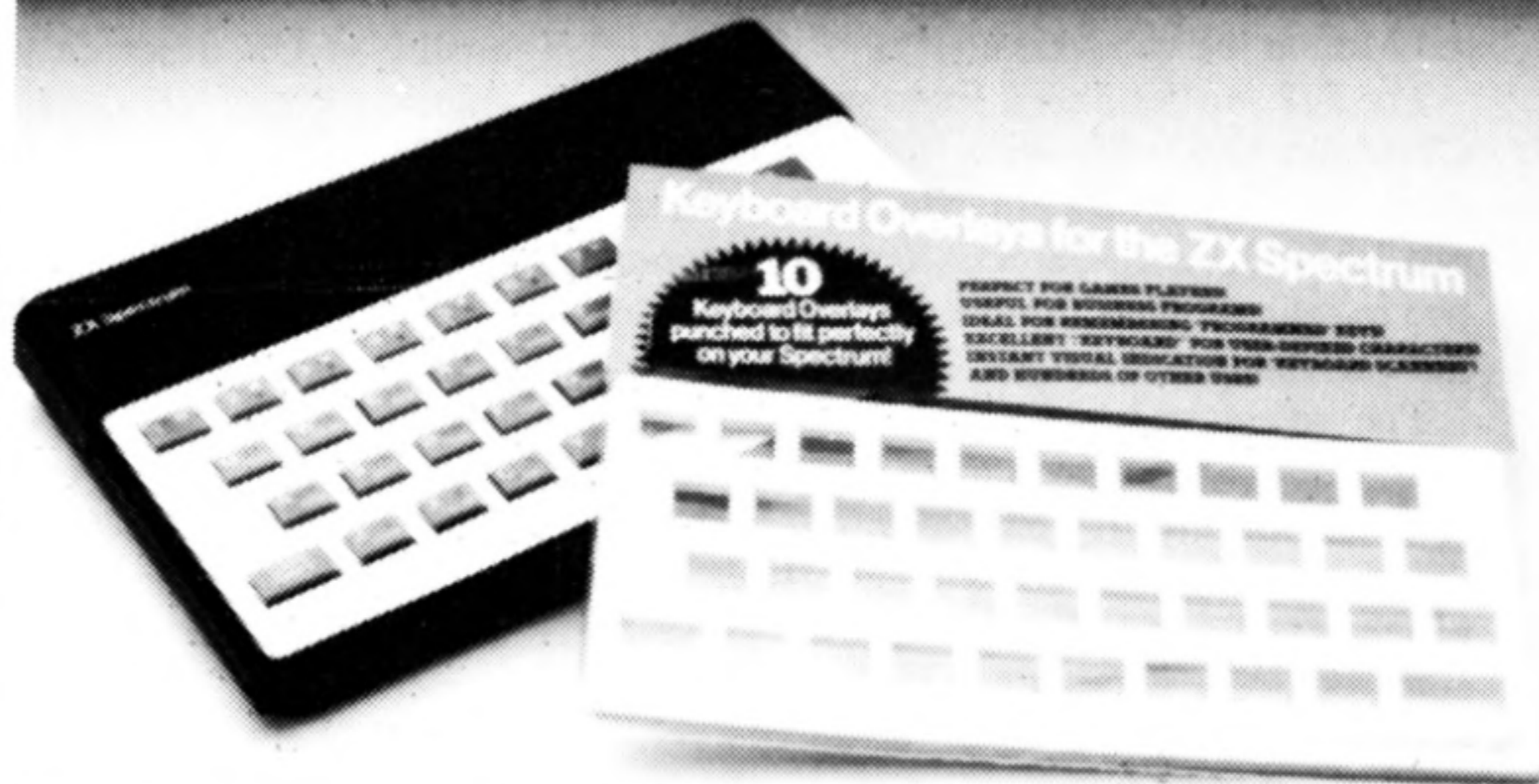
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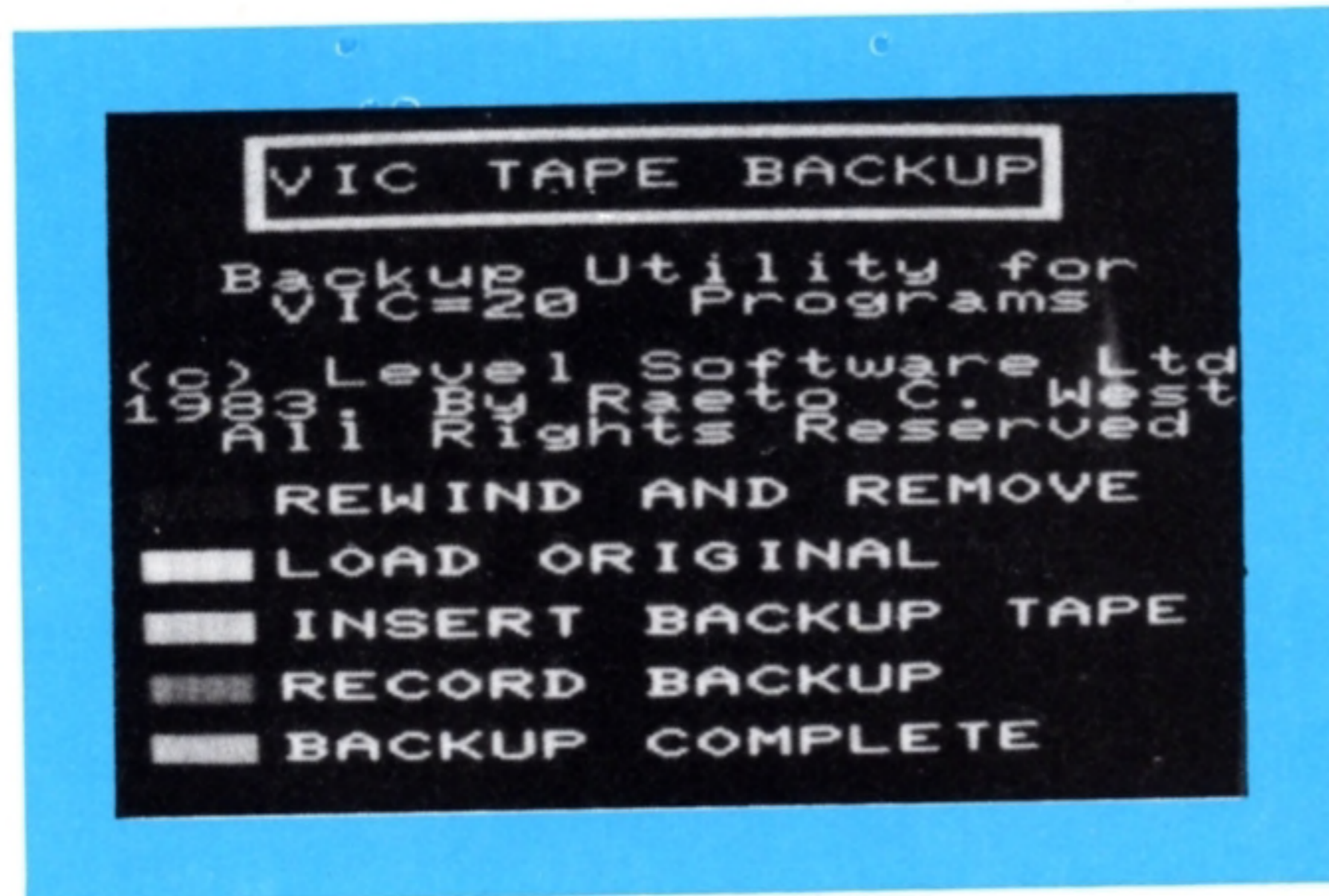
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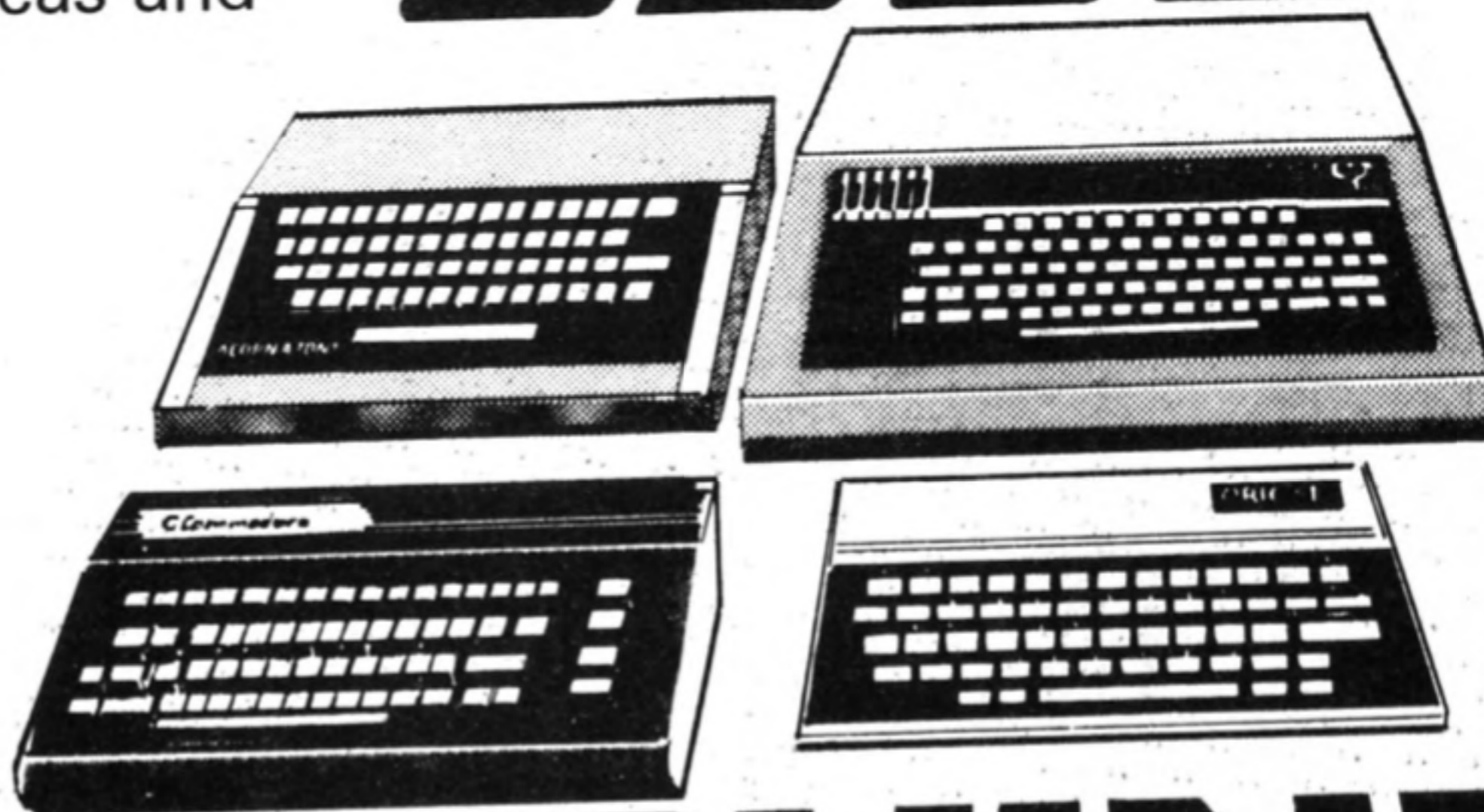
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Darryl Mattocks presents a complete program for space invaders using 6502 machine code. He outlines the five main problem areas and how to solve them.

6502



MACHINE CODE MADE EASY

SURELY MOST people who are even vaguely interested in computer games must, at one stage or another, have tried to program a version of space invaders. Although it looks a simple enough task, once all of the checks are in to provide a good game, Basic is invariably far too slow to enjoy this masterpiece. Let us try machine code.

The main programming problems are drawing the screen, moving the invaders from side to side and down the screen, moving the ship from side to side, firing up at the invaders, and scoring. Once these five points have been overcome, frills can be added such as the invaders changing colour, a mystery ship and so on.

The first problem is drawing the screen. The easiest way to do this is just copy a ready-drawn picture of the screen from memory. This is done very quickly using the routine

```
LDY #00
LDX (NUMBER OF BYTES TO BE
COPIED)
LOOP LDA (SOURCE),X
STA (DESTINATION),X
DEX
BNE LOOP
RTS
```

where Source is the address of the data to be copied and Destination is the address of where the data is to be copied to.

This routine is used twice, once for the score at the top of the screen and once for the defences at the bottom.

Now we have to plot the invaders. This is done separately from the rest of the Draw routine so that the invaders can be moved to lower start positions every fourth sheet. Although all of the invaders look the same there are really two distinct types; one of these moves from left to right, and moves down a

line when it reaches the right, and vice versa. By doing this we can use a groovy little routine which I call the Scan routine.

The operation of this routine can best be seen using the program shown in figure 1 which, as it is in Basic, is slow enough to watch working. But now try and move things down the screen by changing line 30 to
30 IF PEEK(C)=5 THEN POKE C,32:
POKE C+40,5

(continued on page 143)

Figure 1.

```
2 REM ***** BASIC SCAN ROUTINE
3
4 REM ***** SET UP THE SCREEN
5 C=1063
6 C=C+1:POKE C,32:IFRND(1)<.11THENPOKE C,5
7 IFC<1983THEN6
10 C=1064:REM ***** START OF SCREEN
20 C=C+1:IFC=1983THEN10:REM ***** FINISHED ?
25 REM ***** IF THE CHARACTER ON THE SCREEN IS
26 REM ***** AN 'E' THEN MOVE IT UP
30 IFPEEK(C)=5THENPOKE C,32:POKE C+40,5
35 REM ***** DISPLAY THE COUNTER POSITION
40 PRINT " " "C
50 GOTO20:REM ***** REPEAT FOR THE NEXT SPACE
READY.
```

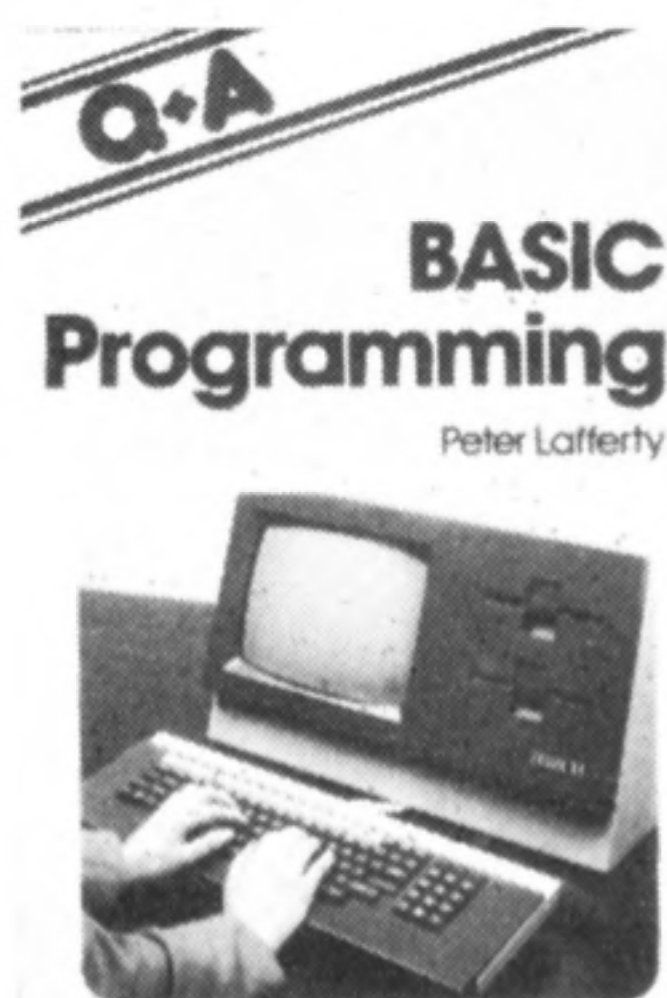
Listing 1.

```
10 RESTORE:PRINT "J"
15 FOR I=0 TO 15:POKE 4*4096+I,0:NEXT:REM RESET VARIABLES
20 READ A:IFA=-1THEN100
30 POKE 10432+R,A:R=R+1:PRINT " " "1062-R:W=W+A:GOTO20
100 PRINT "DATA ITEMS ENTERED =" "R" (1062)
110 PRINT "SUM OF DATA =" "W" (105351)
120 IF W=105351 THEN PRINT "***** CODE OK *****"
130 IF W<105351 THEN PRINT " " "CODE ERROR" "
140 PRINT "HIT [ ] TO START"
150 GET A:IFA<">" THEN 150
160 SYS 10432
1000 DATA 32,47,72,32,73,72,32,150,72,32,188,72,32,221,72
1010 DATA 32,2,76,32,62,73,32,174,74,32,105,74,32,5,75
1020 DATA 32,36,75,32,105,74,32,88,75,173,9,64,240,230,76
1030 DATA 45,75,169,32,162,0,157,0,4,157,0,5,157,0,6
1040 DATA 157,231,6,202,208,241,142,33,208,142,32,208,96,169,1
1050 DATA 162,40,157,0,216,202,208,250,169,7,162,0,157,0,217
1060 DATA 157,0,218,202,208,247,169,10,162,255,157,231,218,202,208
1070 DATA 250,169,0,162,40,157,40,216,157,192,219,202,208,247,96
1080 DATA 32,32,32,2,2,2,32,32,32,2,2,2,32,32,32
1090 DATA 2,2,2,32,32,32,32,48,48,48,48,48,48,32
1100 DATA 162,20,189,120,72,157,32,7,157,52,7,157,72,7,157
1110 DATA 92,7,157,112,7,157,132,7,202,208,232,162,9,189,140
1120 DATA 72,157,0,4,202,208,247,96,169,255,133,86,169,3,133
1130 DATA 87,160,1,162,23,24,165,86,105,40,133,86,165,87,105
1140 DATA 0,133,87,169,23,145,86,202,208,236,96,173,10,64,24
1150 DATA 106,24,106,170,169,160,133,86,169,4,133,87,138,240,17
1160 DATA 24,165,86,105,40,133,86,165,87,105,0,133,87,202,76
1170 DATA 237,72,160,24,169,0,145,86,24,165,86,105,40,133,88
1180 DATA 165,87,105,0,133,89,169,1,145,88,24,165,88,105,40
1190 DATA 133,88,165,89,105,0,133,89,169,0,145,88,24,165,88
1200 DATA 105,40,133,88,165,89,105,0,133,89,169,1,145,88,136
1210 DATA 136,208,197,169,80,133,86,169,4,133,87,160,1,169,63
1220 DATA 141,191,7,24,165,86,105,1,133,86,165,87,105,0,133
1230 DATA 87,177,86,240,7,201,63,208,235,76,168,73,32,135,75
1240 DATA 160,1,169,32,145,86,160,0,177,86,201,5,208,11,160
1250 DATA 1,32,34,75,32,161,75,76,77,73,201,23,208,11,169
1260 DATA 1,160,41,145,86,160,1,76,77,73,169,0,145,86,160
1270 DATA 1,76,77,73,169,32,145,86,160,41,169,1,145,86,160
1280 DATA 1,76,77,73,169,191,133,86,169,7,133,87,160,0,169
1290 DATA 63,141,40,4,56,165,86,233,1,133,86,165,87,233,0
```

```
1300 DATA 133,87,177,86,201,1,240,9,201,6,240,89,201,63,208
1310 DATA 229,96,32,135,75,160,0,169,32,145,86,160,1,177,86
1320 DATA 201,5,208,15,169,32,145,86,160,0,32,34,75,32,161
1330 DATA 75,76,183,73,201,63,208,6,169,1,141,9,64,96,201
1340 DATA 23,208,11,169,0,160,39,145,86,160,0,76,183,73,169
1350 DATA 1,145,86,160,0,76,183,73,169,32,145,86,160,40,169
1360 DATA 0,145,86,160,0,32,35,75,76,183,73,169,32,145,86
1370 DATA 160,40,177,86,201,2,208,9,169,3,145,86,160,0,76
1380 DATA 183,73,201,3,208,9,169,4,145,86,160,0,76,183,73
1390 DATA 201,4,208,9,169,32,145,86,160,0,76,183,73,201,7
1400 DATA 208,6,169,1,141,9,64,96,169,6,145,86,160,0,76
1410 DATA 183,73,160,0,177,90,201,5,240,6,169,1,141,6,64
1420 DATA 96,169,32,145,90,56,165,90,233,40,133,90,165,91,233
1430 DATA 0,133,91,24,165,91,105,212,133,89,165,90,133,88,177
1440 DATA 88,208,1,96,177,90,201,32,240,11,32,34,75,32,161
1450 DATA 75,169,32,145,90,96,169,5,145,90,96,169,32,174,8
1460 DATA 64,157,152,7,32,228,255,208,1,96,201,90,240,9,201
1470 DATA 47,240,19,201,32,240,29,96,173,8,64,201,38,208,1,96
1480 DATA 96,206,8,64,76,36,75,173,8,64,201,38,208,1,96
1490 DATA 238,8,64,76,36,75,173,6,64,208,1,96,24,169,152
1500 DATA 109,8,64,133,90,169,7,105,0,133,91,169,0,141,6
1510 DATA 64,169,5,160,0,145,90,96,141,0,64,142,1,64,140
1520 DATA 2,64,162,128,160,128,136,208,253,202,208,248,173,0,64
1530 DATA 172,2,64,174,1,64,96,96,96,174,8,64,169,7,157
1540 DATA 152,7,96,169,4,141,10,4,141,13,4,169,5,141,11
1550 DATA 4,169,1,141,12,4,165,86,141,32,208,165,87,141,33
1560 DATA 208,230,86,230,87,32,5,75,32,228,255,240,234,76,0
1570 DATA 72,169,42,133,86,169,4,133,87,160,0,140,7,64,24
1580 DATA 165,86,105,1,133,86,165,87,105,0,133,87,177,86,201
1590 DATA 1,240,14,201,0,240,10,201,63,208,229,238,10,64,76
1600 DATA 0,72,96,173,18,208,201,250,176,1,96,160,40,177,86
1610 DATA 201,32,240,3,160,0,96,169,6,145,86,160,0,96,248
1620 DATA 24,173,3,64,105,1,141,3,64,173,4,64,105,0,141
1630 DATA 4,64,173,5,64,105,0,141,5,64,216,173,3,64,106
1640 DATA 106,106,106,24,105,48,141,9,4,173,3,64,41,15,105
1650 DATA 48,141,8,4,173,4,64,106,106,106,106,24,105,48,141
1660 DATA 7,4,173,4,64,41,15,105,48,141,6,4,173,5,64
1670 DATA 106,106,106,106,24,105,48,141,5,4,173,5,64,41,15
1680 DATA 105,48,141,4,4,96,169,0,141,3,64,141,4,64,141
1690 DATA 5,64,141,9,64,141,6,64,141,7,64,141,33,208,141
1700 DATA 32,208,169,12,141,8,64,96,255,255,247,255,-1
READY.
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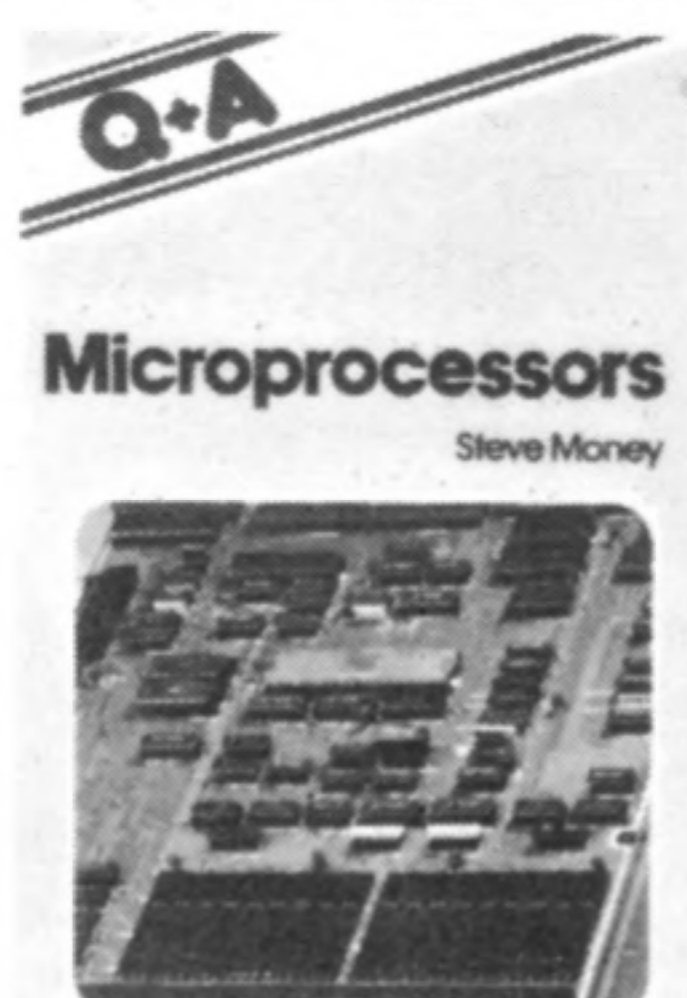


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CS

(continued from page 141)

The results are puzzling at first, but look at it slowly. The pointer will chug along until it finds the first asterisk and it will then move it down one line, a line later it will come across this same asterisk and move it down another line, and another, and another until it comes to the bottom of the screen.

The easiest way to combat this is to scan down the screen if a thing is moving up, and up if it is moving down. This explains why there are two scans. It is these scans which move the invaders and their bullets.

The ship is moved from the keyboard which is a big advantage to those people without a joystick, but a joystick read routine should be quite easy to add.

The input from the keyboard is based upon a routine located at \$FFE4. This is a very useful subroutine which is stored in the ROM and used by Basic. When called it looks at the keyboard and return with the keyboard position of the key pressed, or zero if no key is pressed, in the accumulator.

(continued on next page)

SYMBOL TABLE

SYMBOL	VALUE	SYMBOL	VALUE	SYMBOL	VALUE	SYMBOL	VALUE	SYMBOL	VALUE
BASE	4AAE	BASE1	4ABC	BASE2	4AC9	BASE2A	4AD1		
BASE3	4AD7	BASE3A	4ADF	BASE4	4AE5	BASE4A	4AEB		
BLEEP	4B22	BLEP	4B21	BLP	4B23	BORD	4B3C		
BORD1	4B08	BPLOT	4B24	BUL	4A69	BUL1	005A		
BUL2	005B	BUL3	4A77	BUL4	4A98	BUL5	4AA9		
CLR	482F	CLR1	4833	CMST	D800	COL	4849		
COL1	484D	COL2	4857	COL3	4864	COL4	486E		
DATA	4878	DATA1	488C	DEAD	4B2D	DEAD1	4B3F		
DELAY	4B05	DELAY1	4B10	DELAY2	4B12	DIED	4009		
DRAW	4896	DRAW1	4898	DRAW2	48B2	DRINV	48DD		
DRINV1	48ED	DRINV2	4901	DRINV3	4903	FLAG	4006		
FLAG2	4007	FORE	4B87	FORE1	4B8F	FORE2	4B9A		
IINV	49A8	IINV1	49B7	IINV2	49D3	IINV3	4A27		
IINV4	49F3	IINV5	49FD	IINV6	4A15	IINV7	4A3C		
IINV8	4A49	IINV9	4A56	IINV4	4A60	IINV3	4990		
IJNV5	4A0C	INV	493E	INV1	494D	INV2	4965		
INV3	4981	INVA	4999	MAIN	4800	MAIN1	4812		
OVER	4B58	OVER1	4B65	OVER2	4B86	PLOT	0056		
PLOT2	0058	PLOTT	0057	PLOTT2	0059	POS	4008		
RAND	D012	RESET	4C02	SCOR4	4005	SCOR5	4004		
SCORE6	4003	SCORE	4BA1	SCST	0400	SHEET	400A		
TEMPA	4000	TEMPX	4001	TEMPY	4002				

Listing 2.

```

0001 0000          PUT "0 INV.15"
0002 0000          *****
0003 0000          *****
0004 0000          ** BASIC SPACE INVADERS **
0005 0000          *****
0006 0000          *****
0007 0000          WRITTEN FOR THE COMMODORE 64
0008 0000          BUT WILL RUN ON MOST 6502
0009 0000          BASED MACHINES WITH VERY LITTLE
0010 0000          ADAPATIONS
0011 0000          START THE CODE AT 4*4096
0012 0000          *****
0013 0000          *****
0014 0000          **$4000
0015 0000          *****
0016 0000          *****
0017 0000          VARIABLES
0018 0000          TEMPX .BYT 0
0019 0001 00          TEMPY .BYT 0
0020 0002 00          SCOR6 .BYT 0
0021 0003 00          SCOR5 .BYT 0
0022 0004 00          SCOR4 .BYT 0
0023 0005 00          FLAG .BYT 0
0024 0006 00          FLA02 .BYT 0
0025 0007 00          PLOT = $56
0026 0008          PLOTT = $57
0027 0009          PLOTT2 = $58
0028 0010          BUL1 = $5A
0029 0011          BUL2 = $5B
0030 0012          POS .BYT 12
0031 0013          DIED .BYT 0
0032 0014          SCST = 1024
0033 0015          CMST = 55296
0034 0016          RAND = 53248+18;RASTER REGISTER
0035 0017          SHEET .BYT 0
0036 0018          *****
0037 0019          HERE IS THE MAIN ROUTINE WHICH
0038 0020          CALLS ALL OF THE OTHER
0039 0021          SUB-ROUTINES
0040 0022          *****
0041 0023          *****
0042 0024          *****
0043 0025          *****
0044 0026          *****
0045 0027          *****
0046 0028          *****
0047 0029          *****
0048 0030          *****
0049 0031          *****
0050 0032          *****
0051 0033          *****
0052 0034          *****
0053 0035          *****
0054 0036          *****
0055 0037          *****
0056 0038          *****
0057 0039          *****
0058 0040          *****
0059 0041          *****
0060 0042          *****
0061 0043          *****
0062 0044          *****
0063 0045          *****
0064 0046          *****
0065 0047          *****
0066 0048          *****
0067 0049          *****
0068 0050          *****
0069 0051          *****
0070 0052          *****
0071 0053          *****
0072 0054          *****
0073 0055          *****
0074 0056          *****
0075 0057          *****
0076 0058          *****
0077 0059          *****
0078 0060          *****
0079 0061          *****
0080 0062          *****
0081 0063          *****
0082 0064          *****
0083 0065          *****
0084 0066          *****
0085 0067          *****
0086 0068          *****
0087 0069          *****
0088 0070          *****
0089 0071          *****
0090 0072          *****
0091 0073          *****
0092 0074          *****
0093 0075          *****
0094 0076          *****
0095 0077          *****
0096 0078          *****
0097 0079          *****
0098 0080          *****
0099 0081          *****
0100 0082          *****
0101 0083          *****

```

(listing 2 continued on next page)

(continued from previous page)

The only real problem left is scoring. As this has all been dealt with before, suffice to say that a simple counter is being used in the top left corner of the screen.

Although the program contains very few frills, it is still very long . . . do not forget to save it before running it. The graphics have not actually been defined, but here are the

character numbers and their use if you want to add your own.

Character number	Use
0	Invader (right to left)
1	Invader (left to right)
2	base defence (not hit)
3	base defence (hit once)
4	base defence (hit twice)
5	bullet going up

6	bullet going down
7	base ship
23	marker (should be blank)
32	space
48-58	numbers
63	marker (should be left blank)

The characters d, e and a should be defined for the word "Dead". Happy adapting and have fun with the graphics.

6502 MACHINE CODE MADE EASY

(listing 2 continued from previous page)

```

00284 49D0 4C 4D 49      JMP INVI
00285 4990
00286 4990 A9 00      IJNV3 LDA #0
00287 4992 91 56      STA (PLOT),Y
00288 4994 A0 01      LDY #1
00289 4996 4C 4D 49      JMP INVI
00290 4999
00291 4999 A9 20      INVA LDA #32
00292 499B 91 56      STA (PLOT),Y
00293 499D A0 29      LDY #29
00294 499F A9 01      LDA #1
00295 49A1 91 56      STA (PLOT),Y
00296 49A3 A0 01      LDY #1
00297 49A5 4C 4D 49      JMP INVI
00298 49A8
00299 49A8
00300 49A8
00301 49A8
00302 49A8 A9 3F      IINV LDA #3F
00303 49AA 85 56      STA PLOT
00304 49AC A9 07      LDA #7
00305 49AE 85 57      STA PLOTT
00306 49B0 A0 00      LDY #0
00307 49B2 A9 3F      LDA #63
00308 49B4 8D 20 04      STA 1024
00309 49B7
00310 49B7 30
00311 49B8 A5 56      IINV1 SEC
00312 49BA 89 01      LDA PLOT
00313 49BC 85 56      SBC #1
00314 49BE A5 57      LDA PLOTT
00315 49C0 E9 00      SBC #0
00316 49C2 85 57      STA PLOTT
00317 49C4 B1 56      LDA (PLOT),Y
00318 49C6 C9 01      CMP #1
00319 49C8 F0 09      BEQ IINV2
00320 49CA C9 06      CMP #6
00321 49CC F0 5F      BEQ IINV3
00322 49CE C9 3F      CMP #63
00323 49D0 D0 E5      BNE IINV1
00324 49D2 60
00325 49D3
00326 49D3
00327 49D3 20 07 4B      IINV2 JSR FORE
00328 49D6 A0 00      LDY #0
00329 49D8 A9 20      LDA #20
00330 49DA 91 56      STA (PLOT),Y
00331 49DC A0 01      LDY #1
00332 49DE B1 56      LDA (PLOT),Y
00333 49E0 C9 05      CMP #5
00334 49E2 D0 0F      BNE IINV4
00335 49E4 A9 20      LDA #20
00336 49E6 B1 56      STA (PLOT),Y
00337 49E8 A0 00      LDY #0
00338 49EA 20 22 4B      JSR BLEEP
00339 49ED 20 01 4B      JSR SCORE
00340 49F0 4C 4D 49      JMP IINV1
00341 49F3
00342 49F3 C9 3F      IINV4 CMP #63
00343 49F5 D0 06      BNE IINV5
00344 49F7 A9 01      LDA #1
00345 49F9 8D 09 40      STA DIED
00346 49FC 60
00347 49FD
00348 49FD C9 17      IINV5 CMP #23
00349 49FF D0 0B      BNE IJNV5
00350 4A01 A9 00      LDA #0
00351 4A03 A0 27      LDY #27
00352 4A05 91 56      STA (PLOT),Y
00353 4A07 A0 00      LDY #0
00354 4A09 4C 4D 49      JMP IINV1
00355 4A0C
00356 4A0C A9 01      IJNV5 LDA #1
00357 4A0E 91 56      STA (PLOT),Y
00358 4A10 A0 00      LDY #0
00359 4A12 4C 4D 49      JMP IINV1
00360 4A15
00361 4A15 A9 20      IINV6 LDA #32
00362 4A17 91 56      STA (PLOT),Y
00363 4A19 A0 20      LDY #20
00364 4A1B A9 00      LDA #0
00365 4A1D 91 56      STA (PLOT),Y
00366 4A1F A0 00      LDY #0
00367 4A21 20 23 4B      JSR BLP
00368 4A24 4C 4D 49      JMP IINV1
00369 4A27
00370 4A27 A9 20      IINV3 LDA #32
00371 4A29 91 56      STA (PLOT),Y
00372 4A2B A0 20      LDY #20
00373 4A2D B1 56      LDA (PLOT),Y
00374 4A2F C9 02      CMP #2
00375 4A31 D0 09      BNE IINV7
00376 4A33 A9 03      LDA #3
00377 4A35 91 56      STA (PLOT),Y
00378 4A37 A0 00      LDY #0
00379 4A39 4C 4D 49      JMP IINV1
00380 4A3C
00381 4A3C C9 03      IINV7 CMP #3
00382 4A3E D0 09      BNE IINV8
00383 4A40 A9 04      LDA #4
00384 4A42 91 56      STA (PLOT),Y
00385 4A44 A0 00      LDY #0
00386 4A46 4C 4D 49      JMP IINV1
00387 4A49
00388 4A49 C9 04      IINV8 CMP #4
00389 4A4B D0 09      BNE IINV9
00390 4A4D A9 20      LDA #20
00391 4A4F 91 56      STA (PLOT),Y
00392 4A51 A0 00      LDY #0
00393 4A53 4C 4D 49      JMP IINV1
00394 4A56
00395 4A56 C9 07      IINV9 CMP #7
00396 4A58 D0 06      BNE IINVA

```

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(Vol. 2 Issue 5 June, '83)

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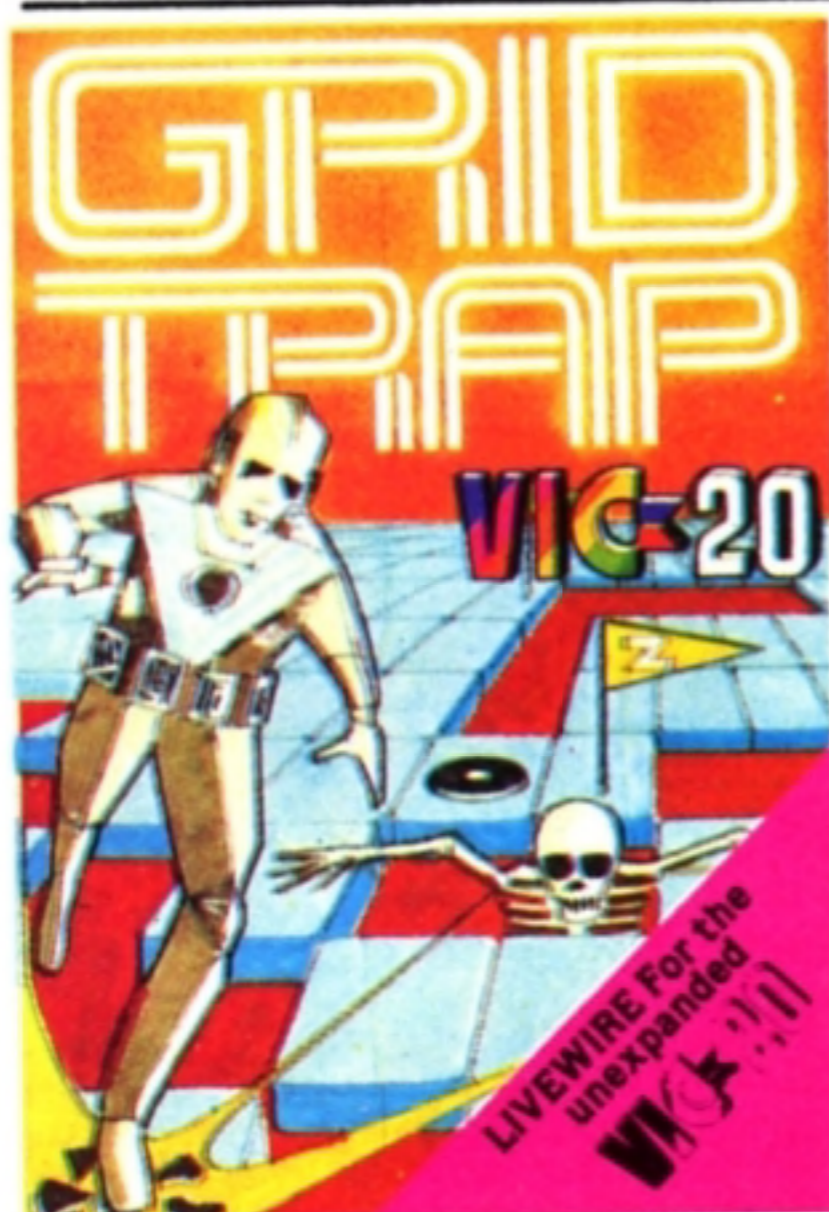
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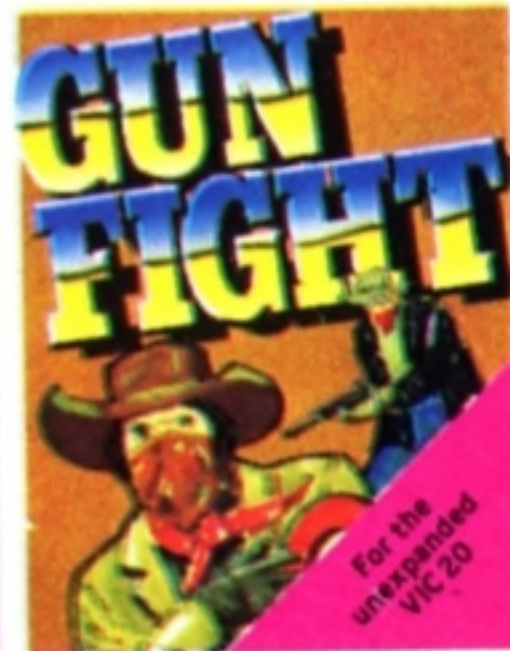
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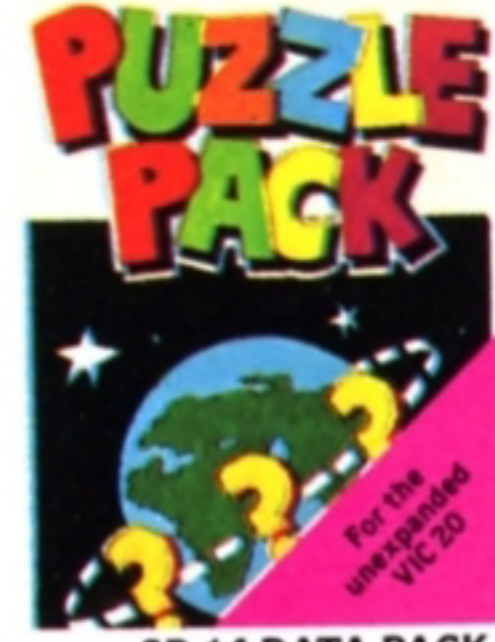
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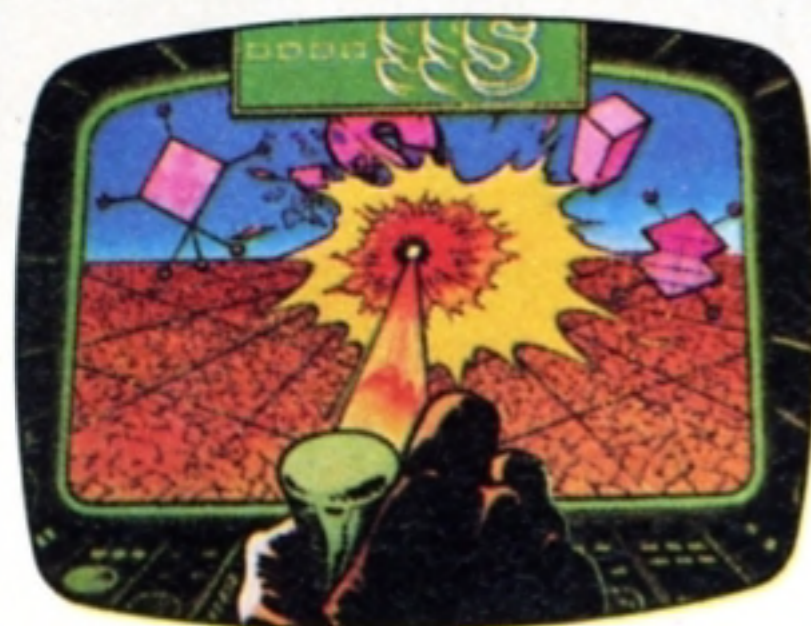
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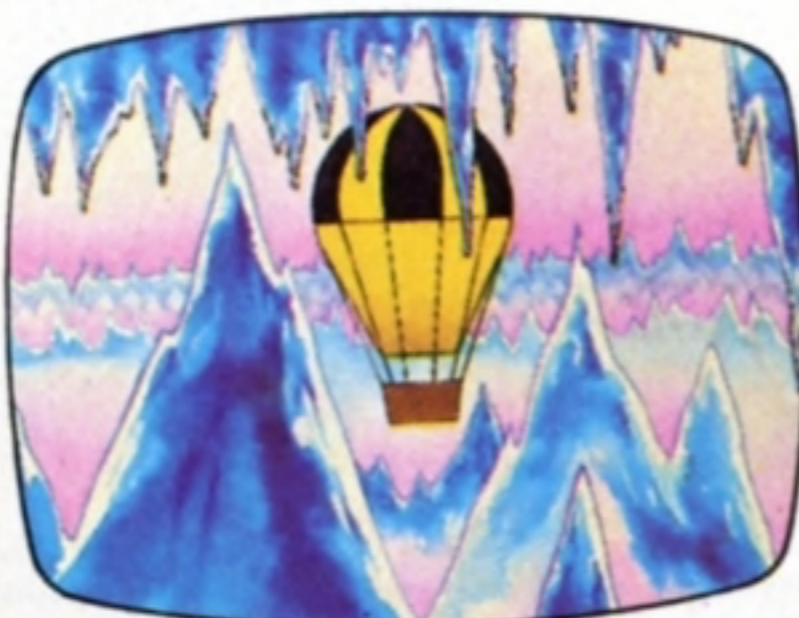


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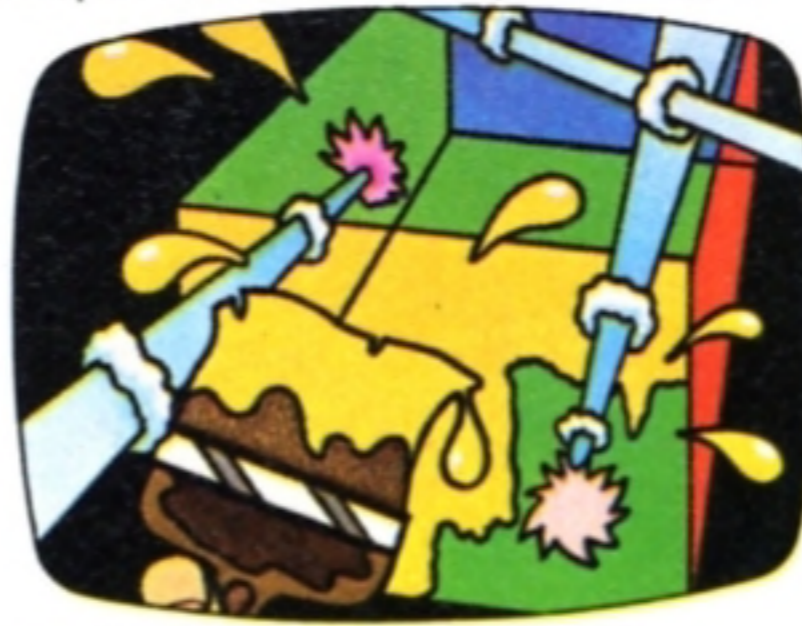
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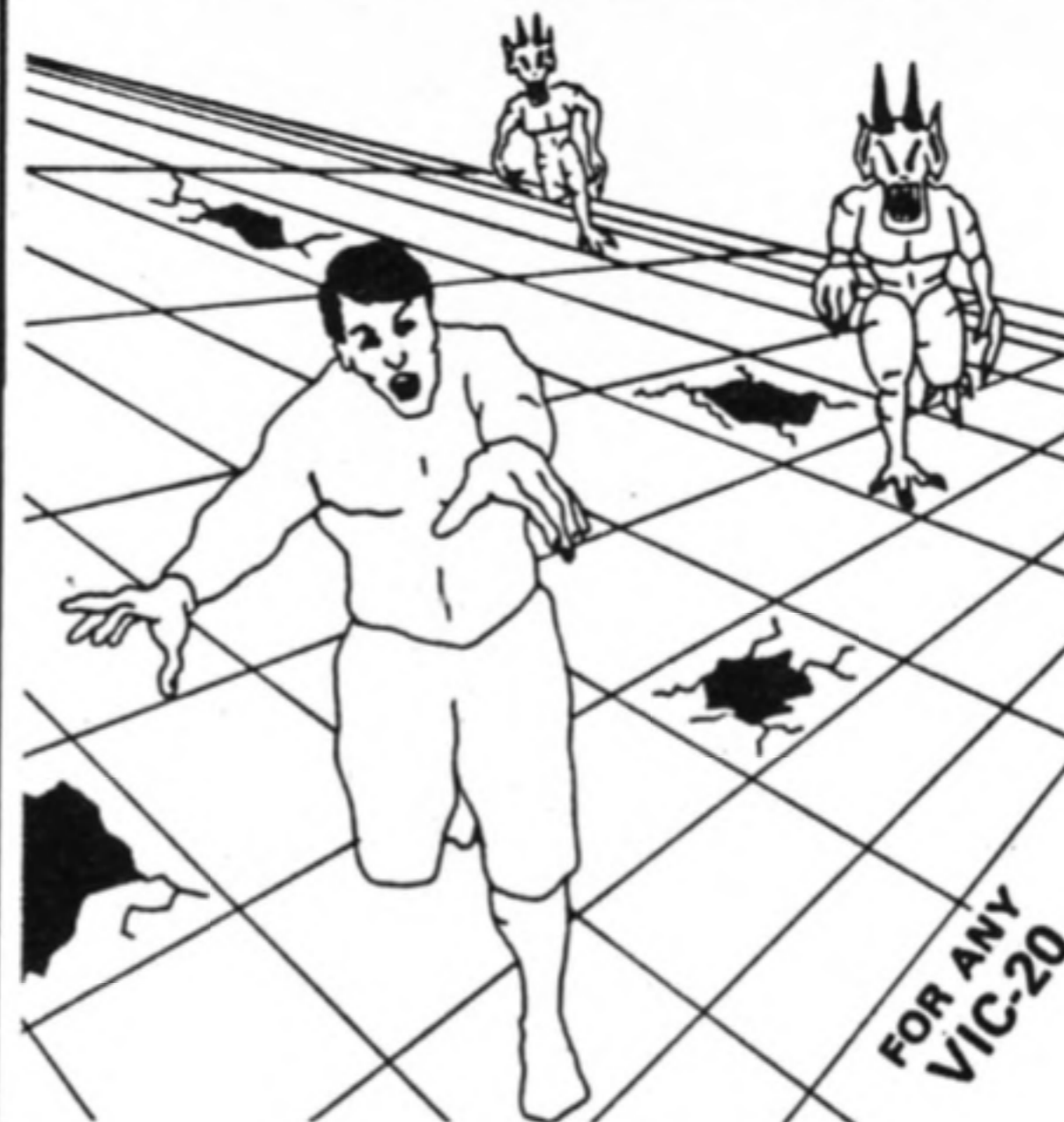
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GUARANTEE

■ Last November I purchased a 16K Spectrum. I found this very useful but as I progressed I found that the 9K RAM available to the user was insufficient for larger programs and databases. I have seen various advertisements for upgrades to 48K for far less than the £60 Sinclair upgrade. I have been led to believe that installation of such an upgrade requires the machine to be taken apart. Does this void the Sinclair guarantee, and if so, do the companies selling such upgrades offer their own guarantee? Are the upgrades easy to fit or do you have to send in your Spectrum for fitting?

*P Crawley,
Bucknell, Salop.*

AS FAR AS I can determine, only one company — Kempstone — claims its memory upgrade will not void the guarantee. You are right in saying the machine must be taken apart to fit the unit. The vast majority of companies selling the upgrade units provide a fitting service. Functionally, there is no difference between a Sinclair memory upgrade, and a non-Sinclair one. You may well find that the Microdrive is more use to you for database programs and may therefore prefer to save your money for the drive.

A GOOD BUY

■ I wish to buy a computer for around £400 or less which will be used predominately for word-processing. Which one is the best to get?

*Vince Gifford,
Hastings, East Sussex.*

THERE ARE several computers in the price range you mention which provide you with serviceable word-processing capabilities. The main things to look for are a "proper" keyboard, that is, one which is like a typewriter keyboard and a word-processing program for that machine. Both these pretty obvious conditions must be met. There are several computers which have word processor programs available, but have keyboards which do not sustain long term typing and could not support touch typing. As well, if you are interested in writing long sections of text — as opposed to just two and three page letters — you will need text storage and for practical use, this should be on disk. However, adding disks will move the cost of the computer out of the range you specify. The BBC Micro is one

machine you should consider. Both the BBC's word processing programs View and Wordwise are available in ROM — View is £52, Wordwise is £34.50! Having a program in ROM means it is always available, simply by typing in a command. Gemini Marketing, 03952-5832, is one of many other companies which provides a word processing package for the BBC Micro. Its program, which is designed primarily for letter-writing, is £19.95. The Dragon is also worth considering, as it has a fairly good keyboard. The Vic-20 has a good keyboard, a choice of several word processing programs, but its coarse screen — 23 characters across — is seen by many as a disadvantage for word processing.

NO POINT

■ Could you please explain why the Point instruction does not work while using Print statements on our BBC Micro Model B with 1.2 operating system and did not work when we had the 0.1 OS either? I find this problem irritating as I feel there is probably some way of making it work.

*Colin MacDonald,
Bothwell, Glasgow.*

THE ONLY reason I can imagine for it not appearing to work is that you are trying to use it in mode 7 — it only works in modes 0 to 6 — and that you are trying to get it to work with Print Tab co-ordinates. Point co-ordinates start in the bottom left hand corner of the screen. The grid is from 0 to 1023 and from 0 to 1279.

ZX-81 KEYBOARD

■ I am a ZX-81 owner. I am considering purchasing a full-size keyboard for my machine. I would like this keyboard to have repeat facilities and possibly single-key Edit, Function, Rubout and the like. The choice on the market is bewildering. However, the keyboard I am most interested in, from Harris and Lockyer Associates, will not fit the ZX-81 PCB inside. This is annoying because if I am going to buy other add-ons which fit on the edge connector — my ZX-81 is tilted at an angle to let the heat out — the weight of them, as they are not resting on the table, will probably either break them or cause a whiteout when they wobble. What keyboard should I buy?

*David Wilding,
London, N16.*

THE CHOICE problem has been compounded by your decision to have the computer at an angle. I use an extension keyboard on a desk. Above the desk is a small shelf which is not connected to the desk. The ZX-81, RAMpack and the rest, sit on this shelf. The ZX-81 is raised slightly off the shelf, held at the edges, to allow heat to escape. However, it is not tilted, but stands parallel to the shelf. I have a large bulldog clip holding the cable onto the edge of the shelf between the computer and the keyboard. This means that even if I knock the keyboard, this is not transmitted to the computer. There are several suitable keyboards on the market, any of which should serve you well. Certainly, we have not heard about recurrent problems with any brand. Simplify your choice by realising you do not have the ZX-81 on an angle.

ANIMATION

■ I own a 16K ZX Spectrum which I have found is not very good for some kinds of high-resolution animated graphics. The BBC's VDU 19 command seems to help here. I was wondering if there was any routine which I could use to emulate this?

*Alan Thompson,
Asham, Penrith.*

I DO NOT know of any 'pre-potted' routine to carry out VDU 19's function. You can easily change the whole background colour of the Spectrum screen without disturbing what is on it, by declaring an array 704 characters long, thus:

```
DIM A$(704),
```

then printing this At 0, 0 prefaced by Over 1. Putting graphics within strings, and then manipulating them by string-slicing is the simplest and, in many cases, the fastest way to get moving graphics on the Spectrum in Basic. If you wish to progress into machine code, and create your own VDU 19, there are a number of books which could help you, including *Machine Language Made Simple on the Spectrum* by Tang, *Mastering Machine Code on the ZX Spectrum* by Baker, and *Spectrum Machine Code Made Easy*, books one and two, Holmes and Walsh.

LYNX QUERY

■ As a present ZX-81 owner, I am contemplating upgrading to a more advanced machine. The computer I have in mind is the Lynx but I have one grave misgiving about the machine — it only handles single statement lines. My question is: can the machine be made to handle multi-statement lines easily? Apart from this query, the Lynx seems to suit my requirements admirably, so I will wait for an answer from you before I go out and buy my Lynx.

*R Drain,
Saltash, Cornwall.*

THE LYNX is not provided with multi-statement lines. However, it does accept lines with decimal points, so 10.453 is a valid line number, which should allow you to insert as many lines as you like in a program. Multi-statement lines cannot be easily emulated on the Lynx. Having more than one statement to a line number is not considered very good programming practice in some circles, as it can lead to listings which are very hard to read and to debug. One time when they are very useful is when you want the computer to evaluate an If-Then statement, and to carry out, or jump, a series of instructions depending on the outcome of the evaluation. You can get round this, as I am sure you have learnt to do, on the ZX-81 by using the If-Then to jump a section of unwanted code. You may well find that other features provided by the Lynx will compensate for the lack of multi-statement lines.

I WANT ARRAYS

■ Your review of the Computer Lynx stressed the potential of this machine for expansion and its CP/M compatibility. In another part of the magazine, it was mentioned that the Lynx was weak on string handling and could not use string arrays. The review mentions CP/M as handling files of data which presumably implies some form of array in use. Does this mean that the Lynx has to expand to CP/M before file handling is possible or is the string restriction caused by the Basic used? If so, would Forth or Pascal provide arrays?

*T Asquith,
Newport, Shropshire.*

YOU SEEM to have confused a couple of points. The Lynx, when first issued, did not provide string arrays, but the reaction to this was so negative, the Basic was modified. String handling is a quite different issue from CP/M. CP/M stands for Control Program/Microcomputer, a very widely used disc-operating system developed and marketed by Digital Research, Pacific Grove, California. A large quantity of public domain software is available to run on CP/M machines.

DO NOT CHANGE

■ I recently purchased by mail order the 'Book of Listings' for my BBC Model B Micro. I was somewhat disappointed to discover the book is written for the operating system 0.1 having recently had my micro fitted with the 1.2. Please could you advise which of the listings in the book will not run on the 1.2, and if possible, any changes to adapt those listings?

*Nigel Hunt,
Bagshot, Surrey.*

ALL PROGRAMS in the book will work on the 1.2 OS. ■

Q. E. D. Systems

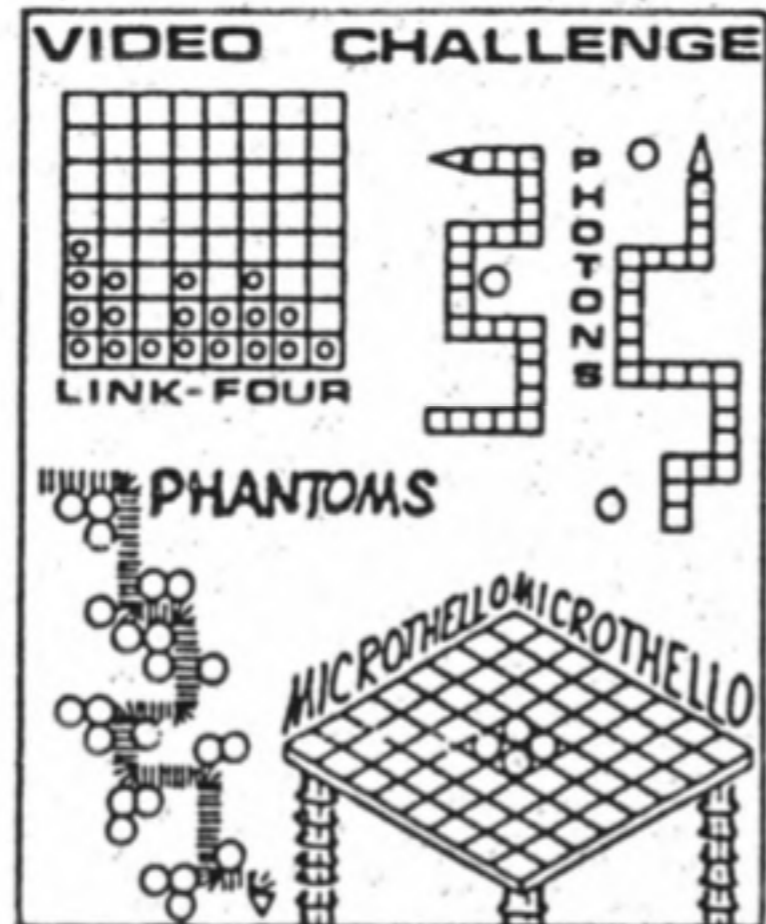
experts in business systems now bringing professionalism into the home market for the SPECTRUM, ORIC, DRAGON and APPLE II micro-computers.



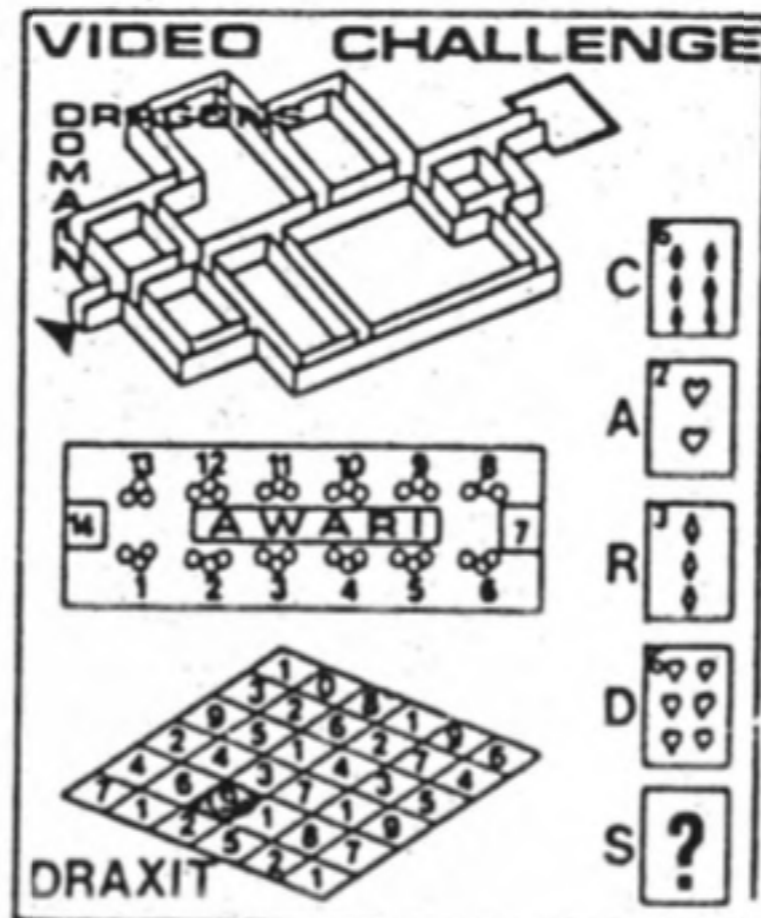
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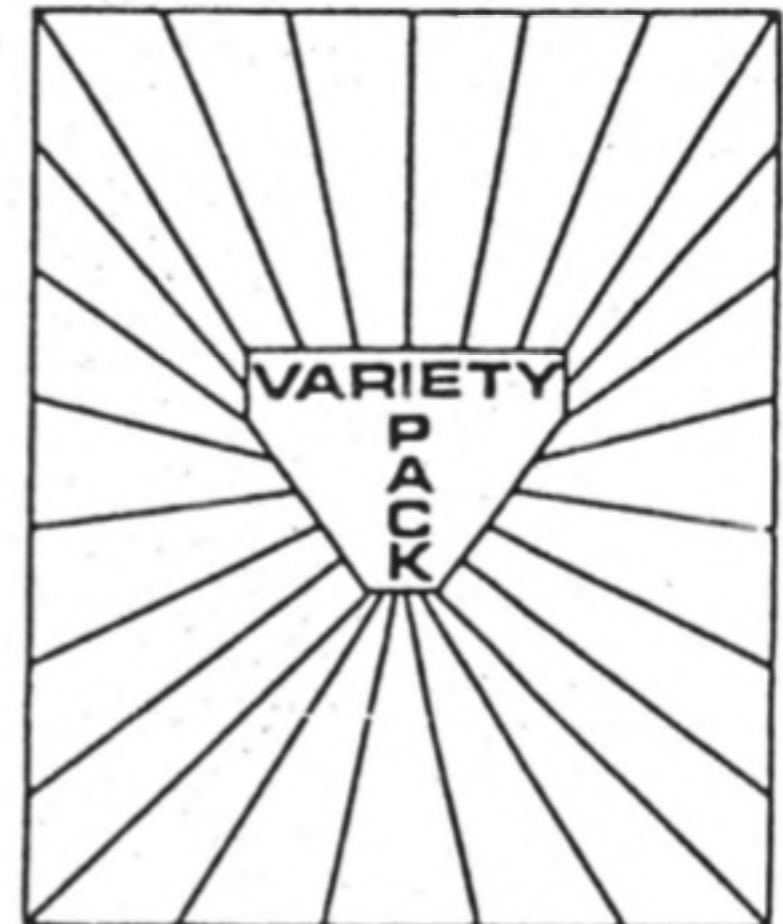
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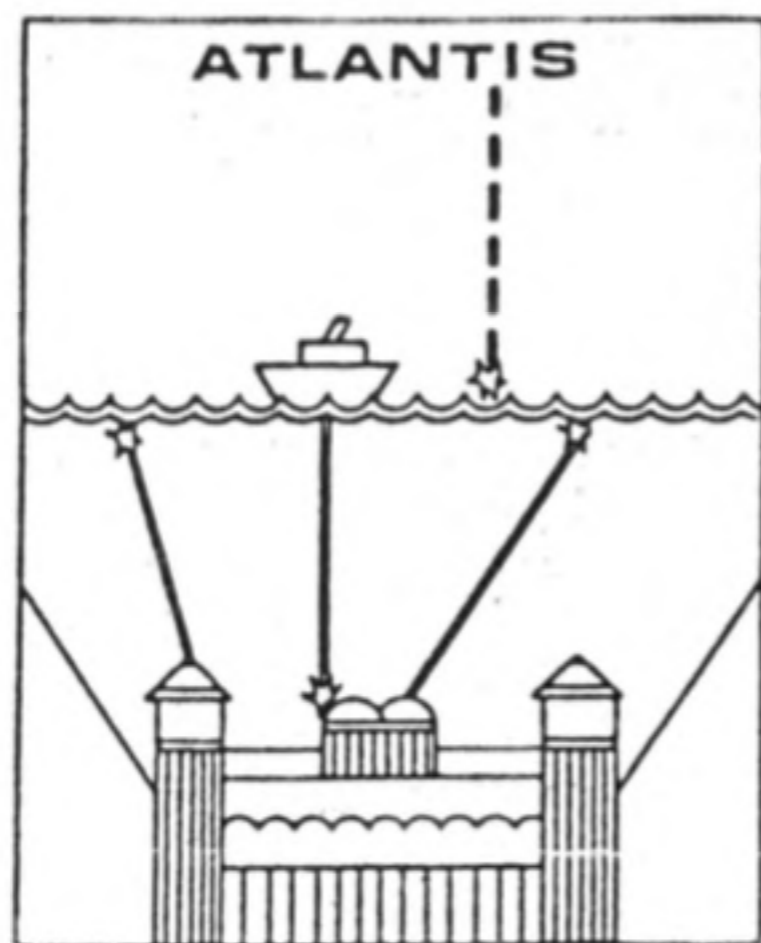
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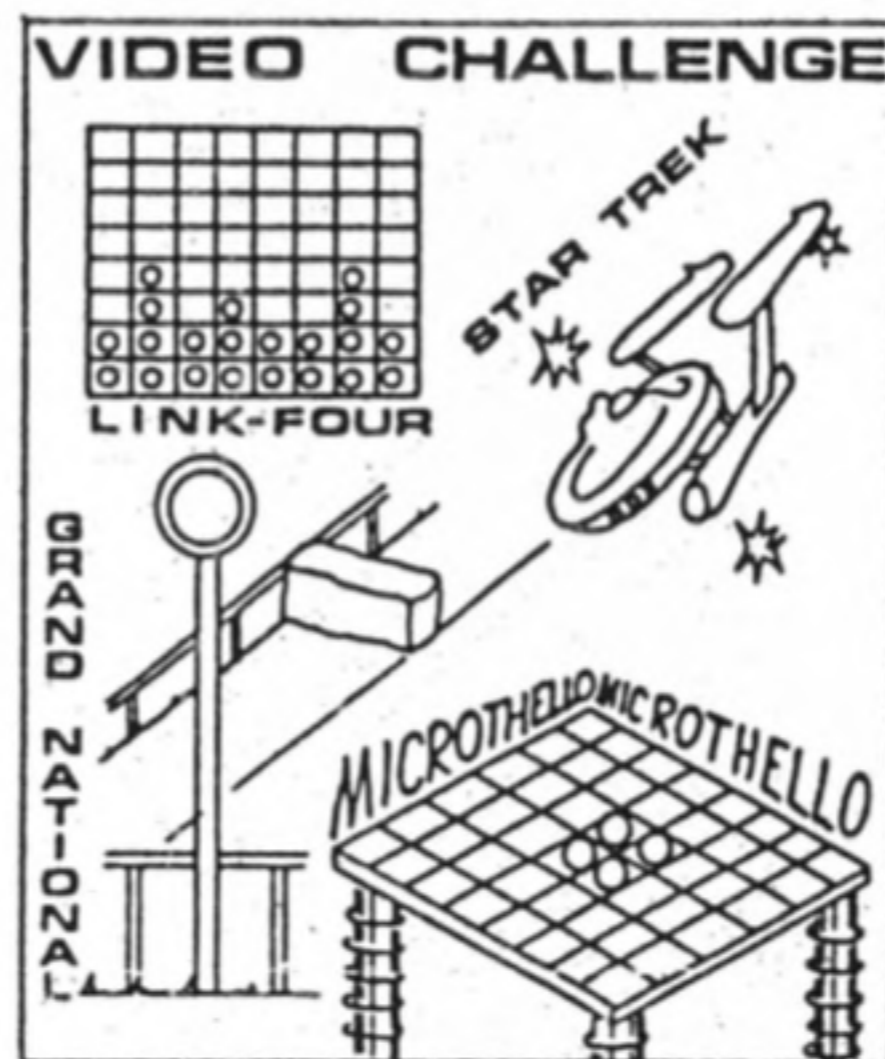
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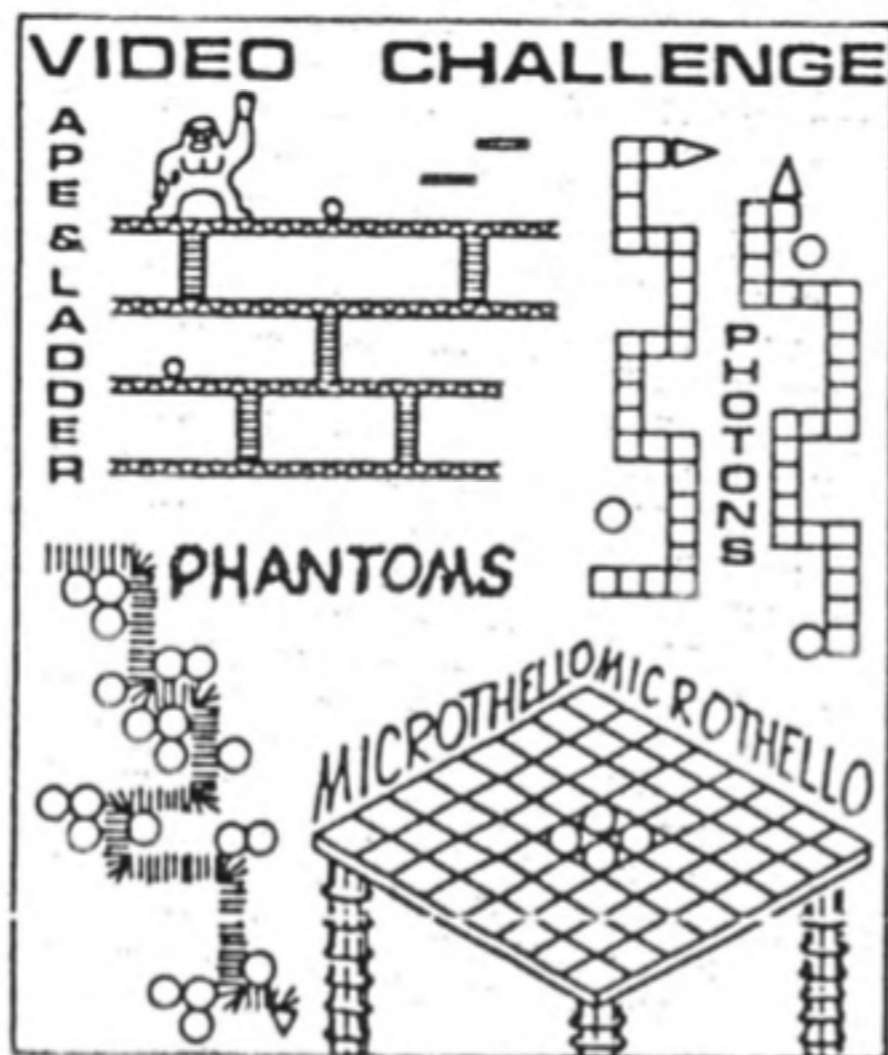
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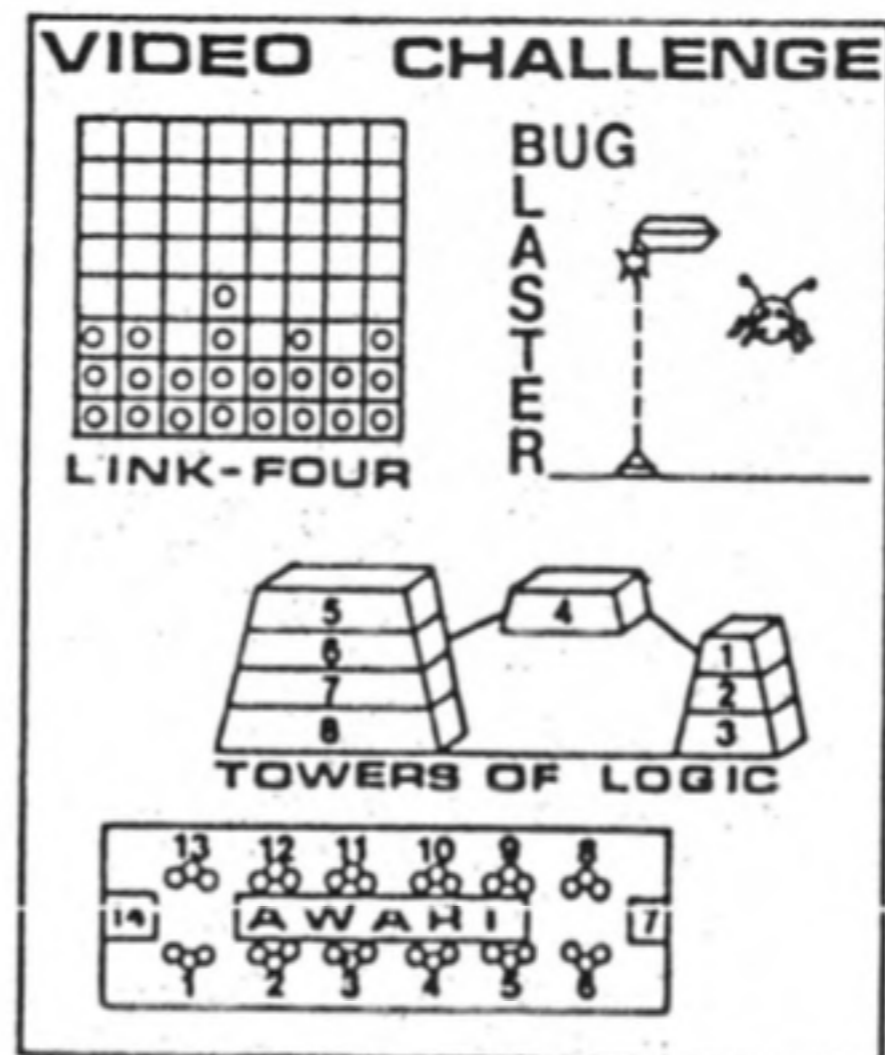
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Tubewars

J Bull,
Dursley,
Gloucestershire.

SPECTRUM

THE GAME TUBEWARS runs on either the 16K or 48K ZX Spectrum. The game is based on the arcade game Tempest. Although it is written entirely in Basic it is still fast enough to be enjoyable. Instructions are included in

the listing but a couple of points should be stressed. When an electron finishes its run by reaching the rim of the tube a magenta cannon is drawn up, indicating that portion of the rim is electrified. If your cannon runs over this section it is destroyed. Your cannon is also destroyed if it is in the path of an enemy when it finishes its run; by reaching the tube rim. The level number is the number of enemy that have to reach the rim before the game ends. That is if your cannon is not destroyed before.

```

20 AT 18,9;"@ 1983 J.Bull"
5015 REM graphics D
5020 PRINT INK 4;AT 3,0;"D -Elec
tron 100 Points Elec
trifies Rim When Reached Do N
ot Touch Electrified Rim"
5025 REM graphics G
5030 PRINT INK 3;AT 7,0;"G -Quar
k 75 Points"
5040 PRINT INK 5;AT 9,0;" 'X'
Rotate Clockwise"
5050 PRINT INK 4;AT 10,0;" 'Z'
Rotate Anticlockwise"
5060 PRINT INK 3;AT 11,0;"SPACE
Fires Cannon"
5070 PRINT INK 6;AT 13,0;"LEVEL
is Number of Enemy That Have t
o Reach Rim Before End"
5080 PRINT INK 4;AT 16,0;"Select
LEVEL 1 2 3 4"
5090 LET v$=INKEY$: IF CODE v$>4
& AND CODE v$<53 THEN LET l=(VAL
v$)+10: GO TO 5110
5100 GO TO 5090
5110 CLS
5130 PRINT INK 6;AT 16,13;"TUBEWA
R"; INK 4;AT 17,13;" "
6000 OVER 0
6010 PLOT 96,152: DRAW 72,0: DRA
W 32,-8: DRAW 16,-16: DRAW 0,-41
: DRAW -16,-16: DRAW -32,-8
6020 DRAW -73,0: DRAW -32,8: DRA
W -16,16: DRAW 0,40: DRAW 16,16:
DRAW 32,8
6030 PLOT 128,119: DRAW 7,0: DRA
W 16,-8: DRAW 0,-7: DRAW -16,-8:
DRAW -7,0: DRAW -16,8: DRAW 0,7
: DRAW 16,8
6040 PLOT 96,151: DRAW 32,-32: D
RAW 7,0: DRAW 32,32
6050 PLOT 215,128: DRAW -64,-16:
DRAW 0,-8: DRAW 64,-16
6060 PLOT 96,64: DRAW 32,32: DRA
W 7,0: DRAW 32,-32
6070 PLOT 48,128: DRAW 64,-16: D
RAW 0,-8: DRAW -64,-16
6200 GO SUB 110: GO SUB 130
6205 OVER 1
6207 REM graphics A
6210 PRINT AT y1,x1;"A";AT y2,x2
:"A"
6215 REM graphics A,B etc
6220 LET a$="AABBCCDD": LET b$="
AEEFFGG"
6230 LET p=1: GO SUB 30: LET k=9
6240 LET sc=0: LET r=0
6300 GO TO 1000
7000 OVER 0: FOR a=1 TO 5: FOR b
=6 TO 0 STEP -1: INK b: GO SUB 2
9+p: BEEP .01,b: NEXT b: BEEP .0
1,a: BEEP .01,a+2: BEEP .01,a+4:
NEXT a
7010 INK 5: PRINT AT 0,11;"<< SC
ORE >>";AT 1,14;sc
7020 PRINT AT 19,1;"Press 'P' to
Play, 'S' to Stop"
7030 IF INKEY$="p" OR INKEY$="P"
THEN RUN 10
7040 IF INKEY$="s" OR INKEY$="S"
THEN STOP
7050 GO TO 7030
8000 DATA 0,0,0,8,0,0,0,0
8010 DATA 0,0,8,20,8,0,0,0
8020 DATA 0,8,20,34,20,8,0,0
8030 DATA 8,20,34,65,34,20,8,0
8040 DATA 0,0,20,8,20,0,0,0
8050 DATA 0,34,20,8,20,34,0,0
8060 DATA 65,34,20,8,20,34,65,0
8100 FOR a=0 TO 55: READ b: POKE
USR "a"+a,b: NEXT a
8120 RUN 10
    
```

```

5 GO TO 8000
10 GO TO 5000
30 PLOT 96,152: DRAW 36,12: DR
AW 36,-12: RETURN
31 PLOT 168,152: DRAW 40,0: DR
AW 8,-24: RETURN
32 PLOT 216,127: DRAW 12,-20:
DRAW -12,-20: RETURN
33 PLOT 168,63: DRAW 40,0: DRA
W 8,24: RETURN
34 PLOT 96,63: DRAW 36,-12: DR
AW 36,12: RETURN
35 PLOT 96,63: DRAW -40,0: DRA
W -8,24: RETURN
36 PLOT 47,127: DRAW -12,-20
DRAW 12,-20: RETURN
37 PLOT 96,152: DRAW -40,0: DR
AW -8,-24: RETURN
40 LET x=16: LET y=6: LET dy=-
.5: LET dx=0: RETURN
41 LET x=17: LET y=7: LET dy=-
.5: LET dx=1: RETURN
42 LET x=19: LET y=8: LET dy=0
: LET dx=1: RETURN
43 LET x=17: LET y=8.5: LET dy
=.5: LET dx=1: RETURN
44 LET x=16: LET y=9.5: LET dy
=.5: LET dx=0: RETURN
45 LET x=15: LET y=8.5: LET dy
=.5: LET dx=-1: RETURN
46 LET x=13: LET y=8: LET dy=0
: LET dx=-1: RETURN
47 LET x=15: LET y=7: LET dy=-
.5: LET dx=-1: RETURN
60 OVER 0: INK 5: GO SUB 199+p
: BEEP .005,10: BEEP .005,20: IN
K 2: GO SUB 199+p: OVER 1
80 IF c=p THEN LET sc=sc+100:
PRINT AT y1,x1;a$(c1): GO SUB 11
0
90 IF d=p THEN LET sc=sc+75: P
RINT AT y2,x2;b$(c2): GO SUB 130
95 RETURN
100 GO SUB 29+k: LET k=c: INK 3
: GO SUB 29+k: INK 2: IF P=C THE
N GO TO 7000
110 LET c=INT (RND*8)+1: GO SUB
39+c: LET x1=x: LET y1=y: LET d
x1=dx: LET dy1=dy: LET c1=1: RET
URN
120 IF P=d THEN GO TO 7000
130 LET d=INT (RND*8)+1: GO SUB
39+d: LET x2=x: LET y2=y: LET d
x2=dx: LET dy2=dy: LET c2=1: RET
URN
200 PLOT 96,152: DRAW 32,-32: P
LOT 168,152: DRAW -32,-32: RETUR
N
201 PLOT 168,152: DRAW -32,-32:
PLOT 216,128: DRAW -64,-16: RET
URN
202 PLOT 216,128: DRAW -64,-16:
PLOT 214,88: DRAW -64,16: RETUR
N
203 PLOT 214,88: DRAW -64,16: P
LOT 167,64: DRAW -32,32: RETURN
204 PLOT 167,64: DRAW -32,32: P
LOT 96,64: DRAW 32,32: RETURN
205 PLOT 96,63: DRAW 32,32: PLO
T 49,88: DRAW 64,16: RETURN
206 PLOT 49,88: DRAW 64,16: PLO
T 48,128: DRAW 64,-16: RETURN
207 PLOT 48,128: DRAW 64,-16: P
LOT 96,152: DRAW 32,-32: RETURN
1200 RETURN
1010 GO SUB 29+p
1020 LET p=p+(INKEY$="X")-(INKEY
$="Z"): LET p=p+(p=0)*8-(p=9)*8
1030 INK 6: GO SUB 29+p: INK 2
1040 IF INKEY$=" " THEN GO SUB 6
0
1100 PRINT AT y1,x1;a$(c1): LET
y1=y1+dy1: LET x1=x1+dx1: LET c1
=c1+1: IF c1=9 THEN LET r=r+1: G
O SUB 100
1110 PRINT INK 4;AT y1,x1;a$(c1)
1120 PRINT AT y2,x2;b$(c2): LET
y2=y2+dy2: LET x2=x2+dx2: LET c2
=c2+1: IF c2=9 THEN LET r=r+1: G
O SUB 120
1130 PRINT INK 3;AT y2,x2;b$(c2)
1200 IF k=p THEN GO TO 7000
1210 IF r>=l THEN PRINT AT 21,3:
"ALL Enemy Have Reached Rim": GO
TO 7000
1500 GO TO 1000
5000 INK 2: BRIGHT 1: PAPER 0: C
LS: BORDER 0: CLS
5010 PRINT INK 6;AT 0,12;"TUBEWA
R"; INK 4;AT 1,12;" "
    
```

Intelligent animal

C A Wilson,
Netherthang,
Huddersfield.

ZX-81

ARTIFICIAL INTELLIGENCE sounds fascinating, but is rarely claimed for the ZX-81. The most common form of AI, an animal-guessing game can be found in many books, written for most computers. However, studying a listing with a view to adapting it to the ZX-81 tends to leave one with the view that, without Data Read, it is simply impossible.

Not so. When "Uncle Clive" said "Who needs Data Read?" he offered a string-handling facility which, in some respects, is actually superior to the normal data-handling routines. Using string-handling allows a much simpler, neater listing. The only disadvantage is that the game would slow down if the

number of animals became too great. Dimensioning A\$ at 2000 provides sufficient space for reasonable use, but the number can be increased without risk if you wish to become wider-ranging.

How, then, does string-handling work? Simply, the string is a chain of empty boxes, of a length fixed in a Dim statement. Each box can be filled by one character of our choice. Any part of the chain can be called upon. If Q\$=BACON, the Q\$(4 TO)=ON. There are two snags to this. The first is the need to know exactly which part of the chain is required and the second is the time taken to look at each box separately.

Fortunately, the cure for the second problem is also the clue to the first problem. Before each entry in the string a pointer is placed, indicating the length of the entry. Thus, if the first entry is "an elephant", the string would be as in figure 1.

This can be used to skip quickly along the

Figure 1.

Chr\$	A	N	E	L	E	P	H	A	N	T	NFB		
11													
Q\$	1	2	3	4	5	6	7	8	9	10	11	12	13

string. To read entry 2, you read Q\$(1) — the length of entry 1 — add on the value found there, move the pointer along to this value on Q\$, and the next box — called Next Free Byte — is where the length of entry 2 will be stored.

To use this in our program, we need three entries for every animal: first, an animal; then a distinguishing question; finally, a defining answer. In each case the length of entry must be stored in front of it.

Lines 99 to 170 initialise the variables. Line 172 sends the program to the shortened version necessary for the first round of play. This is placed at the end, since it will not be used again.

(continued on next page)

SOFTWARE FILE

(continued from previous page)

The subroutine at 180 is used each time new information is written into the string. The subroutine at 500 similarly reads all information from Q\$. Notice that they are placed near the beginning for speed. Lines 510 to 540 move the pointer along the string in jumps indicated by the Chr\$ placed in NFB. When S=0, you have reached the entry you need. Line 550 then reads the number of

characters indicated in NFB. The version of the game needed for all subsequent rounds starts at line 1000.

Finally, provision is made for saving all new information when you leave the game. Line 3500 prepares to Save. When you press Newline at 3525 it will begin the Save routine leading to an auto-start. It is a good idea to record on alternate sides of the tape, so that a mistake still leaves you the last playable

version.

Once playing, do remember to answer in English. When you suggest a question, you must use a question mark. Similarly, when you name an animal, do not forget to put "a" or "an" in front of it. ZX-81 uses the information exactly as you give it, so you must be accurate. Check your spelling before you press Newline. A mistyped word is there for ever.

```

99 REM INITIALISE
101 DIM Q$(2000)
110 LET L=2
140 LET P=1
150 LET A$="AN ELEPHANT"
160 LET NFB=1
170 LET C=0
172 GOTO 2000
175 REM WRITE INTO Q$
180 LET Q$(NFB)=CHR$(LEN A$)
190 LET Q$(NFB+1 TO NFB+LEN A$)
=A$
195 LET NFB=NFB+1+LEN A$
200 LET C=C+1
205 LET N=C
210 RETURN
499 REM READ FROM Q$
500 LET P=1
505 LET S=C
510 LET S=S-1
520 IF S<=0 THEN GOTO 550
530 LET P=P+1+CODE Q$(P)
540 GOTO 510
550 LET Z$=Q$(P+1 TO CODE Q$(P)
+P)
550 RETURN
1000 PRINT "HAVE YOU THOUGHT OF
AN ANIMAL?"
1005 LET C=N-1
1010 INPUT A$
1020 IF CODE A$=62 THEN GOTO 104
0
1030 GOTO 1010
1040 IF C<1 THEN LET C=0
1044 GOSUB 500
1045 IF C=0 THEN GOTO 2117
1047 CLS
1050 PRINT ,TAB 0;Z$;
1060 INPUT A$
1070 LET C=C+1
1080 GOSUB 500
1090 IF CODE A$=CODE Z$ THEN GOT
0 1120
1100 LET C=C-4
1110 GOTO 1040
1120 LET C=C-2
1130 GOSUB 500
1140 PRINT ,TAB 0;"IS IT ";Z$;"
?"
1150 INPUT A$
1160 IF CODE A$<>62 THEN GOTO 12
00
1170 PRINT ,TAB 0;"AREN'T I CLE
VER?"
1175 FOR I=1 TO 35
1175 NEXT I
1180 GOTO 3000
1200 LET C=N
1210 GOTO 2170
2000 GOSUB 180
2005 CLS
2010 PRINT "HAVE YOU THOUGHT OF
AN ANIMAL?"
2090 INPUT A$
2100 IF CODE A$=62 THEN GOTO 211
5
2110 GOTO 2090
2115 GOSUB 500
2117 PRINT
2120 PRINT TAB 0;"IS IT ";Z$;"?"
2130 INPUT A$
2140 IF CODE A$<>62 THEN GOTO 21
70
2145 PRINT
2150 PRINT "AREN'T I CLEVER?"
2155 FOR H=1 TO 50
2155 NEXT H
2160 GOTO 3000
2170 PRINT
2180 PRINT "WHAT WAS IT?"
2190 INPUT A$
2195 LET Y$=A$
2200 PRINT "WHAT QUESTION COUL
D I ASK TO DISTINGUISH BETWEE
N ";A$;TAB 0;"AND ";Z$;"?"
2205 GOSUB 180
2210 INPUT A$
2215 GOSUB 180
2220 PRINT "WHAT WOULD THE ANS
WER BE FOR ";TAB 0;Y$;"?"
2230 INPUT A$
2235 GOSUB 180
2240 GOTO 3000
3000 CLS
3010 PRINT AT 8,3;"MAY I TRY AGA
IN?"
3020 INPUT Z$
3025 CLS
3030 IF CODE Z$=62 THEN GOTO 100
0
3499 REM SAVE
3500 CLS
3510 PRINT AT 8,5;"PLEASE PREPAR
E THE TAPE TO SAVE MY NEW INFORM
ATION."
3520 PRINT ,TAB 5;"PRESS NEWLIN
E WHEN YOU ARE READY"
3525 IF INKEY$="" THEN GOTO 3525
3530 SAVE "ANIMALS"
3535 CLS
3540 GOTO 1000

```

The machine-code loaders.

```

10 'LOADER 1
20 INPUT "ENTER START";S
30 LINE INPUT "DATA ";A$
40 PRINT A$
50 PRINT
60 POKES,VAL("&H"+LEFT$(A$,2)):A$=MID$(A$,4)
70 S=S+1:IF A$<>" " THEN 40 ELSE 30
10 'LOADER 2
20 DATA 96,BC,ETC (MACHINE CODE DATA)
30 FOR F = START TO FINISH
40 READ A$:POKEF,VAL("&H"+A$)
50 NEXT

```

The machine code.

START - 4000	4108 - B4	4214 - 8B
4000 - 96	4109 - A7	4215 - E0
4001 - 8C	4110 - 1F	4216 - 30
4002 - 81	4111 - 3A	4217 - 1
4003 - 13	4112 - 8C	4218 - 1F
4004 - 25	4113 - 6	4219 - 10
4005 - 1	4114 - 0	4220 - C4
4006 - 39	4115 - 25	4221 - 10
4007 - C6	4116 - F6	4222 - 27
4008 - 20	4117 - 35	4223 - 3
4009 - 3D	4118 - 10	4224 - 30
4010 - C3	4119 - 30	4225 - 8B
4011 - 4	4120 - 1	4226 - 10
4012 - 0	4121 - 8C	4227 - 8C
4013 - 1F	4122 - 4	4228 - 6
4014 - 1	4123 - 40	4229 - 0
4015 - 30	4124 - 25	4230 - 25
4016 - 1F	4125 - EB	4231 - E3
4017 - C6	4126 - 8E	4232 - 8E
4018 - 20	4127 - 4	4233 - 4
4019 - 96	4128 - 3F	4234 - 20
4020 - 8D	4129 - 86	4235 - 86
4021 - 27	4130 - 80	4236 - 80
4022 - 5	4131 - A7	4237 - A7
4023 - 86	4132 - 84	4238 - 80
4024 - AA	4133 - 3A	4239 - 8C
4025 - A7	4134 - 8C	4240 - 4
4026 - 84	4135 - 6	4241 - 40
4027 - 3A	4136 - 0	4242 - 26
4028 - 86	4137 - 25	4243 - F7
4029 - 9F	4138 - F8	4244 - 39
4030 - A7	4139 - 39	START = 4300
4031 - 84	START = 4200	4300 - 8E
4032 - 3A	4200 - 8E	4301 - 6
4033 - 8C	4201 - 4	4302 - 0
4034 - 6	4202 - 0	4303 - A6
4035 - 0	4203 - C6	4304 - 84
4036 - 25	4204 - 80	4305 - 81
4037 - FB	4205 - A6	4306 - 2E
4038 - 39	4206 - 84	4307 - 26
START = 4100	4207 - 81	4308 - 16
4100 - C6	4208 - AA	4309 - C6
4101 - 20	4209 - 26	4310 - 80
4102 - 8E	4210 - 5	4311 - E7
4103 - 4	4211 - E7	4312 - 84
4104 - 21	4212 - 84	4313 - E6
4105 - 34	4213 - A7	4314 - 8B
4106 - 10		
4107 - A6		

(continued on page 155)

Scramble

Tony Eccles,
Leyland,
Lancashire.

DRAGON

THIS GAME USES only 1.5K and therefore can be greatly expanded. It uses both machine code and Basic. The object of the game is to see how long you can last without crashing or being blown up by a rocket. The rocket is

CHR\$(170)

and the fuel is an inverse F. The keys used to play are the cursor keys, F and space-bar. The space-bar drops a bomb and F fires a missile. You get 20 points for hitting something with a bomb and 10 for hitting with a missile.

To load the program first type in the Basic — program 1 — that runs the game. Then

Save this on tape. Next type in one of the two loader programs and begin typing in the machine code data, it is by the side of the mnemonics in the disassembly of my game, and check it. Finally check the machine code again then Save it on tape. There is a check in the Basic program to see if you have loaded the code — line 55 — if not then the program will stop. Also the reason for all the variables at the start is that this makes the program run quicker.

The machine code routines are as follows:

- 4000 draws the landscape
- 4100 scrolls the landscape to the left
- 4200 move up the missiles
- 4300 move the bombs down
- 4400 print the score
- 4500 sound of explosion
- 4600 sound of bomb
- 4700 sound of laser
- 4800 part of the sound routines

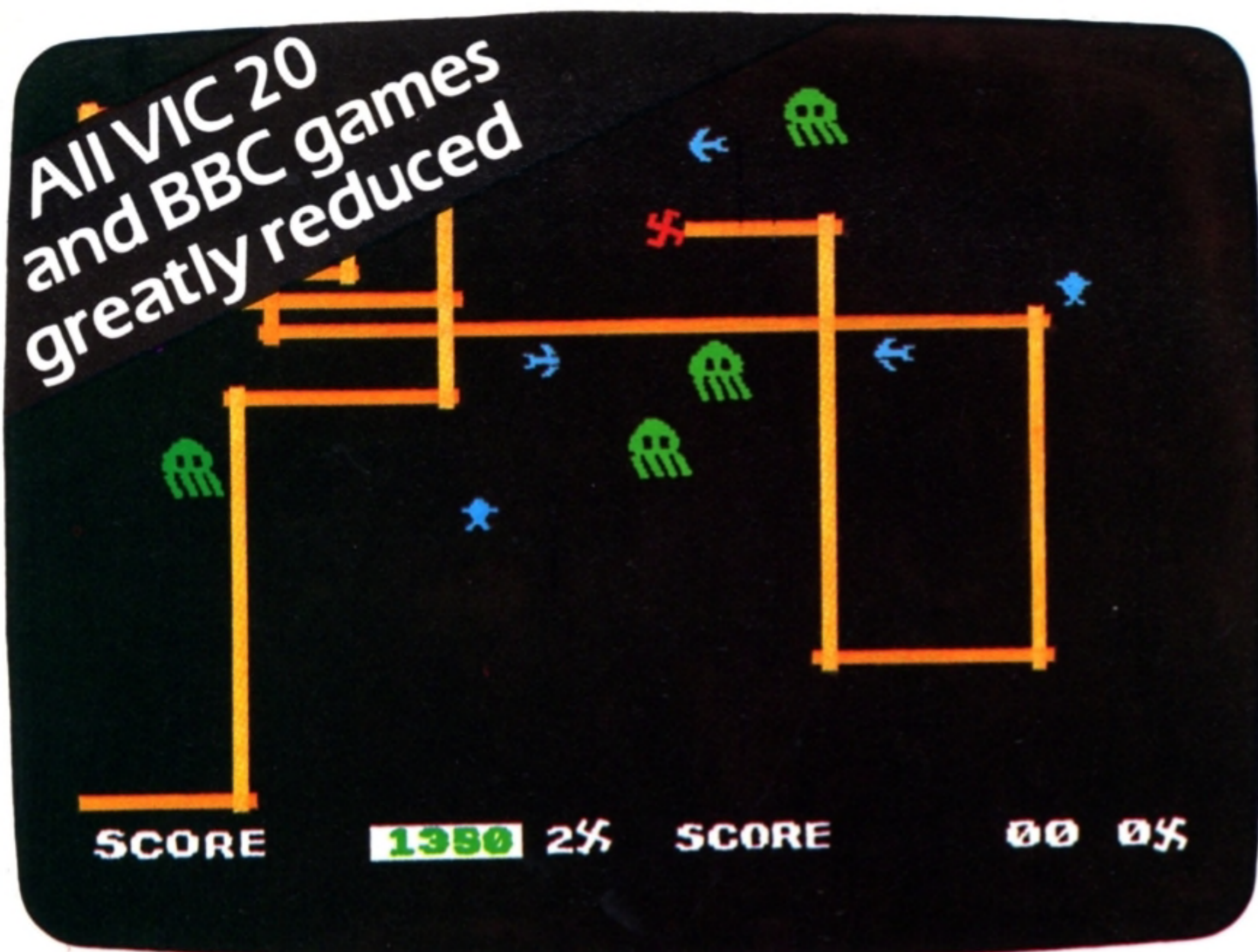
```

1 E0=4000:E1=4100:E2=4200:E3=4300:E4=4400:E5=4500:E6=4
600:E7=4700:T9=18
2 S0=0:S1=1:S2=2:S3=3:S4=4:S5=5:S6=6:S7=0.5:S8=10:S9=2
0
3 F1=341:F2=342:F3=343:F4=344:F5=345
4 L0=4024:L1=1060:L2=1024:Z1$=CHR$(128)+">=":Z2$=STRI
NG$(5,128):H8=140
5 H0=100:H1=128:H2=141:H3=170:H4=179:H5=223:H6=251:H7=
480
6 T0=32:T1=96:T2=89:T3=90:T4=45:T5=46
10 M=0
20 POKE 65315,63
30 FORF=178 TO 181:POKEF,S0:NEXT
40 CLS S0:PRINT@S0,"score";:PRINT@S9,"ships"S3-M;
50 B=20:X=200
55 IF PEEK(4037)<>248 THEN PRINT:PRINT"PLEASE LOAD THE
MACHINE CODE.":END
60 POKE H8,RND(S8)+S6:POKE H2,RND(S2)-S1:IF RND(S0)>S7
THEN POKE L0,S6 ELSE POKE L0,H3
70 EXEC E0
80 EXEC E1
90 PRINT@X-S1,Z1$;

```

(continued on page 155)

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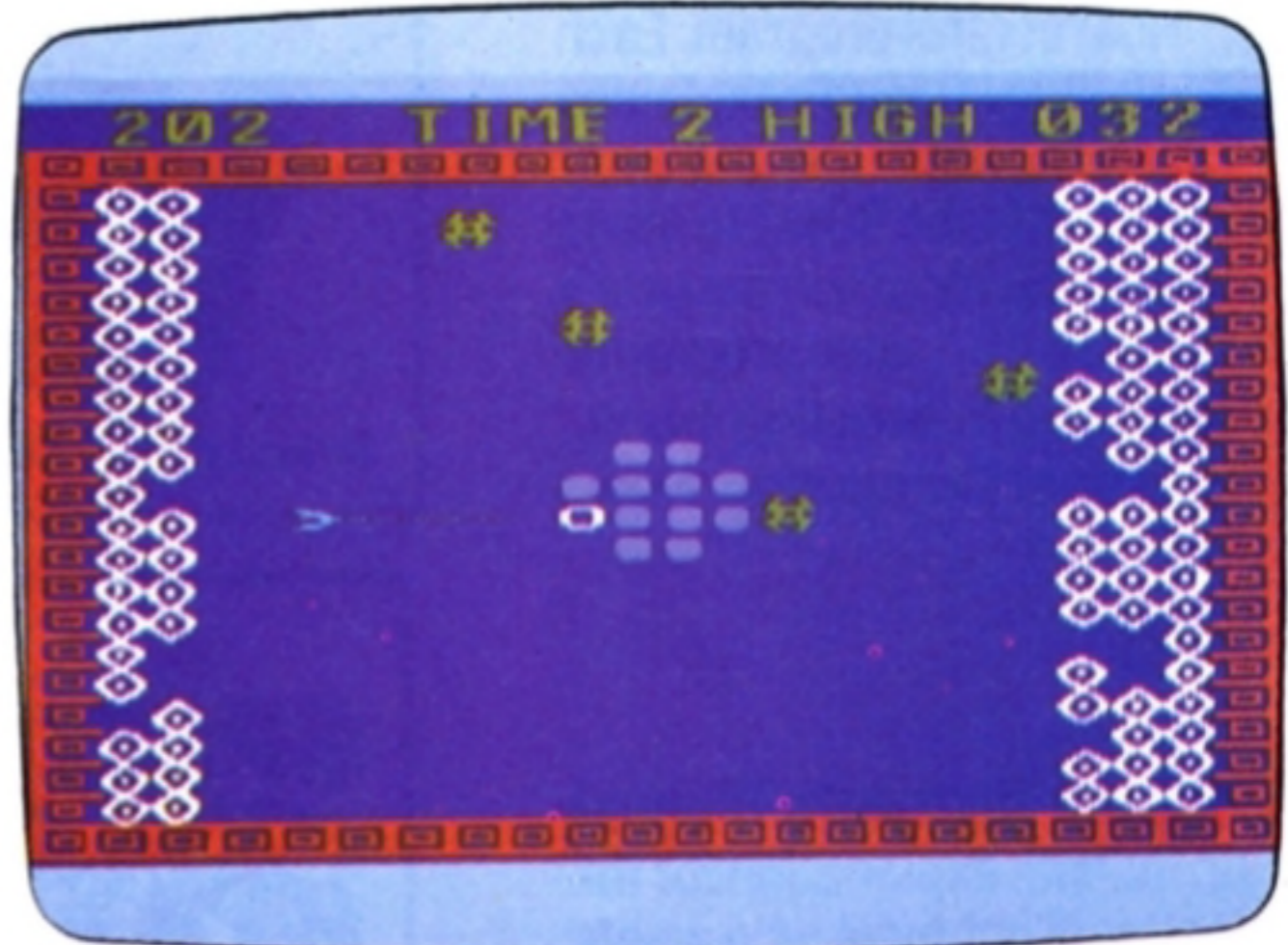
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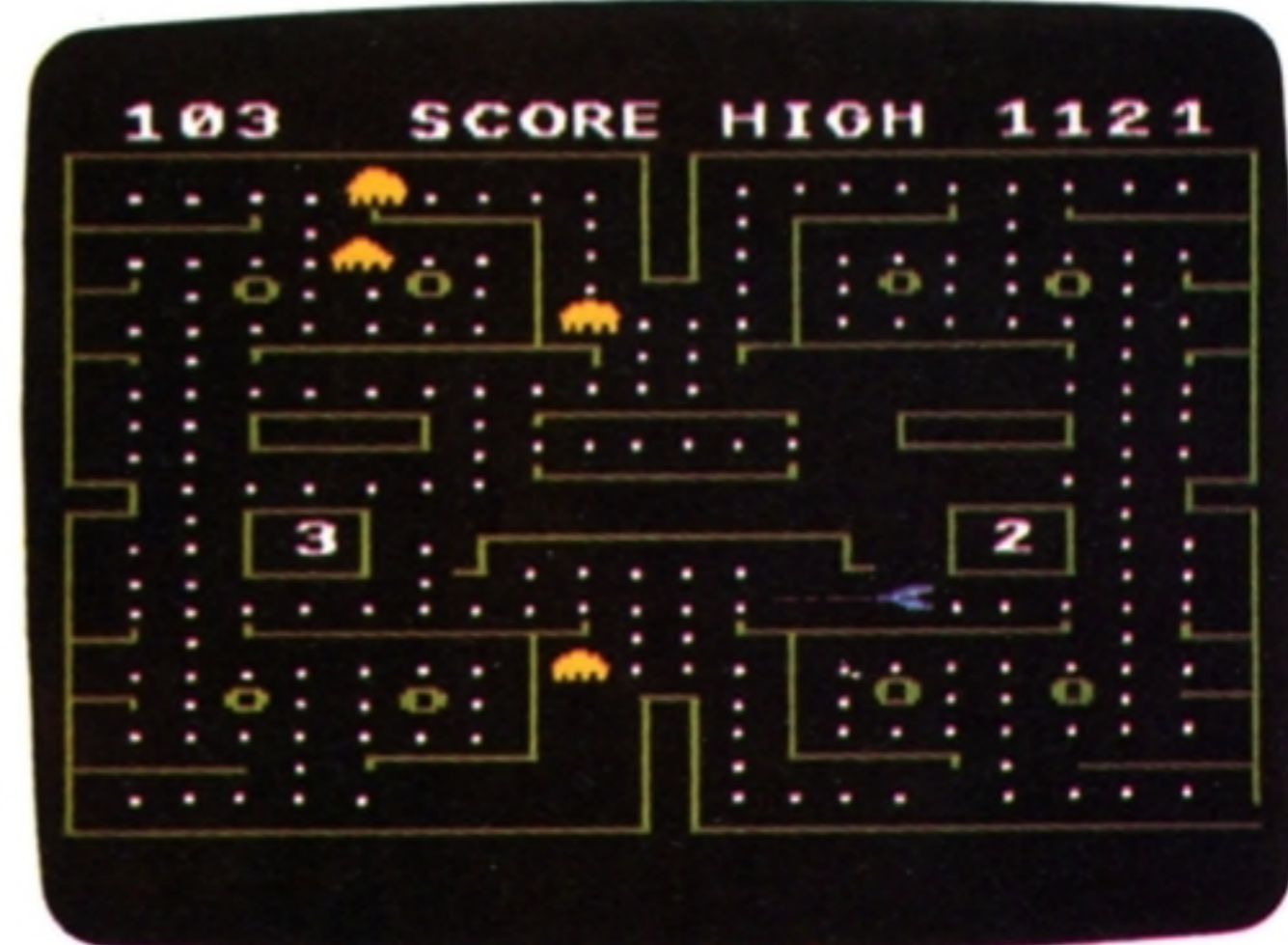
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SOFTWARE FILE

(continued from page 152)

```

4315 - 22      4503 - A6      START = 4700
4316 - C1      4504 - B4      4700 - C6
4317 - B0      4505 - 97      4701 - 4
4318 - 27      4506 - 8C      4702 - 96
4319 - 8        4507 - F6      4703 - 8C
4320 - 96      4508 - 1        4704 - 8B
4321 - B3      4509 - 13      4705 - 4F
4322 - 8B      4510 - D7      4706 - 97
4323 - 14      4511 - BD      4707 - 8C
4324 - 97      4512 - 56      4708 - BD
4325 - B3      4513 - D7      4709 - BA
4326 - 86      4514 - BE      4710 - D4
4327 - 80      4515 - BD      4711 - BD
4328 - A7      4516 - 12      4712 - BA
4329 - 8B      4517 - C0      4713 - D6
4330 - 22      4518 - 30      4714 - 5A
4331 - 30      4519 - 1        4715 - 26
4332 - 1F      4520 - 8C      4716 - F1
4333 - 8C      4521 - 6        4717 - 39
4334 - 4        4522 - 0        4718 - 5A
4335 - 0        4523 - 26      4719 - 26
4336 - 24      4524 - 1        4720 - ED
4337 - DD      4525 - 39      4721 - 39
4338 - 39      4526 - 7E
START = 4400  4527 - 11      START = 4800
                4528 - 97      4800 - BD
4400 - DC      START = 4600  4801 - BA
4401 - B4      4600 - C6      4802 - D4
4402 - D3      4601 - D0      4803 - 96
4403 - B2      4602 - D7      4804 - BD
4404 - DD      4603 - 8C      4805 - BD
4405 - B4      4604 - D7      4806 - BA
4406 - F        4605 - BD      4807 - D6
4407 - B3      4606 - D7      4808 - BD
4408 - BD      4607 - BE      4809 - BA
4409 - 95      4608 - BD      4810 - D4
4410 - 7A      4609 - 12      4811 - 96
4411 - 39      4610 - C0      4812 - BE
START = 4500  4611 - 5C      4813 - BD
4500 - BE      4612 - 26      4814 - BA
4501 - 5        4613 - F4      4815 - D6
4502 - C0      4614 - 39      4816 - 39
    
```

(continued from page 152)

```

100 R=X
110 IF PEEK(F1)=H5 AND X>T1 THEN X=X-T0:GOTO 160
120 IF PEEK(F4)=H5 AND B>T9 THEN B=B-S1:X=X+S1:GOTO 160
0
130 IF PEEK(F3)=H5 AND B<S9 THEN B=B+S1:X=X-S1:GOTO160
140 IF PEEK(F2)=H5 AND X<H7 THEN X=X+T0:GOTO 160
150 GOTO 170
160 PRINT@R-S2,Z2$;
170 IF PEEK(F5)=H5 THEN POKE X+L1,T5:EXEC E6
180 EXEC E3
190 IF PEEK(F4)=H6 THEN 290
200 EXEC E2
210 D=L2+X
220 F=S0
225 I=PEEK(D+F):IF I<H0 OR I>H1 THEN F=T2
226 F=F+S1:IF F<4 THEN 225
250 IF F>T2 THEN 350
260 IF PEEK(H4)=S0 THEN 60
270 PRINT@S5,"";:EXEC E4
280 GOTO 60
290 D=L2+X
300 F=S4
310 IF PEEK(F+D)<>H1 THEN POKEF+D,H1:POKE H4,S8:F=T3:A
M=AM+S8:GOTO 330
320 POKEF+D,T4:FORH=1 TO 10:NEXT:POKEF+D,H1
330 EXEC E3:EXEC E7:F=F+S1:IF F<=B THEN 310
340 GOTO 200
350 PRINT@X,"xxxx";:FOR F=1 TO 10:EXEC E5:NEXT
360 M=M+S1:IF M>S3 THEN PRINT@T0,">GAME OVER<";:END
370 FORF=1 TO 1000:NEXT
380 GOTO 40
    
```

Mini synthesiser

Adam Barnes,
Huntingdon,
Cambridgeshire.

BBC

THIS PROGRAM is for a mini synthesiser using the BBC Model A or B. It will allow the user to key music directly from the keyboard, with four note variations and six different rhythm accompaniments. The pattern of the keys used to play music similar to the arrangement on a normal keyboard instrument, thus:

Black notes: S D G H J

White notes: Z X C V B N M ?

Two octaves may be accessed. Holding down the Shift key engages the top octave. Pressing one of the keys f0 to f3 changes the sound of the note played, thus:

f0: Ping-type tone.

f1: Ping-type tone with long echo.

f2: Fantasy-type vibrato sound.

f3: Vibrato with echo.

Chords — this being a main feature of the program — of two or three notes may be played. Auto-rhythm accompaniment is turned on or off with Tab and the rhythm required by one of the keys f4 to f9, thus:

f4: Rock rhythm version 1.

f5: Rock rhythm version 2.

f6: Rock rhythm version 3.

f7: Waltz.

f8: Fast swing.

f9: Slow march.

If auto-rhythm is on when a rhythm is selected that rhythm will commence at the beginning of the next bar. I would advise serious users of this program to fit a hardware modification so that the internal sound may be amplified — you will soon find the internal speaker inadequate. If, like me, you use a hi-fi amplifier then playing Acornsoft Planetoid once will convince you that the job was worth it.

```

5 REM FOR £ READ HASH CHARACTER
10REM ***SYNTHESISER***
20REM A.BARNES 1983
30*TV255
40ENVELOPE1,0,0,0,0,0,0,0,120,-1,-1,-5,120,110
50ENVELOPE2,0,0,0,0,0,0,0,126,-10,-1,-1,126,96
60MODE7:RESTORE:PROC MC:PROCINS
70R%=590:J%=0
80FORA%=0TO12:READB%:A%?&C80=B%:NEXT
90FORA%=0TO3:SOUND&10+A%,0,0,1:NEXT
100CALL&C00:Z%=INKEY(-1)*-48:IF?&70<255SOUND&11,1,?&70*4+48+Z%,1
110IF?&71<255SOUND&12,1,?&71*4+48+Z%,1
120IF?&72<255SOUND&13,1,?&72*4+48+Z%,1
130IFADVAL(-5)>OREADA%,B%,C%:SOUND0,-J%*A%,B%,C%:IFC%=ORESTORER%
140IFINKEY(-97)J%=NOT(J%):RESTORER%:FORI%=0TO999:NEXT
150IFINKEY(-21)R%=590
160IFINKEY(-117)R%=650
170IFINKEY(-118)R%=710
180IFINKEY(-23)R%=760
190IFINKEY(-119)R%=820
200IFINKEY(-120)R%=860
210IFINKEY(-33)ENVELOPE1,0,0,0,0,0,0,0,120,-1,-1,-5,120,110
220IFINKEY(-114)ENVELOPE1,2,0,0,0,0,0,0,120,-1,-1,-1,120,110
230IFINKEY(-115)ENVELOPE1,1,2,-2,1,2,4,4,120,-1,-1,-2,120,110
240IFINKEY(-116)ENVELOPE1,2,1,-1,1,2,4,2,120,-1,-1,-5,120,110
250GOTO100
260DEFPROC MC
270FORO%=0TO2STEP2:P%=&C00
280LOPT O%
290LDA&0:STA&74:STA&75:LDA&255:STA&70:STA&71:STA&72
300.B LDX&75:LDA&C80,X:TAX:LDY&255:LDA&81
310JSR&FFF4:CPX&0:BEQ A:LDX&74
320LDA&75:STA&70,X:INX:STX&74
330CPX&3:BNE A:RTS
340.A INC&75:LDA&75:CMP&13:BNE B:RTS:J:NEXT
350ENDPROC
360DEFPROCINS
370PRINTCHR$141;"SYNTHESISER"
380PRINTCHR$141;"SYNTHESISER"
390PRINTCHR$130;"Keyboard Layout:"
400PRINTCHR$131;" "
410PRINT"Black notes: S D G H J"
420PRINT"White notes: Z X C V B N M ,"
430PRINTCHR$130;"Function Keys:"
440PRINTCHR$131;" "
    
```

(continued on page 159)

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Software

The MTX's 16k ROM contains several languages and routines which enable the novice or the experienced programmer to make full use of the machine. Standard languages are MTX BASIC, LOGO type commands, and NODDY. ROM routines include an ASSEMBLER/DISASSEMBLER with screen display of the Z80 CPU registers, memory and program, which can be manipulated from the keyboard. Machine code programs can be stepped through one instruction at a time, and easily called from within BASIC programs. A further feature is the Virtual Screen facility which enables the programmer to define sections of the screen to work independently whilst maintaining all full screen facilities. Pascal is available as an add-on ROM pack.

Hardware

The MTX500 has 32k of user RAM as standard (64k on the 512), expandable to 512k plus 16k of dedicated video RAM. Sixteen colours, 40 column text, 256 x 192 high resolution graphics with all sixteen colours available, and easily moveable user defined graphics (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are centronics



printer port, two joystick ports, an uncommitted I/O port, 2400 Baud Cassette port, separate TV and Video Monitor ports, 3 voice sound with hifi output plus a dedicated games cartridge port.

Other standard features include the Z80A processor running at 4MHz, real time clock, full moving key keyboard with 79 keys including eight function keys and separate numeric pad.

The Disc Based System

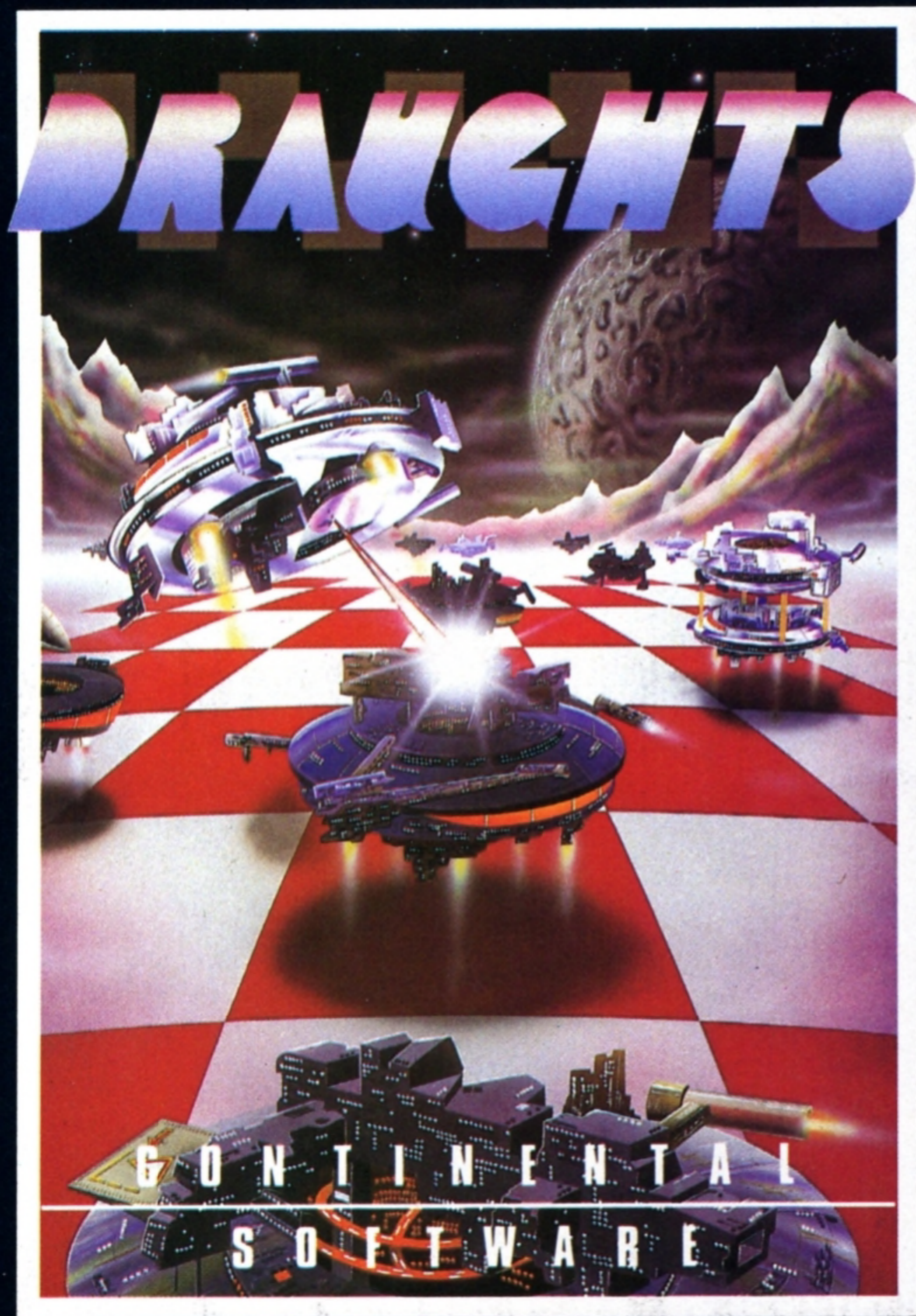
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Software for the
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SERIES

(continued from page 155)

```

450PRINT"f0:'Ping'type tone from keys."
460PRINT"f1:'Ping'type tone with long echo."
470PRINT"f2:Fantasy;fast vibrato sound."
480PRINT"f3:Medium vibrato-echo."
490PRINT"f4:Rock rhythm 1."
500PRINT"f5:Rock rhythm 2."
510PRINT"f6:Rock rhythm 3."
520PRINT"f7:Waltz."
530PRINT"f8:Fast swing."
540PRINT"f9:Slow march."
550PRINT"TAB:Auto rhythm on/off."
560PRINT"SHIFT:Hold down to engage top octave."
570PRINT"CHR$136;**** PLAY NOW ****:ENDPROC
580DATA-98,-82,-67,-51,-83,-100,-84,-101,-85,-86,-70,-102,-103
590DATA2,6,3,0,0,1,2,6,2,0,0,2,2,4,2,0,0,2,2,6,2,0,0,2
600DATA2,6,2,0,0,2,2,6,2,0,0,2,2,4,1,0,0,1,2,4,1,0,0,1,2,4,1,0,0,1,
2,4,1,0,0,1
610DATA2,6,2,0,0,2,2,6,2,0,0,2,2,4,2,0,0,2,2,6,2,0,0,2
620DATA2,5,1,0,0,1,2,5,1,0,0,1,2,5,1,0,0,1,2,5,1,0,0,1
630DATA2,6,1,0,0,1,2,6,1,0,0,1,2,6,1,0,0,1,2,6,1,0,0,1
640DATA0,0,0
650DATA2,6,3,0,0,1,2,6,2,0,0,2,2,4,2,0,0,2,2,6,1,0,0,1,2,4,1,0,0,1

```

```

660DATA2,6,1,0,0,1,2,4,1,0,0,1,2,6,2,0,0,2,2,4,3,0,0,1,2,6,2,0,0,2
670DATA2,6,2,0,0,2,2,6,2,0,0,2,2,4,2,0,0,2,2,6,2,0,0,2
680DATA2,5,1,0,0,3,2,5,1,0,0,1,2,5,1,0,0,1
690DATA2,6,1,0,0,3,2,6,1,0,0,1,2,6,1,0,0,1
700DATA0,0,0
710DATA2,6,3,0,0,1,2,6,2,0,0,2,2,4,2,0,0,2,2,6,1,0,0,1,2,4,1,0,0,1
720DATA2,6,3,0,0,1,2,6,2,0,0,2,2,4,2,0,0,2,2,6,1,0,0,1,2,4,1,0,0,1
730DATA2,6,3,0,0,1,2,6,2,0,0,2,2,4,2,0,0,2,2,6,1,0,0,1,2,4,1,0,0,1
740DATA2,5,3,0,0,5,2,5,3,0,0,3,2,6,1,0,0,1
750DATA0,0,0
760DATA2,6,2,0,0,2,2,4,2,0,0,2,2,4,2,0,0,2
770DATA2,6,2,0,0,2,2,4,2,0,0,2,2,4,2,0,0,2
780DATA2,6,2,0,0,2,2,4,2,0,0,2,2,4,2,0,0,2
790DATA2,5,1,0,0,1,2,5,1,0,0,1,2,5,1,0,0,1
800DATA2,5,1,0,0,1,2,5,1,0,0,1,2,5,1,0,0,1
810DATA0,0,0
820DATA2,6,2,0,0,2,2,4,2,0,0,2,2,6,1,0,0,1,2,6,1,0,0,1
830DATA2,4,2,0,0,2,2,6,1,0,0,1,2,6,1,0,0,1
840DATA2,4,2,0,0,2,2,5,2,0,0,2,2,5,2,0,0,2
850DATA0,0,0
860DATA2,4,8,0,0,4,2,4,2,0,0,2,2,4,2,0,0,2,2,4,2,0,0,2
870DATA2,6,4,0,0,4,2,4,2,0,0,2,2,4,2,0,0,2,2,4,2,0,0,2,2,4,2,0,0,2
880DATA2,5,3,0,0,5,2,6,3,0,0,5
890DATA0,0,0

```

Tron II

H Singh,
Birmingham.

VIC-20

THIS IS A TWO-PLAYER game of skill based on the light-cycle game in the film Tron. It runs on the unexpanded Vic-20 and uses the Vic's sound and high-resolution graphics facilities to the full. The two players play the roles of Tron and the MCP and the objective of the game is to move along the grid trying to trap the opponent while avoiding the walls and trails. The first player to win 10 rounds wins the game.

Tron, who leaves the blue trail, uses the Commodore and Shift keys. The MCP, who leaves the red trail, uses the cursor keys. The keys move you anti-clockwise or clockwise by 90°.

The program has two parts; the initialisation program which sets up the graphics and the main program which plays the game. Type in both programs and Save them before running. The structure of the main program is as follows:

- 10 Changes screen colour and sets up the variables
- 15 to 45 Set up graphic screen
- 70 to 95 Tron keyboard entry and check for crash
- 100 to 125 MCP keyboard entry and check for crash
- 500 to 630 Movement routines
- 1000 to 2010 Crash routines
- 2340 to 2900 Print winner and ask for replay

Death worm

K R Littlefield,
Carshalton,
Surrey.

ZX-81

DEATH WORM IS A variation on the arcade game Centipede. Most of the action is performed by machine-code routines thus making the game fast.

There are four main machine-code routines — move worm, move base and fire, move bombs and the master program.

First, you must reserve some space for the code. Do this by entering:

- 1 REM (95 x's)
- 2 REM (98 x's)
- 3 REM (74 x's)
- 4 REM (24 x's)

then enter the code loader — listing 1. Run
(continued on page 167)

```

25 REM*INITIALISATION*
30 REM*****
35 PRINTCHR$(142)CHR$(8)
40 POKE52,28:POKE56,28:FORI=28TO57:FORJ=0TO7:READN:POKE7168+8*I+J,N:NEXT:NEXT
45 END
50 DATA198,230,246,222,206,198,198,198
55 DATA126,126,16,16,24,24,24,24,248,200,200,248,240,216,216,216
60 DATA252,252,204,204,204,204,252,252,0,0,0,0,0,0,0
65 DATA0,24,24,0,0,24,24,0,198,238,254,214,198,198,198,198
70 DATA254,254,198,192,192,198,254,254,252,252,204,204,252,192,192,192
75 DATA12,12,12,255,255,12,12,24,36,66,90,219,219,66,126
80 DATA126,66,90,90,219,195,36,24,12,252,130,185,185,130,252,12
85 DATA12,63,65,157,157,65,63,12,4,4,168,168,169,169,40,40
90 DATA40,40,42,42,106,106,4,4,4,4,42,42,106,106,40,40
95 DATA40,40,168,168,169,169,4,4,4,4,170,170,170,170,4,4,40,40,40,40,105,105,40
40
100 DATA126,126,102,102,102,102,126,126,56,56,24,24,24,24,60,60
105 DATA126,126,6,126,126,96,126,126,126,6,126,126,6,126,126
110 DATA96,96,108,108,126,126,12,12,126,126,96,126,126,6,126,126
115 DATA126,126,96,126,126,102,126,126,126,102,12,24,48,48
120 DATA126,126,102,126,126,102,126,126,126,102,126,126,6,126,126

```

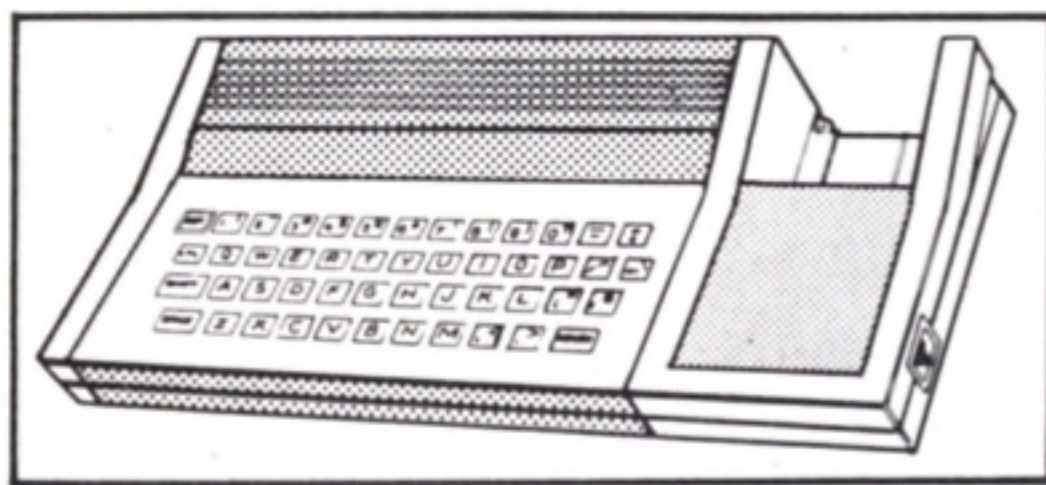
```

1 REM* TRON II *
3 REM* MAIN PROGRAM *
4 REM*****
5 POKE36878,10:POKE36869,255:CLR:PRINTCHR$(147)CHR$(8)
10 POKE36879,24:POKE36865,200:CO=30720:M=7904:T=7970:T1=1:M1=1:PRINT"J"
15 FORI=7724TO8163:POKEI,37:POKEI+CO,0:NEXT
20 POKE7702,44:POKE7702+CO,12:POKE7723,42:POKE7723+CO,12:POKE8164,43:POKE8164+CO,12
25 POKE8185,45:POKE8185+CO,12
30 FORI=7703TO7722:POKEI,46:POKEI+CO,12:POKEI+462,46:POKEI+462+CO,12:NEXT
35 FORI=7724TO8142STEP22:POKEI,47:POKEI+CO,12:POKEI+21,47:POKEI+21+CO,12:NEXT
40 POKEM-1,46:POKEM-1+CO,10:POKEM,40:POKEM+CO,0:POKET-1,46
43 POKET-1+CO,14:POKET,40:POKET+CO,0
45 POKE198,0:PRINT"#####!"+CHR$(34)+"###!"
50 POKE36865,38:PRINT"J"TAB(7)TSTAB(17)MS
70 POKE36876,225:A=PEEK(653)
80 IFA=2THENT2=-22*(T1=-1)+1*(T1=-22)+22*(T1=1)-1*(T1=22):GOTO90
85 IFA=1THENT2=-22*(T1=1)-1*(T1=-22)+22*(T1=-1)+1*(T1=22):GOTO90
88 T2=T1
90 IFPEEK(T+T2)<>37THEN1000
95 GOSUB500:POKE36876,0:T1=T2
100 B=PEEK(197)
105 IFB=31THENM2=-22*(M1=-1)+1*(M1=-22)+22*(M1=1)-1*(M1=22):GOTO118
115 IFB=23THENM2=-22*(M1=1)-1*(M1=-22)+22*(M1=-1)+1*(M1=22):GOTO118
116 M2=M1
118 IFPEEK(M+M2)<>37THEN2000
125 GOSUB600:M1=M2:GOTO70
500 RESTORE
505 READA,B,P,CH
510 IFT1=AANDT2=BTHENPOKET,P:POKET+CO,14:T=T+B:POKET,CH:POKET+CO,0:RETURN
520 GOTO505
530 DATA1,1,46,40,-1,-1,46,41,22,22,47,39,-22,-22,47,38
535 DATA1,-22,45,38,1,22,42,39,-1,-22,43,38,-1,22,44,39
540 DATA22,-1,45,41,22,1,43,40,-22,-1,42,41,-22,1,44,40
600 RESTORE
610 READA,B,P,CH
620 IFM1=AANDM2=BTHENPOKEM,P:POKEM+CO,10:M=M+B:POKEM,CH:POKEM+CO,0:RETURN
630 GOTO610
1000 POKET+CO,2:POKE36874,200:FORI=1TO4000:NEXT:POKE36874,0:POKE36876,0:MS=MS+1
IFMS=10THEN2500
1010 GOTO10
2000 POKEM+CO,2:POKE36874,200:FORI=1TO4000:NEXT:POKE36874,0:TS=TS+1:IFTS=10THEN
2500
2010 GOTO10
2340 IFMS>TSTHENPRINT"THE "CHR$(34)"###"
2350 IFTS>MSTHENPRINT"J!"
2360 GOTO2800
2500 PRINT"J"
2510 PRINT"#####!"
2525 PRINT"#####!"
2530 PRINT"#####!"
2540 IFMS>TSTHENPRINT"THE "CHR$(34)"###"
2560 IFTS>MSTHENPRINT"J!"
2800 PRINT"#####!"
2810 GETA$:IFA$="Y"THENRUN
2820 IFA$<>"N"THEN2810
2900 SYS64802

```

HOME COMPUTERS

20K AQUARIUS



AQUARIUS: The brand new Aquarius Personal Computer is part of Mattel Electronics latest developments in advanced technology and offers full home computing facilities, as well as extensive game play, using a very wide range of plug in cartridges. Since Aquarius is a Mattel Electronics product, it benefits by the company's wide experience of producing high

technology equipment, as well as their game programming expertise which is evident from the advanced games which have been produced for the Intellivision. Aquarius costs £99 and comes with microsoft basic built in. It is so simple to use that you'll be writing your first programs within minutes of taking the machine out of its box. You can even record the programs on your own cassette recorder at home, so you can use them again at a later date. Most available domestic tape recorders are compatible with the Aquarius.

A POWERFUL MACHINE: For all its simplicity, it is also very sophisticated. It has a 280A processor and it comes with 8K of built in ROM and 20K of RAM, expandable to 52K. It has a display of 40x 24 characters, and a graphic resolution of 320x 192 with a total character set of 256 (including the complete ASCII set with upper and lower case letters, numbers and additional graphic symbols). The keyboard has 49 full stroke moving keys, unlike some of the cheaper machines which have membrane keyboards. The size of the machine (excluding any of the additional peripherals), is 13" x 6" x 2".

PERIPHERALS: It is very easy to increase the capabilities of your Aquarius as all the peripherals plug straight into one another. You can add a Printer, a Modem, a Data Recorder, Mini Expander and other items. All of the peripherals are very easy to install and what is more, they're easy to use. But the best news of all is, they're easy to afford.

CPM OPERATING CAPABILITY: The Aquarius is capable of being expanded to 52K RAM and later in 1983 a disk drive will be available for it, with the commercial CPM business operating system. This will allow you access to one of the largest software libraries in the world, with literally hundreds of programs available for you to use.

CARTRIDGES: Various sophisticated programs will be launched on plug in cartridges such as a Visicalc type spreadsheet and a word processor. In addition there will be dozens of games and utilities and alternative languages such as Logo, which combined with the built in microsoft basic gives an unbeatable combination of high quality programming ability.

20K MATTEL AQUARIUS - £86 + VAT = **£99**

ATARI 400/800



NEW LOW PRICES

ATARI 400/800: With the Atari Personal Computers, you can play the ultimate in T.V. games, teach yourself new subjects or skills, balance budgets, and even write your own computer programs in Basic.

SPECIFICATIONS: Both the Atari 400 and 800 can display in up to 16 colours, each with 16 intensities. They have four independent sound synthesizers for music tunes/game sounds, giving four octaves with variable volume and tone control on your T.V.'s speaker. The display graphics

are of amazing quality, having a detailed resolution of 320 x 192, comprising 24 lines of 40 characters. Atari personal computers have a standard 10K ROM operating system. In addition the standard Atari 400 (£129) comes with 16K of RAM and the expanded version with 48K (£178). The Atari 800 (£279) comes with 48K as standard. Both the 400 and 800 are now supplied with a FREE £40 Basic Programming Kit, which includes the Basic Programming Cartridge, as well as a 120 page Basic Reference Manual and the 184 page Self Teaching Manual by Bill Carris called 'Inside Atari Basic', so you can begin programming straight away, without buying any 'extras'. Even a mains plug is supplied!

OVER 500 PROGRAMS AVAILABLE: The Atari computers are supported by well over 500 programs available for your use, a larger selection than you will find on any other television game or home computer! The wide selection puts Atari way ahead of the competition. Just fill in the coupon and we will be pleased to send you a full price list which gives details of our range of software available for entertainment, home education, programming and home office use. We think you'll agree when we say it's quite impressive.

100 FREE PROGRAMS FROM SILICA SHOP: If you buy your Atari Home Computer from Silica Shop, you will receive a FREE presentation pack of 6 cassettes, containing 100 programs including games, utilities and demonstrations. A 16 page booklet giving full details of all of these programs is available on request. If you have already purchased your computer elsewhere you can buy the set of 6 cassettes for £30. What's more, Silica Shop offer a two year guarantee on all computers as well as a FREE joystick. This adds up to a great offer that we believe can't be beaten or matched by any of our competitors.

ATARI 400 WITH 16K £129
 ATARI 400 WITH 48K £178
 ATARI 800 WITH 48K £279

£129

VIDEO GAMES

COLECOVISION



THE SYSTEM: The CBS Colecovision offers new standards in video game play. The excellent graphics are well implemented with arcade titles such as Zaxxon, Lady Bug, Gorf, Wizard of Wor, Carnival, Mouse Trap and the lovable Smurfs. The console comes supplied with a three screen arcade quality version of DONKEY KONG. Parker and other companies have also announced ranges of cartridges for Colecovision, to further enhance the wide range of quality titles available for this new television games machine.

THE CONSOLE: The CBS Colecovision video games system has advanced technology which produces superlative graphics resolution and excellent sound effects. The styling of the console and hand controllers has been carefully researched; the console is designed to complement modern hi-tech equipment, and has clear features for easy operation. The hand controllers allow fingertip control via the 8 direction joystick, and feature 2 independent fire buttons. The push button keyboard is used for game selection and for game control with some cartridges. The hand controllers are detachable and are connected to six feet of telephone coil cable, storing neatly away in the console when not in use.

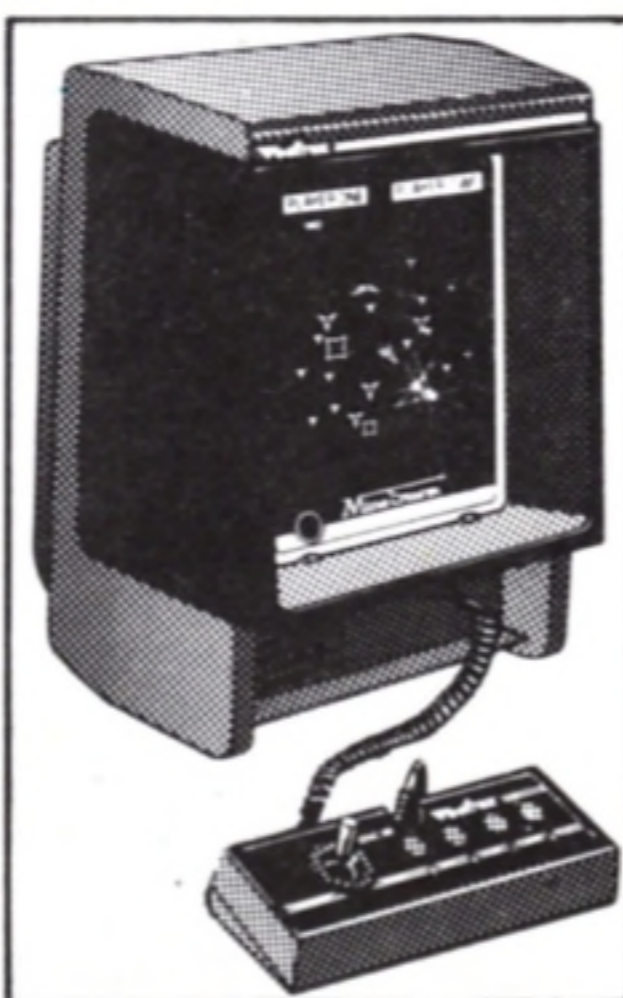
ATARI EXPANSION MODULE: The Atari converter module allows Atari VCS software cartridges to be played on the Colecovision console, allowing owners the freedom to purchase from the extensive range of Atari compatible cartridges. It also means that existing Atari owners can buy the CBS Colecovision games system without discarding their software library. Silica Shop offer part exchange facilities if you wish to upgrade.

TURBO EXPANSION MODULE: The Turbo Driver Expansion Module allows you to actually drive the vehicle that appears on your T.V. screen. The module consists of a steering wheel, dashboard and accelerator pedal. One hand controller is mounted on the dashboard to provide a gear change unit. The module comes complete with a Turbo Driver cartridge, the first of several cartridges to make use of the module, which provides all the action of sitting in the driving seat. This facility is unique to CBS Colecovision.

HOME COMPUTER EXPANSION MODULE: The Home Computer Module scheduled for late 1983, allows conversion of the games unit into a sophisticated Home Computer. This flexibility of design is an important feature of the CBS Colecovision System.

COLECOVISION - £127.82 + VAT = **£147**

VECTREX



THE SYSTEM: Vectrex is a totally unique Home Arcade System, which has been exclusively designed and engineered to duplicate real arcade game play. Complete with its own monitor display, Vectrex won't cause any arguments over the use of the family's television because it has its own built in screen.

THE SCREEN: Vectrex does not use ordinary display techniques, instead it uses vector scanning to control the images on the screen. With this scanning method, the gun only updates the area of the screen that has changed, whereas a normal T.V. re-transmits the ENTIRE screen 50 times a minute. It is this that gives Vectrex its speed, and means that very little computer power is required for screen control, and the results provide very fast responding and clear images. These 'Vector Graphics' are used in several arcade games such as Asteroids and Battlezone, to give you incredibly high resolution and quality. Vectrex brings all of this from the arcade right into your living room. The Vectrex screen is capable of displaying 80 columns by 40 lines, which is significant to the extensive developments planned for the system.

EXCITING SOUNDS AND ELECTRONICS: Vectrex has an advanced microprocessor with more speed and power and exciting effects than many home video games systems.

REAL ARCADE CONTROLS: Vectrex has a unique control panel, similar to those used in many real arcade games, with 4 concave action buttons and a full 360° self centering joystick. This control panel has a 4 foot detachable cord for maximum player freedom.

REAL ARCADE GRAPHICS: Vectrex has its own 9 inch vertical screen and unlike a conventional T.V. screen, uses advanced display technology to achieve brilliant, high resolution imagery and superb game play never before possible. The Vectrex display provides special effects too, such as 3-D rotation and zooming in and out, which a regular T.V. cannot match. Using a black and white monitor, each Vectrex game comes supplied with its own coloured plastic screen overlay to add to the excitement of game play. The range of Vectrex cartridges (£19.95 each), gives a good selection of arcade games such as Berzerk, Scramble, Rip-Off and Bomber Attack. Vectrex comes complete with a fast paced 'Minestorm' game built into memory.

VECTREX: Vectrex has an advanced state-of-the-art microprocessor with more speed than other T.V. games.

VECTREX - £112.17 + VAT = **£129.00**

WHO ARE SILICA SHOP?

Silica Shop are one of the leading specialist suppliers of Video Games & Personal Computers. We consider that our service, to those who already own or to those who are interested in any products in our range, cannot be matched by any other supplier. Just look at what we have to offer:

- * **SHOP DEMONSTRATION FACILITIES** - we provide full demonstration facilities at our shop in Sidcup, so that you can get 'hands on' experience of our range.
- * **SHOP OPENING HOURS** - we are open from Monday to Saturday 9 am - 5.30 pm, but close at 1 pm on Thursday's and 8pm on Friday's.
- * **MAIL ORDER** - we are a specialist mail order company and are able to supply goods direct to your door at no extra cost.
- * **FREE FIRST CLASS DELIVERY** - all orders are sent Post and Packing FREE, most of them being dispatched by FIRST CLASS POST within 24 hours of us receiving your order details. If you require overnight delivery, this can be arranged at a charge of £3 for items under £50, or alternatively £5 for items over £50.
- * **MONEY BACK UNDERTAKING** - if you are totally dissatisfied with your purchase, you may return it to us (in good condition) within 15 days for a full refund.
- * **PART EXCHANGE** - we will offer you up to one third of our current selling price in part exchange on your old Mattel Intellivision or Atari console (and related cartridges), if you decide to buy a new video game or personal computer from us.
- * **SECONDHAND GOODS** - we sell secondhand Mattel & Atari consoles/cartridges (with a full 1 year guarantee), at two thirds of our normal retail price.
- * **COMPETITIVE PRICES** - both our prices and service are very competitive. We are never knowingly undersold and will normally match any bona fide price quoted by our competitors, providing they actually have the goods in stock. We will also send the order to you post and packing free!
- * **HELPFUL ADVICE** - our specialist sales staff are always available to give you advice on the suitability of various computers or T.V. games.
- * **SERVICE/REPAIRS** - are available on all machines in our range, often utilising our in house service facilities. We will support your machine long after you buy it.
- * **ATARI SERVICE CENTRE** - we are now an authorised Atari service centre and can therefore accept repairs on all Atari equipment (TV Games and Computers) even if you did not originally purchase it from Silica Shop. All repairs during the manufacturers 1st year warranty period will be completed FREE OF CHARGE.
- * **2 YEAR GUARANTEE** - we offer a 1 year extension on some manufacturers 12 month guarantee, including Atari Personal Computers.
- * **VIDEO GAMES AND COMPUTER CLUBS** - we offer a full information service on all video games and computers in our range. Advanced information on many new developments is often included, so you are always kept informed. We now issue regular newsletters on software releases so make sure that you join our club.
- * **OVERSEAS ORDERS** - we regularly send goods overseas and use various despatch services. Please let us know your requirements and we will give you a quotation.
- * **PAYMENT** - we accept Access/Barclaycard/Visa/American Express/Diners Club credit cards, as well as cash, cheques, postal orders, COD or Post Office Transcash.
- * **CREDIT FACILITIES** - we also offer credit facilities with varying payment over 12, 24 or 36 months. Please send for our FREE literature and a written quotation.

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 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX
 Telephone: 01-309 1111 or 01-301 1111

VIDEO GAMES

ATARI

ATARI VCS (2600) - THE NO 1 BRAND LEADER IN THE U.K.

ATARI: The Atari Video Computer System known as the Atari VCS or the 2600 has now become the T.V. game brand leader. In the U.K. there are over 700,000 owners of the VCS with access to a range of over 200 different plug in cartridges, each having a multitude of different variations and difficulty levels. Every system comes complete with the main console, two individual joystick controllers, a pair of paddle controllers, aerial splitter, mains adaptor, a 27 game Combat cartridge and a FREE 112 game SPACE INVADERS cartridge. The console also incorporates special circuits designed to protect your T.V. set.

SECONDHAND GAMES: We currently have several secondhand Atari VCS units in stock which we are selling for only £39 (inc VAT). This price includes the Console, with Combat Cartridge and all the accessories, as well as a 12 month guarantee. We also have stocks of several secondhand cartridges many at half price (all with 12 month guarantee). We will normally buy back secondhand units and cartridges at 1/4 of our normal selling price. **£39**

EXTENSIVE CARTRIDGE RANGE: The Atari VCS is so popular that in addition to Atari's own cartridges, there are over 150 compatible cartridges, produced by at least a dozen different third party manufacturers. Silica Shop has one of the largest cartridge selections available in the U.K. Our range of over 200 titles (printed either side of this column), includes items in stock now, as well as many of the new releases for later in 1983.



SILICA ATARI CLUB: Silica Shop has over 20,000 Atari VCS club members registered on our computer. As a specialist company we are able to obtain advance information about new developments and send detailed catalogues to all of our club members, enabling them to evaluate new products before they buy. This is a totally FREE service, to receive your copies complete the coupon below.

SERVICE CENTRE: Atari International (UK) Inc has recently appointed Silica Shop as an authorised Atari Service Centre. This means that we can now service your Atari VCS or 400/800 (under guarantee if applicable), whether or not you purchased it from us.

VCS COMPUTER KEYBOARD: A keyboard will soon be launched to convert the VCS into a fully programmable home computer. For further details, join our club by completing the coupon below. We will then let you know when further information is available.

STARPATH SUPERCHARGER: The supercharger plugs into the cartridge socket of your VCS and expands its RAM almost 50 fold, from 128 to 6,272 bytes. This increased memory adds vivid high resolution graphics capabilities and significantly lengthens the game playing time. Supercharger has a range of multi-load games (at £19.45 each), these offer the facility to play a game in several distinct parts (great for adventures), the next section being loaded when you have completed the previous one, thus enhancing the game play. For further information please complete the coupon below. **£69**

ATARI VCS CONSOLE - With SPACE INVADERS + COMBAT £60 + VAT = £69

- ACCESS Atari**
Aerial Splitter
Joysticks
Keyboards
Mains Adaptor
Paddles
- ACCESS 3rd P**
Ext'n Lead
Joysticks
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Redball
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Vid Command
Wicos
Zircon
- ACCESS Misc**
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Dragster
Enduro
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Freeway
Grand Prix
Ice Hockey
Kaboom
Keyston Capers
Laser Blast
Megamania
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Pitfall
Plaque Attack
River Raid
Robotank
Sequest
Skiing
Sky Jinks
Spider Fighter
Stampede
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- APOLLO**
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Shark Attack
Skeet Shoot
Space Cavern
Space Chase
- ATARI**
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Basic Math
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Centipede
Checkers
Chess
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Codebreaker
Combat
Concentration
Defender
Demons/Diams
Dig Dug
Dodge'em
E.T.
Football/sccr
Fun with Nos
Galaxian
Golf
Gravitar
Hangman
Haunted Hse
Human Cann
Hunt & Score
Indy 500
Jungle Hunt
Kangaroo
Krull
Math G Prix
Maze Craze
Min Golf
Missile Cmnd
Ms Pac-Man
Night Driver
Olympics
Othello
Outlaw
Pac-Man
Phoenix
Pinball
Pole Postn
Raiders of L/A
Sky Diver
Slot Racers
Soccer
Space Invaders
Space War
Star Raiders
Street Racer
Superman

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Surround
Swordquest E
Swordquest F
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Vanguard
Volleyball (r/s)
Warlords
Yars Revenge
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Assault
Great Escape
Splendour
Wall Defender
Z-Tack
- CBS (Coleco)**
Blue Print
Carnival
Donkey Kong
Gorf
Mousetrap
Smurf
Solar Fox
Turbo
Venture
Wings
Wizard of Wor
Zaxxon
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Cosmic Ark
Demon Attack
Dem. Attack II
Dragonfire
Fire Fighter
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Riddle of Spx
Scuba
Starstorm
Star Voyager
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Zone
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Burger Time
Comp Revenge
Frogs & Flies
Intnl Soccer
Lock 'n' Chase
Space Attack
Tron Ddly Dsc
Winter Olymp
- PARKER**
Action Force
Amidar
- PARKER/Con**
Emp Strks Bk
Frogger
Incredible Hulk
James Bnd 007
Jedi Arena
Lord of Rings
Popeye
Q-Bert
Reactor
Rtn of Jedi 1
Rtn of Jedi 2
Sky Skipper
Spiderman
Super Cobra
Tutankham
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- ZIMAG**
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Dishaster
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Pizza Chef
Quest for Gold
Tally Ho
Tanks no Tanks

ACCESSORIES

We stock a wide range of accessories for the Atari VCS and 400/800 personal computers. The same accessories can be used on the Commodore VIC range of computers. The Wico range can also be used with the Texas Instruments computers on purchasing a special adaptor. To give you an idea of the range available, just take a look at the following list:



a directional control which is similar to a jet fighter joystick.

WICO RED-BALL: An arcade type joystick with a red ball handle, it features 2 fire button locations, one at the base and one on the stick. It comes supplied with 4 grip pads for easier table top use.

WICO STRAIGHT - STICK: The main feature of this joystick is its arcade style, bat handle grip. It also has 2 fire buttons. Four grip pads included for table top use.

WICO TRACKBALL: A true arcade style trackball for use with your Atari or Commodore VIC. This product is designed to give arcade control in your living room.

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LE STICK: A mercury filled joystick specially made for one handed operation, with thumb fire button.

QUICK - SHOT: This joystick features a contoured handle grip, thumb trigger and optional base fire button. It is supplied with 4 sure foot suction grips.

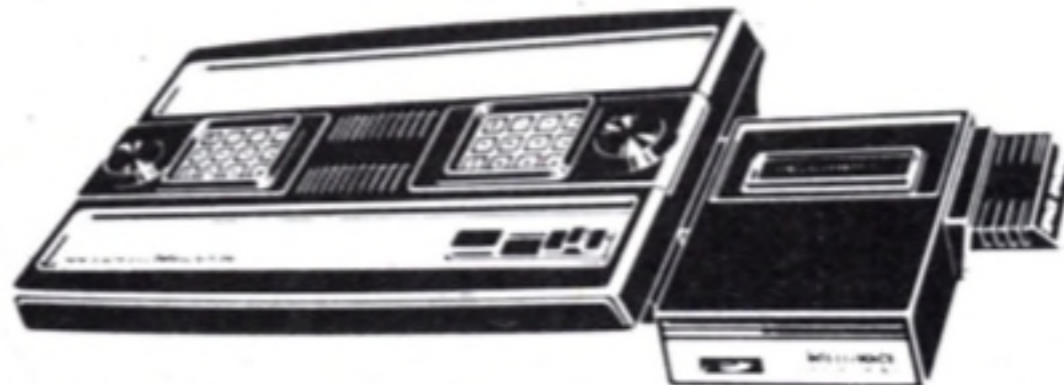
STARFIGHTER: Neat and compact with a small direction stick. Metal interior for added strength.

VIDEO COMMAND: With a tapered handle, this joystick is for one handed use. It has



Wico
Straight
Stick
with
Stick
Fire
Button

MATTEL INTELLIVISION



MATTEL INTELLIVISION: The Mattel games unit is a most versatile T.V. game which offers 3-D graphics quality for only £98. Each cartridge comes with 2 overlays which fit over the unique hand controller giving easy directions for game play. Using the handset's control disc, objects

can be moved accurately in 16 directions giving a realistic simulation of lifelike movement. From 1st September 1983, the Mattel Intellivision T.V. Games Console will come with a FREE VOICE SYNTHESIS MODULE, normally priced at £50. This unit creates high quality synthesised male and female voices as part of the game play on certain cartridges.

NEW MATTEL CARTRIDGE RELEASES: Why not complete the coupon below and join the Silica Mattel Owners Club and receive our FREE news bulletins and 16 page catalogues detailing new Mattel releases. There will soon be over ninety cartridges available for the Mattel, and a small selection from these is listed below:

MATTEL: Arctic Squares, Burger Time, Buzz Bombers, Chess, Cloudy Mountain, Loco Motion, Mission X, Mystic Castle, Sharp Shot, Solar Sailor, Space Shuttle, Vectron, Winter Olympics. **ACTIVISION:** Happy Trails, Pitfall, Stampede. **C.B.S.:** Blue Print, Carnival, Donkey Kong, Gorf, Mousetrap, Smurf, Solar Fox, Turbo, Venture, Wizard of Wor, Zaxxon. **IMAGIC:** Beezer, Dracula, Ice Trek, Nova Blast, Safecracker, Swords & Serpents, Tropical Trouble, White Water. **PARKER:** James Bond 007, Lord of the Rings, Popeye, Q-Bert, Spiderman, Star Wars, Super Cobra, Tutankham.

COMPUTER KEYBOARD: In July/August 1983, Mattel will be launching their new £89, 49-key computer keyboard attachment called 'Lucky' which is fully programmable and has microsoft basic built in. It will transform your Master Component into a home computer. The adaptor also accepts a 6 note polyphonic music synthesiser and full size 49-key piano keyboard that will make learning music as easy as playing games. **£98**

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In a fast moving market like video games, it is difficult to keep up to date with all the developments that take place. With new programmes and accessories being introduced at a fast rate by several different manufacturers, it is impossible to get all the information you require from one manufacturer alone. It is for this reason, that we have set up owners clubs for the more popular video games and home computers, to keep you fully up to date with what is going on with your particular machine. As far as we know, Silica Shop are the only company to offer such clubs, but that is not surprising since we are the specialists. We currently have FREE clubs for the Atari VCS, Atari 400/800 home computers, and Mattel Intellivision. Soon we will have clubs for Colecovision, Aquarius and Vectrex. So if you own one of these machines, fill in the coupon opposite, and we will enrol you FREE OF CHARGE in the club relevant to your computer or video game.

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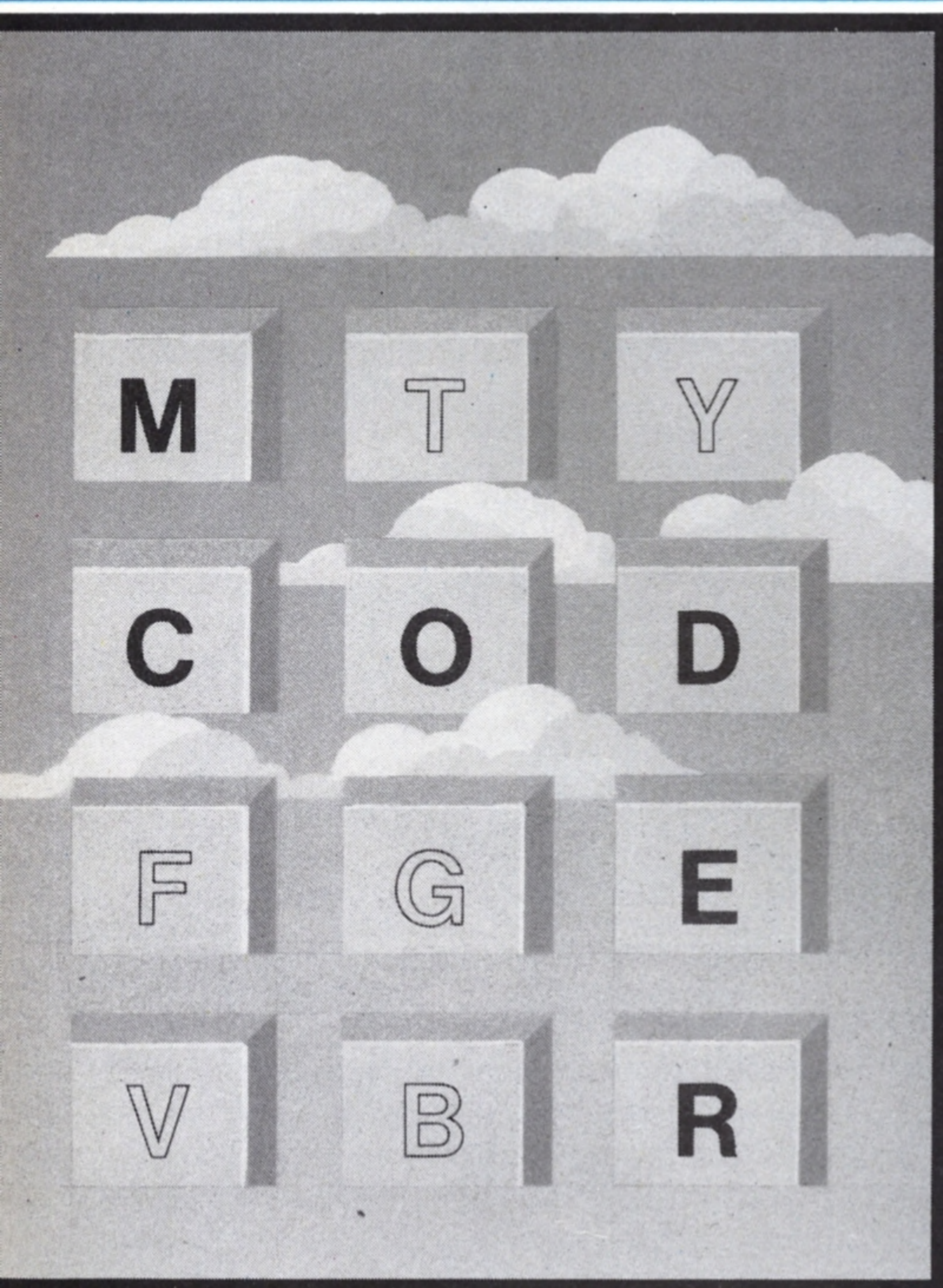


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Assembler/Disassembler ORIC-1

The assembler follows standard 6502 conventions and has proved very reliable while in continual use by Durell Software. Features include the following:

Generally	List File	Pseudo-Op
Auto line numbering	LIST	EQUATE
Six character labels	DELETE	BYTE
Updatable list-file	LLIST	DBYTE
Maths on operands	ALTER	WORD
Syntax checking	INSERT	TEXT
Output to printer	END/STOP	BLOCK

The disassembler also allows output to either screen or line-printer. The tape comes complete with comprehensive instructions. £6.95

Harrier Attack ORIC-1 and SPECTRUM

Pure machine-code, super-fast, action-packed, highly addictive arcade-style game requiring great skill. The harrier takes-off from an aircraft-carrier and flies over seaborne defences to attack enemy installations on a nearby island. The harrier may fly faster, slower, higher or lower, and has bombs and rocket fire with which to protect itself and make its own attack. If it flies too high it is detected by enemy jet-fighters (which it may counter-attack) – so it needs to hug the mountainous terrain which also varies with every new game. But the island is heavily defended by anti-aircraft rockets and tanks, which again the harrier may counter-attack or try to fly through. A tally is kept of fuel, bombs and rockets, plus player score and high score. Finally the harrier must make its bomb-run over the enemy base before returning to its own carrier. £6.95

Starfighter ORIC-1 (48K only)

You are in command of a galactic defence vessel travelling through time and space to attack and destroy intruding aliens. At long range this is carried-out on your computer scanner which displays stars in the local quadrant, with passing planets, space stations, time-gates, and of course the aliens which may strike in packs or singly, scattering anti-matter mines around your ship. You may counter-attack the aliens with your photon torpedoes, or if you move-in close enough switch over to manual and visual control to chase the fleeing alien and blast him with your phasors. See the star-scape spin relative to your ship's manoeuvres, but watch-out for the alien mines whizzing past. You will need to conserve energy carefully to get back to the refuelling points, and then the time-gates to the other quadrants. Weapons, shield and energy status are all monitored throughout this pure machine code game, which may be set to nine levels of skill. £6.95

Lunar Lander/Asteroids ORIC-1

Aimed at the newcomer to BASIC and/or the Oric-1, these exciting and enjoyable games are also easy to learn from, being short, simple and clearly written. Each is followed-up by a second version where every line of the BASIC is explained in an English REMark statement. These games also give a useful guide to the Oric's screen attributes. £5.95

Price includes postage, packing and VAT. Overseas customers please add £1 extra for postage outside UK.

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ENGLAND



Dambuster LYNX

Can you fly your bombers through the enemy flak to make your drop from the right height, speed and distance so that your bouncing bomb finally sinks just behind the dam? This is a game that demands both skill and timing; but more than that it also helps teach you to write games for yourself, as every line of the BASIC program is explained in English in two follow-up versions of the game. Features include:

- Dambusters' theme tune
 - Three planes and three dams
 - Bomber flies higher, lower, faster or slower
 - Random anti-aircraft fire
 - Bomb bounces relative to height and speed of drop
 - Dam crumbles and water floods through
 - Player score plus high score
- £6.95

Jungle Troubles SPECTRUM

Pure machine code with super cartoon graphics. This original and witty game is set in the depths of the African jungle. First you must direct your man to collect an axe and cross a nearby river via stepping stones that protect him from a lurking crocodile. Then he must climb a ladder to the next level, where he has to fell a number of trees in his path. As he does this a marauding ape appears from the left of the screen and steals his axe! So back to the start for another axe and more problems with the crocodile! And the ape! Having hacked a path through the forest he may climb another ladder to level three where he has to leap a pit of flames by grabbing a swinging rope. Will he ever escape back to the city? Can he jump the chasm that suddenly opens before him just as he is about to reach home? A highly amusing game with delightful graphics suited to all members of the family – but very frustrating and addictive. £6.95

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--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NAME _____

ADDRESS _____

*Tick, delete or complete as applicable

16/48K ZX/Spectrum 16K ZX81

You find yourself stranded on a strange alien planet. Your aim is to escape by finding your captured space craft. But beware of the little green man who may get to you!

48K Spectrum 16K ZX81

You are in the middle of a South American jungle when you stumble across a strange Inca temple. Enter it to collect treasure and then try to return. But beware don't let greed be your downfall.

48K Spectrum 16K ZX81

While on a reconnaissance mission you are drawn to an alien cruiser on a humanoid slave mission. Try to escape from aggressive aliens, luscious androids and drunken barmen. Your only help is Fred the friendly android.

48K Spectrum 16K ZX81

You have to survive an engine failure while flying over an apparently uninhabited island in the South Atlantic. Use your wits to harass the enemy, but treat the beautiful native women with respect, to escape from the island and return to an allies aircraft carrier.

SOFTWARE FILE

(continued from page 159)

this, entering 16514 as the start address then type in all the code as in listing 2. When you have done that, type Stop and run the code loader again, entering the start address for listing 3. Do this for all the machine code routines.

The delete the code loader and enter the Basic part of the program — listing 6. You may then Run the program.

The master program calls the other three routines and returns to Basic. By calling the master program over and over from Basic, the action is continuous.

Basic program notes.

- 1 to 4 contains the machine code
- 5 sets up initial length of worm
- 7 to 14 sets up obstacles

- 20 to 24 sets up display
- 90 to 96 stores location of base on screen into 16507 and 16508
- 110 puts base on screen
- 115 puts worm on screen
- 120 calls machine code and checks if 1 is pressed
- 125 loops round
- 130 shows reaction to key 1
- 135 to 140 sees if worm has landed
- 150 increases size of worm
- 160 starts next level
- 200 to 230 game over.

When you run the program several obstacles should appear. Then a border is printed and a one-segment worm appears at the top of the screen. This will start to move, descending one line when it hits an obstacle.

Your base at the bottom of the screen is moved right and left with I and T. Key 0 fires a missile. You must try and destroy the worm before it hits the ground.

If you do, press 1 and hold it down until the computer reacts. You will then move to the next level with a two-segment worm and more obstacles.

You can shoot most obstacles though some are indestructible. If the worm lands, you will have to hold down key 1 until the computer reacts and then the game is over.

The worm will not move into your missile from the side. You must shoot it from underneath. Sometimes the worm splits into many parts, making it very difficult to destroy, but you must cope as best you can.

Listing 1.

```
9000 PRINT "START ADDRESS?"
9010 INPUT A
9020 FOR F=A TO 4E4
9030 INPUT P
9040 POKE F,P
9050 SCROLL
9060 PRINT F,P
9070 NEXT F
```

Listing 2.

```
16514:17 33 0 42 12
16519:64 35 126 254 25
16524:200 254 8 40 7
16529:254 136 40 32 195
16534:136 64 54 0 35
16539:126 254 0 32 5
16544:54 8 195 136 64
16549:25 43 126 254 0
16554:32 5 54 136 195
16559:136 64 237 82 24
16564:247 54 0 43 126
16569:254 0 32 5 54
16574:136 195 136 64 25
16579:35 126 254 0 32
16584:5 54 8 195 136
16589:64 237 82 24 247
```

Listing 3.

```
16613:17 66 0 42 123
16618:64 58 37 64 254
16623:255 200 254 239 32
16628:9 237 82 126 254
16633:14 200 54 14 201
16638:254 223 32 18 54
16643:0 35 126 254 0
```

```
16648:32 7 54 38 237
16653:99 123 64 201 43
16658:24 246 254 251 32
16663:248 54 0 43 126
16668:254 0 32 7 54
16673:38 237 99 123 64
16678:201 35 24 246
```

Listing 4.

```
16715:17 33 0 42 12
16720:64 35 126 254 25
16725:200 254 14 32 247
16730:54 0 237 82 126
16735:254 131 40 6 254
16740:0 32 5 54 14
16745:25 195 81 65 254
16750:8 40 14 254 136
16755:40 10 254 149 32
16760:2 24 239 54 0
16765:24 234 54 149 24
16770:230
```

Listing 5.

```
16793:6 10 205 130 64
16798:205 229 64 205 75
16803:65 16 245 201 61
```

Listing 6.

```
5 LET A$=""
7 FOR N=1 TO 3
8 PRINT AT RND*16,RND*25;"
"( TO INT (RND*5)+1)
9 LET P=RND*30
10 PRINT AT RND*13,P;(" AND
LEN A$=1)+(" AND LEN A$>1)
```

```
11 FOR M=1 TO RND*4
12 PRINT TAB P;"
"(INT (RND*LEN A$)+1)
13 NEXT M
14 NEXT N
20 PRINT AT 21,0;"
";CHR$(LEN A$+156);"
21 PRINT AT 0,0;"
22 FOR N=1 TO 20
23 PRINT AT N,0;"";TAB 30;"
24 NEXT N
30 IF LEN A$>1 THEN GOTO 115
90 LET A=PEEK 16396+256*PEEK 1
6397+673
95 POKE 16508,INT (A/256)
96 POKE 16507,A-256*PEEK 16508
110 POKE A,38
115 PRINT AT 1,10;A$
120 IF USR 16793 THEN IF INKEY$
="1" THEN GOTO 130
125 GOTO 120
130 PRINT AT 21,0;"
135 FOR N=PEEK 16396+256*PEEK 1
6397+660 TO PEEK 16396+256*PEEK
16397+693
140 IF PEEK N=8 OR PEEK N=136 T
HEN GOTO 200
145 NEXT N
150 LET A$=A$+"
160 GOTO 7
200 CLS
210 PRINT "YOU REACHED LEVEL ";
CHR$(LEN A$+28)
215 PRINT "PRESS NEWLINE
FOR NEXT GAME"
220 INPUT I$
225 CLS
230 RUN
9000 FOR F=16793 TO 4E4
9010 PRINT F,PEEK F
9030 NEXT F
```

Metronome

C Makepeace,
Bristol.

DRAGON

THIS PROGRAM IS INTENDED to replace the metronome you had to pawn to pay for your Dragon. It provides a menu of 12 tempos and their approximate frequency in beats per minute.

It permits regular stressing of every nth beat, if required. The beat of the metronome can be speeded up or slowed down using the left and right arrow keys while it is running. Any alteration in beat is shown and the tempo name is altered when the beat equates the frequency as displayed on the menu. While the metronome is running a graphic display of an arm swings — flicks — from side to side in rhythm.

The metronome can be halted by pressing the space-bar during which pause it can be restored by pressing the space-bar again or returned to the menu by pressing another key.

The metronome sounds more like a tooting oboe than a clockwork mechanism. Metronome is 2.7K long and easily shrunk by pruning out the Rems. All Gosubs branch to the subroutines proper and not the Rems.

```
5 REM FOR £ READ HASH CHARACTER
10 ' *****
20 ' METRONOME
30 ' (C) C. MAKEPEACE
40 ' *****
50 GOSUB 450 ' INITIALISE
60 ' *****
70 ' MENU
80 ' *****
90 CLS
100 GOSUB 590 ' TITLE
110 PRINT
120 FOR A=1 TO 12STEP2
130 PRINT USING "££)% %£££ ££)% %£££";A,F$(A)
),T(A),A+1,F$(A+1),T(A)
140 NEXT A
150 GOSUB 640 ' INSTRUCTIONS
160 PRINT
170 INPUT " ENTER TEMPO NO. (1 TO 12)";B$
180 B=VAL(B$):IF B<1 OR B>12 THEN 150
190 BM=T(B)
200 CLS:PRINT@259,T$(B) AT ";BM;"BEATS/MIN."
210 PRINT@323,"AFTER HOW MANY BEATS DO YOU ", " WANT
A STRESS (0 OR MORE)";:INPUT ISTRES$:ISTRESS=VAL(ISTRES$)
220 ' *****
230 ' DISPLAY
240 ' *****
```

(continued on page 171)

Why the BBC Micro? It might be fairer to let someone else answer that question.

"The BBC Microcomputers are the limousines of home computers. The graphics are probably the best of any machine in this class. You are paying for a smart machine which would not disgrace the home of a professional." *Video World, Feb. '83.*

"Its design has given the BBC Micro an unrivalled potential for business, educational and serious home applications. It has been equipped to function as the heart of a system which can be expanded to suit its owner's need." *Which Micro & Software Review, Feb. '83.*

"The most attractive and exciting feature of the BBC Microcomputer is its enormous potential for expansion which will allow a highly expansive system to be built-up." *Deborah Carruthers, Which Micro, June '82.*

"They (the graphics) are tremendously exciting, and they are one of the features that make this machine stand out head and shoulders above everything else that is available in the market place at this time." *Dave Fitcher, Educational Computing, May '82.*

"It is expandable and has a powerful BASIC. It has superb sound and graphics, the software is readily available and the price is right." *Mr. A. D. Alles, a BBC Micro owner from Hampshire.*

"The basics are easy to follow. My wife has developed a program for teaching our daughter French vocabulary. Our daughter uses it mainly for games and simple programming." *Dr. A. Yarwood, a BBC Micro owner from Co. Durham.*

"It is a very powerful computer. My husband has written his own data base. I have been writing programs and programming games. Even the children have written small programs." *Mrs. A. M. Thomas, a BBC Micro owner from Devon.*

"No other computer can offer such ease of use when dealing with complex sound effects." *Which Micro, June '82.*

"It isn't often a journalist can sit down to write about a computer with the certain knowledge that he has never seen a nicer machine." *Guy Kewney, Personal Computer World, Dec. '82.*

"It has got huge potential. Besides playing the games, the whole family are learning basic programming." *Mr. P. S. Green, a BBC Micro owner from Staffordshire.*

"Everything possible seems to have been done to ensure that this is not a 'dead end' machine..." *Paul Beverley, Personal Computer World, July '82.*





Perhaps we could just add that the BBC Micro is the machine which was chosen to be at the heart of the BBC's massive Computer Literacy Project.

It is also the machine which, having won the Department of Industry's blessing, will account for over 80% of the computers bought by British schools this year.

And now for some facts about the machine itself.

The BBC Micro is light, compact and, with a conventional electric typewriter keyboard, easy to get the feel of.



It can be loaded from virtually any cassette recorder. And there is a wealth of ready-made programs available covering games, education and business subjects.

The BBC Micro uses BBC BASIC, a sophisticated version of the most popular computer language.

However, as your confidence and fluency grow, it can be adapted to switch to other languages.

It can also become a word processor, with the facility to link with a second processor for high-powered business use.

A disc drive unit can also be added. And with an adaptor, the BBC Micro is the first micro to be able to pick up programs from the Micronet-Prestel system. Another adaptor converts your TV into a Teletext receiver, with further ability to download programs.

All this for only £399.

The most sophisticated version of the BBC Micro, the Model B, is only £399. The basic Model A is £299. (Both come with a "Welcome cassette" and comprehensive introductory manual.)


They are both available from John Lewis, selected branches of Boots or local stockists.

Alternatively, if you would like to order a BBC Micro B with your credit card, or if you want the address of your nearest stockist, just phone 01-200 0200.

Or, you can buy a Model B by sending off the order form below to: BBC Microcomputers, c/o Vector Marketing, Denington Estate, Wellingborough, Northants.

Your order will be despatched by fully insured courier.

Finally, you can also use the coupon simply to get full reprints of the articles from which the press cuttings featured have been taken.

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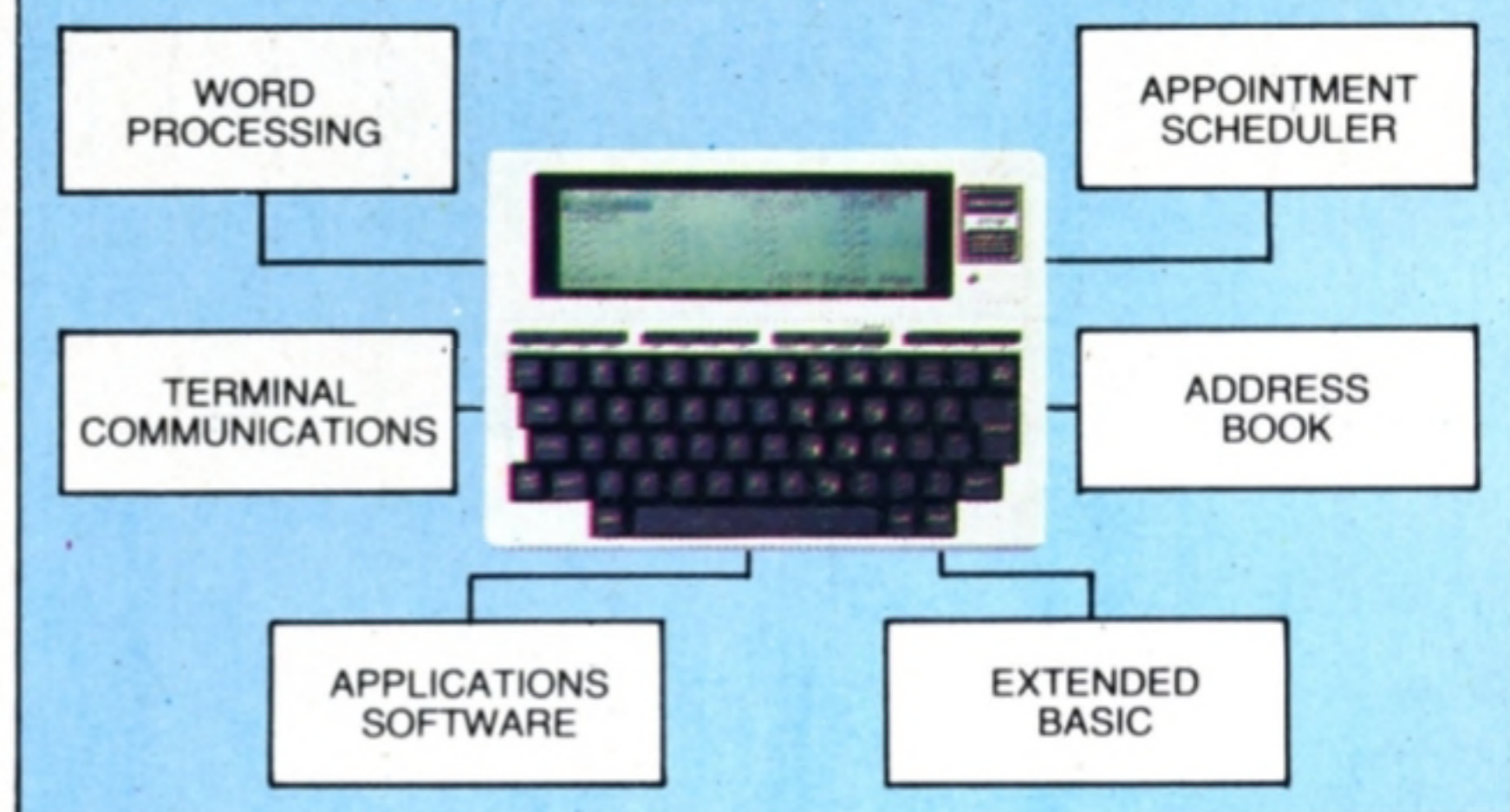
User Friendly Software Makes The TRS-80™ Model 100 Portable Computer Truly Revolutionary

Imagine a computer on your desk so small, it can fit in your in-tray. The second you turn it on, imagine seeing a menu of built-in executive management programs and your own files, ready for immediate use. All revealed on an eight-line by 40-character LCD display positioned just above a full-size keyboard. And when you leave the office, imagine a four-pound computer you can take along, because it works on mains or batteries.

Stop imagining! The new TRS-80 Model 100 is the computer you've been waiting for. As a desk organizer, it's a phone directory, address book and appointment calendar. It's a personal word processor, as well. There's even built-in communications software to access other computers by phone, using an acoustic coupler.

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Address _____

YC1

(continued from page 167)

```

250 CLS:GOSUB590 'TITLE
260 GOSUB640 'INSTRUCTIONS REMINDER
270 GOSUB 710 'TEMPO
280 GOSUB760 'BEAT
290 TIMER=0
300 C$=INKEY$:IF C$<>" " THEN380
310 IF TIMER<BEAT THEN 300 ELSE STRESS=ST+1:TIMER=0:IF
    STRESS=ISTRESS THEN DU=DU+2:ST=0
320 GOSUB 950
330 SOUND FI,DU:DU=MD
340 GOTO300
350 '*****
360 ' ALTER TEMPO & STOP METRONOME
370 '*****
380 IFC$=CHR$(8) OR C$=CHR$(9) THEN GOSUB 820
390 IF C$=" " THEN GOSUB910
400 GOTO 300
410 END
420 '*****
430 'INITIALISATION
440 '*****
450 DINT$(13),F$(13),T(13)
460 FORA=1TO13:READ T$(A),T(A)
470 IFLEN(T$(A))>9 THEN F$(A)=LEFT$(T$(A),2)+" "+RIGHT
$(T$(A),6) ELSE F$(A)=T$(A)
480 NEXT A
490 DATAGRAVE,40,LENTO,42,LARGO,44,LARGHETTO,48,ADAGIO
,52,ANDANTE,60,MODERATO,80,ALLEGRETTO,99,ALLEGRO,116,V
IVACE,126,PRESTO,144,PRESTISSIMO,184,DUMMY,999: TO ALL
OW FASTER TEMPI SANS CRASHING!
500 PITCH=100
510 MDURATION=1:DURATION=1
520 M1=172:M1$=CHR$(159)+" "
530 M2=205:M2$=CHR$(134)+" "
540 M3=172:M3$=" "+CHR$(159)
550 M4=205:M4$=" "+CHR$(137)
560 '*****
570 'TITLE
580 '*****
590 PRINT@43,"METRONOME
600 RETURN
    
```

```

610 '*****
620 'INSTRUCTIONS
630 '*****
640 PRINT@322,"TO SLOW IT DOWN,PRESS'<'KEY
650 PRINT@354,"TO SPEED IT UP,PRESS'>'KEY
660 PRINT@388,"PRESS spacebar TO PAUSE"
670 RETURN
680 '*****
690 ' TEMPO
700 '*****
710 PRINT@263,T$(B)
720 RETURN
730 '*****
740 ' BEAT
750 '*****
760 PRINT@276,BM
770 BEAT=INT(3000/BM)
780 RETURN
790 '*****
800 ' ALTER DISPLAY OF TEMPO & BEAT
810 '*****
820 IFC$=CHR$(9) THEN BM=BM+1
830 IFC$=CHR$(8) THEN BM=BM-1
840 IFBM=>T(B+1) THENB=B+1:GOSUB710
850 IF BM=<T(B-1) THEN B=B-1: GOSUB 710
860 GOSUB760
870 RETURN
880 '*****
890 ' PAUSE
900 '*****
910 PRINT@322,,," PRESS spacebar TO CONTINUE"," PRESS
enter TO RETURN TO TABLE"," "
920 C$=INKEY$:IF C$=" " THEN 920 ELSE IF C$=" " THEN GOS
UB 640: RETURN
930 GOTO 70
940 '*****
950 ' GRAPHICS
960 '*****
970 IF FL=0 THEN PRINT@M1,M1$:PRINT@M2,M2$:FL=1: ELSE
PRINT@M3,M3$:PRINT@M4,M4$:FL=0
980 RETURN
990 END
    
```

Instant command

A D Robinson,
Wath-on-Deerne,
South Yorkshire.



WHEN USING COMPILERS or disassemblers, or when developing a Basic program, it is often necessary to repeatedly make the same command. For example,

```
RAND USR 40000, SAVE "DEMO"
```

This can be very monotonous. This program listing for the 16K or 48K Spectrum enables the user to define a specific key or shifted key to give this command instantly.

The command to be defined is entered as line 1 of the program and is then edited and a Rem statement is inserted at the beginning. It can be changed as and when necessary.

Enter either the 16K or 48K listing, Save it, then Run it. When the machine code has been entered the program will ask for the code of the trigger key. This can be entered as a number from the list of codes at the back of the Spectrum manual or by entering, for example, Code "Z". Obviously choose a key that will not be needed. The program will then execute New and disappear, but the routine is now working.

Now type in

```
1 PRINT "This is an Example"
```

Press enter, the edit the line and inset the Rem statement before the word print. Now press enter again. To test the program press the chosen trigger key/keys and line 1 will be recreated at the bottom of the screen as a direct command and will be executed. It is best to stick to single statements in line 1 as multi-statement lines sometimes produce a syntax-error.

Another use for the routine is to prevent the accidental pressing of the New key. Enter 230 as the trigger code, enter 1 Rem Goto 9999, the line 9999 as Input 2\$: IF 2\$="Yes" then New. If the New key is then pressed, the program will check to see if you really mean it. To return to normal and switch off the defined key facility, simply type

```
RAND USR 65100 (32319 for 16K)
```

The program works by altering the interrupt mode of the Spectrum so that every 1/50 second it calls our machine-code routine. This routine looks at the system variable Last K and, if it is the trigger key, it jumps to the routine to change this. The program starts with the byte after the Rem statement and enters this into Last K.

It then sets bit 5 of system variable flags to fool the machine into thinking a new key has been pressed. A pointer is then incremented so that, on the next interrupt, the following byte is entered, and it keeps on doing this until the Enter character is found to indicate the end of the line. The pointer is then reset.

Remember to switch the routine off before overwriting any of the code used by the program.

Kippax Stock Market

Charles W Peel,
Leeds.



KIPPAX MAY NOT BE the biggest village in England but it can now boast about this fun stock market game which bears its name. The game is ideal for gatherings of up to nine people. This limitation is only due to the presentation which is available on the Atom. I personally organise the party so that one person is the keyboard operator to interpret the wishes of individual players.

The initial screen introduces the market and the players are requested to determine the number of rounds they wish the game to consist of, and also their respective *nom de plumes* in the order they wish to play. Each *nom de plume* can be up to nine characters including any full stops or spaces.

The Atom then displays the current state of the market in respect of six commodities — gold, tin, silver, copper, lead and plastics. The details which follow are:

- The actual quote for each commodity expressed in pence.

```

1 REM PRINT "16K Example"
10 CLEAR 32318: PRINT AT 10,10
; "STAND BY"
20 DATA 62,62,237,86,237,71,20
1,0,0,0
30 DATA 62,9,237,71,237,94,33
,208,92,34,98,126,201,0,0,0,0,0
0
40 DATA 255,243,245,229,42,103
,254,125,254,206,32,8,33,8,92,12
6,254,95,32,34,42,103,254,126,33
,34,103,254,33,8,92,119,58,59,92
,203,239,33,59,92,119,58,8,92,2
4,13,32,6,33,206,92,34,103,254,2
25,241,251,201
50 FOR a=32319 TO 32405: READ
b: POKE a,b: NEXT a
60 CLS: PRINT "CODE of trigge
r key ?"
70 INPUT z: POKE 32365,z
80 RANDOMIZE USR 32329: NEW
91 REM RANDOMIZE USR 32319 TO
STOP

1 REM PRINT "This is an examp
le"
10 CLEAR 65099: PRINT AT 10,10
; "STAND BY"
20 DATA 62,62,237,86,237,71,20
1,0,0,0
30 DATA 62,9,237,71,237,94,33,
208,92,34,103,254,201,0,0,0,0,0
0
40 DATA 255,243,245,229,42,103
,254,125,254,206,32,8,33,8,92,12
6,254,95,32,34,42,103,254,126,33
,34,103,254,33,8,92,119,58,59,92
,203,239,33,59,92,119,58,8,92,2
4,13,32,6,33,206,92,34,103,254,2
25,241,251,201
50 FOR a=65100 TO 65166: READ
b: POKE a,b: NEXT a
60 CLS: PRINT AT 10,4;"CODE o
f trigger key ?"
70 INPUT z: POKE 65146,z
80 RANDOMIZE USR 65110: NEW
    
```

- The realisable value of each share after deducting 10 percent for each sale.

- The cost of each share after including the charge of 10 percent for each purchase.

Columns two and three are only expressed to three significant figures, so beware of rounding traps.

- When the time is due — see column six — the shares will pay out dividends determined in a random manner from 20 to 120 pence per share. Catching the high dividends is the sure way to make your fortune and win the game.

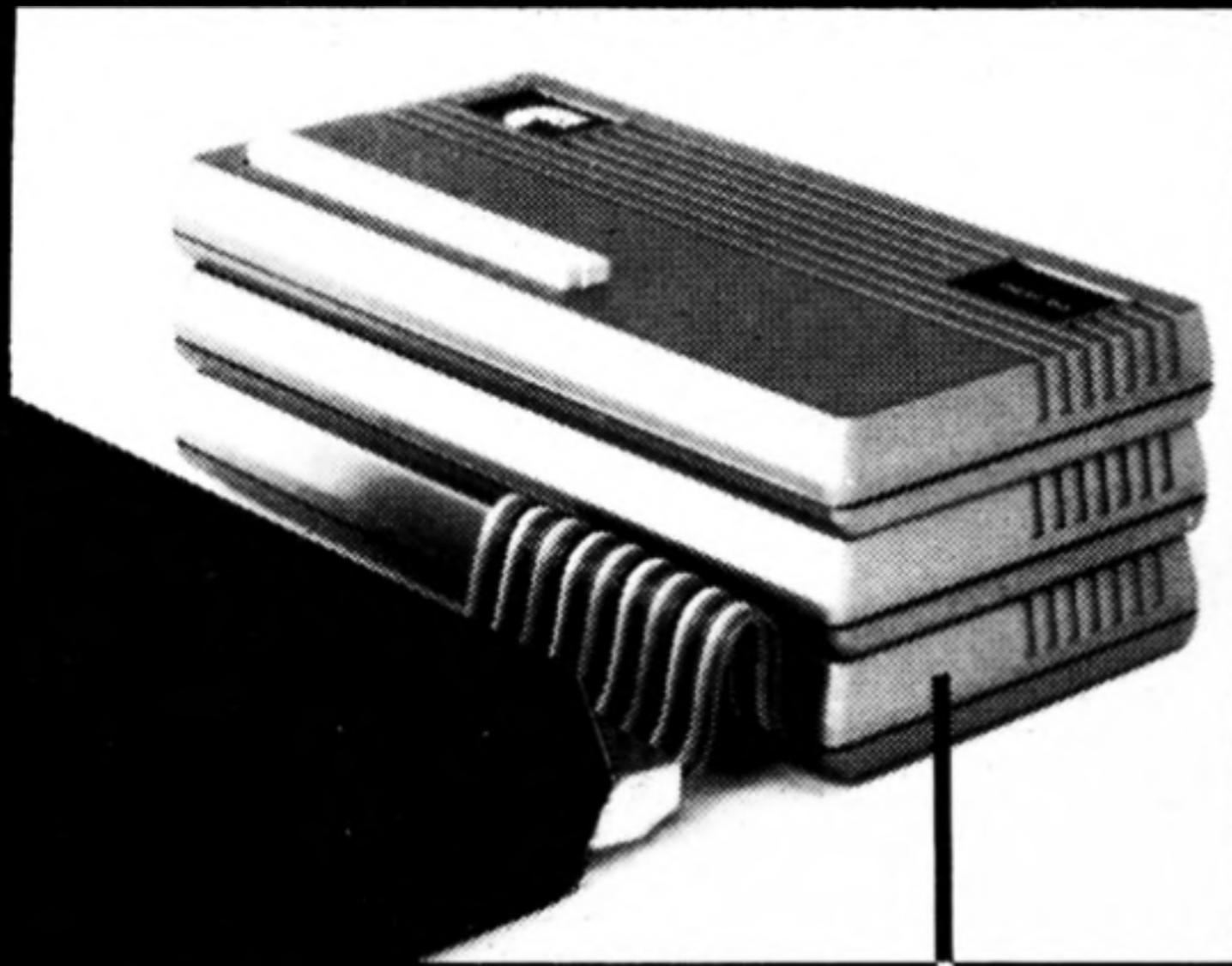
- The market makes available 999 shares in each commodity and this column informs you how many are available for purchase.

- Each commodity is initially given a number which is determined by the number of players taking part. This indicates the time left to the next dividend pay out. This number is reset after a pay out so that you have to make a judgment — when to buy or sell.

The lower part of the screen then displays the state of the player whose turn it is to play.

(continued on page 173)

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(continued from page 171)

Displayed are the cash in hand initially set to £200, the number of shares of each commodity held and the potential worth of the player should he be able to sell all his holdings.

The final line displays action and this is where the transactions are entered. Each player is allowed up to four transactions per turn but only one of them may be a sale. The actions available are:

- B — Buy
- S — Sell
- N — Next player please

after B or S the next character must be from the following:

- G — Gold

- T — Tin
- S — Silver
- C — Copper
- L — Lead
- P — Plastics

followed by the number of shares to buy or sell.

Beware. If you miscalculate, the Atom will display a cryptic remark and terminate your turn by calling up the next player. When the entry is complete press the space-bar and the Atom will revise your current state due to this action.

After each player's turn the current state of all players is displayed in the form of cash in

hand and potential worth, as well as the number of rounds remaining in the game. This is important to watch because at the end of the game only the cash in hand is considered to determine the winner. Because only one sale may be made in any one round, if you do not sell your shares at the right time you may lose their value.

When all players have had an equal number of turns — that is the end of each round their names are sorted into the sequence of the cash in hand held. The potential value is also displayed. In this manner it is possible to judge your current performance against all the others. Best wishes for happy marketeering.

```

10L=£8200;E=£8200;F=£8218;G=£8230;B=£8260;T=£8248
20M=£80;N=£81;O=£82;Q=£88;S=£83;H=£8B;R=£8A;DIMLL5
30F.I=0T05;LLI=£9000;N.I;P.#3#15#21;F.I=0T01;P=£9000
40C.LL0 JSRFFFE6;STAM;RTS
50.LL4 ADC£84;STAE84;STAQ;LDA00;ADCE85;STAC£85;STAE89;JMPLL3
60.LL2 LDA£84;ASLA;STAE84;LDA£85;ROLA;STAE85;RTS
70.LL1 LDA00;STAE84;STAE85
80.LL3 JSRLL2;STAE87;LDA£84;STAE86;JSRLL2;JSRLL2;LDA£84
90 ADC£86;STAE84;LDA£85;ADCE87;STAE85
100.LL5 JSRFFFE3;CMP013;BE0LL5;JSRFFFE52;JSRFF87E
110 BCCLL4;RTS;J;N.I
120aP.#6#12;P." KIPPAX STOCK MARKET""
130IN."NO.OF ROUNDS TO END "Z;P."
140IN."NO.OF PLAYERS "A;J=0;@=0;F.I=0T0 A;H?I=I;N.I;I=0
150P.#12" KIPPAX STOCK MARKET""
160DOP."NAME OF PLAYER NO."(I+1);IN.#B;B=B+LENB+1;L!J=20000
170F.K=J+4T0J+28 STEP4;L!K=0;N.K;J=K;I=I+1;U.I=A
180F.I=0T020 STEP4;E!I=100;F!I=999;G!I=8#A;T!I=0;N.I
190D=0;B=£8260;Q=4
200bP.#12" KIPPAX STOCK MARKET""
210P." ACT BID OFF DIV BNK POS"
220P."SOLD " ;?0=0;GOS.J;P."tIN " ;?0=4;GOS.J
230P."SILVER " ;?0=8;GOS.J;P."COPPER " ;?0=12;GOS.J
240P."LEAD " ;?0=16;GOS.J;P."PLASTICS" ;?0=20;GOS.J
250P." CURRENT ACCOUNT FOR ""CASH IN HAND""
260P."SOLD";DOP." " ;U.C.=14;P."tIN"
270P."SILVER";DOP." " ;U.C.=14;P."COPPER"
280P."LEAD";DOP." " ;U.C.=14;P."PLASTICS"
290P."TOTAL ASSETS";DOP." " ;U.C.=20;P."ACTION " ;C=0;Y=0;G.h
300cLI.LL0;IF?M=CH"B";P."UY " ;?N=?M;C=C+1;G.d
310IF?M=CH"S";P."ELL " ;?N=?M;C=C+1;Y=Y+1;G.d
320IF?M=CH"N";P."EXT PLAYER";G.i
330P.#8" "#8;G.c
340dIFC>4;G.u
350IFY>1;G.t
360LI.LL0;IF?M=CH"G";P."OLD " ;?0=0;G.e
370IF?M=CH"T";P."IN " ;?0=4;G.e
380IF?M=CH"S";P."ILVER " ;?0=8;G.e
390IF?M=CH"C";P."OPPER " ;?0=12;G.e
400IF?M=CH"L";P."EAD " ;?0=16;G.e
410IF?M=CH"P";P."LASTICS " ;?0=20;G.e
420P.#8" "#8;G.d
430eLI.LL1;IF?N=CH"B";G.f
440IF(L!(D*32+(4+?0))-(256*(Q?1)+?0))<0;G.v
450!S=((E!(?0))*((256*(Q?1)+?0)*9)/10;G.9
460f!S=((E!(?0))*((256*(Q?1)+?0)*11)/10
470IF(F!(?0)-(256*(Q?1)+?0))<0;G.w
480IF!S>L!(D*32);G.x
490F!(?0)=(F!(?0))-(256*(Q?1)+?0);L!(D*32)=(L!(D*32))-1S
500L!(D*32+(4+?0))=L!(D*32+(4+?0))+((256*(Q?1)+?0);G.h
5109F!(?0)=(F!(?0))+((256*(Q?1)+?0)
520L!(D*32+(4+?0))=(L!(D*32+(4+?0)))-(256*(Q?1)+?0)
530L!(D*32)=(L!(D*32))
540hF.I=0T06;P.#11;N.I;P." ;DOP.#9;U.C.>20;P.#B;DOP." " ;U.C.>30
550P." ;DOP.#9;U.C.=13;J=L!(D*32);GOS.m;P."
560DOP.#9;U.C.=9;P.L!(4+D*32);DOP.#9;U.C.=26;P.L!(8+D*32)
570P." ;DOP.#9;U.C.=9;P.L!(12+D*32);DOP.#9;U.C.=26;P.L!(16+D*32)
580P." ;DOP.#9;U.C.=9;P.L!(20+D*32);DOP.#9;U.C.=26;P.L!(24+D*32)
590P." ;DOP.#9;U.C.=14;J=L!(D*32);GOS.n;GOS.m;P."
600DOP.#9;U.C.=7;DOP." " ;U.C.=25;P.#13;DOP.#9;U.C.>32;G.c
610iU=B;V=D;D=0;B=£8260;P.#12"TABLE OF CURRENT PLAYER VALUES""
620DOP." " ;U.C.=13;P."ASSETS"
630DOP.#B;DOP." " ;U.C.=12;J=L!(D*32);GOS.n;GOS.m;P." ;B=B+LENB+1
640D=D+1;U.D=A;B=U;D=V;B=B+LENB+1;D=D+1;IFD=A;D=0;B=£8260
650GOS.n;LI.LL0;IFD=0A.Z<>1;GOS.o;GOS.n;LI.LL0;G.b
660IFD<>0;G.b
670GOS.o;P."THANK YOU FOR PLAYING""
680IN."DO YOU WISH TO PLAY AGAIN"#B;IF?B=CH"Y";G.a
690E.
700JG!(?0)=G!(?0)-(A.R.%6+1);T!(?0)=0
710IFG!(?0)<0;T!(?0)=0-(20*(G!(?0)));G!(?0)=8#A;G.l
720kIFG!(?0)%5=0;E!(?0)=E!(?0)-2
730IFG!(?0)%5=1;E!(?0)=E!(?0)-1
740IFG!(?0)%5=3;E!(?0)=E!(?0)+1
750IFG!(?0)%5=4;E!(?0)=E!(?0)+2
760P.E!(?0);E!(?0)*9/10;E!(?0)*11/10;T!(?0);F!(?0);G!(?0);R.
770I=0;DOL!(I*32)=L!(I*32)+((L!(I*32+(?0)+4))*T!(?0))
780I=I+1;U.I=A;G.k
790mP.(J/100);@=0;P." " ;IF(J%100)<10;P."0"
800P.(J%100) " ;@=4;R.
810nF.I=0T020STEP4;J=J+((L!(4+I+D*32))*E!I)*90/100;N.I;R.
820aP.#12" BIG SPENDERS LEAGUE""NO.OF ROUNDS LEFT "
830D=0;Z=Z-1;P.Z;DOP." " ;U.C.=12;P."CASH TOTAL"
840D0;J=L!(D*32);GOS.n;L!(D*32+28)=J;D=D+1;U.D=A;W=A-1
850D0;X=0;D0;IFL!(H?X)*32<L!(H?X+1)*32;GOS.9
860X=X+1;U.X=W;W=W-1;U.W=0;D0;B=£8260;IFH?W=0;G.P
870F.I=1T0H?W;B=B+LENB+1;N.I
880P.#B;DOP." " ;U.C.>9;J=L!(H?W)*32;GOS.m
890J=L!(H?W)*32+28;GOS.m;P." ;W=W+1;U.W=A;D=0;B=£8260;R.
900q?R=H?X;H?X=H?X+1;H?X+1=?R;R.
910rP."NEXT PLAYER - "#B;"PRESS SPACE BAR TO CONTINUE"";R.
920sF.I=0T05;P.#11;N.I;P." ;F.I=0T02;DOP." " ;U.C.>30;P." ;N.I;R.
930tGOS.s;P."SORRY - ONLY ONE SALE ALLOWED";G.y
940uGOS.s;P."GREEDY - TOO MANY TRANSACTIONS";G.y
950vGOS.s;P."YOU HAVE ONLY";L!(D*32+(4+?0))" UNITS";G.y
960wGOS.s;P."ONLY";F!(?0)" UNITS AVAILABLE";G.y
970xGOS.s;P."YOU HAVEN'T GOT ENOUGH - SORRY"
980yF.I=0T0300;WAIT;N.I;G.i
    
```

Padcalc

B R Law,
Leicester.

2X-31

PADCALC IS A general-purpose mathematical program that will allow up to five formulae to be entered for subsequent calculation. It is most useful when only a limited number of "what if?"-type calculations are required, and under these circumstances it is easier to set up than a spreadsheet program and the format is more readily understandable.

In general terms using Padcalc is the computer equivalent of paper and pencil because it works in the same way you would if working through a formula or series of formulae. It initially asks you to enter your formula containing all of its variables. When you have entered your last formula press Newline and it will list all the variables for which it requires you to enter values. You will notice that it does not ask for a variable if this

has been calculated previously or if the same variable was used in a previous formula.

The cursor over the variable letter indicates that it is waiting for you to enter a value against this letter; when this is done it moves to the next variable. When the last variable is entered the results are automatically calculated and printed below the variables.

At this stage the cursor over the last variable letter begins to flash, indicating that you can now change the value of one of the variables. The cursor can be moved up and down in response to the cursor keys 6 and 7 and when key V is pressed a new value for the variable on which the cursor sits, can be entered.

Variables can continue to be changed in this manner until key C is pressed. A new set of results are then calculated and the result is printed adjacent to the first set. This process can be continued until four sets of variables and results are printed on the screen. Any further changes will result in the screen being cleared and the next set of results are printed down the first row.

A warning that this will happen is given at the bottom of the screen after four sets of results have been calculated. The following types of functions can be used in the formula: +, -, *, /, **, E, Sin, Cos, Tan, Asn, Acs, Atn, Rnd, Int, Sqr, Pi, Abs

There are, however, certain constraints that should be applied when entering a formula, and they are as follows.

No more than five formulae may be entered at any one time.

Variable names should be no more than two characters long and if numerics are included they should be put after an alphabetic character. For example, A1, V2 and so on.

When using trigonometric functions a single alphabetic character only can be used and any angle must be given a variable name. A numeric angle will not be accepted in a formula. For example Sin 30° should be entered as Sin A. The angle can then be entered as a variable.

All angle variables should be entered as

(continued on page 175)

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(continued from page 173)

decimal degrees. For example, Sin 30° 30' should be entered as Sin 30.5°.

All answers involving degrees are given in decimal form.

When using the functions Sin, Cos and Tan the variable which the function acts upon has initially to be multiplied by $\pi/180$ to change degrees to radians. In cases where the variable has no brackets around it the $\pi/180$ is inserted immediately after the function by the program. When brackets are present $\pi/180$ is inserted inside the first bracket. Therefore, if brackets are required always put on an additional set. For example, Sin A; Sin (A×B); Sin ((A+B)).

Now an example to clarify the entry procedures. This example uses the program to calculate various features of a gear. The variables used are defined as follows:

- PD = Pitch circle diameter
- OD = Outside diameter
- RD = Root diameter
- TT = Tooth thickness
- N = Number of teeth
- DP = Diametrical pitch.

After loading the program using Load "Padcalc" you should receive a prompt asking for the first formula. Proceed as follows:

- PD = N/DP → N/L
- OD = PD + 2/DP → N/L
- RD = OD - 2×2.25/DP → N/L

TT = 1.5708/DP → N/L → N/L.

The screen should now have a black cursor visible over the letter N. Now enter the value for N, for example 45 → N/L. The cursor jumps to DP so enter a value for this, for example, 11 → N/L. After this last entry the answers are automatically calculated and displayed against their respective variables.

After this either of the two variables can be changed by shifting the cursor using keys 6 or 7 then pressing key V and entering the new variable. To see the new results press C for recalculation. For example, 7 → V → 15 → N/L → will recalculate the results with the number of teeth changed to 15.

```

1000 REM "PADCALC"
1010 FAST
1020 DIM M$(5,50)
1030 DIM F$(5,100)
1040 DIM A(5)
1050 LET U$=""
1060 LET A$=""
1070 LET F=0
1080 LET KU=0
1090 LET DP=0
1100 LET FL=0
1110 REM "FORMULA ENTRY"
1120 PRINT AT 21,0;"FORMULA? PRE
1130 L TO FINISH"
1140 LET F=F+1
1150 INPUT M$(F)
1160 IF M$(F,1)="" THEN GOTO 10
1170
1180 LET F$(F)=M$(F)
1190 GOSUB 500
1200 PRINT AT F-1,0;M$(F)
1210 IF F=5 THEN GOTO 110
1220 GOTO 65
1230 LET F=F-1
1240 SLOW
1250 LET U1=LEN U$ / 2
1260 DIM U(LEN A$ / 2)
1270 DIM P(U1)
1280 DIM V(U1)
1290 PRINT AT F,0;"
1300
1310 PRINT AT 21,0;"
1320
1330 FOR X=1 TO U1
1340 LET P(X)=F+X
1350 PRINT AT P(X),0;U$((X*2)-1
1360 TO X*2)+"="
1370 NEXT X
1380 PRINT "*****"
1390 FOR Y=1 TO LEN A$ / 2
1400 LET W(Y)=P(X-1)+1+Y
1410 PRINT AT W(Y),0;A$((Y*2)-1
1420 TO Y*2)+"="
1430 NEXT Y
1440 GOTO 600
1450 REM "CHANGE OF VARIABLE"
1460 REM "*****"
1470
1480 LET X=0
1490 LET X=X+1
1500 IF F$(F,X)="" THEN GOTO 57
1510
1520 IF CODE F$(F,X) > 198 AND COD
1530 E F$(F,X) < 205 THEN GOSUB 700
1540 IF F$(F,X)="E" AND CODE F$(
1550 F,X-(X<>1)) > 28 AND CODE F$(F,X-(
1560 X<>1)) < 38 THEN GOTO 510
1570 IF CODE F$(F,X) > 37 AND CODE
1580 F$(F,X) < 64 THEN GOTO 530
1590 GOTO 510
1600 IF CODE F$(F,X+1) < 28 OR COD
1610 E F$(F,X+1) > 63 THEN LET F$(F)=F$
1620 (F,1 TO X)+" "+F$(F,X+1 TO )
1630 REM "CHANGE OF VARIABLE"
1640 END

```

```

532 IF X=1 THEN GOTO 555
533 IF U$="" THEN GOTO 542
534 FOR Z=1 TO LEN U$:(LEN U$) =
535 LEN A$+LEN A$:(LEN A$) > LEN U$) 5
536 IF Z+1 > LEN U$ THEN GOTO 540
537 IF F$(F,X TO X+1)=U$(Z TO Z
538 +1) THEN GOTO 545
539 IF Z+1 > LEN A$ THEN GOTO 541
540 IF F$(F,X TO X+1)=A$(Z TO Z
541 +1) THEN GOTO 545
542 NEXT Z
543 LET U$=U$+F$(F,X TO X+1)
544 LET X=X+1
545 GOTO 510
546 LET A$=A$+F$(F,X TO X+1)
547 GOTO 545
548 REM "*****"
549
550 LET X=5
551 LET F$(F)="A"+STR$ VAL "F"
552 +F$(F,3 TO )
553 LET X=X+1
554 IF F$(F,X)="" THEN RETURN
555 IF F$(F,X)="E" AND CODE F$(
556 F,X-(X<>1)) > 28 AND CODE F$(F,X-(
557 X<>1)) < 38 THEN GOTO 580
558 IF CODE F$(F,X) > 37 AND CODE
559 F$(F,X) < 64 THEN GOTO 590
560 GOTO 580
561 LET Y=1
562 IF Y > LEN A$ THEN GOTO 625
563 IF F$(F,X TO X+1)=A$(Y TO Y
564 +1) THEN GOTO 645
565 LET Y=Y+2
566 GOTO 605
567 LET K=1
568 IF F$(F,X TO X+1)=U$(K TO K
569 +1) THEN GOTO 655
570 LET K=K+2
571 GOTO 630
572 LET F$(F)=F$(F,1 TO X-1)+"A
573 (" +STR$( (VAL "Y"+1) / 2) +") "+F$(F
574 ,X+2 TO )
575 GOTO 660
576 LET F$(F)=F$(F,1 TO X-1)+"U
577 (" +STR$( (VAL "K"+1) / 2) +") "+F$(F
578 ,X+2 TO )
579 LET X=X+4
580 GOTO 580
581 REM "*****"
582
583 IF CODE F$(F,X+1) < 16 THEN
584 GOTO 740
585 IF CODE F$(F,X) > 198 AND COD
586 E F$(F,X) < 202 THEN GOTO 730
587 LET F$(F)=F$(F,1 TO X-1)+"1
588 80/PI*"+F$(F,X TO )
589 GOTO 765
590 LET F$(F)=F$(F,1 TO X+1)+"P
591 I/180*"+F$(F,X+2 TO )
592 GOTO 765
593 IF CODE F$(F,X) > 198 AND COD
594 E F$(F,X) < 202 THEN GOTO 760
595 LET F$(F)=F$(F,1 TO X-1)+"1
596 80/PI*"+F$(F,X TO )
597 GOTO 765

```

```

760 LET F$(F)=F$(F,1 TO X)+"(PI
761 /180*"+F$(F,X+1)+" "+F$(F,X+2 TO )
762
763 LET X=X+7
764 RETURN
765 REM "*****"
766
767 LET PS=PEEK (16396)+PEEK (1
768 6397) *256+1
769 LET PC=PS+(F+1)*33
770 LET X=1
771 GOTO 845
772 LET PP=PC
773 IF FL=0 THEN GOSUB 1000
774 GOSUB 3000
775 POKE PP,PEEK (PP)-128
776 POKE PC,PEEK (PC)+128
777 GOTO 825
778 REM "*****"
779
780 IF X > U1 THEN GOTO 2000
781 INPUT U(X)
782 PRINT AT P(X),4;U(X)
783 LET PC=PC+33
784 IF X=U1 THEN LET PC=PC-33
785 LET X=X+1
786 GOTO 840
787 REM "*****"
788
789 LET FL=1
790 FOR X=1 TO F
791 LET A(X)=VAL F$(X,6 TO )
792 PRINT AT W(X),4+KU;INT (A(X)
793 )*(10*DP)+.5)/(10*DP)
794 NEXT X
795 LET KU=KU+7
796 IF KU > 25 THEN PRINT AT 21,
797 0;" NB:SCREEN TO CLEAR"
798 RETURN
799 REM "*****"
800
801 IF INKEY$="U" THEN GOTO 310
802
803 IF INKEY$="C" THEN GOTO 320
804
805 LET PC=PC+(INKEY$="6")*33)
806 *(PC-PS<>(F+1)*33)-(INKEY$="7"
807 )*33)*(PC-PS<>(F+1)*33)
808 RETURN
809 REM "CHANGE OF VARIABLE"
810
811 LET D=((PC-PS)/33)-F
812 INPUT U(D)
813 IF KU > 25 THEN GOSUB 4000
814 PRINT AT P(D),4+KU;U(D)
815 RETURN
816 FOR X=1 TO U1
817 PRINT AT P(X),4+KU;U(X)
818 NEXT X
819 GOTO 2000
820 REM "*****"
821
822 LET KU=0
823 FOR X=F+1 TO U(F)
824 IF X=P(U1)+1 THEN GOTO 4025
825 PRINT AT X,3;"
826
827 NEXT X
828 PRINT AT 21,3;"
829
830 RETURN
831 SAVE "PADCALC"
832 GOTO 1

```

Othello

A P Walrond,
Pitney,
Somerset.



THIS PROGRAM is Othello, also known as Reversi, and it runs on a Model B BBC Micro or a Model A upgraded to 32K.

The program plays a good strong game of Othello and has two extra features:

- You can swop colours at any point in the game.

- It contains a can't go check — if you think you cannot go, the computer will check. Operating instructions are given in the program.

The average time taken by the computer to make its move is 10 seconds.

A word of advice to beginners: aim for the sides, and the corners in particular.

```

10 REM ***OTHELLO***
20 REM By A.P.Walrond
30 ON ERROR GOTO 370
40 MODE7:PROCINSTRUC
50 MODE5
60 VDU19,0,1,0,0,0:VDU19,1,3,0,0,0:VDU19,2,0,0,0,0
70 COLOUR130:CLS
80 GCOL0,0
90 *FX11,0
100 MOVE800,1000:MOVE800,200
110 PLOT85,0,1000:PLOT85,0,200
120 GCOL0,3
130 VDU5
140 FOR I=0 TO 800 STEP 100:MOVE I,200:PLOT21,I,1000:IF I<800 MOVEI+15,190:PRI
141 NT CHR$(65+(I/100))
150 NEXT I
160 FOR I=200 TO 1000 STEP 100:MOVE 0,I:PLOT21,800,I:IF I<1000 MOVE 810,I+70:P
161 RINT STR$(I/100-1)
170 NEXT I
180 VDU4
190 DRAW0,1000:DRAW0,200:DRAW 800,200:DRAW 800,1000
200 DIM B$(7,7),P$(7,7),BIG$(4)
210 FOR R=0 TO 7:FOR C=0 TO 7:READ P$(R,C):NEXT C:NEXT R
220 DATA 32,2,16,16,16,16,2,32,2,0,1,1,1,1,0,2,16,1,8,4,4,8,1,16,16,1,4,2,2,4,
221 1,16,16,1,4,2,2,4,1,16,16,1,8,4,4,8,1,16,2,0,1,1,1,1,0,2,32,2,16,16,16,16,2,32
222
230 B$(3,3)=2:B$(3,4)=3:B$(4,3)=3:B$(4,4)=2
240 CCM=0:YCM=0:YTX=2:CTX=2:YC=3:CC=2
250 PROCUPDATE
260 COLOUR1

```

(continued on page 177)

wildings

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(continued from page 175)

```

270 PRINTTAB(0,27);"Shall I go first? ";A$=GET$:PRINT A$
280 REPEAT:IF A$="N" THEN A$="":PROCYMOVE:GOSUB320
290 PROCYMOVE:GOSUB320
300 PROCYMOVE:GOSUB320
310 UNTIL FALSE
320 IF YTX+CTX<64 AND (YCM+CCM)<>2 AND YTX<>0 AND CTX<>0 THEN RETURN
330 MODE7
340 IF YTX>CTX THEN A$=" YOU WIN! ":COL=130:ELSE IF CTX>YTX THEN A$=" I WIN! "
:COL=133:ELSE A$="IT'S A DRAW! ":COL=132
350 PROCWIN
360 A=INKEY(100):PRINTTAB(10,18)"Another game?":A$=GET$:IF A$="Y" THEN RUN
370 #FX12,0
380 END
390 DEFPROCUPDATE
400 PZ=0
410 FOR YZ=1000 TO 300 STEP-100
420 FOR XZ=0 TO 700 STEP 100
430 IF POINT(XZ+50,YZ-50)=BZ(YZ/100-3,XZ/100) THEN 460
440 GCOL0,BZ(YZ/100-3,XZ/100)
450 MOVEXZ+50,YZ-5:MOVEXZ+10,YZ-5:PLOTB5,XZ+50,YZ-95:MOVEXZ+90,YZ-50:PLOTB5,X
XZ+50,YZ-5
460 PZ=PZ+1
470 NEXT XZ:NEXT YZ
480 ENDPROC
490 DEFPROCYMOVE
500 YCM=0
510 #FX15,1
520 COLOUR1:PRINTTAB(0,27);"Row number?":SPC(29):RZ=GET-49:COLOUR0:IF RZ>=-1 A
ND RZ<=8 THEN PRINTTAB(12,27);CHR$(RZ+49) ELSE VDU7:GOTO520
530 IF RZ=-1 THEN 610
540 IF RZ=8 THEN PROCYMOVE:ENDPROC
550 COLOUR1:PRINTTAB(0,28);"Column letter?":SPC(25):CZ=ASC(GET#)-65:COLOUR0:IF
(CZ>=0 AND CZ<=7) OR CZ=-17 OR CZ=-8 THEN PRINTTAB(14,28);CHR$(CZ+65) ELSE VDU7
:GOTO550
560 IF CZ=-17 THEN 610
570 IF CZ=-8 THEN PROCYMOVE:ENDPROC
580 PROCCHANGE(YC,CC,1,RZ,CZ)
590 IF ER=1 THEN PRINTTAB(0,27);SPC(40):VDU7:GOTO 520
600 ENDPROC
610 COLOUR0:PRINTTAB(0,27)"O.K. I'll check.":SPC(25)
620 FOR R=0 TO 7:FOR C=0 TO 7:PROCCHANGE(YC,CC,0,R,C):IF ER=0 THEN C=8:R=8:GOT
O640 ELSE NEXT C:NEXT R
630 PRINTTAB(0,28)"O.K. My go! ":VDU7:A=GET(160):YCM=1:ENDPROC
640 NEXT C:NEXT R
650 PRINTTAB(0,28)"Yes you can!...":VDU7:A=INKEY(160):GOTO 520
660 DEFPROCCHANGE(YCOL,OPCOL,FILL,RZ,CZ)
670 YRZ=RZ:YCY=CZ:TYZ=0:ER=0
680 IF BZ(RZ,CZ)<>0 THEN ER=1:ENDPROC
690 DATA 1,0,1,1,0,1,-1,1,-1,0,-1,-1,0,-1,-1,0,-1,1,1,-1
700 RESTORE 690
710 FOR CHECK=1 TO 8:RZ=YRZ:CZ=YCY:READ RCZ,CCZ:GOSUB 760:NEXT CHECK
720 IF TYZ=0 THEN ER=1:ENDPROC
730 IF YCOL=CC AND FILL=1 THEN CTZ=CTZ+TYZ+1:YTY=TYZ-TYZ
740 IF YCOL=YC AND FILL=1 THEN YTY=TYZ+TYZ+1:CTZ=CTZ-TYZ
750 ENDPROC
760 IF RZ+RCZ<0 OR RZ+RCZ>7 OR CZ+CCZ<0 OR CZ+CCZ>7 THEN RETURN
770 IF BZ(RZ+RCZ,CZ+CCZ)<>OPCOL THEN RETURN
780 NZ=0
790 REPEAT
800 RZ=RZ+RCZ:CZ=CZ+CCZ:NZ=NZ+1
810 UNTIL BZ(RZ,CZ)=YCOL OR BZ(RZ,CZ)=0 OR CZ+CCZ<0 OR CZ+CCZ>7 OR RZ+RCZ<0 OR
RZ+RCZ>7
820 IF BZ(RZ,CZ)<>YCOL THEN NZ=0 ELSE TYZ=TYZ+NZ-1
830 IF FILL<>1 OR NZ=0 THEN RETURN
840 REPEAT
850 RZ=RZ-RCZ:CZ=CZ-CCZ:NZ=NZ-1:BZ(RZ,CZ)=YCOL
860 UNTIL NZ=0
870 PROCUPDATE
880 RETURN
890 DEFPROCYMOVE
900 CCM=0
910 COLOUR0:PRINTTAB(0,27);"Thinking... please wait. "
920 BIGZ(0)=0:BIGZ(1)=0
930 FOR ROWZ=0 TO 7:FOR COLZ=0 TO 7
940 PROCCHANGE(CZ,YC,0,ROWZ,COLZ)
950 IF TYZ=0 THEN 1000
960 PTZ=PZ(ROWZ,COLZ)
970 IF PTZ>2 THEN 990
980 ON (PTZ+1) GOSUB 1040,1080,1150
990 IF TYZ+PTZ>BIGZ(0)+BIGZ(1) THEN BIGZ(0)=TYZ:BIGZ(1)=PTZ:BIGZ(2)=ROWZ:BIGZ(3)
=COLZ
1000 NEXT COLZ:NEXT ROWZ
1010 IF BIGZ(0)=0 THEN VDU7:PRINTTAB(0,27);"I can't move!":SPC(27):A=INKEY(160)
:ENDPROC
1020 FOR I=1 TO 3:BX(BIGZ(2),BIGZ(3))=CC:PROCUPDATE:BX(BIGZ(2),BIGZ(3))=0:PROCU
PDATE:NEXT I:PROCCHANGE(CZ,YC,1,BIGZ(2),BIGZ(3))
1030 ENDPROC
1040 IF ROWZ<3 THEN R=0 ELSE R=7
1050 IF COLZ<3 THEN C=0 ELSE C=7
1060 IF BZ(R,C)<>0 THEN PTZ=B
1070 RETURN
1080 PTZ=6
1090 IF ROWZ>1 AND ROWZ<6 THEN RM=0 ELSE IF ROWZ<3 THEN RM=-1 ELSE RM=1
1100 IF COLZ>1 AND COLZ<6 THEN CM=0 ELSE IF COLZ<3 THEN CM=-1 ELSE CM=1
1110 IF BZ(ROWZ+RM,COLZ+CM)<>CC THEN PTZ=PTZ-2
1120 IF BZ(ROWZ+RM+CM,COLZ+CM+RM)<>CC THEN PTZ=PTZ-2
1130 IF BZ(ROWZ+RM-CM,COLZ+CM-RM)<>CC THEN PTZ=PTZ-2
1140 RETURN
1150 IF ROWZ=1 THEN RM=-1 ELSE IF ROWZ=6 THEN RM=1 ELSE RM=0
1160 IF COLZ=1 THEN CM=-1 ELSE IF COLZ=6 THEN CM=1 ELSE CM=0
1170 IF BZ(ROWZ+RM,COLZ+CM)=0 THEN PTZ=0
1180 IF BZ(ROWZ+RM,COLZ+CM)=CC THEN PTZ=16
1190 RETURN
1200 DEFPROCWIN
1210 PRINTTAB(8,10);CHR$(136);CHR$(COL);CHR$(141);A$
1220 PRINTTAB(8);CHR$(136);CHR$(COL);CHR$(141);A$
1230 ENDPROC
1240 DEFPROCINSTRUC
1250 PRINTTAB(12);CHR$(130);CHR$(141);"OTHELLO";TAB(12);CHR$(130);CHR$(141);"OT
HELLO";TAB(11);CHR$(130);CHR$(141);"*****"
1260 PRINT:PRINT CHR$(132);"Instructions:"
1270 PRINT:PRINT"You must try to beat the computer at this game called 'OTHE
LL0'.The program incorporates several special features to make the game easie
r and more interesting."
1280 PRINT:PRINT"You start off as WHITE,but you may change colour during y
our turn simply by typing '9'."
1290 PRINT:PRINT"If you think you can't go,type '0' and the computer will chec
k.If it finds thatyou can go,it will tell you,otherwise it takes its move."
1300 PRINT:CHR$(134);"Press any key to continue"
1310 A=GET:ENDPROC
1320 DEFPROCYMOVE
1330 COLOUR0:PRINTTAB(0,27);"O.K.-Colours swapped. -You are now ";
1340 IF YC=3 THEN PRINT"BLACK" ELSE PRINT"WHITE"
1350 SW=YC:YC=CC:CC=SW:SW=YTY:YTY=CTZ:CTZ=SW
1360 VDU7:A=INKEY(200):ENDPROC

```

Filecard

Steve Jaynes,
Barry,
South Glamorgan.



FILECARD IS a database-type program for storing information on the 48K Spectrum. The program is written in Basic which has obvious limitations but is still able to offer all the usual features associated with database programs, plus a couple of extra features I have put in myself.

I have tried to make the display on the screen as interesting and attractive as possible. I have come across some database programs before but found them very boring, especially in the display format, and as a result they never captured my interest. It was because of this that I wrote the Filecard program.

Most of the database programs I had come across held the data as a single or double line of information, held in one string

DIM A\$(100,32)

which allows for 100 files each with a length of 32 characters per file. This would be displayed as a single line of information across the screen from left to right. With the Filecard program the data is displayed as eight lines each with 15 characters — a total of 120 characters per file — and is placed as a block of information in the centre of the screen.

I have tried to create a card-type display rather than a couple of lines of data across the screen. I had to sacrifice the number of files that would be available to the user in order to make the most of the Spectrum's colour, and add the extra features which are available in

the Filecard program. There are, in fact, only 250 files available but this number could be increased slightly by not using the colours of the Spectrum. I think that if you have the colour facility you should make the most of it. Database-type programs will come into their own once the long-awaited Microdrive is made available, as it will mean very fast retrieval of data which has been stored outside the computer.

I used a single string array A\$, but I made it a three-dimensional array. This way allows for a number of different entries per file i.e.,

DIM A\$(250,8,15)

which gives us 250 files each with eight lines containing 15 characters each. With this type of array the format for the display could be made to resemble that of a small filecard, see figure 1.

FILECARD NO. 1	
NAME-	FRED BLOGGS
DETAILS-	16 ARTHUR ST
	BLOWDOWN
	COST £175.00
	DEPOSIT £17.50
	BALANCE £157.50
	INTEREST 10%
	12 AT £14.44

Figure 1.

The features of this program are:

Terminate. This option allows you to stop the program. If you exit the program and then decide to continue, providing the program is still in the computer, you can type Goto 330, which is the start of the menu routine, and the files which were in the computer will still be there.

Add a filecard. This allows the input of filecards through the keyboard. Each line is

entered as a string of 15 characters, a For-Next loop does this eight times — the number of lines per file. There is also a facility to correct any mistakes that are made during the entry of files. After all the files have been entered they are sorted into alphabetical order.

Search a filecard. You simply enter the name of the file you wish to see and the computer will search through all the file names until it finds the one you chose. It will then print the whole file on the screen.

Save filecards. This option allows the user to Save files on to cassette. Data is Saved twice.

Load filecards. This allows the user to load files from cassette.

List filenames. This option takes the first line of every file and prints in a list. Each file is in alphabetical order and is numbered. There is the optional output to printer in this routine.

List filecards. This option displays each file, in a complete form, on the screen. The files are in alphabetical order and each is numbered. There is also the optional output to the printer if required.

Scan filecards. This allows the user to browse through the filecards at his own pace. When entering this routine the first filecard to be displayed is number 1, by pressing any key except P or Q you can move on to the next file. The P key allows you to move backwards down the list. The Q key will return the user to the menu. All the filecards are displayed in their complete form.

Alter filecards. This allows the user to alter a filecard at any time. The filecard is displayed on the screen; all the user has to do is position

(continued on page 179)

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| GALACTIC DOGFIGHT | CANNONBALL BATTLE | SPACE SEARCH |
| ZION ATTACK | OVERTAKE | UNIVERSE |
| IVASIVE ACTION | SITTING TARGET | RATS |
| OXO | SMASH THE WINDOWS | TANKER |
| BOGGLES | SPACE SHIP | PARACHUTE |
| PONTOON | JET FLIGHT | JETMOBILE |
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SOFTWARE FILE

(continued from page 177)

the small cursor alongside the line they wish to change. Changing that line is a simple task.

All these options are easy to use and all the instructions needed are printed on the screen for you.

The lack of files is one of the bad points

about the program. Another bad point is the time it takes to sort. This is because every time a swap has to take place, all the information which is held in eight lines has to be swapped as well, making it a very long process. The routine uses a For/Next loop to transfer the file in the sort but it does take its time.

Program notes.

POKE 23658,8 forces caps lock on
POKE 23609,50 is the keyboard bleep
POKE 23692,0 will scroll the screen
There are no Rem statements in order to allow maximum storage area. A\$ is the dimensioned array for holding the filecards

```

10 PAPER 0: INK 7: BORDER 0: CLS
20 PAPER 0: INK 7: BORDER 0:
30 PRINT INK 6; BRIGHT 1; AT 10, 11; " F
ILECARD 1 "; AT 19,0; "By Steve Jeynes"; AT
21,0; "PRESS ANY KEY TO CONTINUE"
40 POKE 23609,50: POKE 23658,8
50 LET F$="FILECARD NO. ": LET N$="NAM
E- ": LET H$="DETAILS-": LET L$="MAX.
15 CHR$ PER LINE": LET E$="MAX. 8 LINES
PER CARD": LET G$="ENTRY NO. "
60 DIM a$(250,8,15): LET E=1
70 PAUSE 0: CLS
80 GO TO 330
90 REM INPUT FILES
100 PRINT INK 7; BRIGHT 1; AT 0,9; "FILEC
ARD ENTRY"
110 GO SUB 820: GO SUB 910
120 PRINT INK 5; BRIGHT 1; AT 3,23; E
130 PRINT AT 19,0; "
"; AT 20,0; "
"; AT 21,0; "
"
140 PRINT INK 7; BRIGHT 1; AT 20,3; G$
150 FOR J=1 TO 8
160 PRINT INK 7; BRIGHT 1; AT 20,12; J
170 PRINT BRIGHT 1; INK 7; AT J+4,13; ">>
"
180 INPUT A$(E,J,1 TO 15)
190 IF A$(E,J)="" THEN L
ET A$(E,J)="" " THEN L
200 PRINT INK 6; BRIGHT 1; AT J+4,13; A$(
E,J) (1 TO LEN A$(E,J)): NEXT J
210 BEEP .5,50: LET F=E: GO SUB 930
220 BEEP .10,10: LET E=E+1: IF E>200 TH
EN GO TO 240
230 PAUSE 50: FOR J=1 TO 8: PRINT AT J+
4,13; " ": NEXT J: GO TO 12
0
240 REM SORT
250 CLS : PRINT INK 4; BRIGHT 1; INVERS
E 1; AT 0,6; "STAND BY- SORTING"
260 FOR B=1 TO E-1: FOR C=B+1 TO E-1
270 IF A$(B,1)<A$(C,1) THEN GO TO 300
280 FOR J=1 TO 8
290 LET D$=A$(B,J): LET A$(B,J)=A$(C,J)
: LET A$(C,J)=D$: NEXT J
300 NEXT C
310 NEXT B
320 PRINT INK 5; BRIGHT 1; INVERSE 1; AT
0,6; " SORTING COMPLETE ": FOR H=-20 TO
20: BEEP .010,H: NEXT H: CLS
330 REM MENU
340 PRINT INK 6; BRIGHT 1; AT 0,11; "OPTI
ONS"; AT 2,7; "1 - TERMINATE"; AT 4,7; "2 -
ADD A FILECARD"; AT 6,7; "3 - SEARCH A FIL
ECARD"; AT 8,7; "4 - SAVE FILECARDS"; AT 10
,7; "5 - LOAD FILECARDS"; AT 12,7; "6 - LIS
T FILE NAMES"; AT 14,7; "7 - LIST FILECARD
S"; AT 16,7; "8 - SCAN FILECARDS"; AT 18,7;
"9 - ALTER FILECARDS"
350 IF INKEY$="" THEN GO TO 350
360 IF INKEY$="1" THEN CLS : PRINT INK
6; BRIGHT 1; AT 10,0; "DO YOU WISH TO STOP
THE PROGRAM?": INPUT BRIGHT 1; "ENTER Y
/N"; B$: IF B$="Y" THEN STOP
370 IF INKEY$="2" THEN CLS : GO TO 090
380 IF INKEY$="3" THEN CLS : GO TO 460
390 IF INKEY$="4" THEN CLS : GO TO 530
400 IF INKEY$="5" THEN CLS : GO TO 570
410 IF INKEY$="6" THEN CLS : GO TO 600
420 IF INKEY$="7" THEN CLS : GO TO 1180

```

```

430 IF INKEY$="8" THEN CLS : GO SUB 108
0
440 IF INKEY$="9" THEN CLS : GO TO 740
450 CLS : GO TO 330
460 REM SEARCH
470 INPUT BRIGHT 1; "HARD COPY? (Y/N)";
B$
480 CLS : PRINT BRIGHT 1; INK 1; PAPER
7; AT 10,2; "ENTER FILE TO BE SEARCHED FOR
": LET F=E
490 INPUT Z$
500 IF Z$=A$(F,1) ( TO LEN Z$) THEN CLS
: PRINT BRIGHT 1; INK 1; PAPER 6; AT 1,10
; "FILE FOUND": GO SUB 820: PRINT INK 5;
BRIGHT 1; AT 3,23; F: FOR J=1 TO 8: PRINT
INK 7; AT J+4,13; A$(F,J): NEXT J: PAUSE 4
00: IF B$="Y" THEN COPY : CLS : GO TO 33
0
510 IF F>1 THEN LET F=F-1: GO TO 500
520 CLS : PRINT INK 2; PAPER 7; INVERSE
1; AT 21,7; "FILE SEARCH COMPLETE": GO TO
330
530 REM SAVE DATA
540 FOR V=1 TO 2: CLS
550 PRINT INK 7; BRIGHT 1; AT 4,9; "SAVIN
G DATA A$": SAVE "DATA" DATA A$(): NEXT V
560 CLS : PRINT INK 7; BRIGHT 1; AT 4,9;
"SAVE COMPLETE": PAUSE 100: CLS : GO TO
330
570 REM LOAD DATA A$
580 CLS : PRINT INK 7; BRIGHT 1; AT 0,7;
"LOADING DATA A$": LOAD "DATA" DATA A$()
590 CLS : GO TO 330
600 REM LIST
610 PRINT INK 7; BRIGHT 1; AT 7,0; "PRESS
""P"" KEY TO HOLD LIST PRESS ANY K
EY TO CONTINUE LIST NO HOLD WHEN PRINTE
R IS USED"
620 LET E=1: INPUT BRIGHT 1; "HARD COPY?
(Y/N)"; B$: CLS
630 IF A$(E,1)="" " THEN G
O TO 710
640 IF INKEY$="P" THEN PAUSE 0
650 PRINT INK 7; BRIGHT 1; A$(E,1); INK
5; INVERSE 1; "NO.-"; E; CHR$ 94: PRINT
660 IF INKEY$="P" THEN PAUSE 0
670 IF B$="Y" THEN LPRINT A$(E,1); INVE
RSE 1; "NO.-"; E; CHR$ 94: LPRINT
680 IF INKEY$="P" THEN PAUSE 0
690 LET E=E+1: PAUSE 30: POKE 23692,0:
GO TO 630
700 PAUSE 200: CLS : GO TO 330
710 PRINT FLASH 1; INK 6; PAPER 1; "LIST
COMPLETE"
720 IF B$="Y" THEN LPRINT "LIST COMPLET
E"
730 PAUSE 100: CLS : GO TO 330
740 REM ALTER FILE
750 CLS : INPUT BRIGHT 1; "ENTER FILE NU
MBER TO BE CHANGED "; F: GO SUB 820: GO S
UB 910
760 PRINT INK 7; BRIGHT 1; AT 3,23; F: FO
R J=1 TO 8: PRINT INK 6; BRIGHT 1; AT J+4
,13; A$(F,J): NEXT J
770 GO SUB 970
780 INPUT BRIGHT 1; "ALTER ANOTHER FILE?
(Y/N)"; B$
790 IF B$="Y" THEN GO TO 750
800 CLS : GO TO 240
810 RUN

```

```

820 REM DRAW
830 INK 5: PAPER 0: BRIGHT 1
840 PLOT 28,68: DRAW 200,0: DRAW 0,88
850 PLOT 28,156: DRAW 0,-88
860 PLOT 228,156: DRAW -200,0
870 PLOT 28,140: DRAW 200,0
880 PLOT 100,140: DRAW 0,-72
890 PRINT AT 3,9; F$; AT 5,4; N$; AT 6,4; H$
900 RETURN
910 PRINT INK 7; BRIGHT 1; AT 15,3; L$; AT
14,3; E$
920 RETURN
930 INPUT BRIGHT 1; "IS THIS FILE CORREC
T? (Y/N) "; B$
940 IF B$="Y" THEN RETURN
950 IF B$="N" THEN GO TO 970
960 GO TO 930
970 PRINT INK 7; BRIGHT 1; AT 19,0; "PRES
S ""A"" TO SELECT INCORRECT ENTRY WITH
<< CURSOR""PRESS ""P"" WHEN SELECTED"
; AT 5,30; "<<"
980 LET J=1
990 LET S$=INKEY$: IF S$="" THEN GO TO
990
1000 IF S$="P" THEN GO TO 1050
1010 IF S$="A" THEN LET J=J+1
1020 IF J=9 THEN PRINT AT J+3,30; " ": L
ET J=1
1030 PRINT INK 7; BRIGHT 1; AT J+4,30; "<<
"; AT J+3,30; " "
1040 PAUSE 100: GO TO 990
1050 INPUT BRIGHT 1; "INPUT CORRECT ENTRY
"; A$(F,J)
1060 PRINT INK 6; BRIGHT 1; AT J+4,13; A$(
F,J); AT J+4,30; " "
1070 GO TO 930
1080 LET F=1
1090 GO SUB 820: PRINT INK 7; BRIGHT 1; A
T 18,0; "PRESS ""P"" TO SCAN PREVIOUS FIL
E PRESS ""Q"" TO RETURN TO MENU PRES
S ANY OTHER KEY TO CONTINUE"
1100 IF F<1 THEN LET F=1
1110 PRINT INK 7; BRIGHT 1; AT 3,23; F; " "
: FOR J=1 TO 8: PRINT AT J+4,13; A$(F,J):
NEXT J
1120 IF INKEY$="" THEN GO TO 1120
1130 IF INKEY$="P" THEN LET F=F-1: GO TO
1100
1140 IF INKEY$="Q" THEN CLS : GO TO 330
1150 IF INKEY$<>"P" AND INKEY$<>"Q" THEN
LET F=F+1
1160 IF F=E THEN CLS : PRINT INK 7; BRIG
HT 1; AT 1,10; "NO MORE FILES": PAUSE 100:
CLS : GO TO 330
1170 GO TO 1100
1180 INPUT BRIGHT 1; "HARD COPY? (Y/N)";
B$
1190 LET F=1: GO SUB 820
1200 FOR J=1 TO 8
1210 PRINT INK 7; BRIGHT 1; AT 3,23; F; AT
J+4,13; A$(F,J)
1220 NEXT J
1230 PAUSE 100
1240 IF B$="Y" THEN COPY
1250 IF F=E-1 THEN GO TO 1280
1260 LET F=F+1
1270 GO TO 1200
1280 CLS : PRINT INK 7; BRIGHT 1; AT 3,10
; "LIST COMPLETE": PAUSE 100: CLS : GO TO
330

```

Renumber

G M Jackson,
Osmkirk,
Lancashire.

ORIC

THIS IS A useful renumber program for the Oric 1. Oric owners should find the way it utilises some of the machine's addressing features informative. Although it is written in Basic it is surprisingly fast.

The program only renumbers program lines and does not alter the number after Gosubs and Gotos. To use it simply tag it on the end of the program you want to renumber and enter Goto 63900.

```

10 REM THE PROGRAM USES THE FOLLOWING VARIABLES:
20 REM DEEK(£9A) = THE START OF BASIC PROGRAM
30 REM DEEK(£9C) = END OF BASIC PROGRAM = E
40 REM A = ADDRESS OF BASIC PROGRAM LINE = DEEK(A)
50 REM N = LINE NUMBER
60 REM S (INITIALLY) = START LINE NUMBER FROM
70 REM I = INCREMENT
63900 REM FOR £ READ HASH CHARACTER
63905 PRINT CHR$(12); SPC(10) "RENUMBER": PRINT
63910 INPUT "COMMENCE LINE NUMBERS FROM"; S
63915 IF S<1 OR S>63899 THEN GOTO 63910
63920 INPUT "INCREMENT BY"; I
63925 IF I<1 OR I>100 THEN GOTO 63920
63930 A=DEEK(£9A): E=DEEK(£9C)
63935 N=DEEK(A+2)
63940 IF N>=63900 OR A>E THEN PRINT "RENUMBER COMPLETED": END
63945 DOKEA+2, S: S=S+I: A=DEEK(A)
63950 GOTO 63935

```



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COMPETITION CORNER

A £15 book token will be awarded to the first correct solution drawn from the competition bag. All entries must be at the *Your Computer* offices by the last working day in September. The name of the winner, the solution, and a competition report will be published in the November, 1983 issue of *Your Computer*.

If you want to set a competition for Competition Corner, remember that the simplest solution should be calculable by a short program rather than by any other form of reckoning.

COMPETITION RESULTS AND WINNERS

"I WOULD LIKE AN Electron to enter my orbit because . . ." was the way July's competition sentence began. Most competitors drew their inspiration from physics. The electron, it appears carries a negative charge and attracts particles with a positive charge. Almost a hundred people were struck by this fact and started their entries with "I am positive . . .". B. Moxley said simply, "I am positive I would be attracted to it", while N Langley confessed "I am positively unstable without it". The winning entry came from R Warriner, 59 Reeds Lane, Moreton, Wirral, who wrote "I am positively excited by it current potential".

Other variations on the nuclear theme were R Munday's "I don't want to Bohr people with my Atom".

Competitors had clearly ransacked their physics textbooks for appropriate puns, as in R Booth's "coming with no charge would give it a unique charm" and E Jupp's "it would bring me out of my shell by a quantum leap". The most ingenious of these perhaps was "I.C. I can't resistor current micro: watt ohms not ampered without one" from N Reckert.

Leptons, protons, positrons, neutrons, quarks all made an appearance but particle of the month was undoubtedly the ion. "Ion-estly find myself attracted by its high positive potential" quipped M Cutler. And in common with several others S Baker reported "I have had my ion it for some time".

Only a few entries managed to escape from the world of particles and electricity. P Mullen suggested "its a dream-piece rainbow warrior to harpoon the wailing industry" and B Turner offered "If win <> Electron then repeat Goto arcade until cashflow = 0".

The Trinary Tribulation puzzle was almost too easy for most competitors. Finding a solution only requires that you convert the decimal number 282506 to its trinary equivalent, 1121000112012. If you now consult the table of alphabetic codes you can translate four groups of three "trits" to give the answer, NINE.

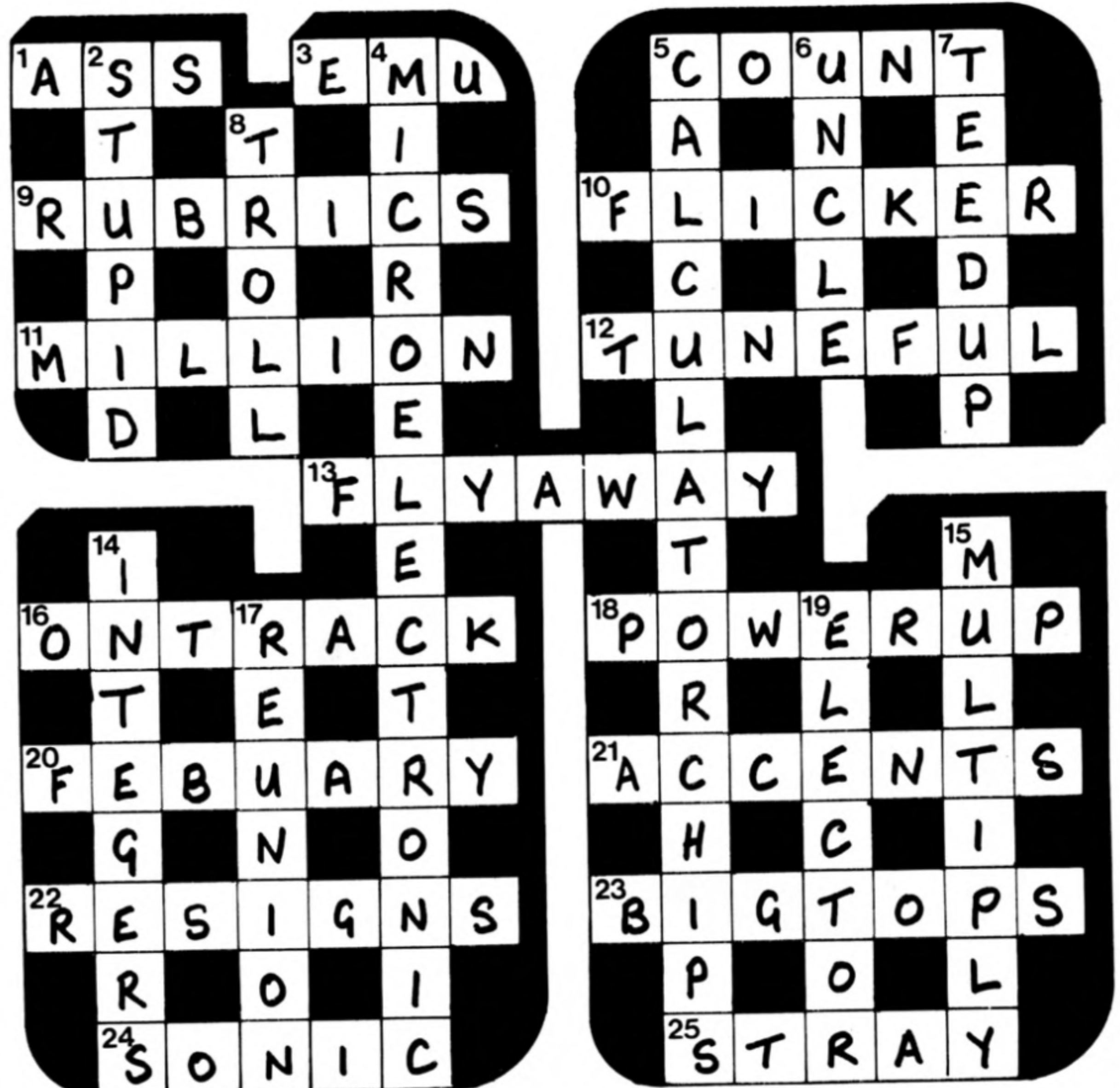
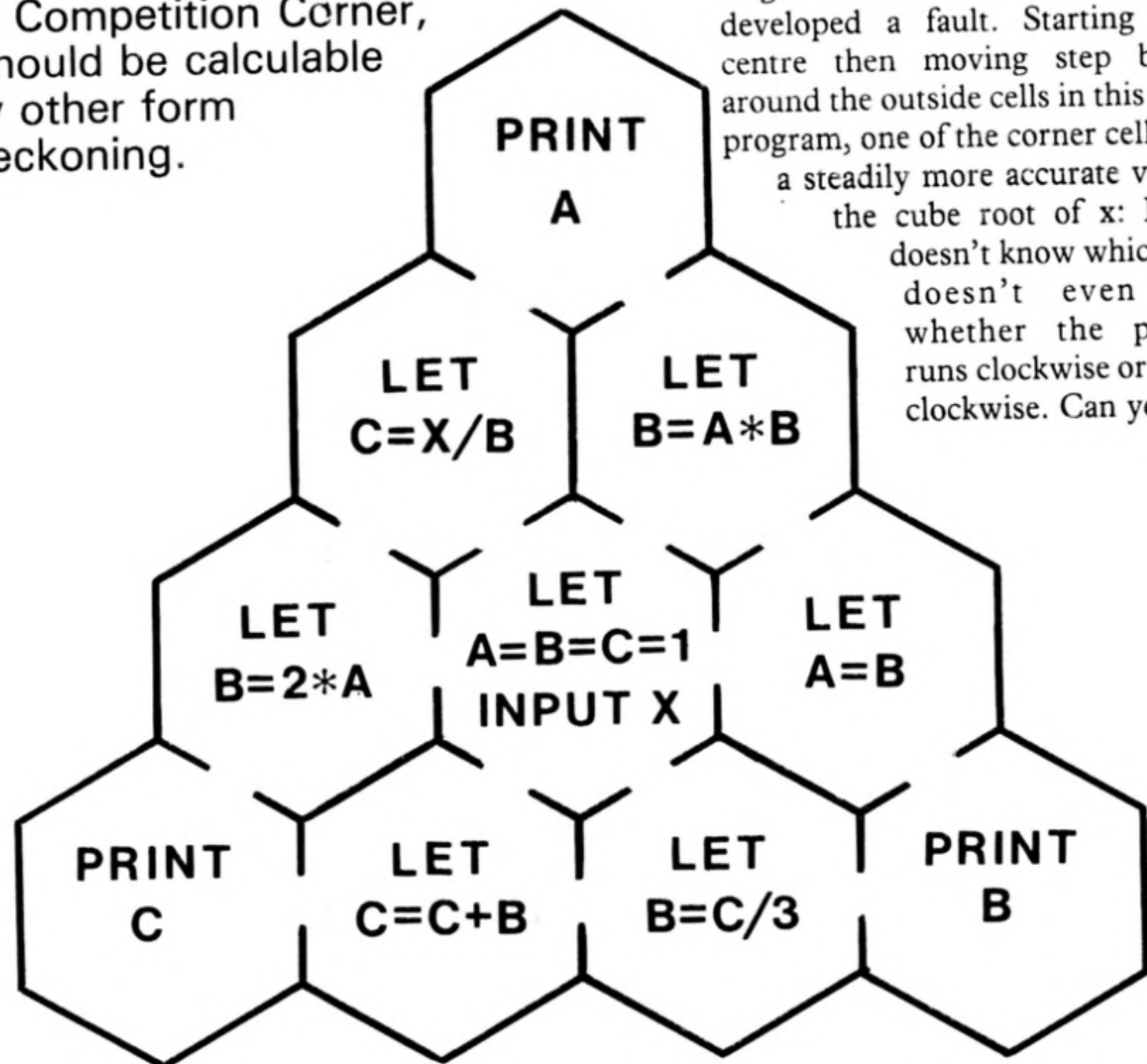
We awarded the £15 book token to A Caslaw, 31 Purton Stoke, Swindon, Wilts, who submitted the following program to run on a ZX81:

```
10 LET A$=""
20 INPUT X
30 LET Y=X/27
40 LET X=INT Y
50 LET B#=CHR$ (27*(Y-X) +37)
60 LET A#=B#+A#
70 IF X>0 THEN GOTO 30
80 PRINT A#
```

HONEYCOMB

BY ANTHONY ROBERTS

THE QUEEN OF the hive-ship Sting has another problem — the Honeycomb Logic board of her hex-micro has developed a fault. Starting in the centre then moving step by step around the outside cells in this cellular program, one of the corner cells prints a steadily more accurate value for the cube root of x: But she doesn't know which — she doesn't even know whether the program runs clockwise or counter clockwise. Can you help?



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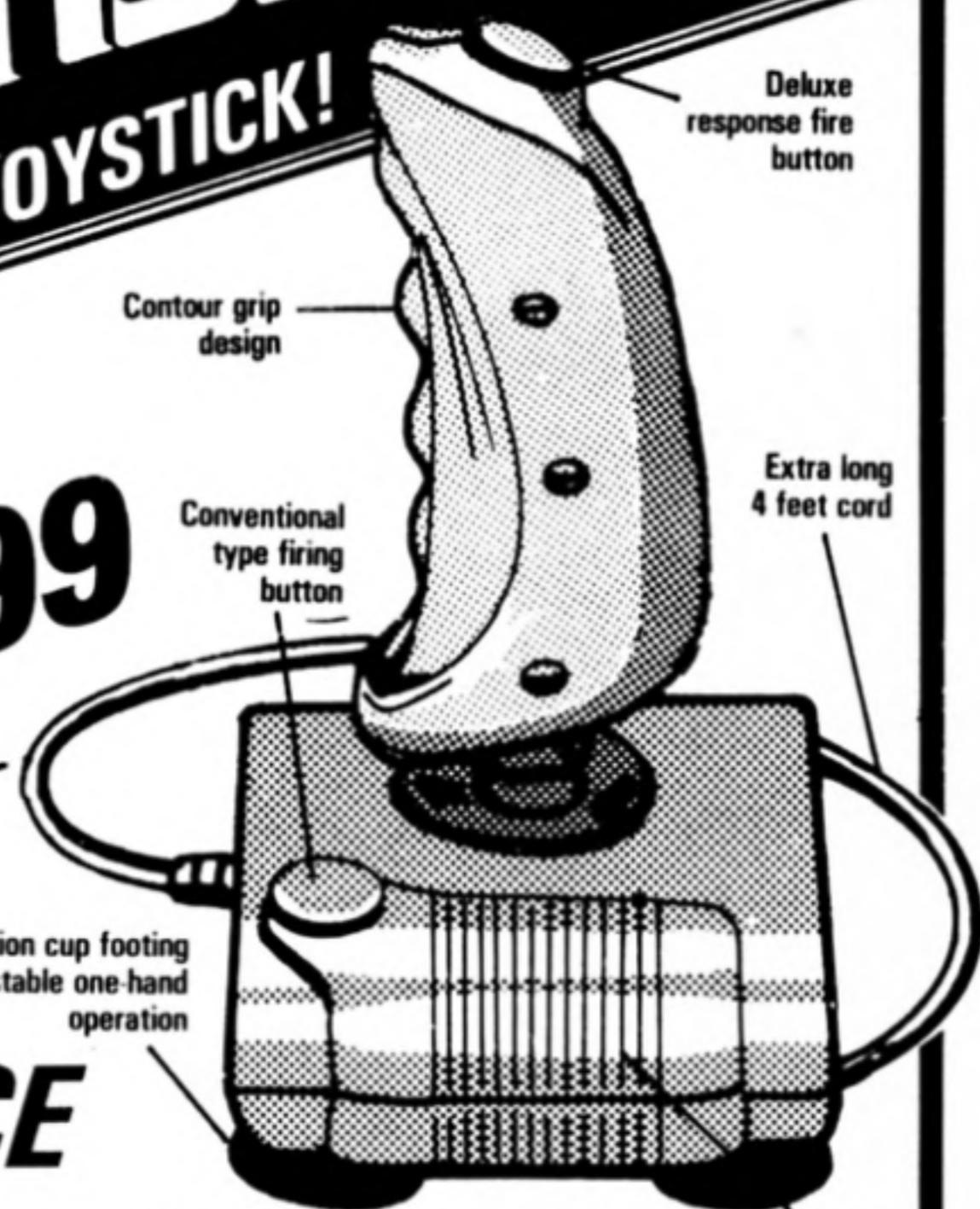
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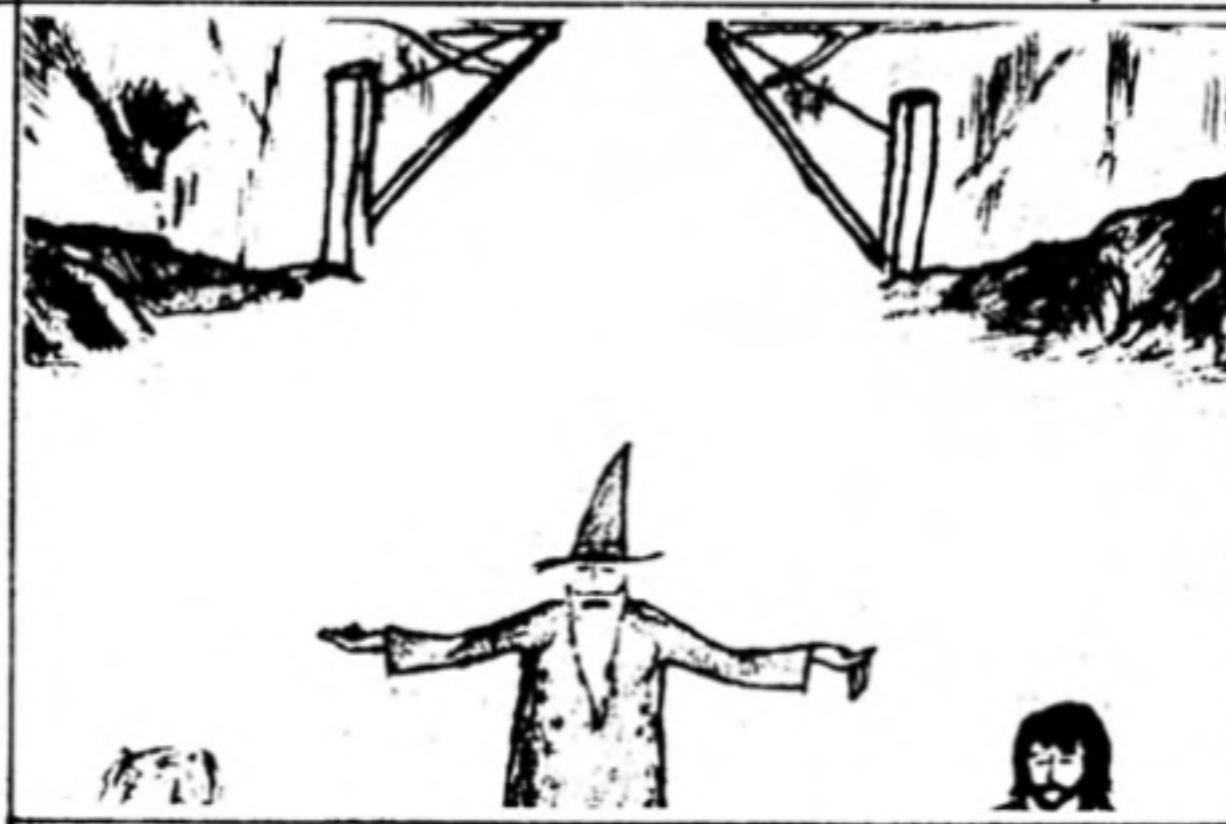


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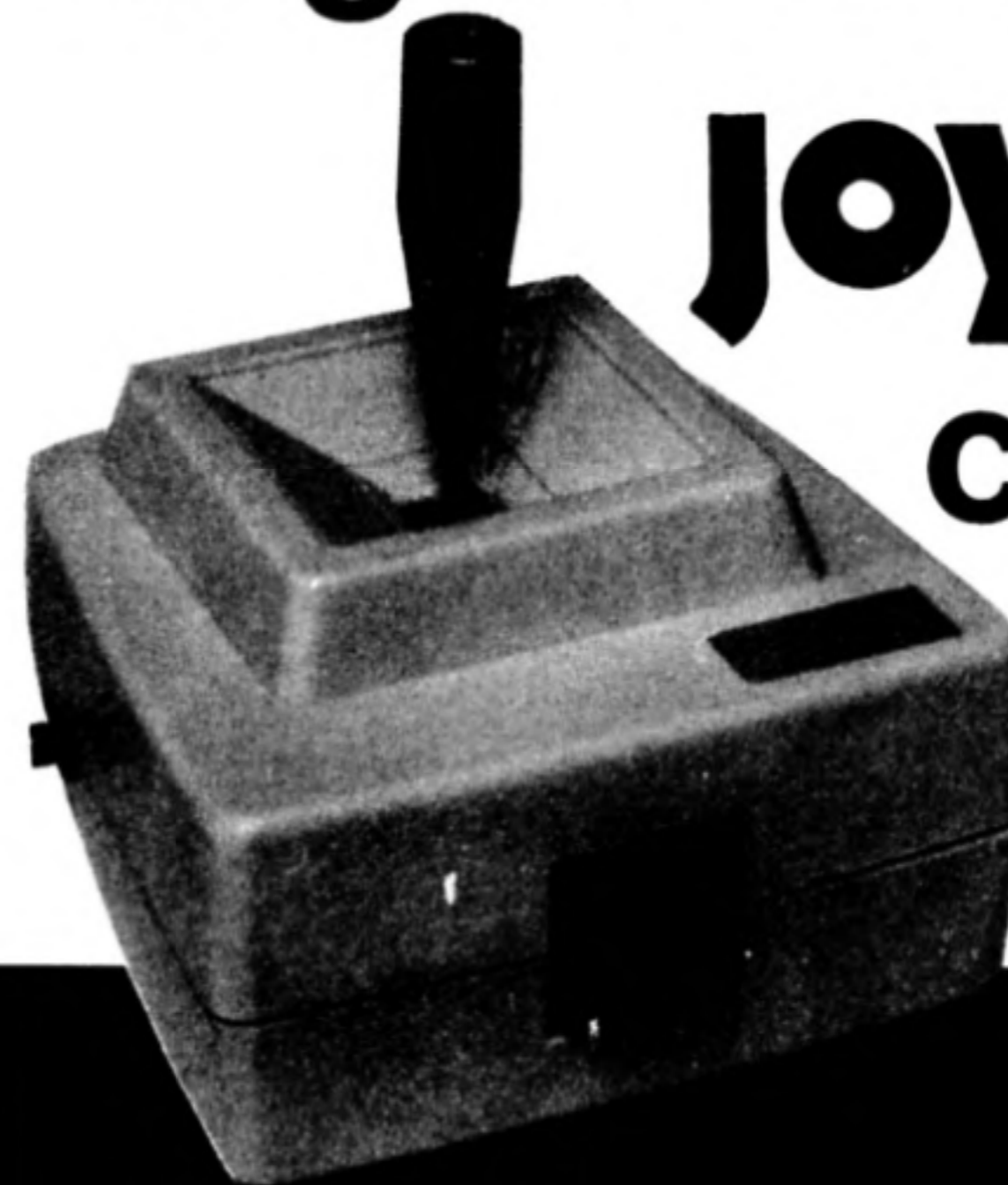
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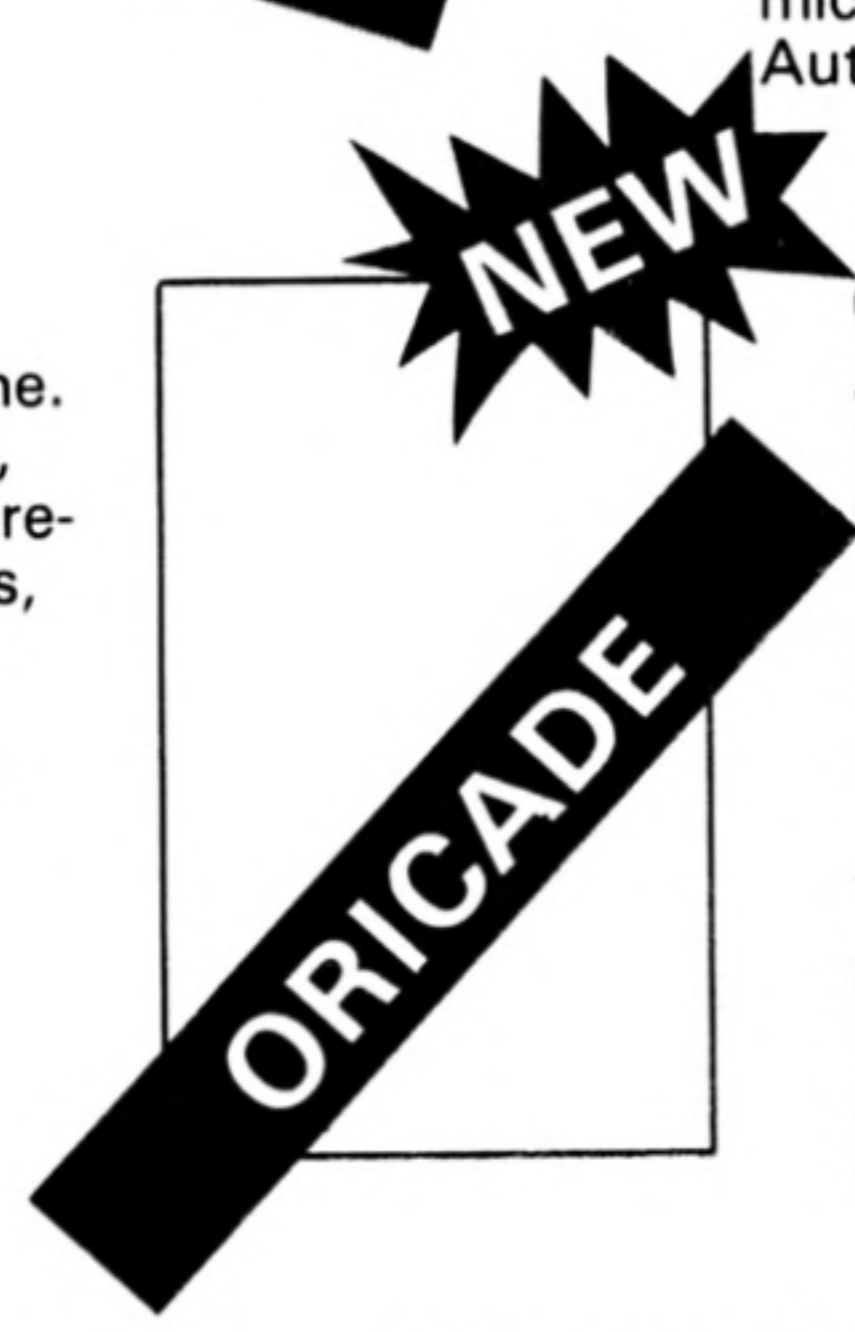
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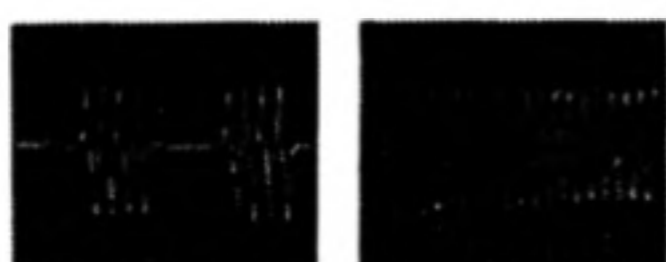
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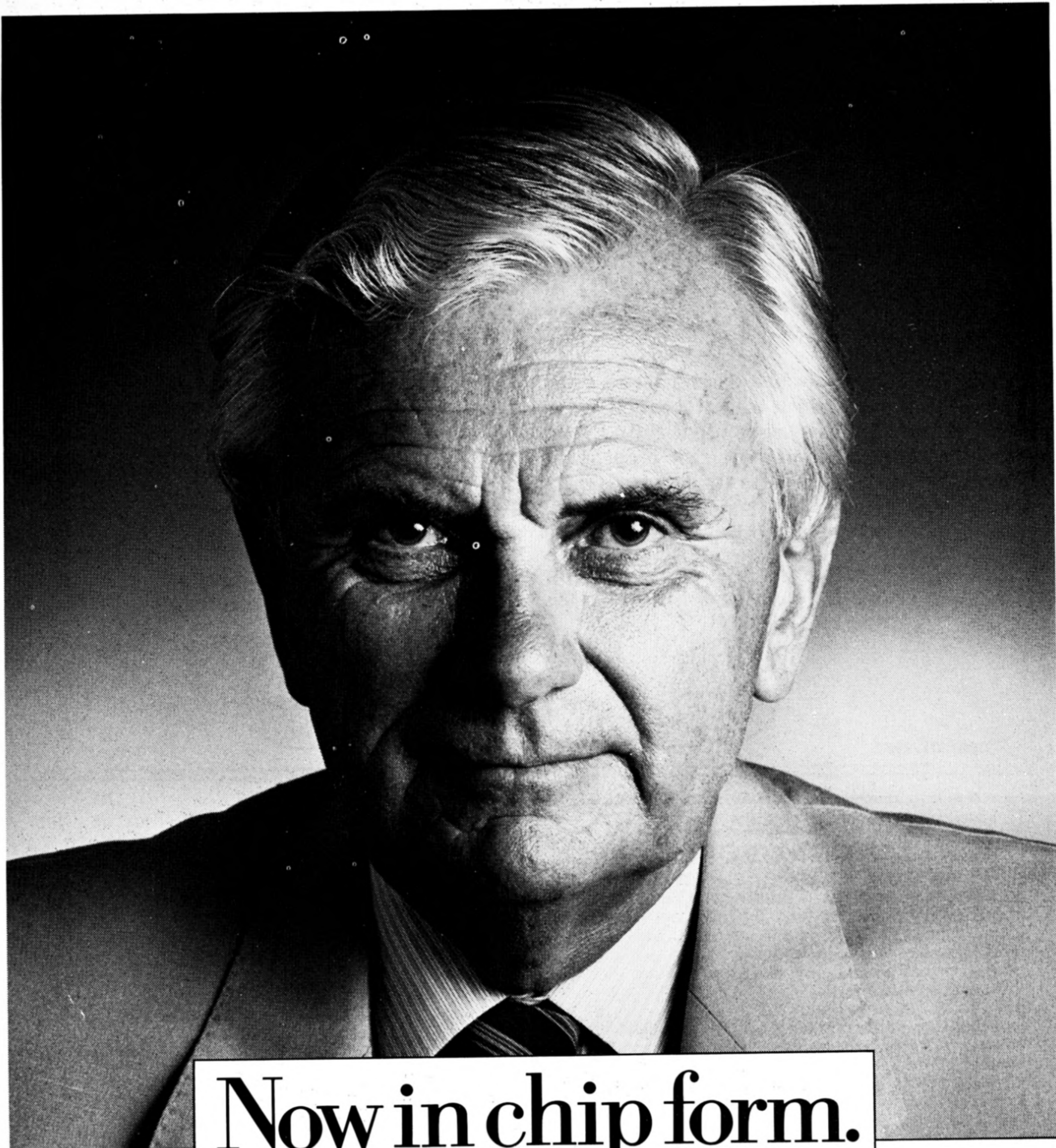
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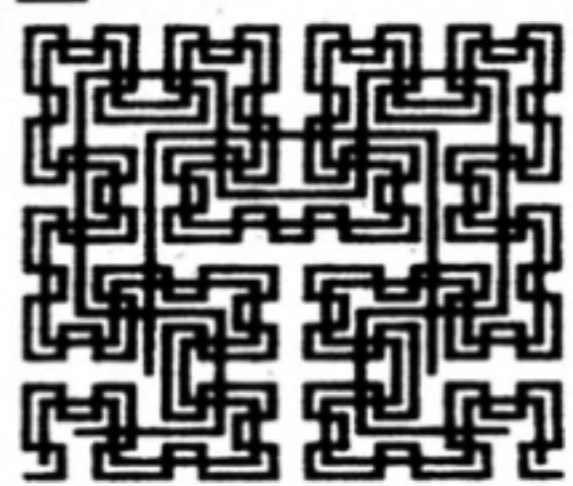
combined to form several hundred other words.

The chips also provide the 'serial' processing capability whereby future software cartridges can also be plugged into the front of your BBC Micro. (The machine's vocabulary will be widened via such cartridges.)

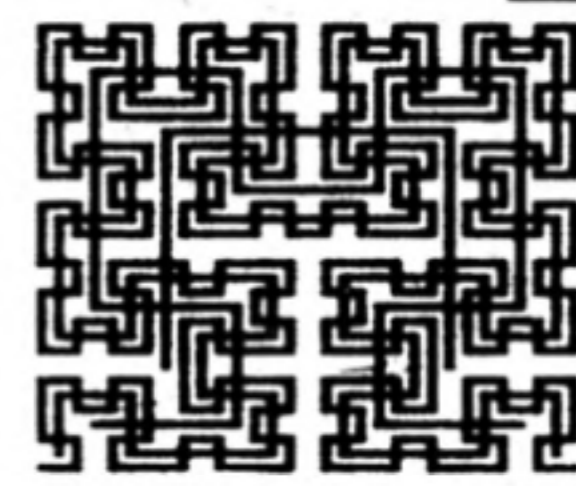
Priced £55, Speech Synthesis is available from your local BBC/Acorn dealer. (To find out where that is, simply call 01-200 0200.)



If you'd like more information, he'll complete the story. In plain English, of course.



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Hisoft DEVPAC comprises a powerful assembler and a disassembler/debugger which open up the secrets of fast machine code programming on the SPECTRUM. DEVPAC contains a unique blend of advanced features that you will not find together in any other product. These include conditional assembly, front panel display of registers, single step of programs and much, much more. 'DEVPAC is most highly recommended' - Your Computer, May 1983.

PRICES: **SPECTRUM: PASCAL 4T - £25 inclusive, DEVPAC - £14 inclusive,**
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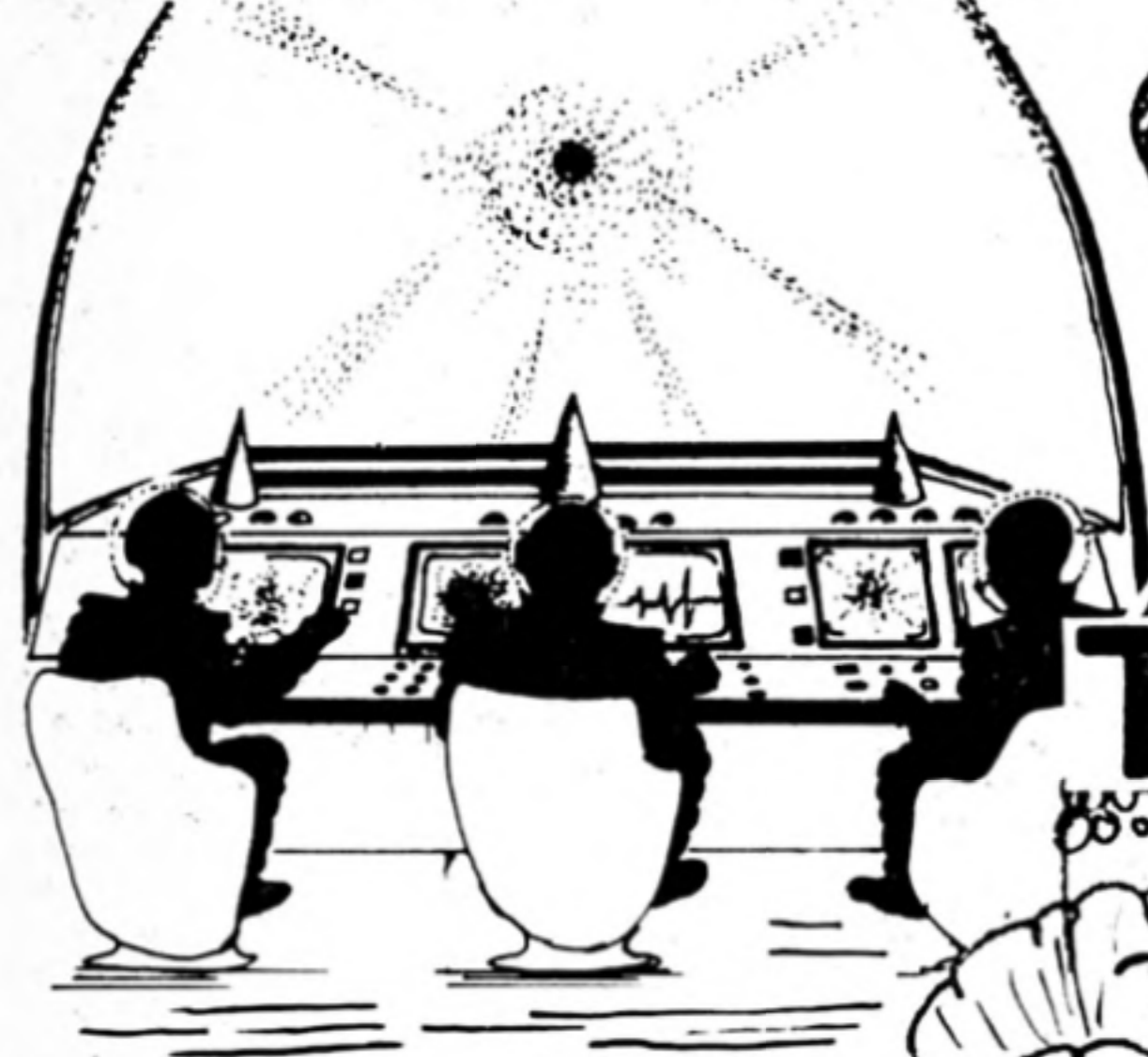
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March Issue: Program Features: Life (32K), Artillery Dual (16K/32K), Square Dance, Microsketch (16K) screen drawing program in only one line of code. 3D Rotation (will rotate any object). Printers for the BBC micro — Review of Epson, Seikosha, Tandy and Olivetti. What to do with the new Operating System Chip, Disc Formatter Program, and full Disc instruction set, Newcomers article on Text and Graphics Windows. PLUS How to get a new Operating System ROM and a special deal on Wordwise (members only).

April/ May Issue Special Anniversary Issue — Contains index to the whole of BEEBUG Volume 1. Music Composer — create complex 3 part harmonies with this synthesiser Program. Colour bar chart generator program. Beeb implementation of the Connect-Four Game. Invasion — a 16K. Plus Review of Tape Recorders for the Beeb; a Basic Program Editor, which lists variables and procedures, and executes find and Replace in a Basic Program; Reviews of Acornsoft Games and the Torch 200 Disc Pack. Disc Menu Program. Newcomers introduction to Mode 7. How to save the unsavable; and a routine to print Double Height characters in all modes.

June Issue: Program Features 'Return of the Diamond' A 16K adventure game, 'hedgehog' a well implemented 'Frogger' type game, and Ellipto. Create your own off the shelf sound effects with Sound Wizard. Plus articles on using Files, Rotating and Expanding Characters, Using Printers, and How to multi-program the User Keys. Reviews of The Hobbit Floppy Tape System, Adventure Games, and a Comparative Review of Wordwise and View. Plus FX Call Update, Disc Program Auto-relocator, Wordwise Update, and more BBC Book Reviews.

STOP PRESS
BEEBUG has negotiated a deal with ACORN over the new 1.2 OPERATING SYSTEM ROM. BEEBUG members are offered the ROM at around half-price. See BEEBUG Feb. Issue for details.

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offers members a growing range of software from £3.50 per cassette. 1. Starfire (32K). 2. Moonlander (16K). 3D Noughts and Crosses (32K). 3. Shape Match (18K). Mindbinder (16K). 4. Magic Eel (32K). 5. Cylon Attack (32K). 6. Astro-Tracker (32K). Utilities: 1. Dissembler (16K). Redefine (16K). Mini Text Ed (32K). Applications: 1. Superplot (32K). 2. Masterfile (32K).

Magazine programs now available on cassette to members at £3.50 inc: VAT & p+p — see April/ May issue for details.

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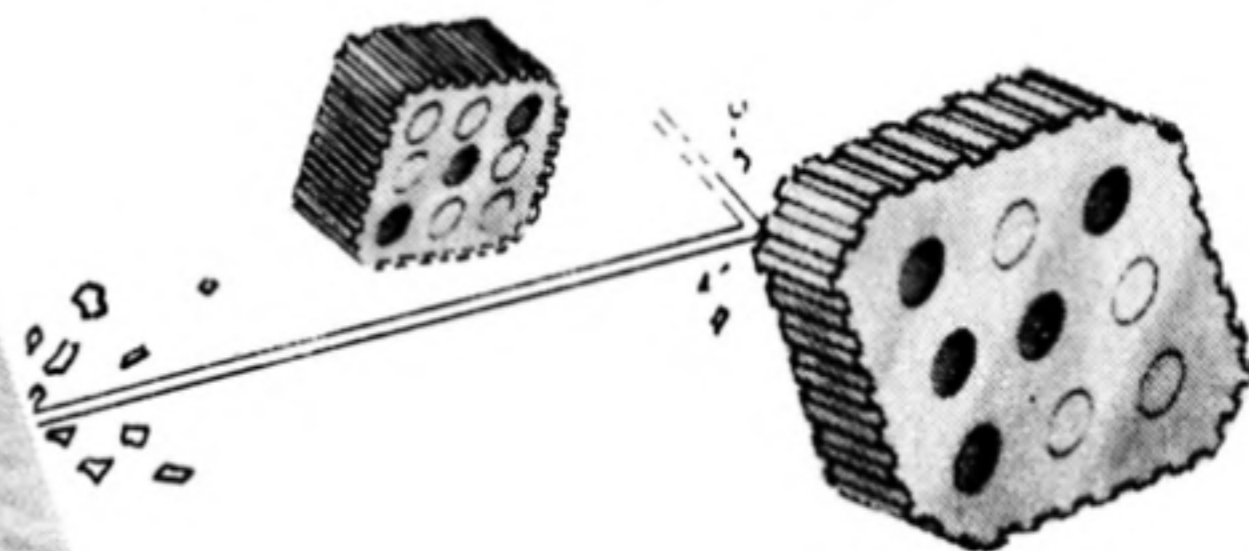
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4-8
year
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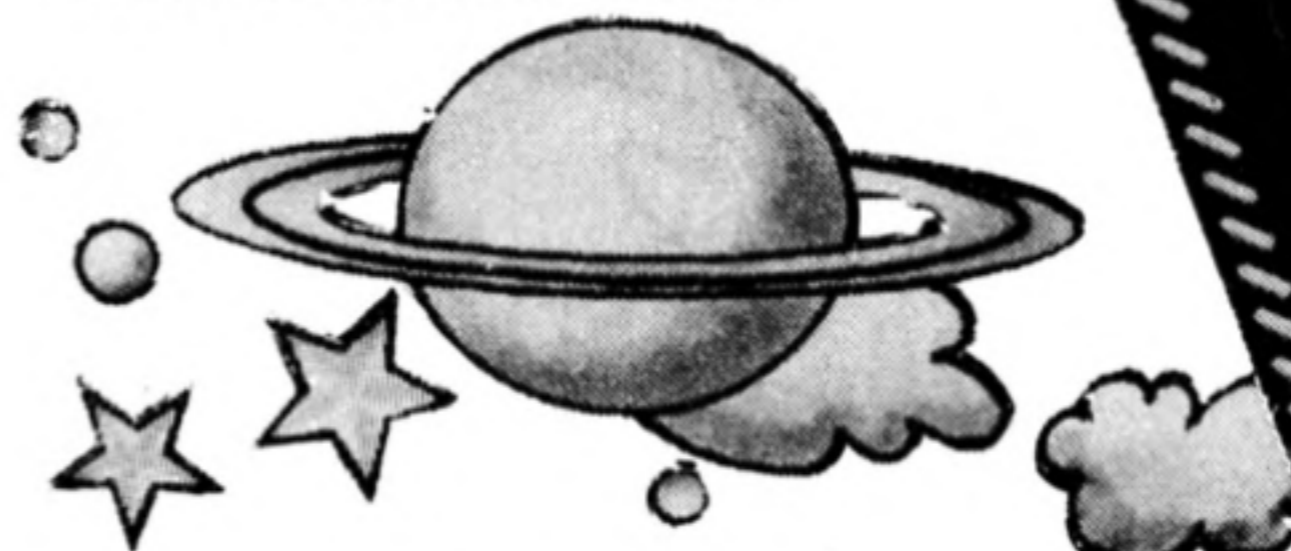


a,b,c... Lift-off! - an exciting introduction to the alphabet that teaches the letters in correct order. Page through the alphabet picture book and help load our spaceship to Venus by matching pictures and words. See lift-off with full sound effects!

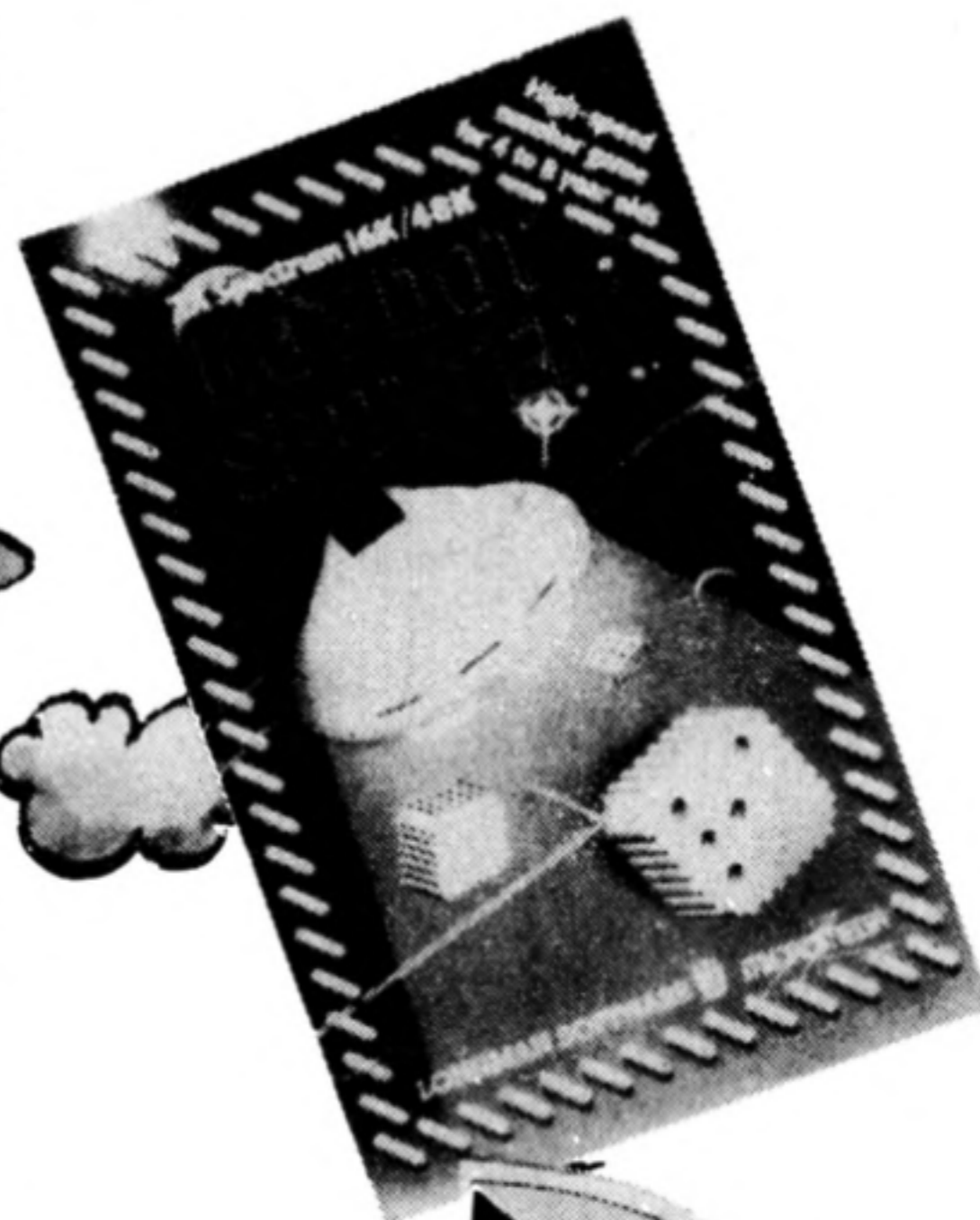
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NEWS
HUNT WINS GRAND PRIX

At yesterday's Monaco Grand Prix, a hunting party strayed onto the track at the climax of the race. Cars were halted as the hounds rampaged around the circuit. "The whole place has gone to the dogs," one driver was reported as saying. The race was restarted; riders and drivers battled bitterly around the course before the Hunt thundered past the finishing line to take the chequered flag (it hasn't been seen since).

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Police are baffled by the disappearance of Dan Diamond. He was last seen approaching the eerie edifice known as Franklin's Tomb, but the authorities are completely unable to find any trace of him. Citizens are asked to report any information relating to his disappearance immediately. For further details, buy **FRANKLIN'S TOMB**, a new adventure game for the **DRAGON 32** and **48k ORIC-1**. This adventure comes complete with a 24-page illustrated Case File. £9.95 from **BOOTS, SPECTRUM, COMPUTERS FOR ALL, WEBSTERS** and all other purveyors of software. Don't

2 DEAD IN EVEREST TRAGEDY

The Everest Expedition ended in tragedy yesterday as Carl and Fred plunged down a crevasse to a grisly death. He the expedition leader was quoted as saying "Yuk". *Continued on page 10*

COLD WAR ON XARG ESCALATES

Thousands dead in Ice Storm Muduras the M said yesterday



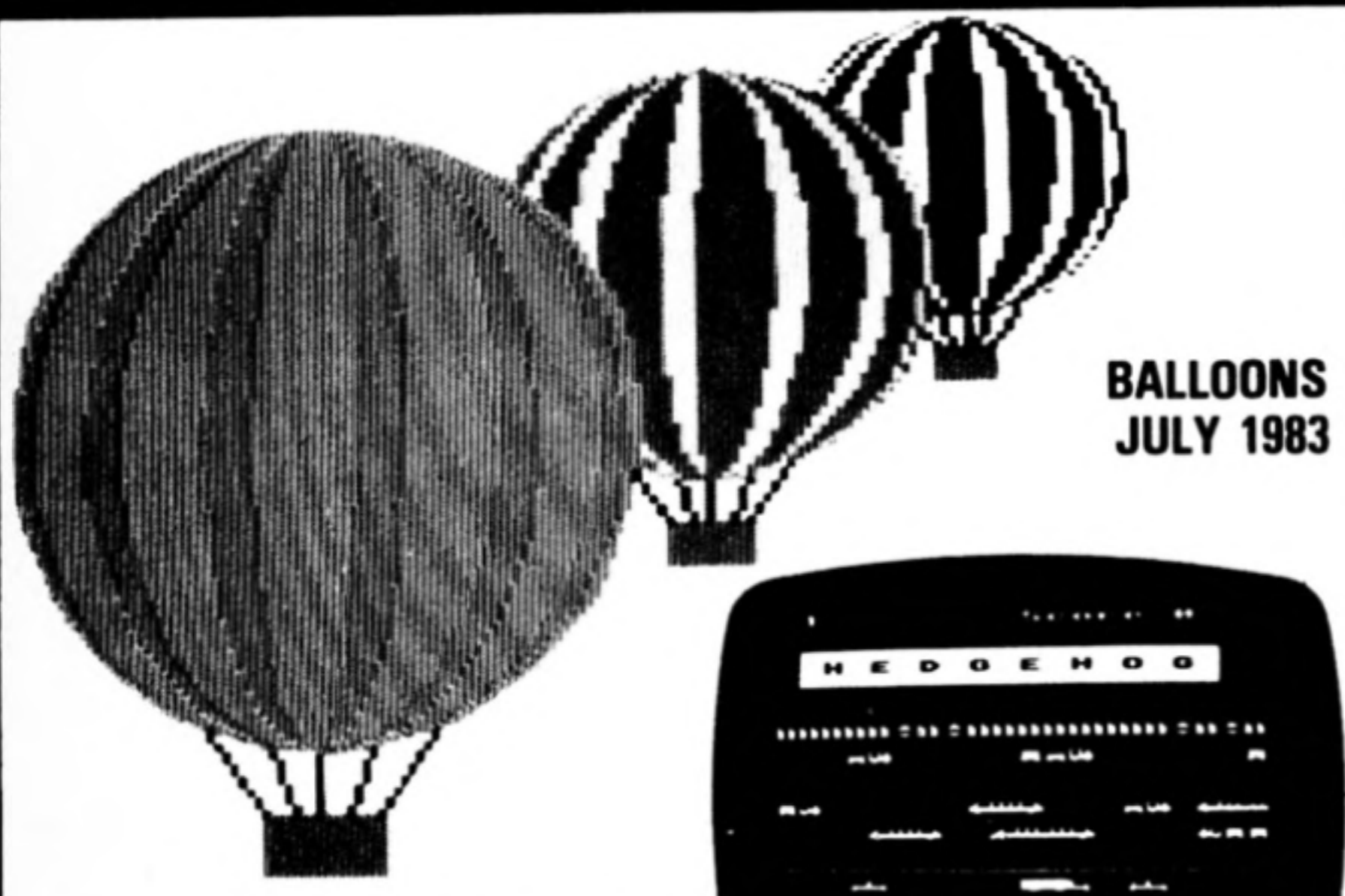
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JULY 1983**



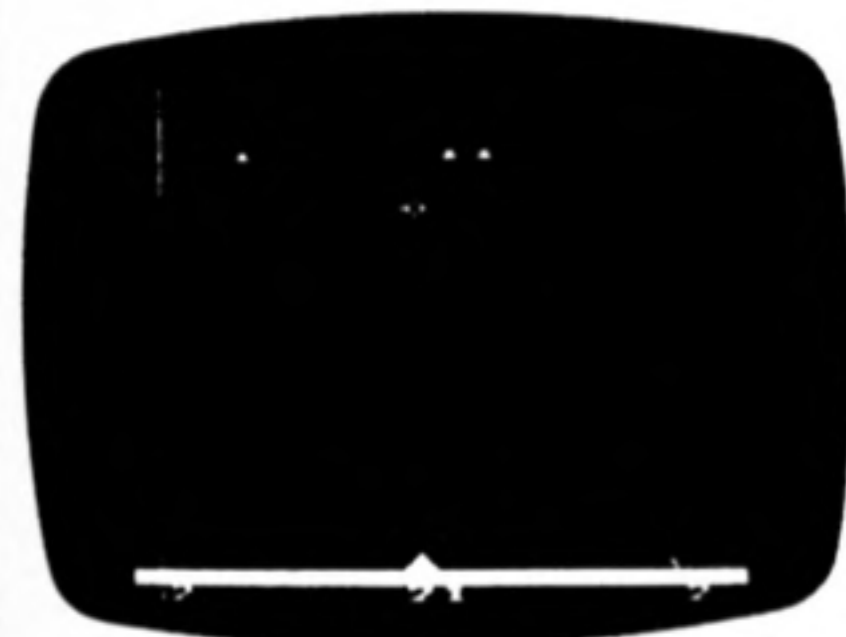
ELLIPTO JUNE 1983



HEDGEHOG JUNE 1983



**RETURN OF THE DIAMOND
JUNE/JULY 1983**



INVASION APRIL/MAY 1983



**ANAGRAMS
JULY 1983**

Magazine programs now available on cassette to members at £3.50 inc: VAT & p&p — see April/May issue for details.

February Issue: Program Features: BEEBMAZE — Find your way through the random maze, guided by 3D views from inside the maze — an excellent game. FIVE-DICE — A Beeb implementation of YAHTZEE (R), a novel dice game. Also a listing of WINDY FIELD — a creation from Acornsoft, SPIROLOT screen doodler, and a complete memory display program in a user key. Plus Machine Code Screen Dumps for the Epson and Seikosha Printers; articles on USING FILES, IDEAS ON ANIMATION (Including a Rotating Cube program), an Introduction to the Use of Procedures, a Survey of Books on the BBC Micro, and a Roundup of Disc System Hints. PLUS a variety of HINTS, TIPS AND INFO, including a single VDU command to perform a SIDEWAYS SCROLL.

March Issue: Program Features: Life (32K), Artillery Duel (16K/32K), Square Dance. 3D Rotation (will rotate any object). Printers for the BBC micro — Review of Epson, Seikosha, Tandy and Olivetti. What to do with the new Operating System, Disc Formatter Program, and full Disc instruction set, Newcomers article on Text and Graphics Windows. PLUS How to get a new Operating System ROM and a special deal on Wordwise (members only).

April/May Issue Special Anniversary Issue — Contains index to the whole of BEEBUG Volume 1. Music Composer — create complex 3 part harmonies with this synthesiser Program. Colour bar chart generator program. Beeb implementation of the Connect-Four Game. Invasion — a 16k. Plus Review of Tape Recorders for the Beeb; a Basic Program Editor, which lists variables and procedures, and executes Find and Replace in a Basic Program; Reviews of Acornsoft Games and the Torch Z80 Disc Pack. Disc Menu Program. Newcomers introduction to Mode 7. How to save the unsavable; and a routine to print Double Height Characters in all modes.

June Issue: Program Features: 'Return of the Diamond' A 16k adventure game, 'hedgehog' a well implemented 'frogger' type game, and Ellipto. Create your own off the shelf sound effects with Sound Wizard. Plus articles on Using Files, Rotating and Expanding Characters, Using Printers, and How to multi-program the User Keys. Reviews of The Hobbit Floppy Tape System, Adventure Games, and a Comparative Review of Wordwise and View. Plus FX Call Update, Disc Program Auto-relocator, Wordwise Update, and more BBC Book Reviews.

July Issue: Games: Robot Attack (32K) and Anagrams, a 16K word game. Watching the Beeb at work — a simple program to show your micro at work. An introduction to discs — what are they and are they worth getting. Balloons — a coloured animation. Make your micro speak like Kenneth Kendal. Bad Program Lister — lists programs even when the computer pronounces them 'bad'. Reviews of Epson and Seikosha's new printers. Five books of programs reviewed, plus more software reviews. Using Files part 4. A full disc sector editor program — to read and retrieve lost disc files. And how to modify Acornsoft's Planetoid. Plus hosts of useful hints.

BEEBUGSOFT: BEEBUG SOFTWARE LIBRARY
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As a result of BEEBUG negotiations with Acorn the ROM now may also be offered by other user groups to their members.

1. Starfire (32K). 2. Moonlander (16K). 3D Noughts and Crosses (32K). 3. Shape Match (16K). Mindbender (16K). 4. Magic Eel (32K). 5. Cylon Attack (32K). 6. Astro-Tracker (32K).

Utilities: 1. Disassembler (16K). Redefine (16K). Mini Text Ed (32K).

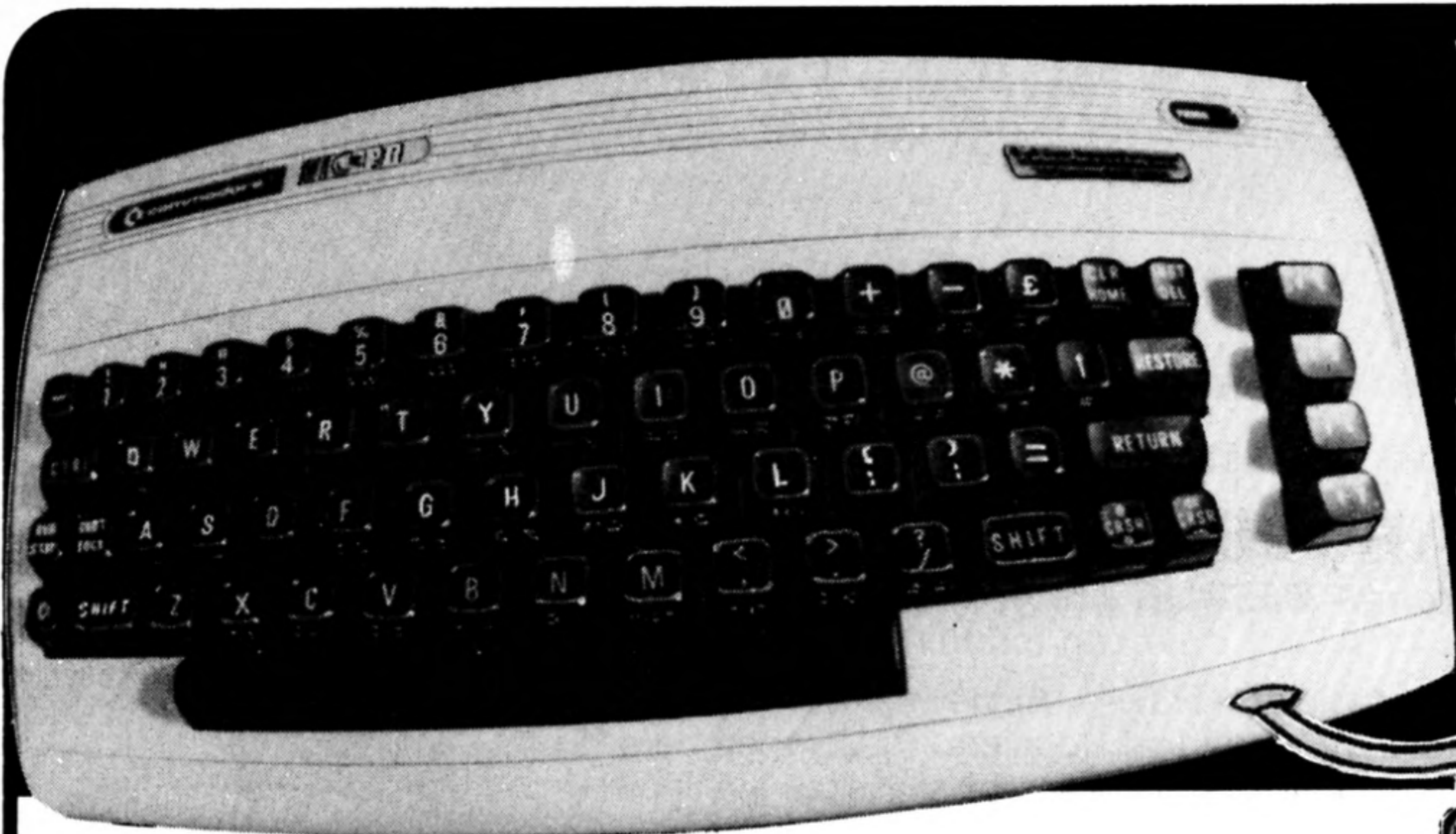
Applications: 1. Superplot (32K). 2. Masterfile (32K).

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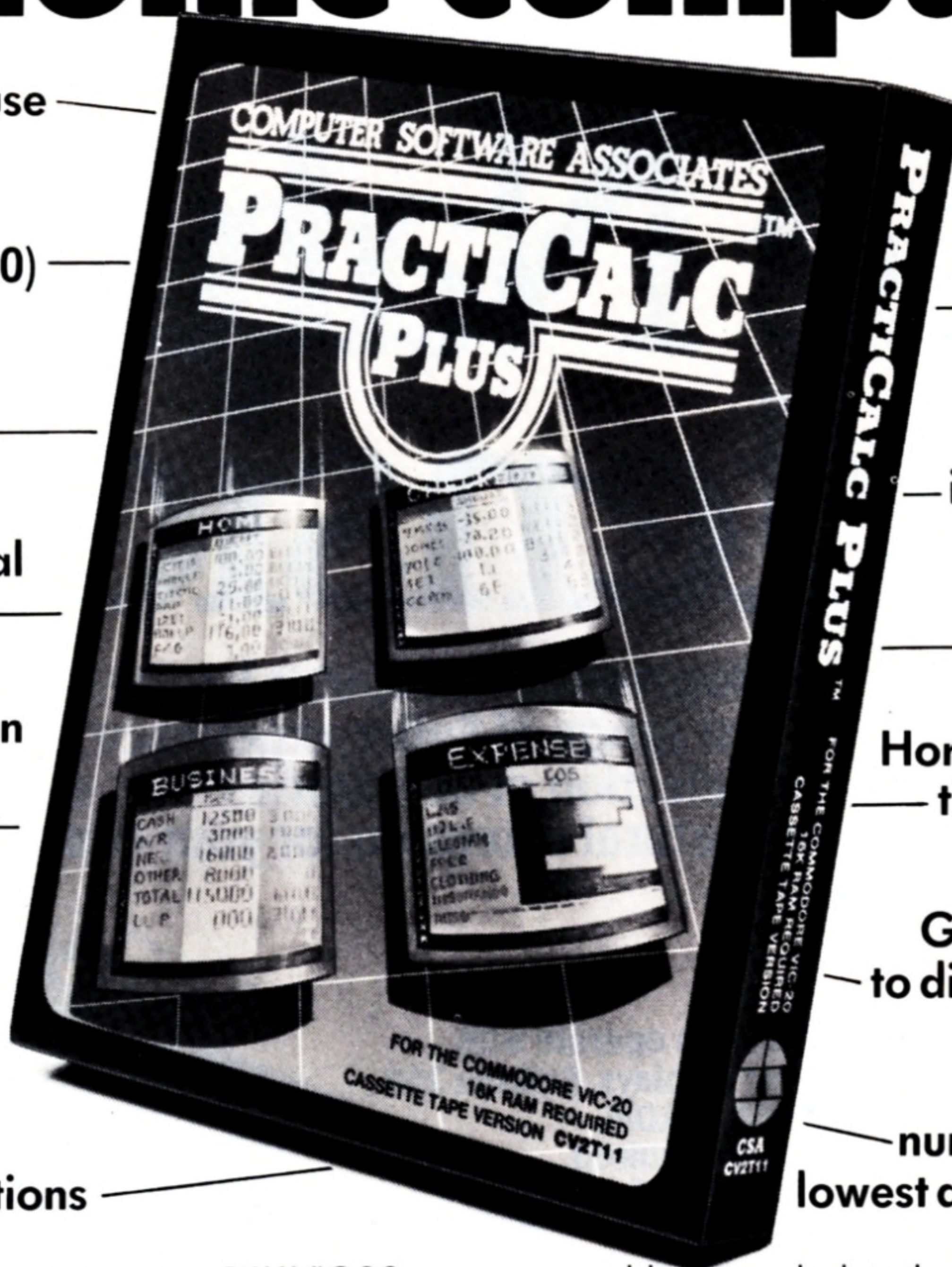
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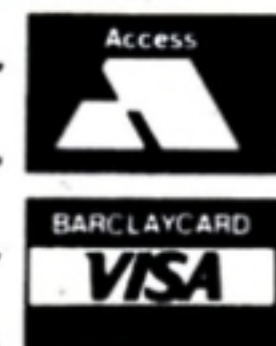
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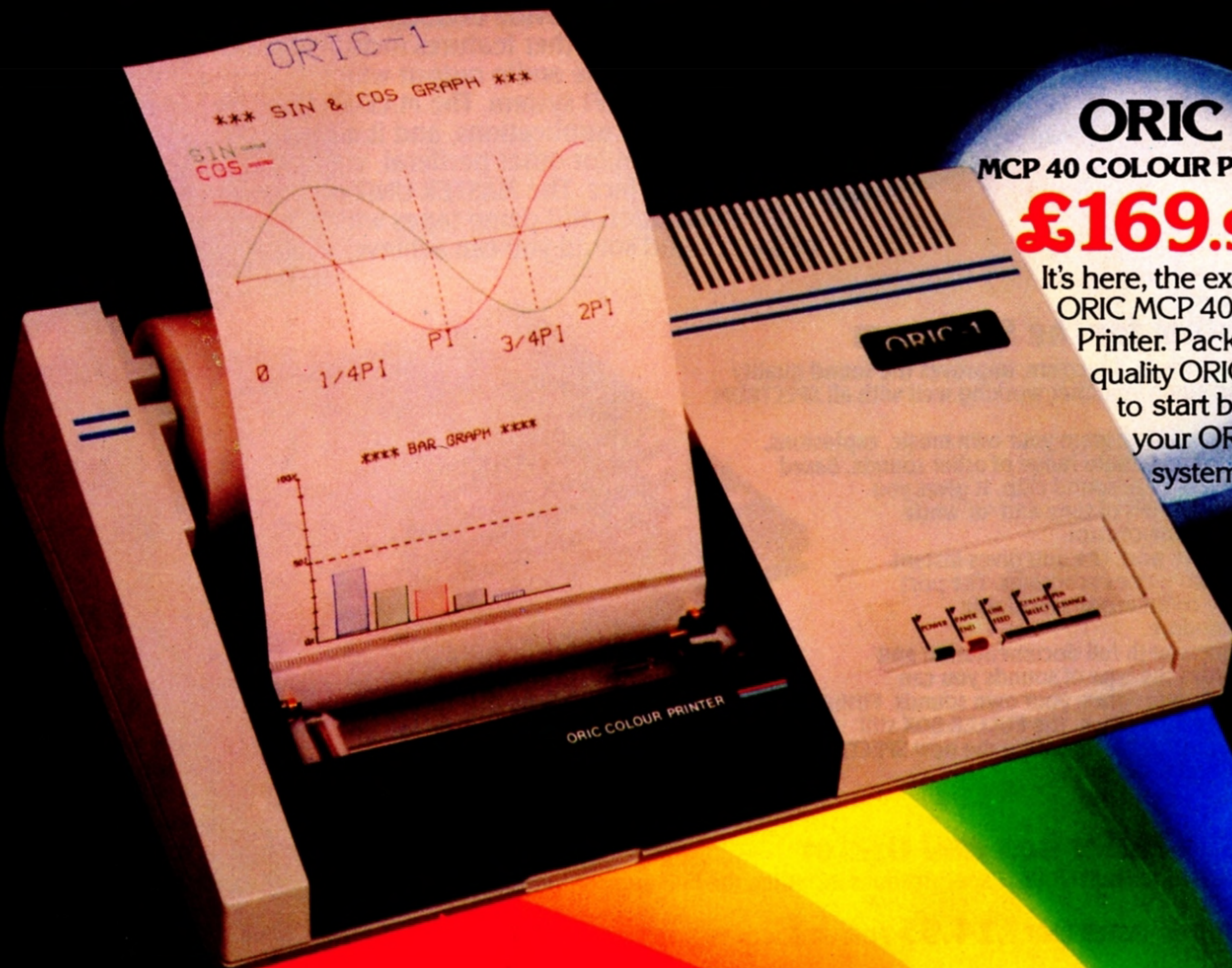


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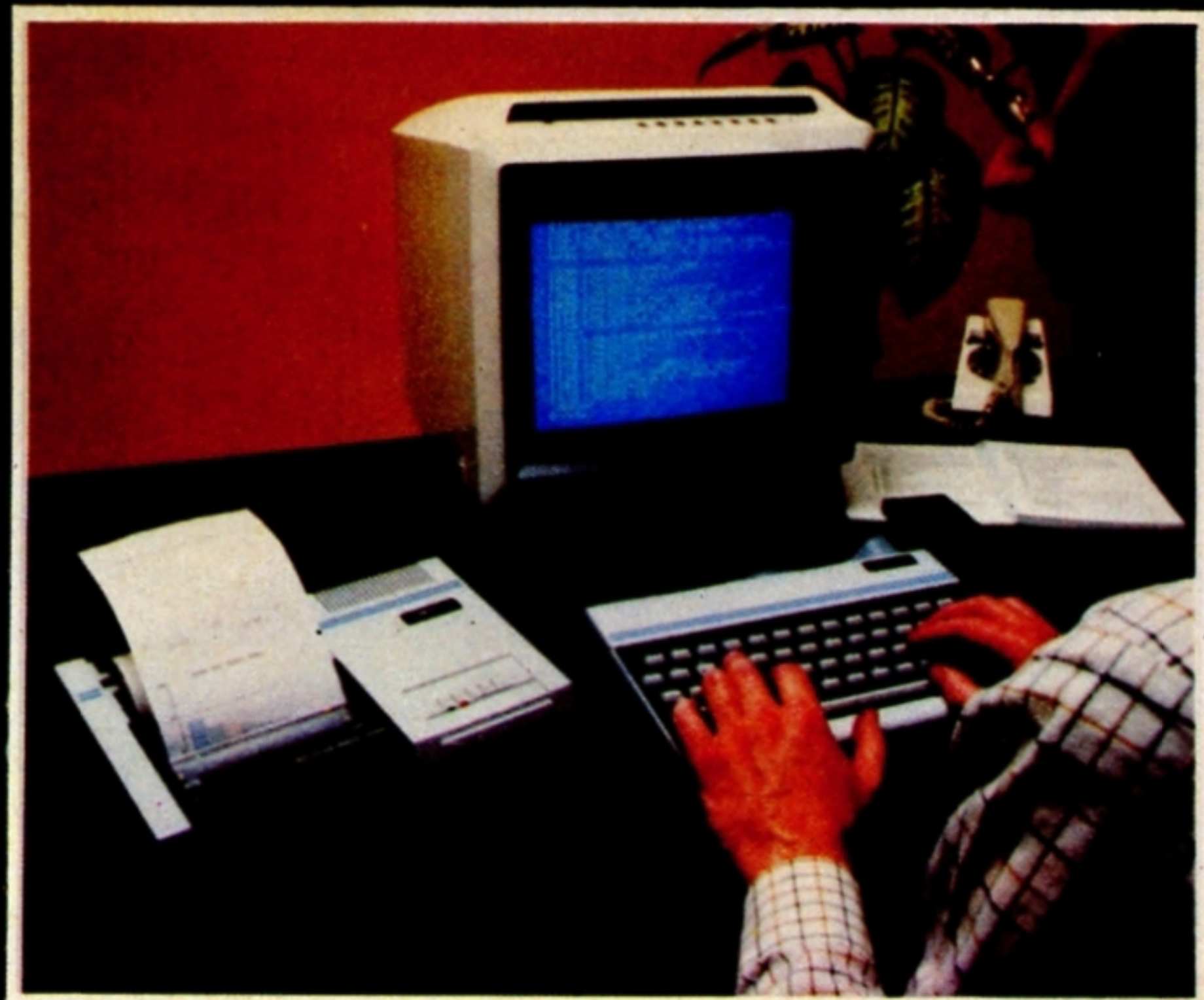
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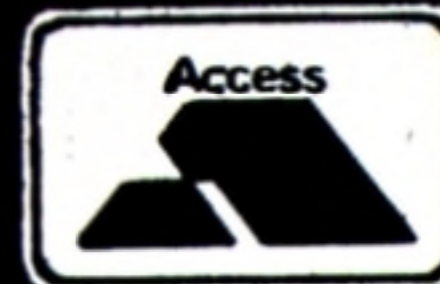
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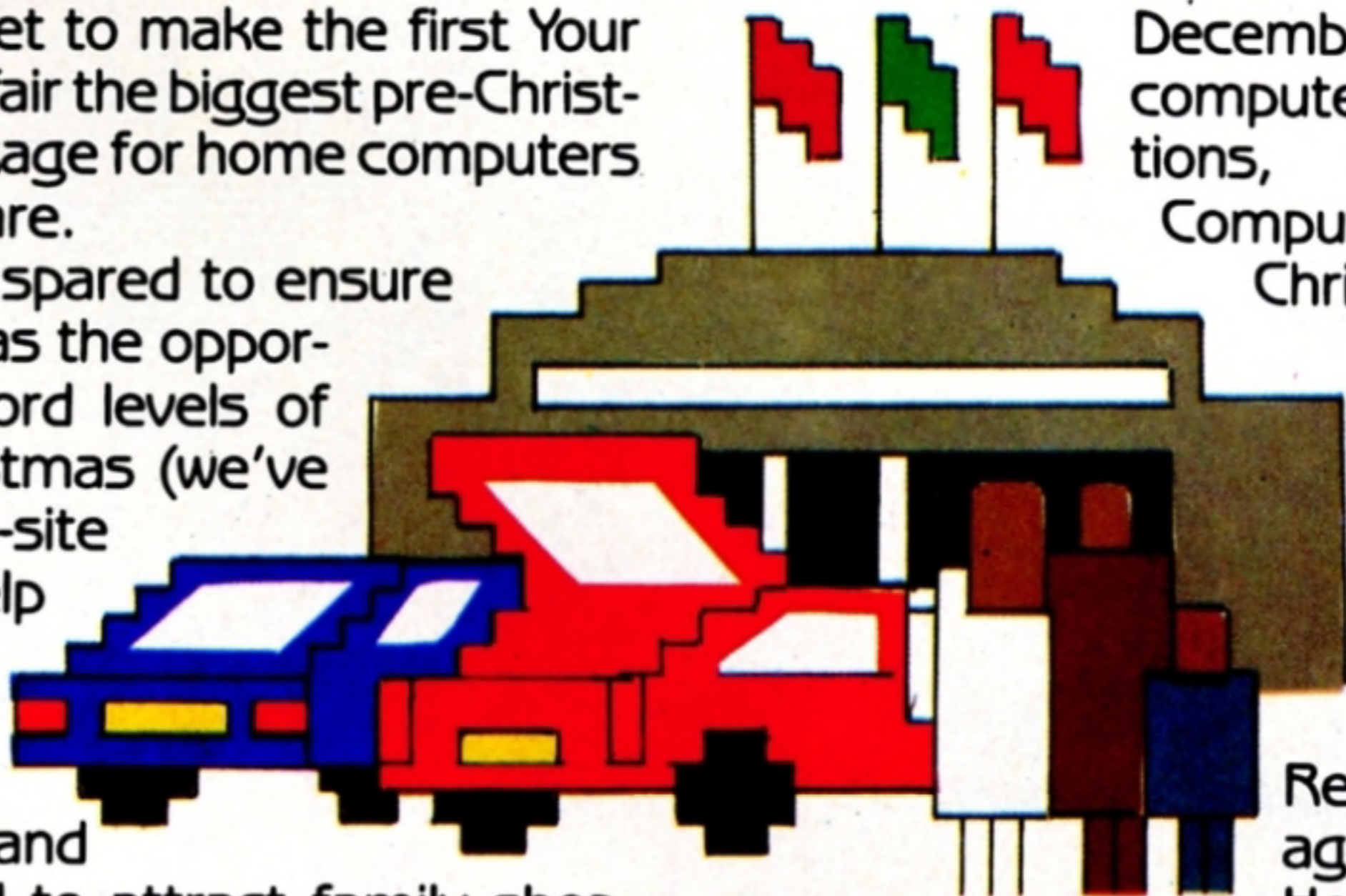
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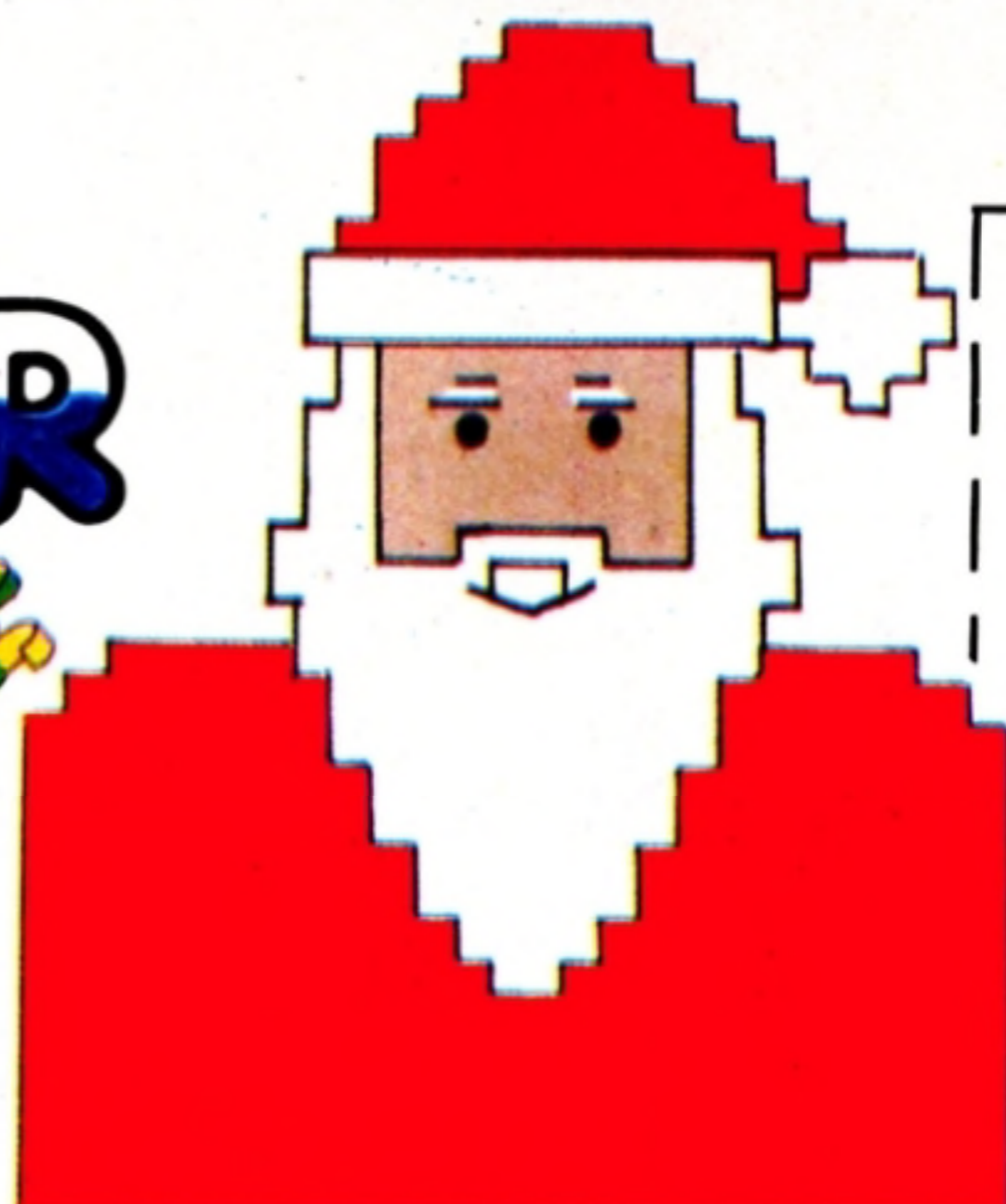
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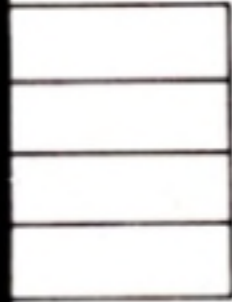
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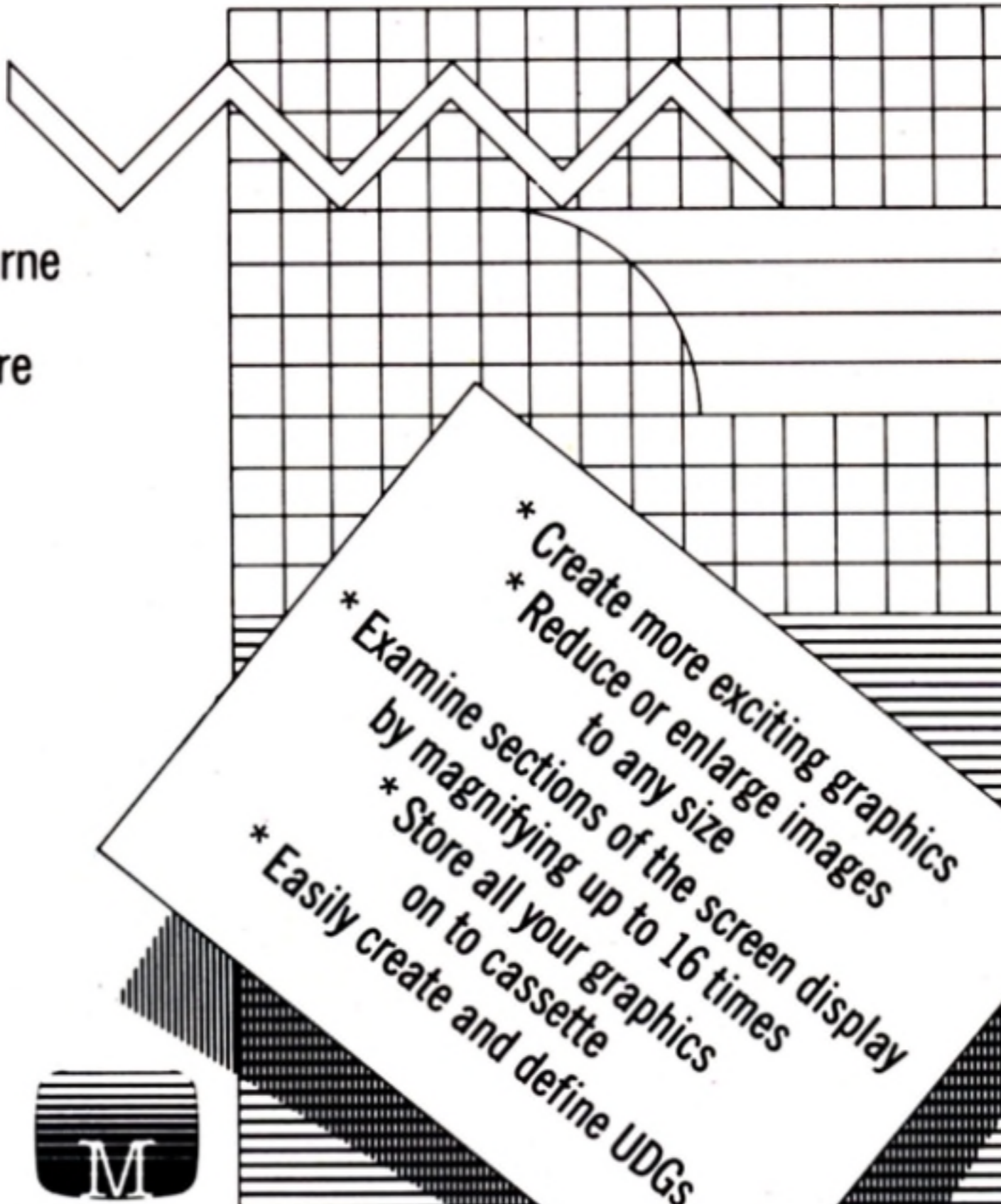
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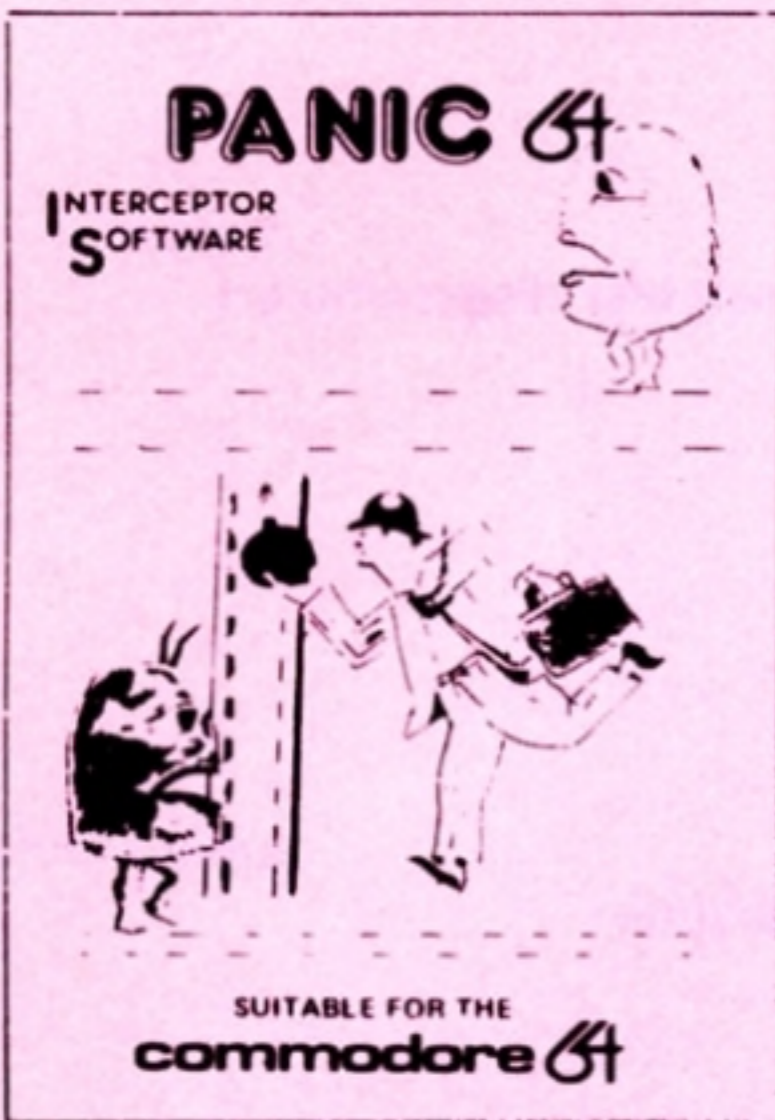
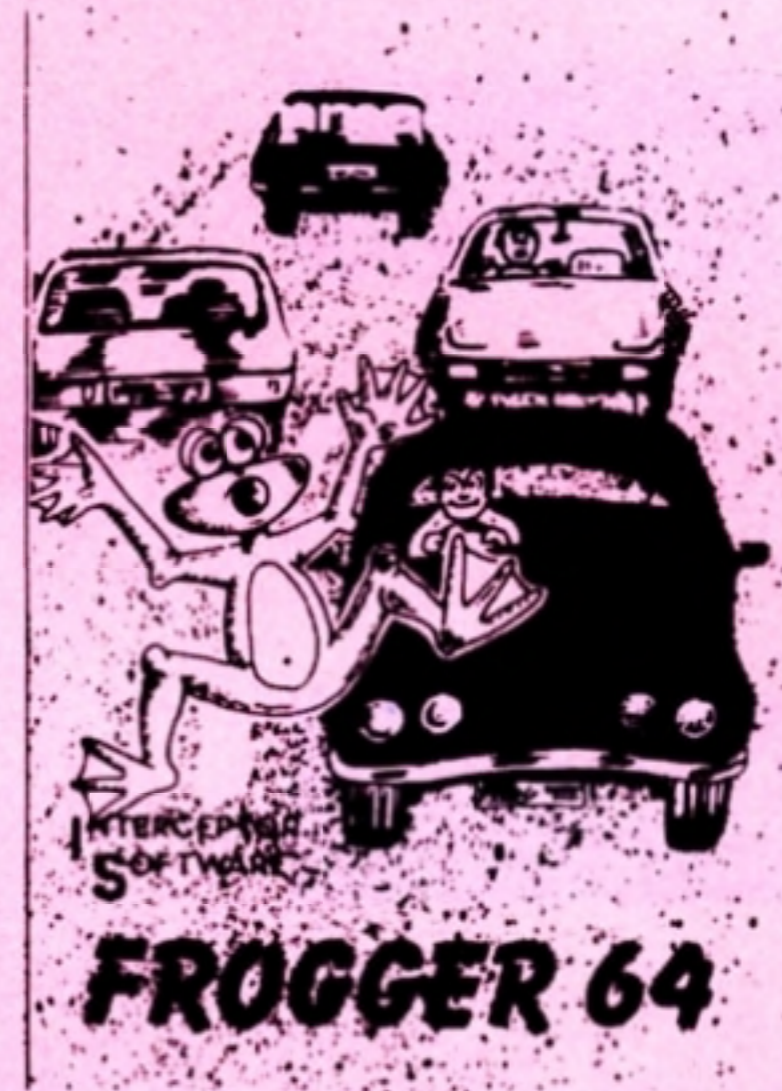
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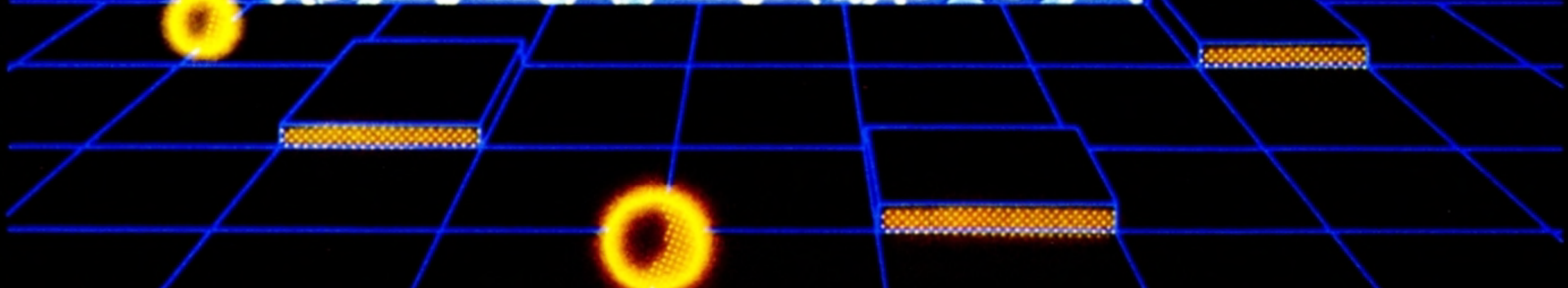
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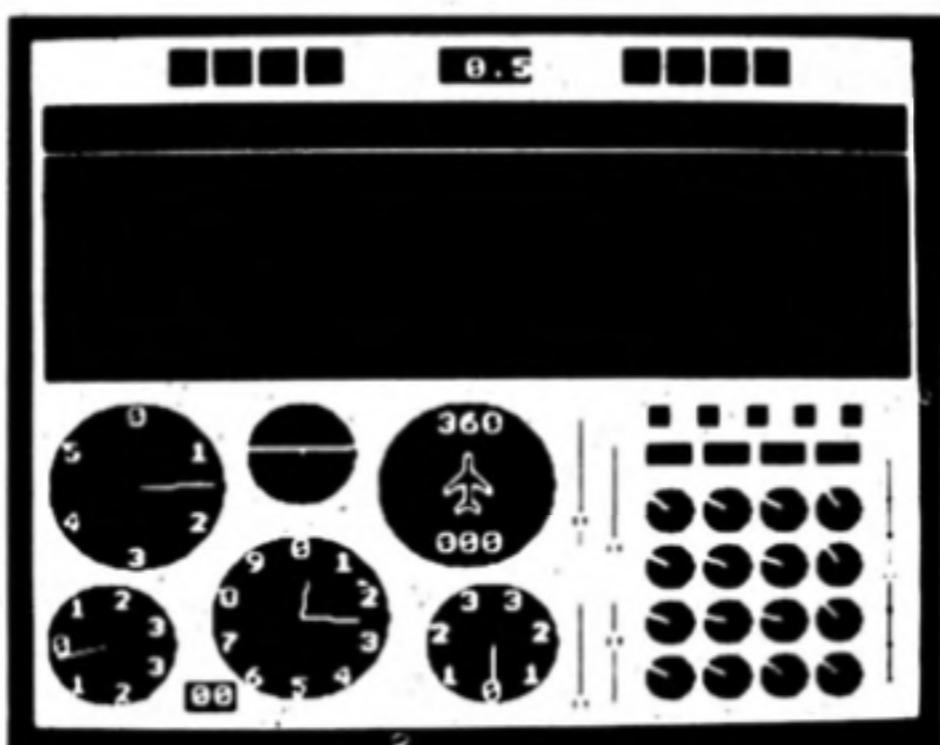
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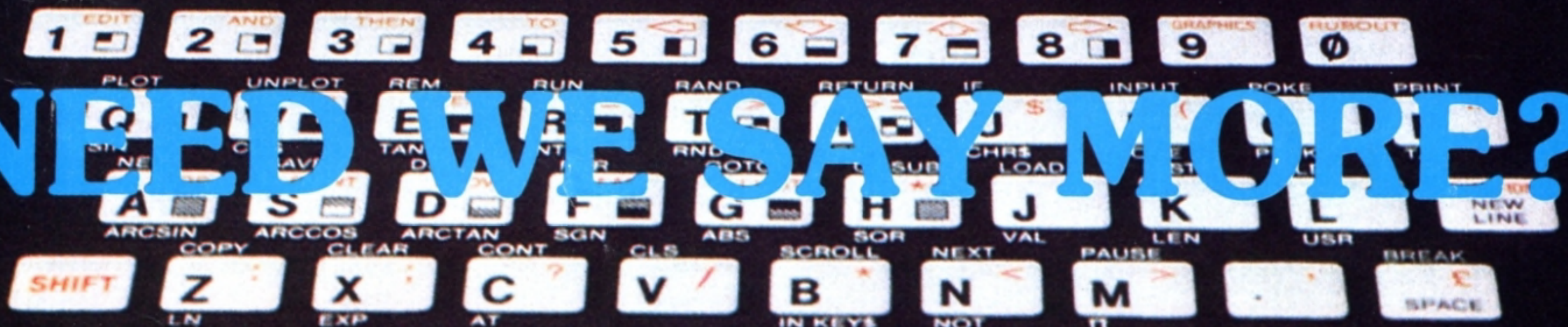


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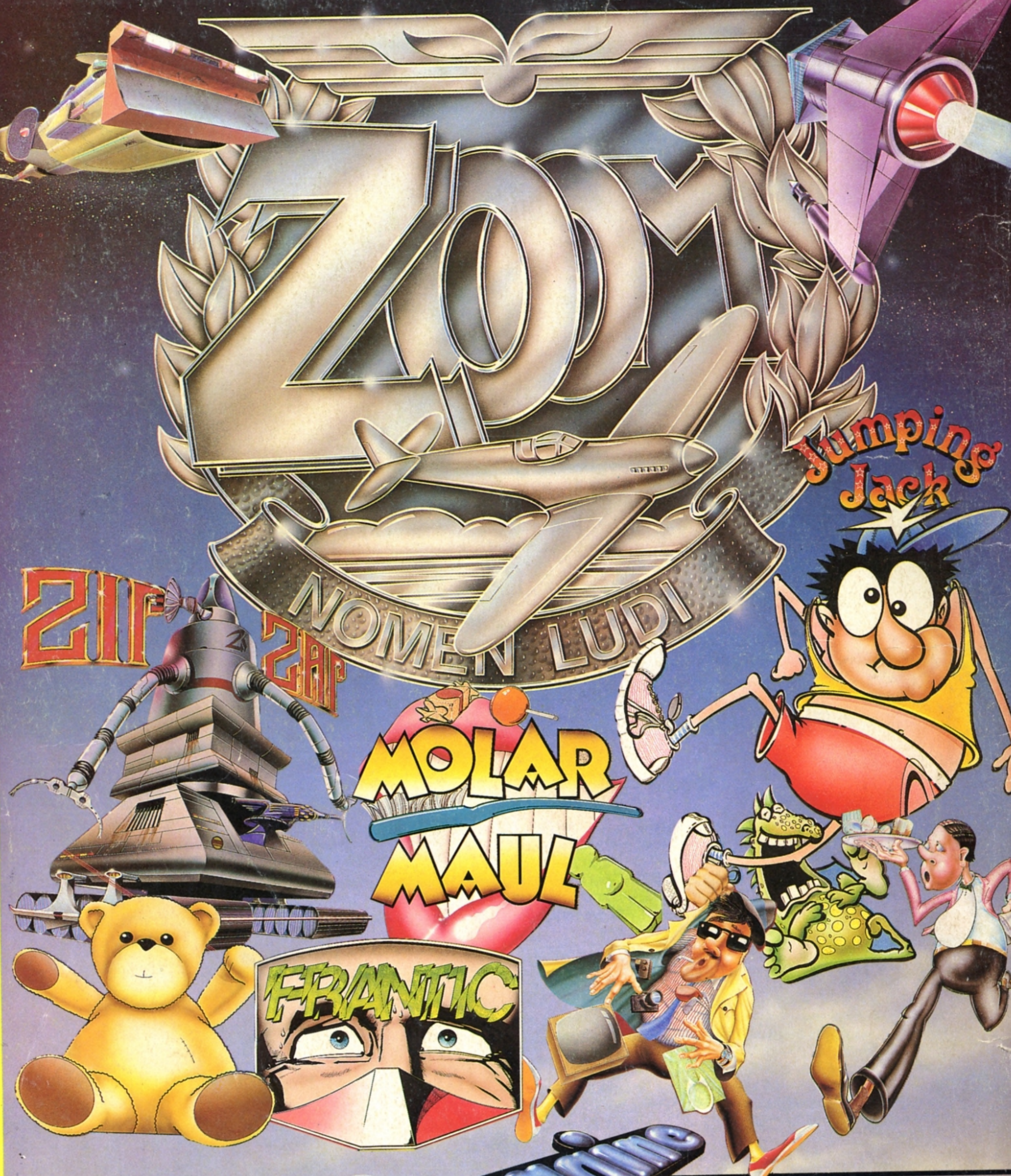
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