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# COMPUTER

APRIL 1985

BRITAIN'S BIGGEST-SELLING HO

ZINE

Vol. 5 No. 4

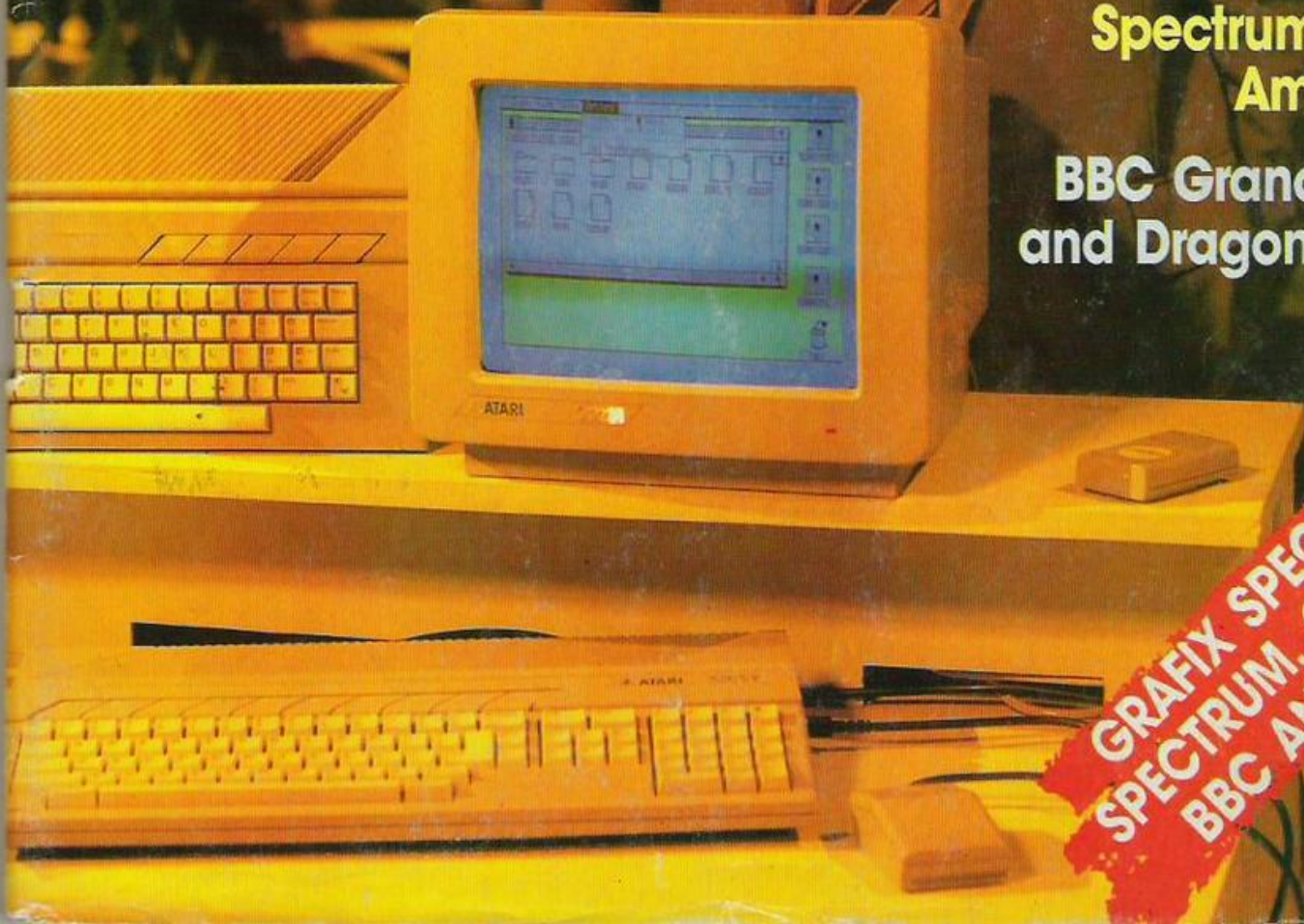
## THE MOUSE THAT JACK BUILT

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Can Atari's sprat  
catch the Mac?

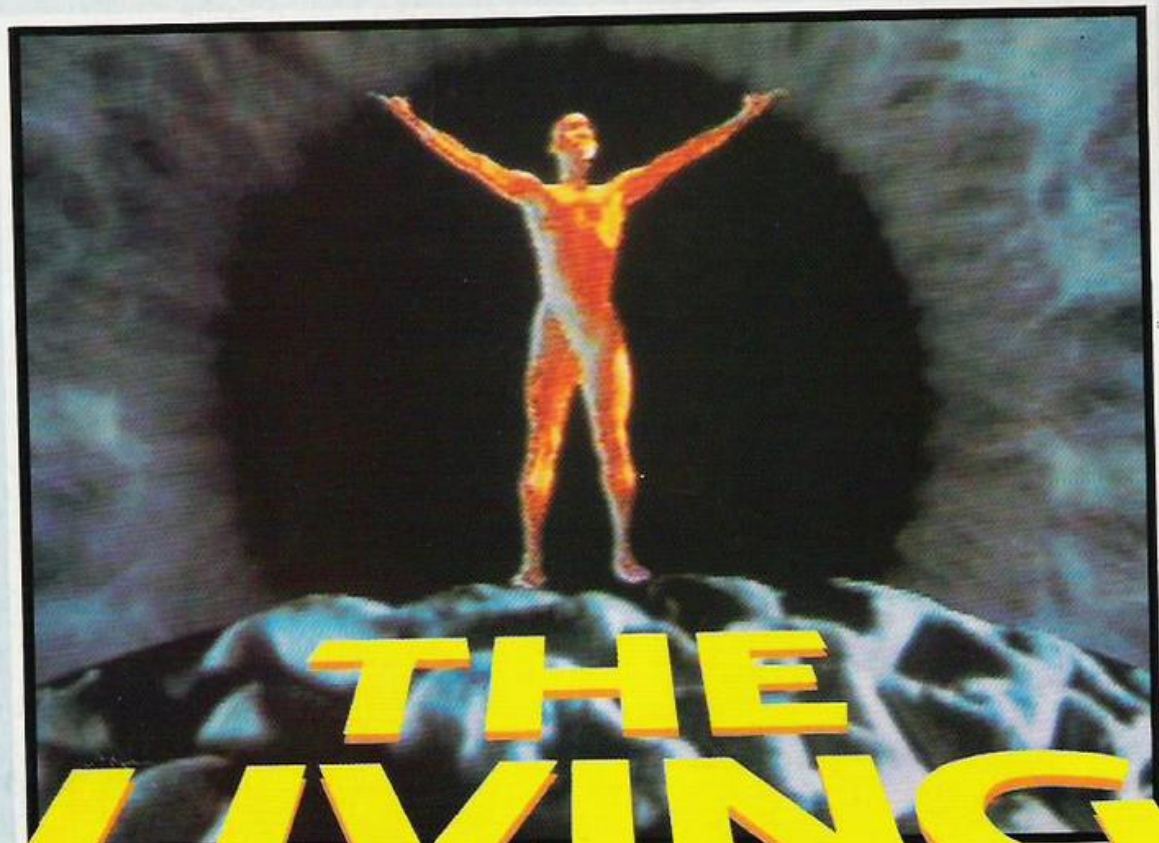
Crossfire for  
Spectrum and  
Amstrad

BBC Grand Prix  
and Dragon Spix



GRAFX SPECIAL  
SPECTRUM, CBM-64,  
BBC AND ZX-81





# THE LIVING BODY

Consultant Professor Christiaan Barnard

Building on the tremendous success of Channel 4's 'THE LIVING BODY' now regularly attracting more than 1½ million viewers a week, Martech is proud to present 'THE LIVING BODY' for the microcomputer.

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3. Heart operation
4. So you think you can breathe
5. Adventure in digestion
6. Keeping Going

plus a 32 page full colour booklet.

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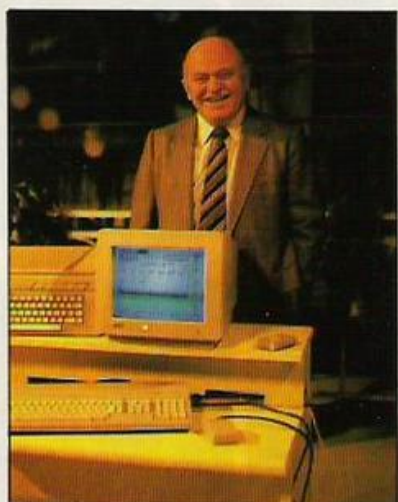
CHANNEL FOUR TELEVISION

**48K SPECTRUM · COMMODORE 64 · BBC 'B' · ELECTRON**



# YOUR COMPUTER *Contents*

APRIL 1985



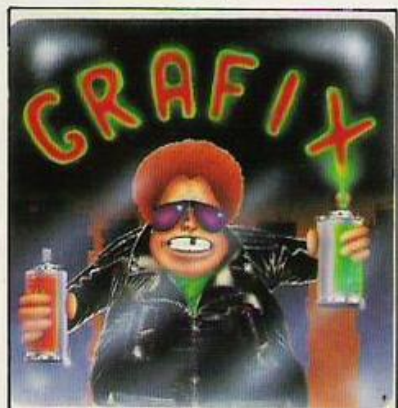
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**90 BBC GRAPHICS:** Ever wanted to plot points in Mode 7, Mode 3 or Mode 6? Chris Bowerman puts the boot in to accepted BBC programming procedures.

**94 SPECTRUM PIKCHACHANJA:** Timothy Closs puts the gloss on graphics with a mind-expanding visual animation procedure.

**96 COMMODORE CBM-64 PIKCHACHANJA:** Nalin Sharma does wonders with the number four. Be your own independent television station.

**99 ZX-81 SCREEN LASSO:** Mark Stenlake ropes in his 16K ZX-81 to cut screen handling problems down to size.

**104 CBM-64 QUICKPLOT:** Jeff Hatto enables you to plot points in high resolution and then switch back between hi-res and normal character display.

**107 SPECTRUM COMPACTOR:** James Higgs squeezes his Sinclair.

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**110 SPECTRUM SINGLESTEP:** Singlestep from Ian Potts is one giant leap for a micro. Step through machine code programs.

**113 TELSOFT:** Every month you can get Your Computer programs into your computer via a modem. This month it's Spectrum Pikchachanja and BBC Graphics.

**115 QL TUTOR:** Phil Holliday provides a fully-fledged monitor program in the last of his series. Want to monitor machine code? Then this is the one for you.

**120 AMSTRAD DISASSEMBLER:** Kevin Probert turns raw machine code data into readily-understandable assembly language mnemonics.

**125 C-5 SINCLAIR WINNERS:** Fasten your seatbelts as we reveal the lucky winners of the world's most advanced tricycle.

**127 RESPONSE FRAME:** Tim Hartnell helps readers who have problems with their home computers.

**129 SOFTWARE FILE:** Ten pages of free software.

**162 DATABASE:** Forthcoming micro events are subtly hinted at.



It's a range of top quality software from Commodore designed to make the most of your Commodore 64's capabilities.

New packages will be introduced to the Gold Medallion range every so often, but only if they are really exceptional. They'll definitely be hard soft to beat. Miss any of them, and you really will be missing out.



## MUSIC MAKER

Whether you're an accomplished musician or an out-and-out beginner, Music Maker strikes exactly the right note.

No matter if you've never played a note before, so long as you can hum and you know your ABC, you can start to play famous popular tunes immediately.

And it won't be long before you appreciate Music Maker's many advanced capabilities: you can



synthesise many musical instruments, even create your own 'synth' electronic sounds, choose between monophonic or polyphonic play, summon up pre-programmed rhythms and bass accompaniments, and more.

Music Maker is the first in a series of packages which will fully exploit the Commodore 64's outstanding musical capabilities.

On disk or cassette, with music keyboard, a clear and concise manual, and song book, for just £29.95.

## SPIRIT OF THE STONES

It's a treasure hunt for 41 real diamonds hidden somewhere on the Isle of Wight.

Only one man knows where they are, and he's not saying.

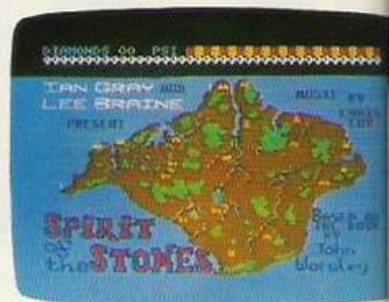
All that he has to say he's said already –

# GOLD IF YOU YOU H

but in the form of riddles, clues and puzzles.

Solve the puzzles in the Spirit of the Stones program and you'll find it much easier to solve the puzzles in the Spirit of the Stones book.

Solve the puzzles in the book and one (or more) of the diamonds can be yours.



Whoever discovers a diamond can also claim his or her share of the Royalty Fund, which could grow to a maximum of £1 million. It's a game that's as entertaining as it can be rewarding.

On cassette or disk, £14.99.

## INTERNATIONAL FOOTBALL

Already it's recognised as the best football game ever seen outside of Wembley.

It's startlingly life-like, and gives you near perfect control of the players.

You can kick the ball, dribble it, pass it,



# MEDALLION. HAVEN'T GOT IT AVEN'T GOT IT.

head it or even throw it in from the touch-line. And every time you belt the ball into the net, the crowd cheer wildly.

How often you score depends on how good you are, and also at what level you choose to play.

There are 9 levels you can play against the computer. Or you can play a friend.

International Football is a real test of skill, dexterity and speed. It is certain to drive you football crazy.

On cartridge, £14.99.



addictive game, a game of strategy and cunning. We can almost guarantee it will turn you into a head-case.

To stay alive, Jack must leap aside from collapsing bridges and crashing blocks, and at the same time he must

make sure he doesn't fall into the water...

and drown.

And that's the easy bit.

Because everywhere Jack goes he's dogged by jolly bouncing sadistic heads that are out to nut him.

He has to squash their heads before his is squashed.

And Jack can't afford to lose his head because we've only given him three, and when they've gone, he's gone...

Jack Attack is available for both the Commodore 16 and Plus/4. On cartridge £14.99.



## JACK ATTACK

There's no other game like it. It has been voted by the U.S. magazine 'Electronic Games Hotline' as a 'must buy.'

Jack Attack is about squashing heads. It's an

**commodore**  
**HARD SOFT TO BEAT**



At 21.15 hours on the night of May 16th 1943 a flight of specially prepared Lancaster Bombers led by Wing Commander Guy Gibson of 617 Squadron left Scampton Airfield for a mission so daring, that if successful, would do immense damage to the German war machine and change the course of World War II.



*'Dambusters' Lancaster Bomber  
reproduced by kind permission of the  
Royal Air Force Museum, Hendon.*

On May 16th 1985, a computer program will be launched, so full of excitement and realism that it will change the course of games software production.

# THE DAMBUSTERS

You will relive the spine chilling experience of this famous raid as you take the place of some of the bravest men in recent history. You will play the role of pilot, navigator, gunner and bomb-aimer in this real-time multiscreen, arcade/strategy game which is an authentic recreation of that fateful flight.



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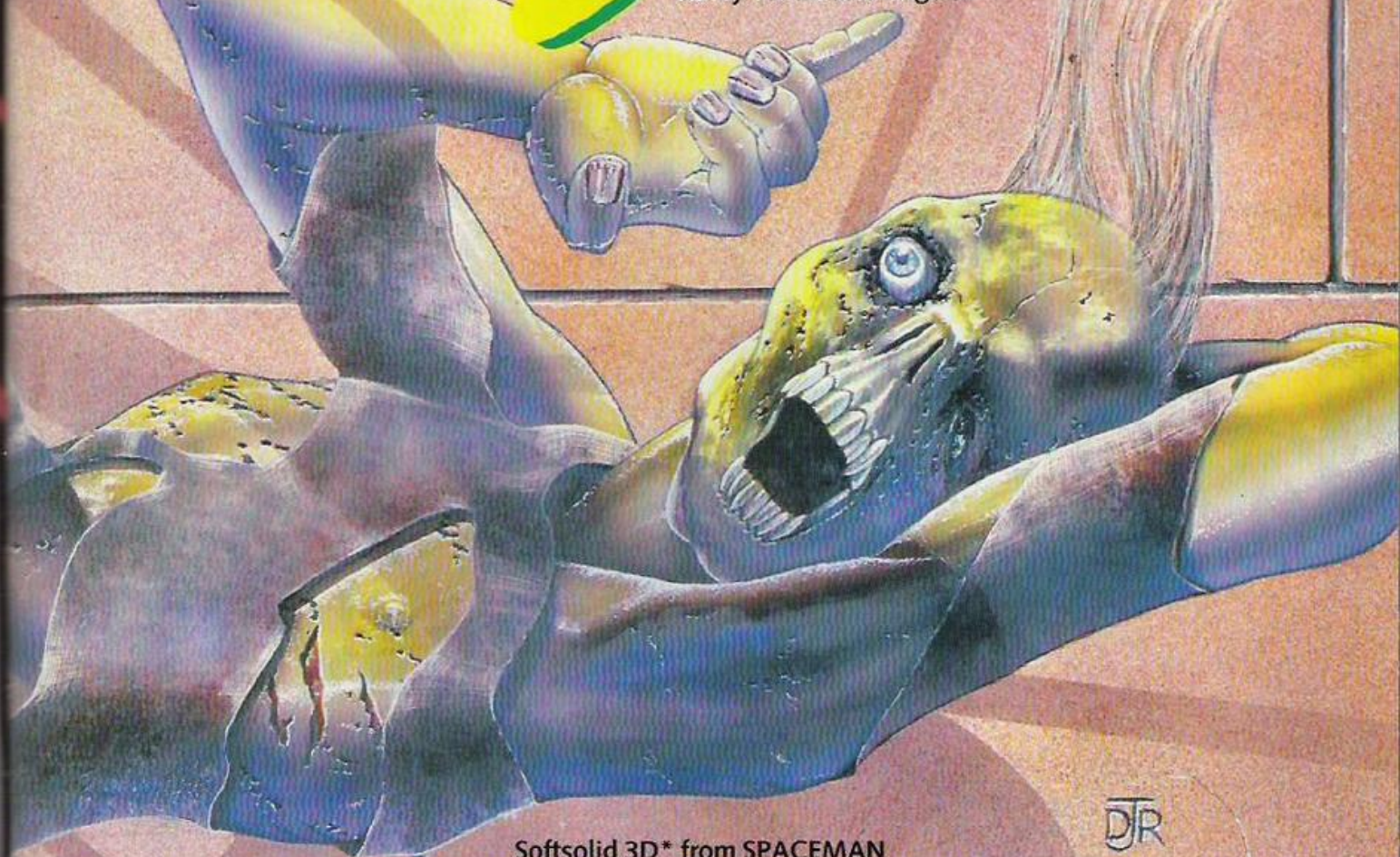
VORTEX SOFTWARE (SALES) LIMITED, VORTEX HOUSE, 24 KANSAS AVENUE, OFF SOUTH LANGWORTHY ROAD, SALFORD M5 2GL



A prophecy is about to be fulfilled. The Dead will rise again to eat the flesh of the living...

# Zombie

From the authors of ANT ATTACK,  
Sandy White and Angela.



Softsolid 3D\* from SPACEMAN  
\*Patent pending

DJR

**48K Spectrum £6.95**

All titles available from

## QUICKSILVA

Quicksilva Mail Order, P.O. Box 6, Wimborne, Dorset BA21 7PY.  
Telephone (0202) 891744.

WARNING: These programs are sold according to QUICKSILVA Ltd's terms of trade and conditions of sale, copies of which are available on request.

WHSMITH



WOOLWORTH

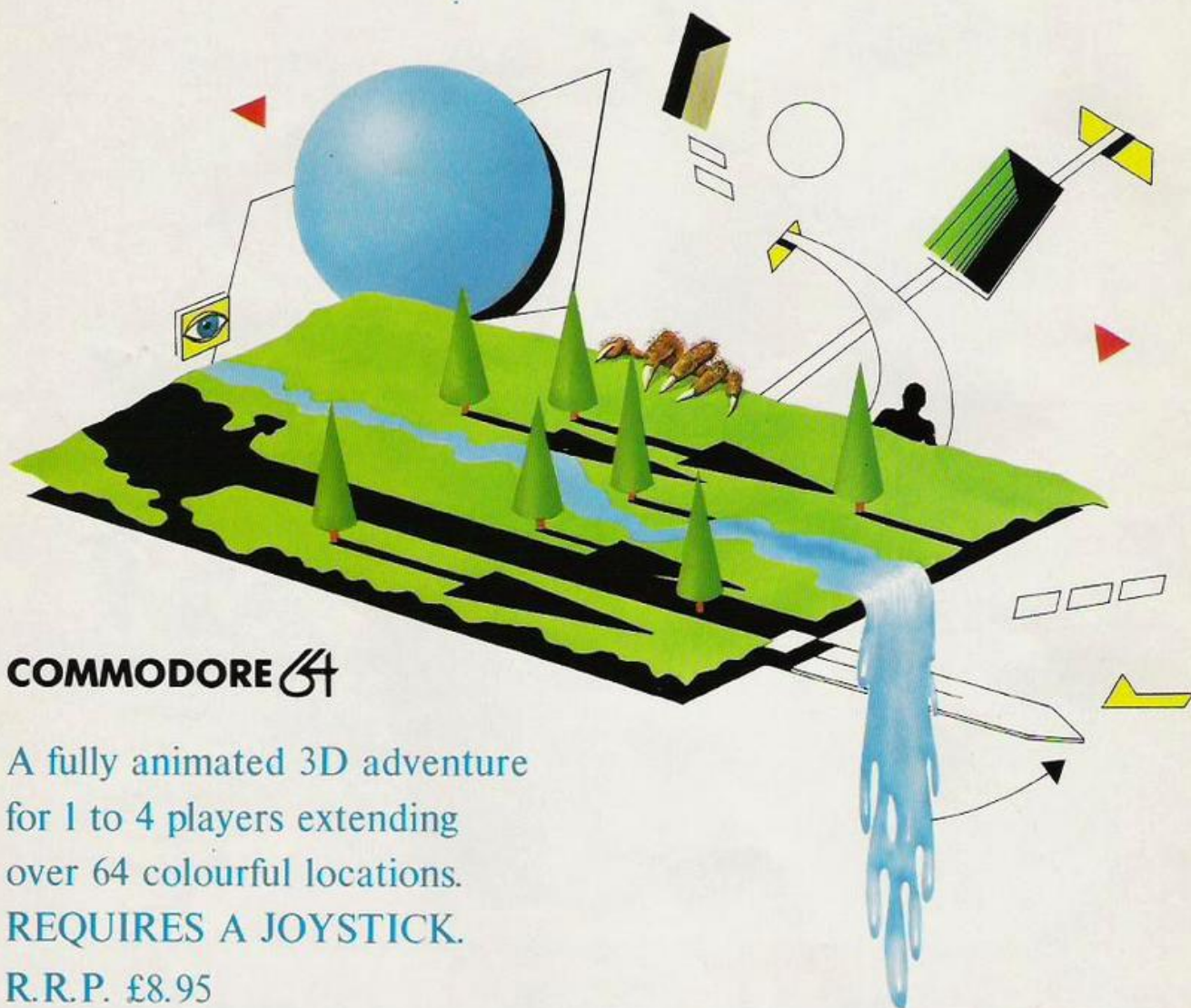
John Menzies

and leading multiple retailers and  
specialist computer stores.





# S H A D E S



**COMMODORE 64**

A fully animated 3D adventure  
for 1 to 4 players extending  
over 64 colourful locations.

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News from the world of  
Sinclair QL computing.

# QL NEWS

## The communications explosion takes shape!

Communications are now  
the most exciting, essential part of any computer.

In the past six months alone, over 150,000  
modems have been sold in the UK.

Now, the QL's own communications explosion is  
taking shape ... and it has the potential to make  
more of communications than any other micro!

Read on and discover exciting new ways to use  
your QL ... with the QL modem ... telephony  
unit ... and powerful interface options.





# DAVID KARLIN

## Why Q COM is everything you could wish for in communications.

The QL is now communicating – via Q COM! This exciting three-part peripheral presents QL users with a multitude of ways to exploit the world of communications.

Once connected to the QL, Q COM allows you to access the considerable number of phone-in databases, such as Prestel and QNet.

Q COM enables you to communicate with other computer users. Its facilities include electronic mail, data transfer from Microdrives and bulletin boards.

Through it you can link your QL to larger minicomputers. Q COM has full capability in this area, and allows the QL to talk to powerful mainframes.

Q COM's automatic dialling

and call acceptance facilities, together with the storage of messages from other modems, will revolutionise the way you use your telephone.

The next few pages of QL News tell you much more.

It's enough for me to say here that with the QL and Q COM,

you'll be exploring new openings in communications for some time to come!

*David Karlin*

David Karlin,  
Chief Design Engineer.



## The Q COM package

### Three special parts to stack!

#### QL communications interface

This multi-speed interface contains the sophisticated software used to set up QL communications – and to control the Q CALL and Q MOD units.

Q CON also comes complete with Microdrive-based software. This enables the QL to link to larger computers using VT100 and viewdata protocols.

The software will also run any standard modem – connected via Q CON's built-in RS-232-C port.

Most importantly, Q CON allows the QL to transmit and

receive at rates switchable from 75 to 9600 baud (encompassing the widely-used 75/1200 Prestel rates, and 1200/1200 half duplex rates for user-to-user exchange).

Q CON is specially styled to suit your QL – with similar fluting and ribs – and forms the base module of a vertical-stacking system.

It's supplied with full instructions, software on Microdrive cartridge, and connecting leads.



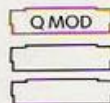
#### QL auto dial/answer unit

Q CALL gives every QL user something out of the ordinary.

It's a module which links directly to your telephone, and allows auto-dialling at the push of a single key. In the same way, it will permit incoming calls to be

accepted automatically... and even trigger pre-programmed activity from the QL!

Q CALL is the central unit of the package. It plugs directly into Q CON – so there are no connecting cables to worry about.



#### QL modem

Q MOD has all the powerful facilities expected of a modem, in a neat and simple unit.

It uses either V23 75/1200 or 1200/1200 baud rates, for Prestel, Micronet 800 and all the

viewdata services described alongside.

It also incorporates a telephone extension socket for manual dialling.

Q MOD is the top unit of





Q COM, and comes with a 9' built-in telephone cable.

All three units are available from OEL on (0276) 66748 and from selected Sinclair stockists.

## The QL hooked on voice and data

The QL can now act as your personal address book and telephone operator!

Q COM allows you to store hundreds of personal or business numbers.

You can store lengthy passwords and account numbers – and recall them – at the touch of a single key.

And any information that's sent to you from other modem-owners can be gathered and stored on Microdrive cartridge, or incorporated into your QL Quill documents!



# Exploring the world of QNet, Prestel, Micronet and more!

Thousands of QL users already enjoy the excitement of linking to a nationwide mainframe.

Q COM turns your QL into an intelligent terminal, allowing you to access many thousands of pages of information, software and communications facilities.

The services brought to you through Prestel can include Micronet 800, Viewfax 258 and QNet, the new QL database.

Membership of QNet will bring you free software, QL news and features, and all the wide-ranging services of viewdata!

If armchair shopping is more

your style, that's easy too. It's often possible to place a direct order using your QL! For dedicated QL owners, there's a daily selection of software reviews, chart toppers... and all the facts and figures you need to make buying peripherals simple.

With Q COM you can also 'download' software from the system directly into your QL and either use it immediately, or store it on Microdrive cartridge.

In fact the only problem you'll face with a viewdata service is finding enough time to explore its many features!

You can find out how to join QNet by phoning 01-278 3143.



News... information... banking services and QNet. And only a fraction of the QL's new viewdata capability.

# QL meets the mainframes!

The Q CON unit of Q COM turns your QL into a VT100 terminal, providing instant access to in-house computing services, both mainframe and mini.

Whether you are using your QL at home or at work, Q COM gives you access to electronic bulletin boards which provide help and advice 24 hours a day. You can leave messages or notices for friends or business contacts and even hold live discussions with them.

Additional benefits for the QL business user include easy access of in-house company software, and the interrogation of other data bases around the country.

There's also the opportunity of linking to British Telecom Gold – the widely-publicised and popular messaging service.

**sinclair**



# QL Hardware

## Microdrive cartridge

### price cut to only £1.99!



Sinclair Microdrive cartridges – up to 100K of programs and data on a medium so compact you can pop it into your pocket.

On February 1, the cost of Microdrive cartridges came down from £4.95 to £1.99 each.

Microdrive cartridges are the QL's own unique storage medium. Each stores up to 100K of information (that's 40 pages of A4 text), on a cartridge no bigger than a book of matches!

Over 500,000 cartridges are now being used throughout Britain.

You can store up to 50 different data files per cartridge, identified by titles of your own choice.

And QL Microdrives themselves are standard equipment on the new ICL One Per Desk micro, and British Telecom's new Merlin Tonto.

## IEEE-488... the instrument connection

IEEE-488 is the interface standard set by the Institute of Electronic and Electrical Engineers for instrumentation control.

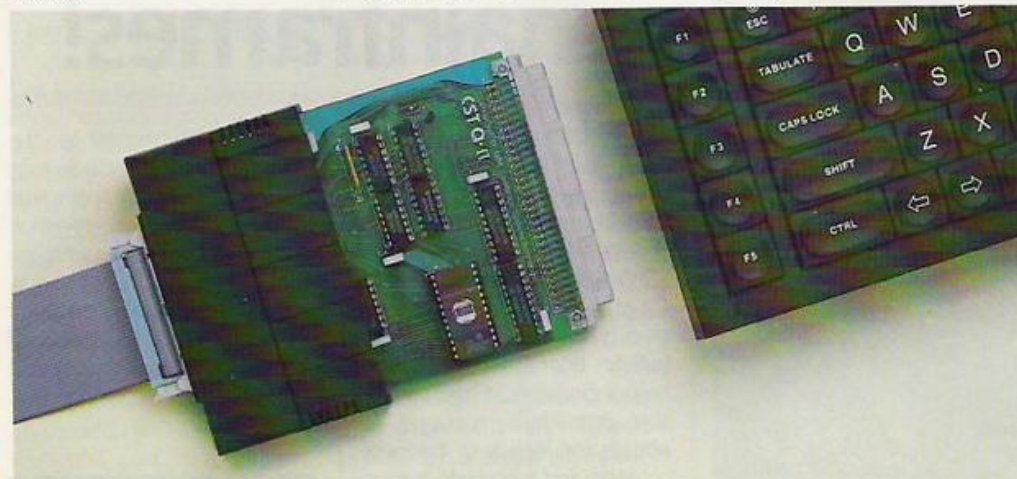
IEEE-488 – or General Purpose Instrumentation Bus – is a parallel interface specifically designed for high speed data transfer between a number of

different types of device.

It is commonly used for controlling instrumentation via a computer, allowing the creation of laboratory data acquisition systems, industrial control schemes, etc.

The QL now has a fully-fledged IEEE-488 interface from CST. It plugs neatly into the QL's RAM expansion port, and can control up to 16 instruments simultaneously.

It's available from CST on (0223) 323302.



An IEEE-488 interface slips discreetly into place.

## New inte 3 1/2" or 5 1/4"

With new Q-Disk, you can transform the QL into a powerful small business system – comprising QL, monitor, disk interface, twin disk drives and printer.

Q-Disk upgrades the QL to disk storage. Fitting easily into the QL's left hand RAM expansion port, without the need for a special expansion box, it contains a Western Digital disk controller chip. Software is held in an on-board EPROM (so little of the QL's RAM is used).

Plug in Q-Disk, and the QL accepts one or two disk drives, sized 3 in, 3 1/2 in, 5 1/4 in, either 40 or 80 track, single or double-sided. Even when two drives are used, they can be different types!

Q-Disk offers up to 1.6 Mbytes of quick, reliable storage with a compatible disk drive.

It's made by Computamate, who also offer a full range of





## QL to link students

Strathclyde University, in Glasgow, plans to have a campus network of 7000 QLs linked to a central VAX minicomputer.

That's one QL for every student... a major investment project in a university which is now a leading centre for artificial intelligence work.

Sinclair is giving support worth £250,000 to the project. And it's likely that QL users

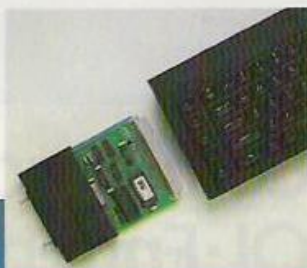
everywhere will benefit – the students plan to develop AI programs to run on the QL!

The QL has impressed Prof. James Alty of the University's Computer Science Department, who says 'only the QL could offer the computing power, range of applications, and above all the portability, at a realistic price.'

## face to connect 3" disk drives

complimentary QL disk drives.

To contact Computamate, phone (0768) 811711.



Single disk unit fitted with 5 1/4 inch drives and (inset) the Q-Disk controller.

# The QL's high-tech spec

### Dimensions

138 x 46 x 472mm  
(5 3/8" x 1 3/4" x 18 3/4")

### Weight

1388 gms (3.055 lbs)

### RAM

Massive 128K standard RAM, externally expandable to 640K. Extra RAM is available in 64K, 128K, 256K and 512K units, from third-party suppliers.

### ROM

48K, containing Sinclair SuperBASIC and the Sinclair Qdos operating system.

### CPU

Motorola 68008 (running at 7.5 MHz) for all principal functions. (Architecturally, the 68008 is a 32-bit processor with an eight-bit data bus. One megabyte of non-segmented address space is available.)

In addition, an Intel 8049 controls the keyboard, generates the sound, and acts as an RS-232-C receiver.

### Operating system

Qdos (developed by Sinclair Research) is a single-user multi-tasking time-sliced system using Sinclair SuperBASIC as a command language with display handling for multiple screen windows; and device-independent input-output.

### Language

Sinclair SuperBASIC, with the advantages of procedure structuring; extendability (including syntax); interpretation speed independent of program size; clean machine code interface; operating system facilities accessible from SuperBASIC; equal capability for strings and arrays; and full error-handling facilities.

### Microdrives

The QL incorporates twin QL Microdrives, each with a minimum 100K capacity, 3.5 seconds average access time. Typical loading rate of machine code programs is 2-3K per second.

### Video

High resolution graphics capability with colour or monochrome monitor (or TV) in two modes – 512 x 256 pixels (four

colours available) and 256 x 256 pixels (eight colours available). Normal character display format of up to 85 x 25 with choice of character sets available (TV format of up to 40 to 60 columns depending on the software).

### Keyboard

Full-size, 65-key QWERTY keyboard featuring a space bar, left- and right-hand shift keys, five function keys and four cursor control keys. The keyboard can be angled by means of detachable feet.

### Expansion

Excluding RGB monitor, power socket and TV port, eight peripheral/expansion ports are provided – one internal expansion, one Microdrive expansion, one ROM cartridge, two serial and two control channels, and the local area network.

### Serial

Two standard RS-232-C communications interfaces for printers, modems, etc. Transmission at rates from 75-19200 baud or full duplex transmit/receive at seven rates up to 9600 baud.

### LAN

For up to 64 QL computers. Data transmission over the net can be achieved at 100K baud.

### Power supply

9VDC at 1.8A, 15.6V AC at 0.2A.

### Joysticks

Provision for one or two devices for games or cursor control.

### Applications Software

QL Quill – word processor  
QL Abacus – spreadsheet  
QL Easel – graphics  
QL Archive – database  
All four packages supplied with the QL.

### Price

£399 including VAT, QL programs, full A4 manual, power supply, 4 blank cartridges and free Helpline service.

**sinclair**



# QL Software

## Updated versions of Psion software now available!

QL Abacus, Archive, Easel and Quill are the four Psion programs supplied with every QL. They're now converted to 100% machine code, and as a result they load from Microdrive cart-ridge much faster.

The overlays present in Version One software have been removed, resulting in noticeably quicker on-screen performance.

With the compactness of machine code, there's a big saving in QL memory too – all four programs now cope with larger, more professional applications!

Version Two software is now supplied with every new QL. Existing QLUB members – see back page.

### QL-Quill

QL Quill makes it easy to type in, correct and store your letters, memos and reports.

No training is needed – a beginner can be using QL Quill for word-processing within minutes!

QL Quill has the facilities of professional word processing packages: including word wrap, search and replace, justification, page headers and footers.



### QL-Abacus

QL Abacus is a powerful, yet easy-to-use spreadsheet.

The program allows you to manipulate the contents of whole rows and columns by the names you assign them. There's no need to depend on confusing letters and numbers.

QL Abacus also incorporates a range of functions which let you carry out rapid 'what if' analyses on your data.

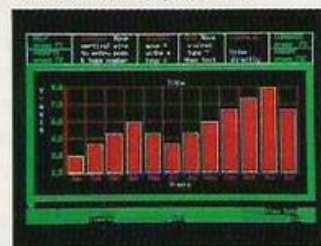


### QL-Easel

QL Easel allows you to create graphs, bar charts and pie charts – at the touch of a key.

The program handles anything from lines and shaded curves to overlapping or stacked bars.

QL Easel designs and scales automatically or under your control. Text can be added and altered as simply as data.



### QL-Archive

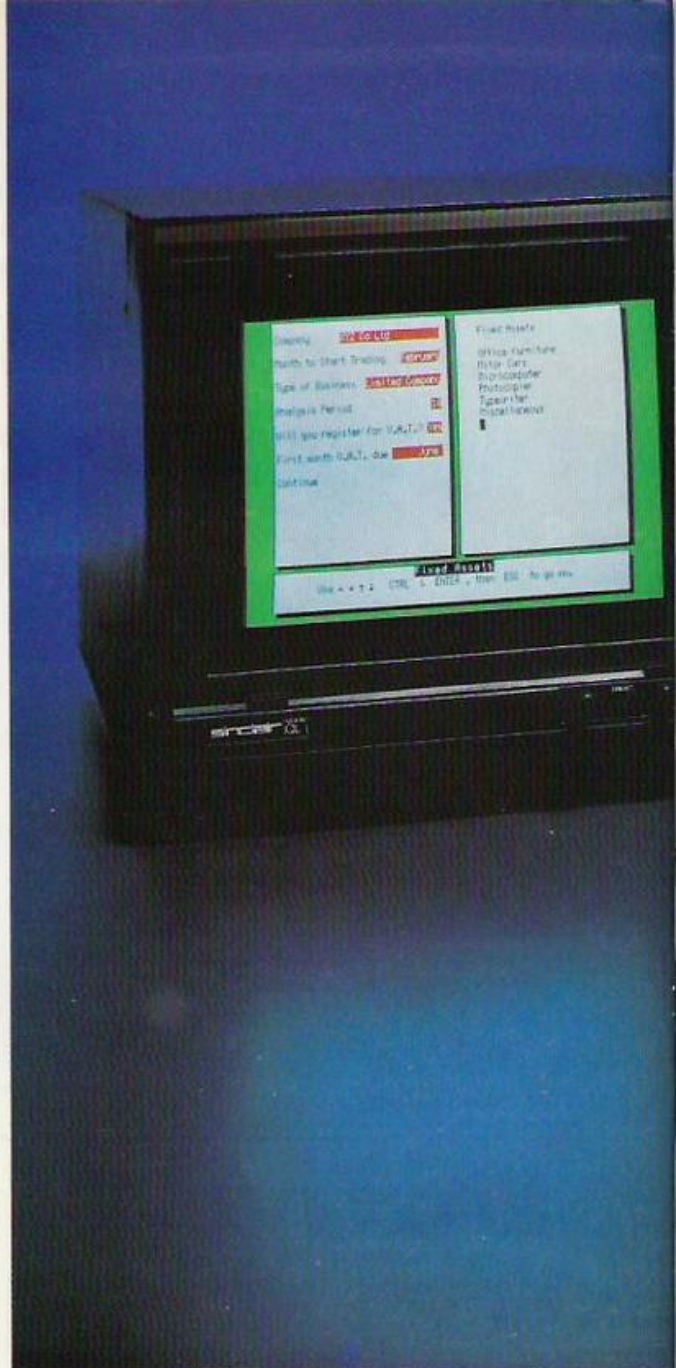
QL Archive is a sophisticated, powerful database program.

It includes a screen editor which allows you to design your own screen and format your reports, and a procedure editor which lets you tailor QL Archive to your own requirements.

QL Archive is ideal for all database uses, yet it's powerful enough to be used by many software houses to generate specific database applications.



Non-members of QLUB can purchase new versions of the above software for £15 per title, or £50 for all four programs. Phone (0276) 686100 for details.



(Left to right) QL Entrepreneur, QL Project Planner and QL Decision Maker from Sinclair.

## Coming soon- QL-Entrepreneur, QL-Project Planner, QL-Decision Maker!

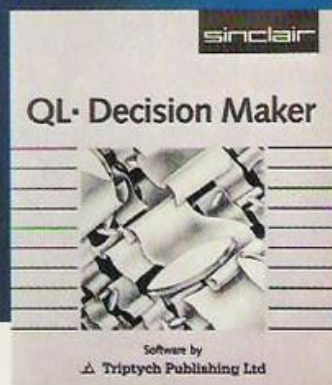
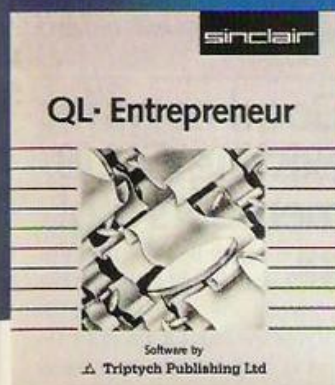
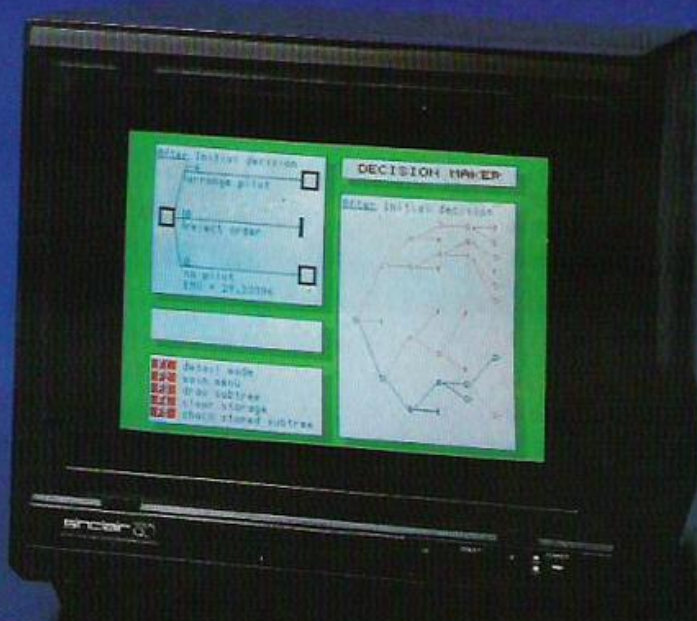
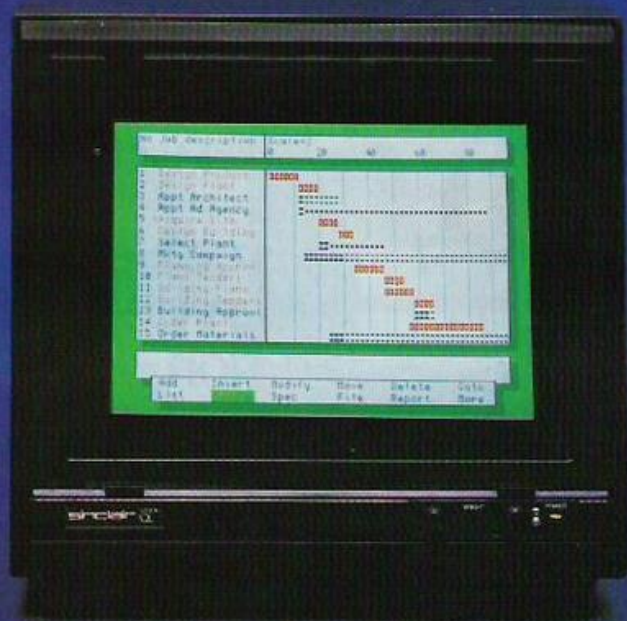
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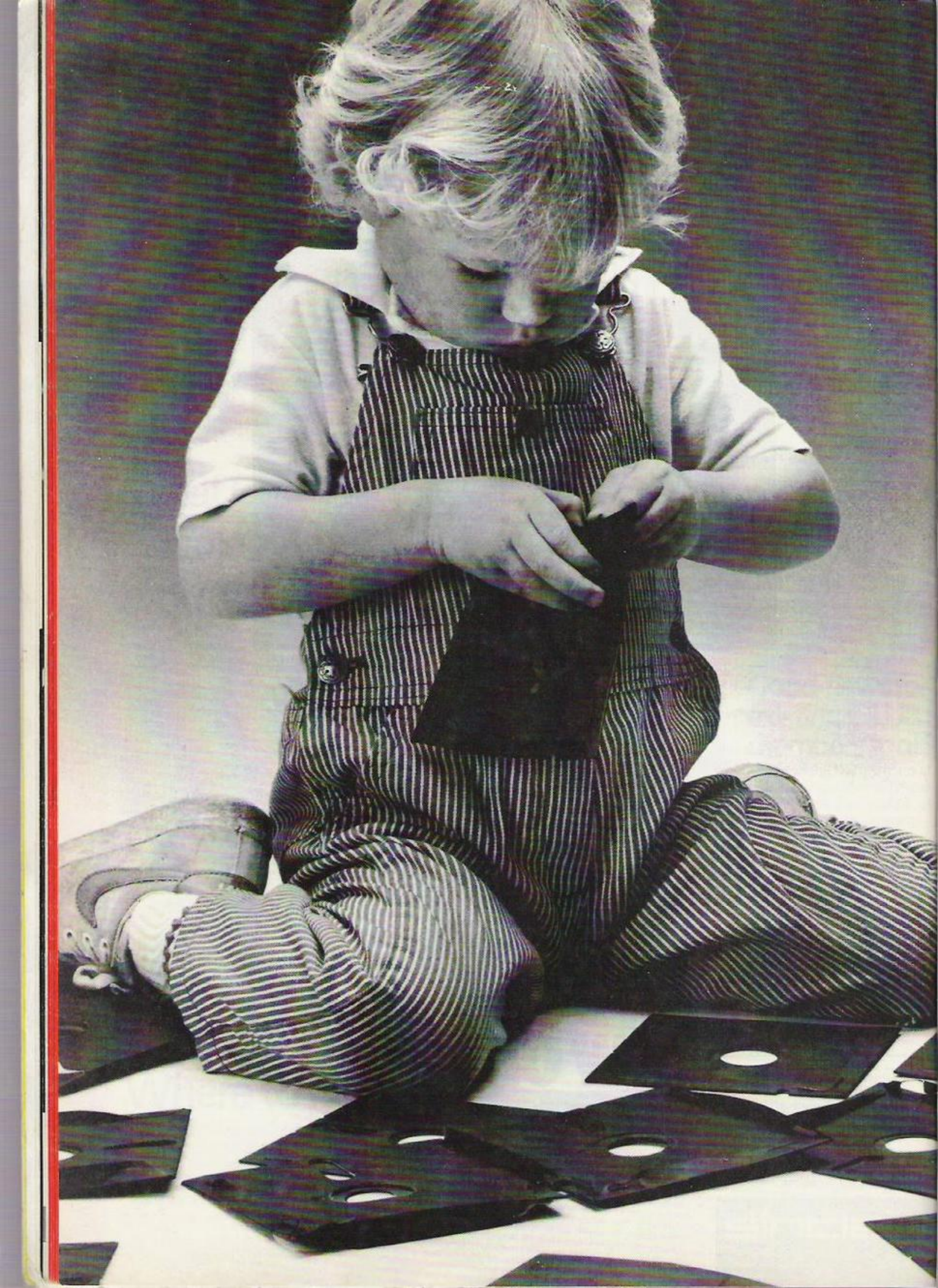
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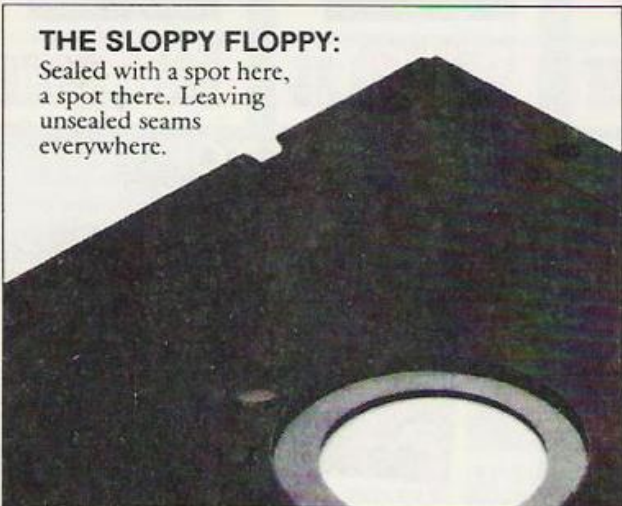
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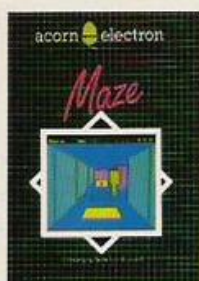
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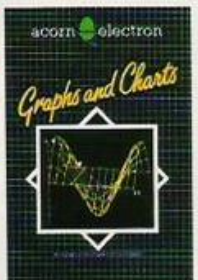
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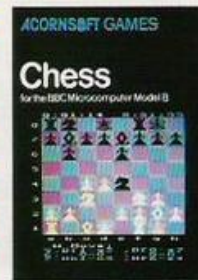
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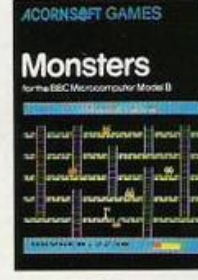
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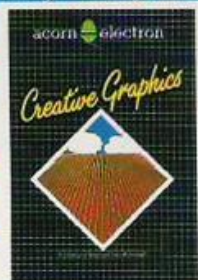
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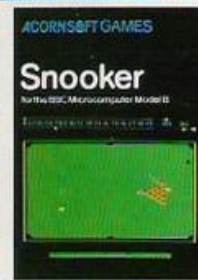
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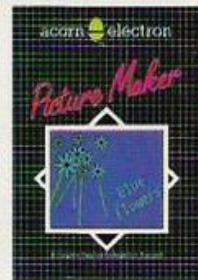
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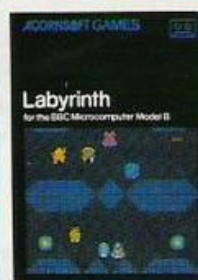


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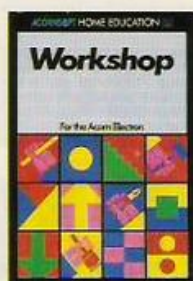
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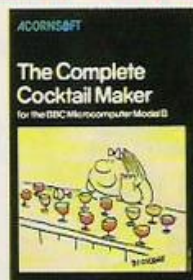


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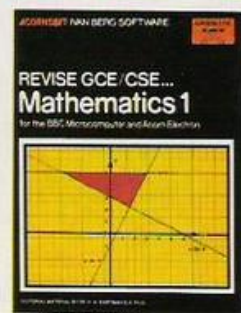
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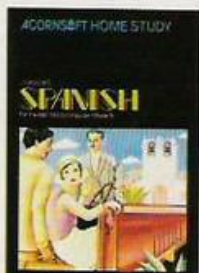
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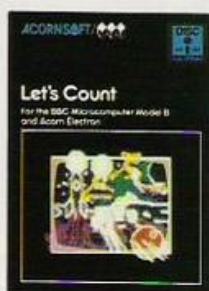
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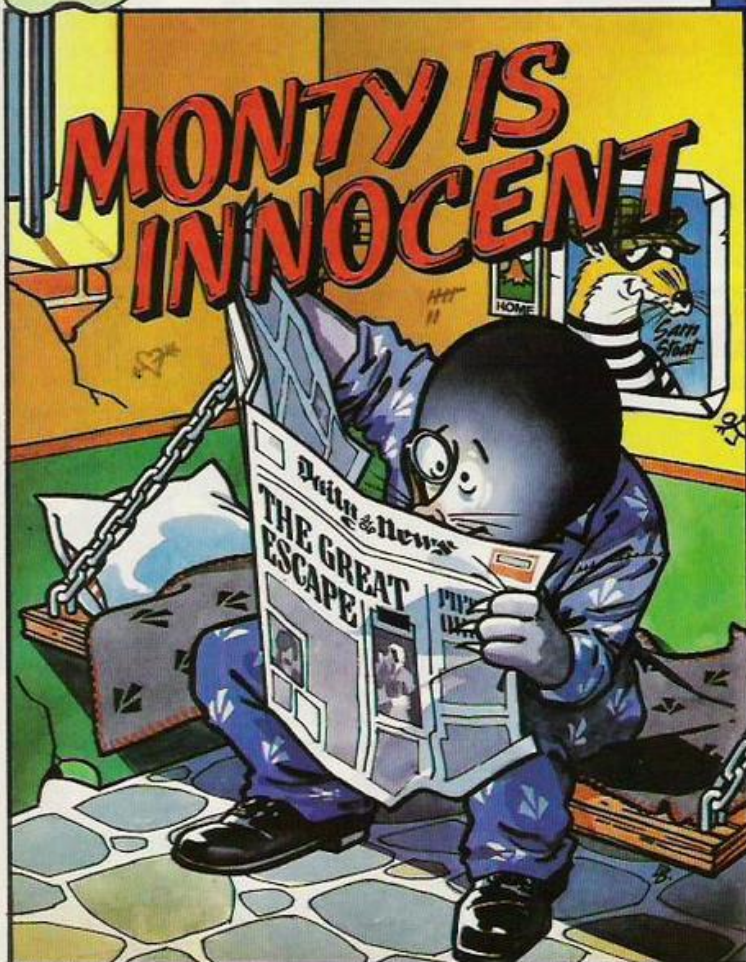
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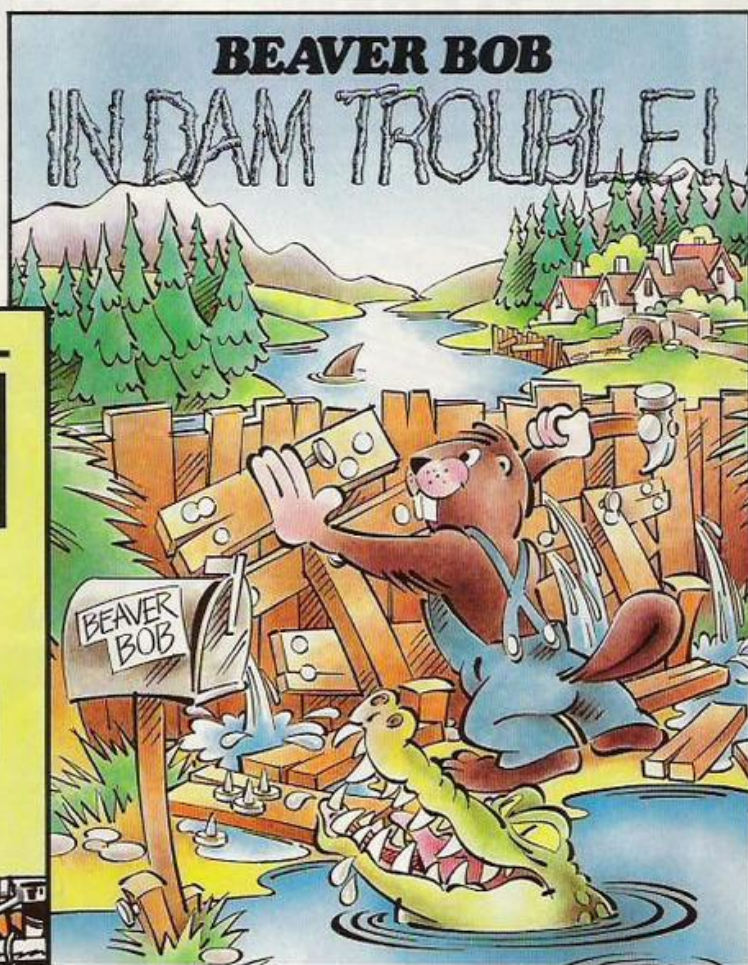
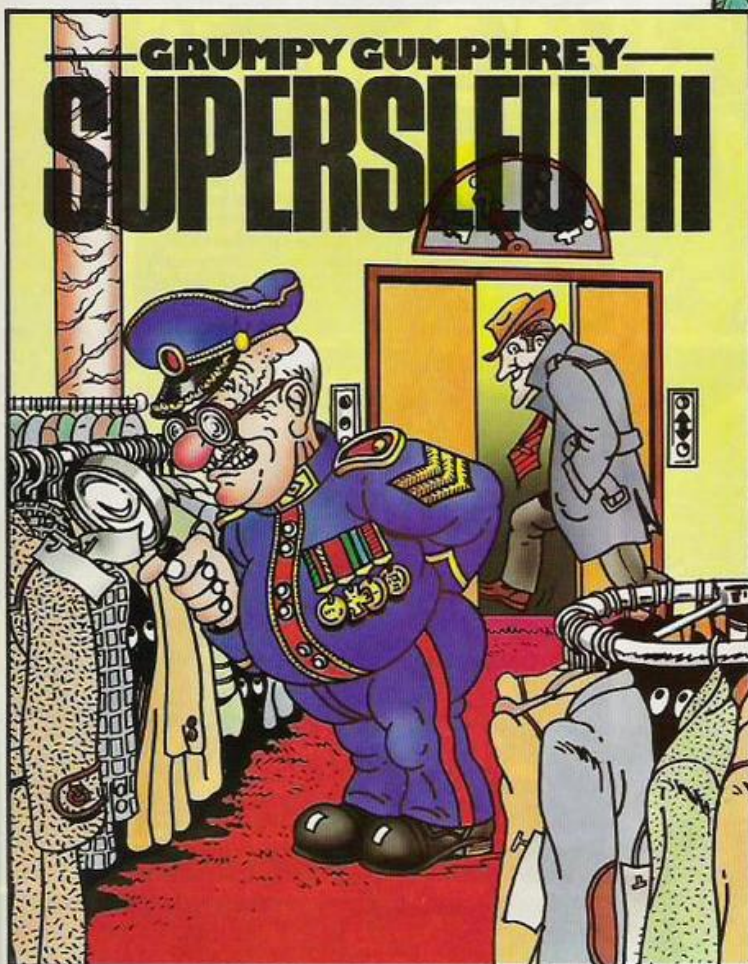


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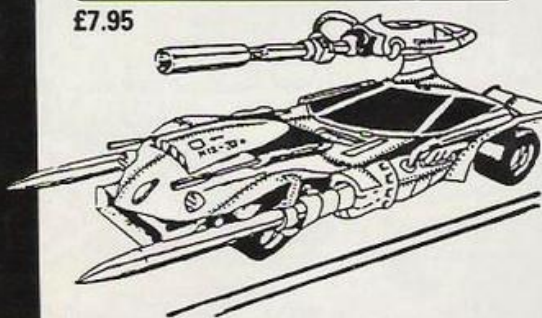
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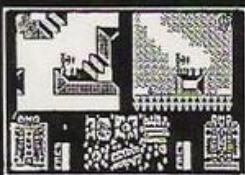


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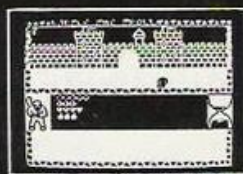


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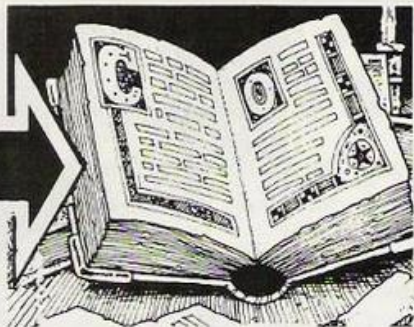
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# WHY WHIZZ KIDS ARE GOING GREY

HALF THE SOFTWARE houses in Britain could be wiped out overnight if one more major distributor like Prism goes bust. That's what the prematurely-aged whizz-kids of 1982 are saying as this financial year draws to a shaky close.

While the U.K.'s ailing computer manufacturers were getting all the sympathy, the money from the Christmas selling period was trickling back to the software houses from the distributors. As Oric crashed, and Trade and Industry Secretary Norman Tebbit met Olivetti to hear some soothing reassurances about Acorn's future, British software makers were totting up the cost of staying in the business for another year.

With their pocket calculators going through batteries like C-5s, let's do some sums of our own to see what's scaring them. First, how much is the British software market worth? Around £85 million from the retail end sounds about right. But of that only about £38 million will go to the software houses.

Next, how many companies are fighting for a slice of that £38 million cake? Back in the heady days of 1983 there were probably more than 300 software producers. Many were one man and a dog and program outfits. Now as the market punishes the unprofessional fewer than 150 remain. And only 100 of those have had any measure of success.

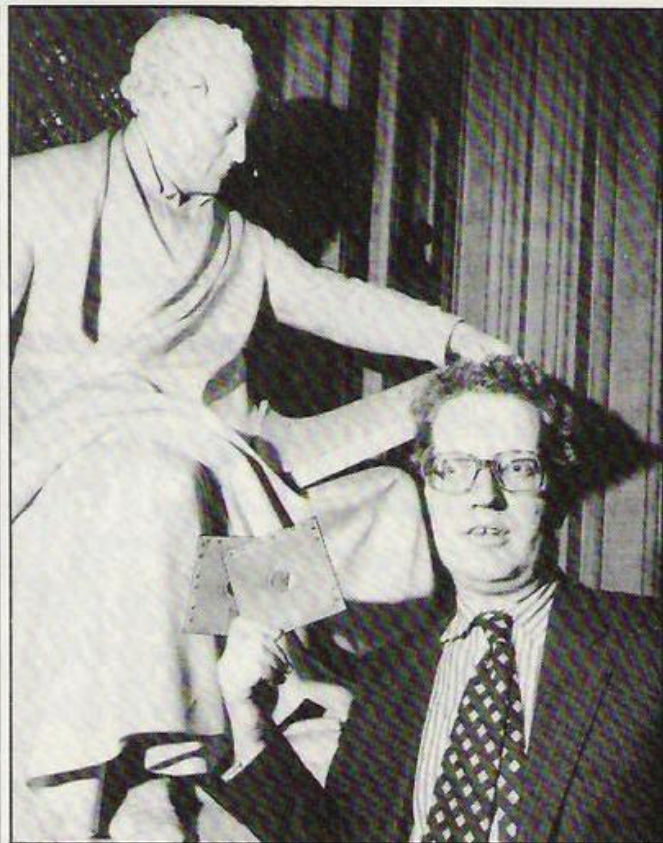
Well, £380,000 revenue per software house doesn't sound bad, but the market research company Ram-C reckons that the top 30 producers accounted for 87 per cent of the takings in the crucial Christmas period — with the top three of Ocean, Ultimate and U.S. Gold scooping up more than 30 per cent.

That leaves 70 firms scrapping it out for 13 per cent of £38 million — just over £70,000 each assuming they each get an equal share, which they won't. Now deduct running costs like salaries, royalties, tape duplication, marketing and advertising, and the word "shake-out" will be flashing up on LCDs all round.

Who is to blame and can anything be done? Perhaps the software houses themselves should take some of the criticism for not making the right quality of innovation last year when home computing was reaching a crucial point in its growth.

Price cutting may help in the short term but the real hopes are pinned on the new powerful computers due this year from Atari and Commodore to give the software market a badly needed fillip.

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Powell fights piracy while old friend looks for dandruff.

## PIRACY LAW NEAR

WILLIAM POWELL'S MP's anti-piracy Bill should be law by July. The Amendment to the Copyright Act will remove any legal obstacles for software houses which want to prosecute counterfeiters and home tapers, and will allow courts to impose fines of up to £2,000 or two months imprisonment for selling, exhibiting or even just possess pirated software.

Counterfeiters themselves could face two years in gaol or unlimited fines. The Federation against Software Theft which has promoted the bill is now co-operating with the Federation against Copyright Theft which co-ordinated raids on video counterfeiters after that part of the copyright law had been clarified to cut video piracy by two thirds.

## Ghost busters

REMEMBER Captain Spectre — the eccentric Cambridge spook hunter who hoped to bust ghosts with his micro? What he needed was a Banana.

Banana is what Castle Associates of Scarborough, 0723-584250, are calling their new interface for the Commodore 64 and BBC. It

costs around £230 and can handle eight inputs such as temperature, touch, movement, sound and light sensors and then drive eight outputs controlling cameras, lights, recorders, even nets and trap-doors if you must.

Why Banana? As it is designed for students Castle makes it "so simple a monkey could use it".



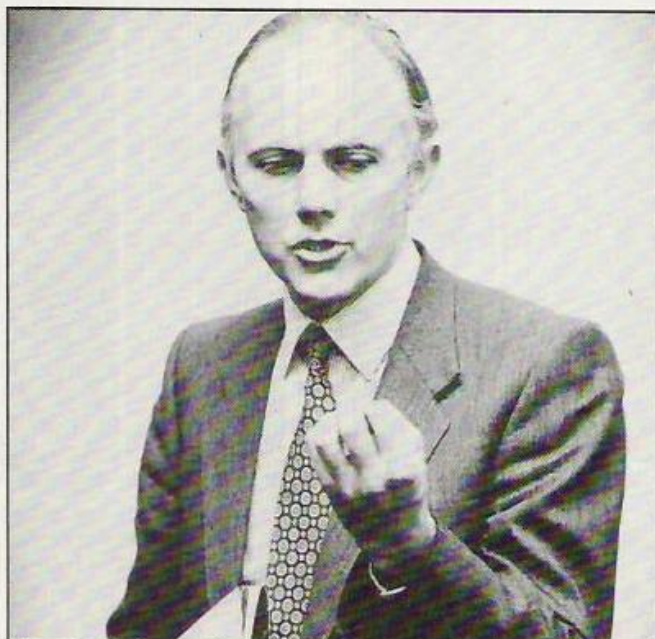
# ACORN SURVIVES

## Olivetti money to the rescue

"MORE LIKE the Turin shroud than a saviour" was how one Cambridge employee described Olivetti's purchase of 49 percent of the ailing BBC Micro makers.

With £47 million of debts and the share price crashing from 193p to 28p before trading was suspended in February Acorn was in desperate need of a rescue operation. Poor Christmas sales and £10 million losses on the failed attempt to break into the American market had created the crisis.

Now Italian typewriter and micro maker Olivetti has bought nearly half of Acorn for £10 million with an option to make that a majority shareholding, but the BBC will keep to their deal with Acorn for the moment. Alex Reid, appointed Chairman in the emergency over Chris Curry and Herman Hauser's heads admits that "we will not have an easy ride over the next 12 months". But he hopes that restructuring the company into four divisions, Education, Consumer, Scientific and Industrial and Business and



Alex Reid: favourite food — spaghetti.

sacking 120 staff will allow Acorn to survive.

The Electron will still be sold — perhaps in a pack with a disc drive — but there are big stockpiles so it may never go back into

production. The ABC range will now just be sold to the specialist research and development market and there is still no word as to when the BBC will be replaced and what with.

## Soft Aid £200,000 Ethiopia target

SOFT AID — the £5 "Greatest Hits" games tape for Ethiopia is now on sale. Rod Cousens of Quicksilver, who organised the appeal, hopes that it will raise £200,000 for the Bob Geldof Band Aid Ethiopian Appeal Fund.

The tape, which includes Kokotoni Wilf, Ant Attack, Horace goes Skiing and 3D Tank Duel amongst others, and an audio track of Band Aid's *Do they know it's Christmas* is available in Spectrum and Commodore 64 versions.

## 1985 Grand National on Spectrum

JUST BEFORE the real race begins, Elite has launched Grand National for the Spectrum, which lets you place your bets without risking any money and then watch overhead and side views as your horse completes the 30 fence Aintree course. You steer the reins, crack the whips to increase speed and time your jumps, but foul play can lead to a steward's enquiry. The program costs £7 but you might be better off putting that on Lucky Vane.

## Coast to coast by C5

SIR CLIVE is about to risk his C5 on a John O'Groats to Land's End run. 28 days?

Meanwhile, Sinclair has been spelling out his plans for successors to the C5 electric triangle. The C10 will be a side-by-side two-seater with 30mph top speed and 40 mile range and should be on the roads in 28 months, while the much more ambitious four-seater teardrop-shaped C15 capable of 80mph flat out for hundreds of miles, will not appear until the end of the decade.

# SINCLAIR'S SECRET WEAPON — THE QL V2



QL V2 looks the same as V1.

QL OWNERS who did not take up the £35 option to join the Qclub are angry that Sinclair expects them to pay for the new get-it-right Version 2 of the free Psion software.

Sinclair's issuing of Version 2 which loads twice as fast,

occupies less memory in the machine and operates 25 percent faster than Version 1 is a tacit admission that the Quill, Abacus, Archive and Easel programs were flawed in their original QL implementation. In effect Sir Clive is relaunching

the QL with some software and peripherals finally available and others coming soon.

After the disastrous 50,000 sales in the first year of production Sinclair has publicly announced a target of 200,000 QL sales in the U.K. alone in 1985.

The QL now has a communications package QCom which includes a modem, auto dial/answer unit and interface.

Computamate has produced a Q-Disc floppy-disc controller and Computer One has completed QL Pascal, Forth, Assembler and Monitor. Other companies have produced BCPL, LISP, graphics, accounts, and filing packages but games are still limited to chess, backgammon and bridge.



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YC/4



IS ACORN'S ALEX REID really Mr Chessman in disguise? Chessman was the strange food-obsessed villain of a recently repeated Avengers episode. Famous scientists and electronics specialists kept disappearing into his very English hotel only to find that they had been sold to a foreign power. Chessman's only weakness was that he would die if the central heating was turned down below 80°. Imagine my surprise at an Acorn "don't panic" press conference after the Olivetti deal which was held in a room with the temperature in the nineties. Nevertheless, Reid refused to enter the room until his aides had closed all the windows. One of his PR cronies sat in a corner trying to hide a file marked Top Secret. Inside was a list of "Danger Questions" such as, "What would the foreign power do if you didn't succeed" to which he gave the prepared answer "kick me out". The one question the PR had failed to predict emerged, "What if you do succeed?" A strange Chessman-like gleam came into his eyes and Reid answered, "I will retire with a large plate of spaghetti from Olivetti in 2001".

"WHY SHOULD the devil have all the best computer games" asks the Reverend Stoker Wilson — bringing General Booth up-to-date. He and his 900 strong Church Computer Users Group are going forth and multiplying and now publish a Top Ten of christian programs. No. 1 is Jericho Road with 2300 sales. "Two years ago it was just one or two freak vicars" says Stoker. I remind him that he wrote to us in 1983. No checks are made on the religious bona fides of members. "So they could be devil-worshippers", I ask innocently, perhaps thinking of Bram Stoker. "They could be", Stoker replies, "but you generally find they're not".

SOME CHARTS measure "not what the shops are selling but what they would like to get rid of" mutters Riva Gould, adding darkly something about people getting places in the Top 20 in return for "favours". Not the church chart I hope. Riva used to promote Computers. "I used to see the Lynx selling very well — when I knew it wasn't."

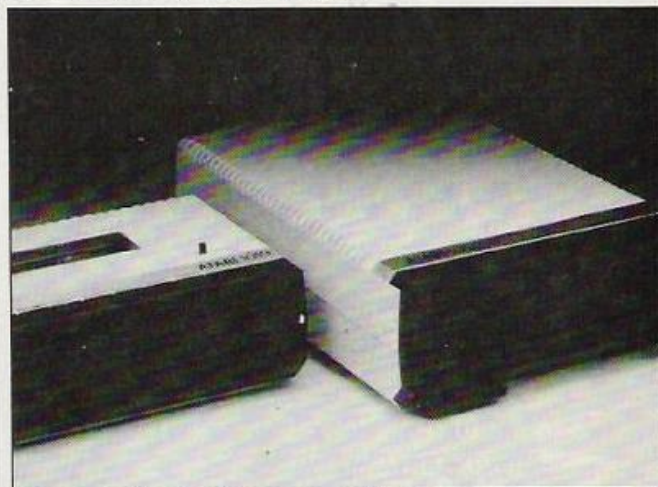
*Elsie Dee*

# PRICE CRASH

## Free disc drive offer

ATARI'S new 64K computer plus disc drive offer for £250 sets the pace in the price war. But Commodore's halving of the Plus 4's £300 tag will also make competition rough on the £130 Spectrum Pluses and Electrons.

The Atari offer is £130 800XL with a £200 1050 disc drive and two discs containing a home filing manager and demonstrations all for £250. The Plus 4 at £150 is a 64K computer with simple spreadsheet, word processor, database and filer all built in on rom, but there are fears that Commodore may soon abandon the product without software support. Commodore denies this but with a whole range of products — from the CBM 128, through the 68000-based AMigo, to the PC and Z-8000 all due to be launched this year the range is

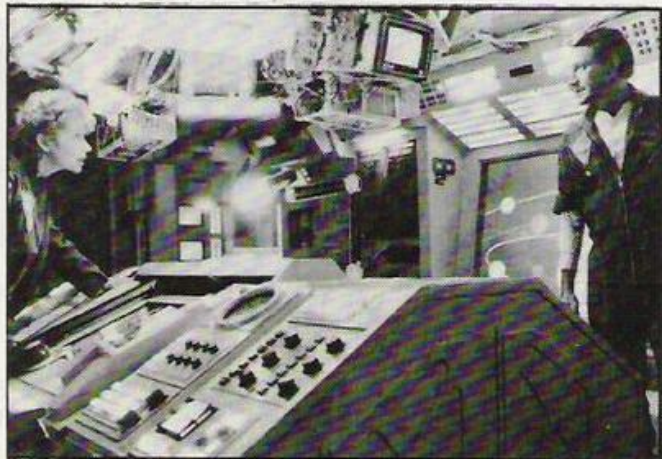


From tape to disc is Atari's way.

beginning to look crowded — especially now that the CBM-64 has been reduced to £160 yet still finds two Commodores, Plus 4 and 16, or both must go. Mean-

while, Orics are being sold for £50 or less and some stores are selling off BBC model A's for £150 or less — cheap if you can find an inexpensive upgrade.

# HAL RETURNS FROM DEAD



Can Hal survive till 2019?

SPACE AND COMPUTERS are mixing happily at the moment. While Douglas Adams's Hitchhiker's Guide to the Galaxy computer game has finally knocked Flight Simulator off the top of the American charts, over here HAL-9000 the oversized calculator that became a film star in 2001, is returning to our cinemas in 2010. Peter Hyams, who has adapted Arthur C Clarke's novel for the screens

wants to make the computer a little less threatening than he was in 2001. A joint Soviet American mission is travelling to Jupiter on the spaceship Leonor. En route it has to encounter the Discovery, which is still in the grip of that on-board computer Hal, which has to out-act Sal9000, a red she-computer, Helen Mirren and a bunch of assorted Americans and Russians if it is to survive.

## Blame the weather on Mac

BBC's NEW weather presentation uses an Apple Macintosh to display the overlays for the chart. Clouds, sunshine, snow, rain and hail are all icons which can be moved around the screen with a mouse.

In preparation for the change the BBC experimented with joysticks and graphics tablets but found that on the mouse with icons was the best solution.

## Chess Game it is not

WHETHER Karpov ends up fighting Kasparov in London's docklands this year or not, MicroClassic will go ahead with the launch of The Chess Game for the Commodore 64.

For the game is not chess but an arcade adventure based on the theme of the game. Up till now MicroClassic has worked as a development house producing programs like Hunchback for Ocean.



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## SHARDS THE FAMILY FAVOURITES

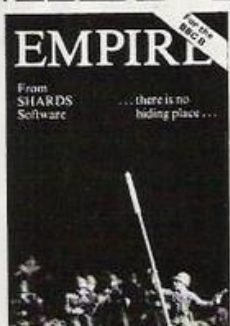


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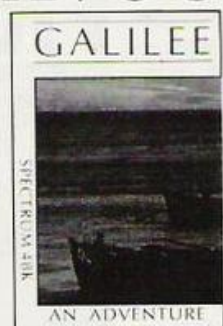
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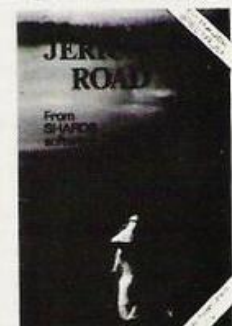
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# POP★ TOPS

## SOFTWARE TOP 20

- |                      |             |     |
|----------------------|-------------|-----|
| ↑ 1 Matchday         | Ocean       |     |
| ↑ 2 Booty            | Firebird    | Sp  |
| ↓ 3 Ghostbusters     | Activision  | Sp  |
| ↓ 4 Daley            | Ocean       | Sp  |
| Thompson's Decathlon |             |     |
| ↑ 5 Brian            | Edge        | Sp  |
| Bloodaxe             |             |     |
| ↑ 6 Airwolf          | Elite       | Sp  |
| ↑ 7 Starstrike       | Real Time   | Sp  |
| ↑ 8 Knight Lore      | Ultimate    | Sp  |
| ↑ 9 Technician       | Hewson      | Sp  |
| Ted                  |             |     |
| ↑ 10 Automan         | Bug Byte    | C64 |
| ↑ 11 Wild Bunch      | Firebird    | Sp  |
| ↑ 12 Frak            | Statesoft   | C64 |
| ↑ 13 Blockbusters    | Macsen      | Sp  |
| ↑ 14 Go Go Ghost     | Firebird    | C64 |
| ↑ 15 Overdrive       | Superior    | El  |
| ↑ 16 Blue Max        | US Gold     | Sp  |
| ↑ 17 Gift From       | Ocean       | Sp  |
| The Gods             |             |     |
| ↑ 18 Skool Daze      | Microsphere | Sp  |
| ↑ 19 Combat Lynx     | Martech     | Sp  |
| ↑ 20 Elite           | Acomsoft    | El  |

Sp = Spectrum/Bc = BBC16 = C16  
 El = Electron/Vc = Vic-20  
 Dr = Dragon/64 = CBM64  
 Am = Amstrad/Or = Oric/A1 = Atari  
 \* = New release — Same position  
 Source: WH SMITH

## SOFTWARE TOP 3 BY MACHINE

- |                       |                   |    |
|-----------------------|-------------------|----|
| ↑ 1 Punchy            | Mr Micro          | Vc |
| ↑ 2 Perils of Willy   | Software Projects | Vc |
| ↓ 3 Psycho            | M. Tronics        | Vc |
| ↑ 1 Booty             | Firebird          | 64 |
| ↑ 2 Ghostbusters      | Activision        | 64 |
| ↑ 3 Daley             | Ocean             | 64 |
| Thompson's Decathlon  |                   |    |
| ↑ 1 Booty             | Firebird          | Sp |
| ↑ 2 Airwolf           | Elite             | Sp |
| ↑ 3 Ghostbusters      | Activision        | Sp |
| ↑ 1 Chuckie Egg       | A&F               | Dr |
| ↑ 2 Dragon Chess      | Oasis             | Dr |
| ↑ 3 Frogger           | Microdeal         | Dr |
| ↑ 1 Millionaire       | Incentive         | Bc |
| ↑ 2 Magic Sword       | Database          | Bc |
| Pub                   |                   |    |
| ↑ 3 Sports Quiz       | Kosmos            | Bc |
| ↑ 1 Encounter         | Hi-Tech           | At |
| ↑ 2 Attack of         | Llamasoft         | At |
| The Mutant Camels     |                   |    |
| ↑ 3 Zaxxon            | Centresoft        | At |
| ↑ 1 Flight 015        | Craig Comm.       | 16 |
| ↑ 2 Games Tape 1      | Melbourne         | 16 |
| Hse                   |                   |    |
| ↑ 3 Williamsburg Adv. | Microdeal         | 16 |
| ↑ 1 Elite             | Acomsoft          | El |
| ↑ 2 Overdrive         | Superior          | El |
| ↑ 3 Felix Meets       | Micropower        | El |
| Evil Weevils          |                   |    |
| ↑ 1 Football Manager  | Addictive         | Am |
| ↑ 2 Manic Miner       | S. Projects       | Am |
| ↑ 3 Snooker           | CDS               | Am |
| (S. Davis)            |                   |    |

Source = Websters Software

## TELSOFT IN NZ

TELSOFT works very well from here in New Zealand. We have downloaded four programs successfully now. The phone bill is not excessive either as it doesn't take too long to download the programs.

We are using a VTX 5000 modem. One suggestion we do have, though, is that we would like to see more complete instructions on how to save off the more complicated programs like Windos. This is the only program that we have not been able to run.

D.T. Ready,  
 Manukau Computers (NZ) Ltd.,  
 Auckland,  
 New Zealand.

## ZX-81 EXCHANGE

YOUR CORRESPONDENT S.P. Kaliszczak — February 1985 — is by no means alone with his problem, ie finding software for the ZX-81. Through the postal user group, ZX Exchange, of which I am organiser, this is perhaps the most frequently voiced complaint of recent months.

The solution, as I continually advise people, is to write your own, and then to exchange it with others. This is not as difficult as it may seem provided that the right help is forthcoming and that is exactly the purpose for which ZX Exchange exists. By this kind of mutual co-operation, the ZX-81 user not only gets programs tailor-made to

# YOUR Letters

long may that situation continue!

Nick Godwin,  
 4 Hurkur Crescent,  
 Eyemouth,  
 Berwickshire,  
 Scotland,  
 TD14 5AP.  
 Telephone: Eyemouth  
 (0390) 50965.

his own requirements, he is also forced to learn the fundamentals of computing, but in an agreeable and friendly manner. If and when he decides to acquire a more versatile and expensive machine he is well equipped first to get the right machine for his purposes and, second, to make the best of it when he gets it. Any of your readers who are interested in ZX Exchange are invited to write to me with a s.a.e. at the address below, or to telephone me any evening.

Since I am writing, however, I must take the opportunity to congratulate Your Computer on having continued to publish ZX-81 programs of considerable quality, despite the obvious temptations to forget about this "downmarket" area. Certainly, the number and quality of such programs has proved sufficient to keep me as a regular subscriber long after I have given up other magazines;

## "BASIC IS BEST"

IT SEEMS to be the fashion these days to blame Basic and to praise any other languages, like A. Hegedus, D. Sutton — Your Computer, October 1984 — and A. MacPhee — Your Computer, January 1985 — do in their letters. That kind of talk can only be understood as an attempt to give the impression of being a computer expert but, in fact, it shows ignorance of programming and Basic language.

Standard Basic is a structured, modular and extensible multi-tasking language. It is powerful, but still easy to learn and use. Of course, the Basics in most cheap home-micros are very

(continued on page 35)

## SINCLAIR TRANSPORT KEEPS ON KEEPIN' ON

RECENTLY, WHILE researching into my own family history, I came across the following which alludes to the inventiveness of a Sinclair, approximately 100 years ago. He is referred to in 1886 as being, "the present Earl of Caithness" who must be the 14th Earl, James Sinclair.

Some similarities between the "steam car" of Sir James and the "electric" one of Sir Clive deserve examination and our admiration.

D. C. Hardy,  
 Torquay,  
 Devon.

"The front view of the vehicle is that of a phaeton placed on three wheels, and made a little wider than ordinary, so as to have room for three or even four abreast. His Lordship sits on the right hand side and drives, resting his left hand on a handle at the end of a bent iron bar, fixed below the front spring, to the fork in which the front wheel runs, and guiding the direction of the carriage.

"Placed horizontally before him is a small fly-wheel, fixed on an iron rod, that, passing downward, works at the lower end by a screw, through one end of a lever, attached at the other end to a strong iron bar that passes across the

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 ONLY JUST ARRIVED!



carriage, and has fitted on it a drag for each of the hind wheels. By giving the fly-wheel in front a slight turn with his right hand, his Lordship can apply a drag of sufficient power to lock the hind wheels and stop the carriage on the steepest declivities of common roads.

"Inside the carriage, a line backward from his right hand, is placed a handle, by which the steam is let on, regulated, and shut off at pleasure.

"The power of the engine, and the perfect control His Lordship has over it, enabled him on several occasions to make long journeys over rough and mountainous roads

at the rate of eight miles an hour; there can therefore be no doubt that carriages propelled by steam can be used for the purpose of traffic on common roads.

"A journey of 140 miles made in two days, at a cost of less than one penny per mile for fuel, proves this; and the fact that no accident to man or beast was caused by the steam carriage during the whole journey, answers the objections as to frightening horses.

"His Lordship continues to use the carriage, and is most kind and courteous in explaining its constructing and working."





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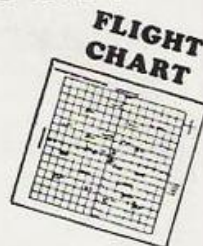
**AMSTRAD CPC 464**



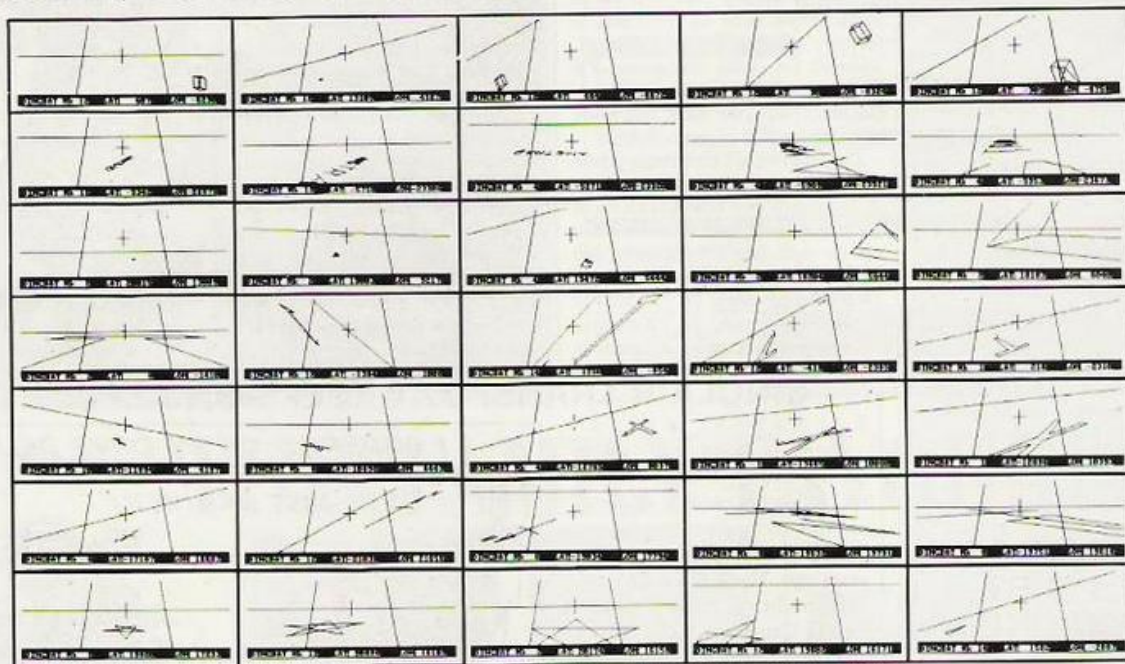
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DISPLAY**



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OR Debit my Access A/C No.:-

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OR Telephone through your Access Order.

Signed.....



# IN ★ TOUCH

## How to write for Your Computer

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticisms of machines and software in general. Here's how you go about getting your name into print. Your article should be typed, double-spaced, on A4 paper. A name and address on each sheet would help. Don't forget to tell us which machine it runs on. With programs please include a cassette or disc and some indication of how long it is. Please put what machine it's for on the envelope. Don't forget full instructions to us how to load and list your program and how to enter it for the readers.

The article must be submitted exclusively to *Your Computer*. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

## Telsoft

Telsoft is *Your Computer's* software downloading service. Any program for the Spectrum or the BBC — and soon the Commodore — which has a telephone symbol next to it is available on the service. Both 1200 and 300 baud speeds are catered for. For more details call Colchester (0206) 8068. No more lonely nights typing in endless pages of hex digits.

## Message service

You can get messages to us in two ways. Either use the Prestel Telex Link to 892084 BISPRES G or you can use our very own modem, day or night on 01-661 8978. The modem is V21, 300 baud, even parity, 10 bits per character. You simply transmit in upper case "YRC" — our address code, and wait for the acceptance code "++ + STF GO". Then off you go. Don't forget to tell us who it's for. Sign off with "NNNN" — again in upper case.

(continued from page 33)

cut-down versions, but even those are in many aspects better than the standard versions of Pascal or Fortran. And comparing £10 Basic to £300 Pascal is not very fair, is it?

In my work, I have used several languages, including Pascal, Fortran, PL/Z/SYS, C, Assemblers and, of course, Basic. I have often made comparisons by writing the same program or procedure in different languages. In almost all cases programming in Basic has been the easiest, the shortest and the most readable. I suspect that those who criticise Basic have never done such comparisons.

Perhaps the most serious claim that has been made against Basic is that it leads to bad programming practice. However, the reason is not Basic, but the fact that home computer manuals

# YOUR Letters

do not teach programming, they only list the commands. How would you expect anyone could learn programming without any aid? If you try with Pascal or Fortran, the result is at least as bad. The only difference is that those languages are more difficult to learn.

Now that the ANSI Basic standard is finally coming, I believe that Basic

will be more widely used and more appreciated in the future.

Pauli Lindgren,  
Software engineer,  
Helsinki, Finland.

## VISIBLE ERROR

THANK YOU for publishing the Invisible Toolkit. A typing error appears at the bottom of page 111 — *Your Computer*, March. The address 16544 should read 16514. My thanks to George Payne of Watford for his letter. Also, here are a few modifications to improve the handling of system variables automatically:

```
20 LET L = 768
405 POKE 16417, 0
415 IF PEEK 16417 = 1 THEN POKE
16384, 28
```

Change all occurrences of the line number 10222 to 10220.

Before running program 3, type in the following pokes:

```
17327,6
17328,253
17329,203
17330,33
17331,198
17332,24
17333,144
17334,201
```

All cassette tapes are the modified program.

Stuart Clark,  
Glenrothes,  
Fife.

## BULLETIN

I WOULD APPRECIATE it if you would include my Bulletin Board, the first one in Scotland, in your magazine. My Bulletin Board is called SABBS (Scottish Atari Bulletin Board Service) and is on 0698 884804. It runs 24 hours a day at 300 Baud on an Atari 800 XL.

Nick Rosser,  
Larkhall,  
Lanarkshire.

## SECURIFILE

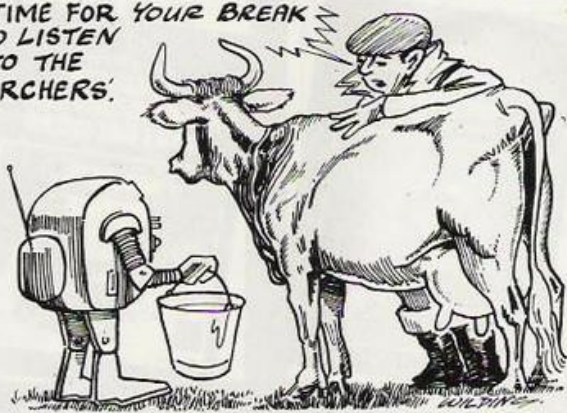
SEVERAL READERS have written to me about my program Securifile for the Spectrum published in the March issue of *Your Computer*. Their enquiries concern the possibility of operating Securifile on Microdrive. I have produced a Microdrive-compatible version which, at the cost of losing a small amount of data and space, may be operated on Microdrive.

This version is available on cassette from 29 Ashridge Drive, Brichet Wood, St Albans, Hertfordshire for £3.75. Please order as version 2.3. The standard tape version is also available at the same price, order as version 2.1.

Jon Ellis,  
St. Albans,  
Hertfordshire.

## "GET ORGANISED, PSION!"

TIME FOR YOUR BREAK  
TO LISTEN  
TO THE  
'ARCHERS'.



AFTER WINNING a Psion Organizer in a competition in *Your Computer* last September and receiving it in January, I set about using it. A fun little thing I thought but what about a practical application. Well, in the competition I wrote down I would use it to keep records of my cows. So that's what I set about doing.

The Organizer comes with a Utility Pack and a 5K pack which allows you about 12,000 characters which would be inadequate for my herd. But you can buy packs of 14K. I then worked out a form to use and decided two 14K packs would be sufficient for five years supply of data.

The Organizer has a great ability to cross refer and return data which is exactly what I need. The format I devised would have to be able to find a given number, such as a cow's number, eg No. 53 and also tell one when she calved, if the vet has seen to her and when she was served by the A.I. etc. These records must be able to be cross filed with 100 other cows. So I could call for all the cows that calved in August to be printed out etc. This format would need to be updated at least five times a year. With the Organizer when you update data you delete or add to a file, then resave it.

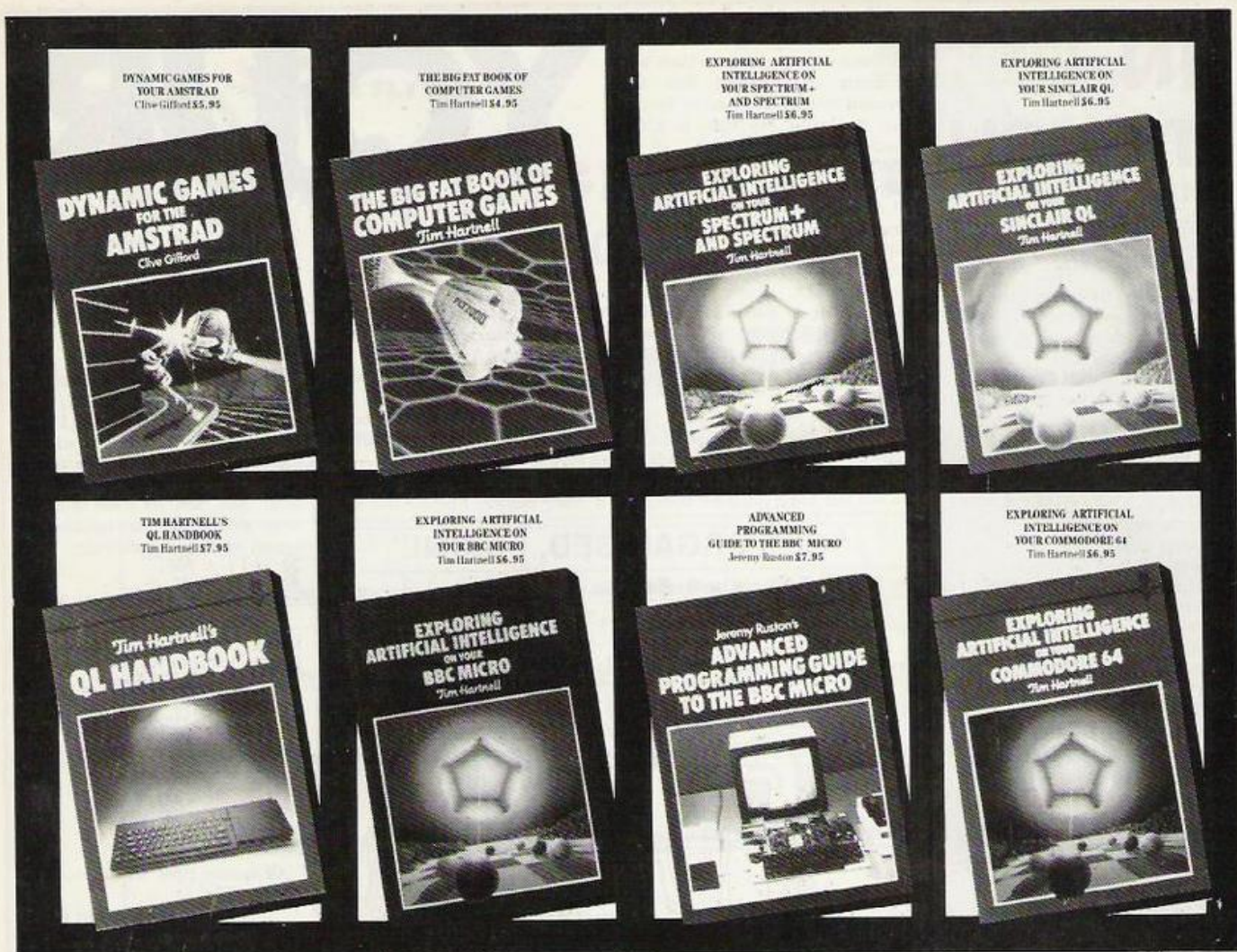
The format I went for ran as 53 — CAUG 14/4 — VSEPT 10/4 etc. This allowed me to save bytes and cross file. Type in 53 and I get the whole record for that cow, or Type C (stands for calving) Aug (date) and I get every cow which calved in August. The 14/4 is the 14th day 1984 and so on.

As you can see the range of data is vast. So off to Bristol I went. W.H. Smiths — "no". Boots — "yes". "Two 14K packs please", "£39.90" came the reply. "Hell, no thanks" and home I went.

Here I have a computer to use with a practical application but cannot afford the software. The Organizer is a very powerful compact unit with mathematical and scientific use. The data handling is excellent with a fast multi cross filing system but 20 quid for a 14K pack?

Rod Shaw,  
Nailsea,  
Bristol.





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# I could do that...

Anyone who plays with the Macdraw program on Apple's Macintosh will be impressed by how flattering it is to their artistic abilities. Even those with no gift whatsoever for drawing can produce pleasing effects. In this respect perhaps the most useful of its facilities is the one which mirrors or reflects a drawing in four or eight different axes. In effect this simulates a kaleidoscope, creating a symmetrical pattern where before was just a random squiggle.

For this month's £15 competition we would like you to furnish your micro with a kaleidoscope facility. It should allow you to draw a figure in the top right hand quadrant of the screen, using the keys to move the screen 'pen' a pixel at a time in any direction. At the same time it should reflect the figure in each of the other three quadrants.

If you own a micro such as the BBC which allows the graphics origin to be defined then your task is fairly simple. First move the origin to the centre of the screen. Now to reflect a pixel into another quadrant you need only to multiply its co-ordinates by -1. Thus pixels in the top left quadrant have negative x co-ordinates while pixels in the bottom right have negative y co-ordinates.

If your micro has a fixed origin — usually at the bottom left-hand corner — you can calculate the reflected positions in the same way and the convert to screen co-ordinates by subtracting the amount needed to move the origin.

No 100 line blockbusters please.

February's I Could Do That asked you to supply a bug-ridden program. Unfortunately it drew only a small response and none of the programs submitted were judged sufficiently interesting to publish. However we are still in the market for unusual bugs and will hold the prize over.

# 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.

## Sinister art of hacking

HACKERS HAVE been in the news lately, earning themselves rather dubious reputations. Originally a hacker just meant anyone who spent hours of his or her — usually his — life locked in a bedroom with a micro. To begin with, this machine would have probably been some kit micro like the once famous and now forgotten Altair. Or it might have been the still-famous Apple computer, which also began life as a hobbyist's toy.

Hackers developed almost mystical bonds with their machines which they knew backwards and inside out. That was in the early days, when micros were primitive, and required weird and wonderful skills like machine-code programming, and the ability to wield a soldering iron.

But things soon changed. In a rather unsporting move, micro manufacturers began to make their machines easier to use — so easy in fact, that almost anyone could use one. This obviously took away most of the hacker's fun, who delighted in the tricks of the trade that were incomprehensible to outsiders. So hackers began to look a little further afield for challenges. They started to take on the outside world.

At the same time that micros became more user-friendly, the communications side of things began to develop. Using a modem and an ordinary phone, a micro could link up with other micros thousands of miles away. They could also be hooked into rather bigger fry, the giant main-frame computers used in business and government applications.

This proved to be great fun. After all, most of the systems had been designed with the specific idea of keeping unauthorised users out. And it is a well-known fact that it is much more interesting to be somewhere you shouldn't. So some of the hacking community moved on from just writing shoot-'em-ups in machine code to playing what seemed like a real grown-up adventure game.

Hacking became a more familiar



idea through the film *War Games*. In it, a young hacker used his micro to ring through all the telephone numbers in a certain area to search out which ones were connected to computers. Having found one, he tried to break into it. The film is about his unfortunate success: the computer he gets into controls America's entire missile system. When, as a result of this, the computer gets too big for its own boots, the world teeters on the brink of nuclear catastrophe.

Needless to say, the all-American boy saves the day in the end. The interesting thing is that shortly after the film was released, a real young hacker succeeded in gaining access to a sensitive U.S. military computer. Since then, there have been a number of reports of people, armed with little more than a micro, a modem and a mischievous sense of fun, getting into several supposedly watertight systems.

In this country, British Telecom's Prestel service has been the victim of hacker's attacks. Abroad, people have got into German financial systems, and computers owned by the French atomic energy authority.

The main way that unauthorised individuals are locked out is by using passwords. These are simply words or sequences of numbers and letters that have to be fed into the computer before you can go on any further. The more passwords a system requires, the more secure it should be. In particular, if there are any operations that are very vulnerable or sensitive, it is customary to demand a special password each time they are

used.

Passwords are found on such things as Prestel, Telecom Gold, which is a method of sending private messages by computer over the telephone lines and many small business programs. More advanced programs only allow you a limited number of tries before you are locked out. This is to prevent an obvious hacking technique of programming your computer to run through all the possible password combinations. Not a quick way of getting in, but one that should work — eventually.

You can always try and guess. This is not such a hopeless procedure as it sounds. When it comes to thinking up random passwords, most people are very unimaginative. They tend to pick their own name, or their wife/husband's name, or the name of the dog/budgie, and so on. So a little background information on the person who set the password can often be a good clue. This was in fact the technique used in *War Games*.

Nowadays, though, hackers are a good deal less scrupulous in the means they employ. Using a mole inside the relevant organisation seems to be becoming increasingly common. This is because when passwords are being changed regularly, it should be impossible to crack them consistently. And yet hackers have succeeded in getting into many systems where such precautions are taken. In particular, once a master password has been obtained, not only is it possible to get into a system, it is even quite easy to lock out the legitimate users.

(continued on page 39)



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Features: Commands are single-entry keywords in graphics mode. Syntax is checked on entry. Fully compatible with Spectrum Basic. Microdrive compatible. Comprehensive manual.

NOTE: Release 1.0 is still available for 16/48K Spectrum at £11.00.

ALTER screens colours  
(general or specific)  
AUTO line numbering  
BREAK out of code loops  
CLOCK digital clock  
CURSOR CONTROL CODES allow  
strings to have complex shapes  
DEF KEY user definable keys  
DELETE a block of lines  
DO-LOOP structure  
DPOKE double poke  
EDIT specified line  
ELSE used with IF... THEN  
EXIT leave DO-LOOP

FILL enclosed area with specified ink  
or paper  
GET wait for keypress  
JOIN two program lines  
KEYIN a string  
KEYWORDS new keywords on/off  
LISTLIST line TO line  
USED used with GOTO, GOSUB  
ON ERROR trap errors  
(with LINE, STAT and ERROR)  
PLOT a string (may contain cursor  
control codes)  
POKE a string  
POP Basic's stack  
PROC, DEF PROC, END PROC  
(for named procedures)

RENUM versets renumber  
ROLL all or part of screen in any  
direction by specified number of  
pixels, with or without attributes  
SCROLL like ROLL, but without wrap-  
around  
SORT arrays (very fast)  
SPLIT program lines  
TRACE program execution  
UNTIL used with DO or LOOP  
USING used with PRINT  
WHILE used with DO or LOOP  
XOS, YOS move PLOT origin  
XSG, YSG change PLOT scale

## FUNCTIONS

AND (bit-by-bit)  
BINE decimal to binary  
CHARS number to 2 characters  
CODE fast cosine  
DEC hexadecimal to decimal  
DPEEK double PEEK  
FILL fill area

HEX decimal to hexadecimal  
INSTR string search  
MEM free memory  
MEMORY all of memory as a string  
MOD modulus  
NUMBER 2 characters to number  
OR (bit-by-bit)

RND fast RND  
SCRN recognises user graphics  
SINE fast sine  
STRINGS repeats strings  
TIME current time  
USING formats numbers  
XOR (bit-by-bit)

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# M W

## THE MICRO WORKSHOP

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**12 STATION APPROACH**  
**EPSOM, SURREY.**  
**EPSOM 21533**



(continued from page 37)

The mole technique succeeds because people tend to be very careless with their passwords. Favourite tricks include leaving them on a scrap of paper next to the machine, or in a nearby drawer. It therefore only requires a little effort to get hold of these precious numbers.

Hacking started as fairly harmless fun by people who relished the extra challenge. But as computers begin to affect more and more of our lives, the dangers of this kind of unauthorised

use are growing. For example, in America, a reporter who had written slightly critically of the hacking community found that his credit card number was obtained from his bank's central computer, and was being posted on computer bulletin boards for all to see and use.

It is easy to imagine some of the problems this kind of thing could give rise to. Bank balances could be tampered with, medical details investigated in hospital records, even police records broken in to and possibly changed.

## How and what the processor processes

DECEMBER'S FIRST BYTES described how silicon chips were made. The same basic techniques are used for all the different varieties. This includes the most important chip in a micro, the processor. As its name implies, it is concerned with the actual business of manipulating the strings of digits that are fed into it.

Whether these digits represent blobs moving on screen, Basic programs or word-processing applications, is completely irrelevant. The processor simply takes each command in a program and implements it blindly.

The microprocessor can only understand machine-code instructions, so some translation may be necessary. For example a program written in Basic exists as a series of English-like lines of commands: it is a high-level language — see February's First Bytes for a fuller discussion. If the processor is to obey these commands, they must first be converted to the machine-code instructions that carry out the same operations.

This can be done in two ways. Most Basics are interpreted. This means that when a program is run, each line in turn is converted to machine code by the Basic interpreter. In fact this is precisely what takes up most of the space when you load Basic into your machine. An interpreter has to know all the rules for converting Basic programs into the correct machine code for that particular processor. In addition, it normally checks the syntax of your program as it does this.

Incorrect syntax, which includes things like using words unknown to Basic, leaving off brackets and mixing up the types of variables, will throw up an error message, and stop execution of the program. This is why Basic is such a good language for beginners. It tells you about your mistakes as they occur, so it is far easier to locate and correct them. Earlier, less sophisticated languages simply tried to run your program, failed, and just told you that you had failed — just in case you hadn't noticed.

If this kind of error-checking is a big plus for interpreted Basics, there is also a down side. Since each line is translated and checked and then run

one at a time, the whole process is relatively slow. This is particularly true if the program is at all interactive, that is requires constant input from you, as in a computer game. Ideally, you would like to bung in the whole program, and let it run straight away.

This is precisely what an alternative way of running a Basic program does. Instead of interpreting a program, you compile it. This simply means that you feed in all the lines at once to something called a compiler. The program that you enter in this way is called the source code. Once the compilation is complete, you then run the resulting machine code — called the object code.

Such a process breaks up the running of a program into two stages. Provided your program contains no errors, its object code version will run much more quickly, because the processor can just get on with it, instead of constantly pausing to ponder over a line of Basic, translate it using the interpreter, and then run it.

Just as the big advantage of interpreted Basic was its error checking, so the drawback of compilers is that they translate everything before they bother telling you about the errors. This means it is harder to debug a program with a compiler. Ideally you would develop software using an interpreter, and once it is all running smoothly, you would then compile it to a very compact object code file which you would then run instead of the source code itself.

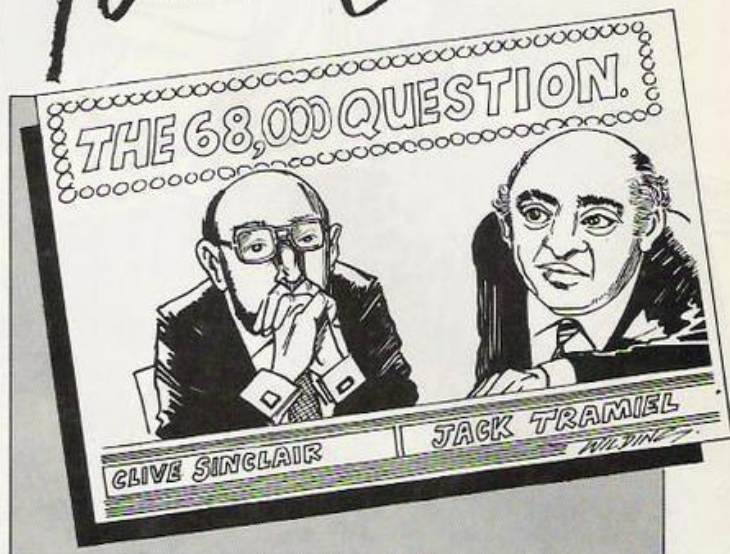
Sometimes professional programmer use this technique when they wish to avoid the trouble of writing in the mind-blowing hieroglyphics of the machine code, but need something faster than ordinary Basic programs.

The end result of interpreted and compiled Basic programs is commands written in machine code. This is true whatever language a program is written in, and for whatever machine. This also explains why machine code represents the ultimate for programmers: they can talk directly to the heart of the micro, the processor.

However this machine code is produced, it is stored in Ram, the temporary memory of your computer. The amount of Ram therefore deter-

# BEGINNERS

## first bytes



mines more or less the size and complexity of programs that can be run. More complex programs sometimes use a technique called overlays to allow you to run far larger programs than your Ram can theoretically cope with. For this, though, you need at least a floppy disc system; ideally a hard disc is best.

The technique used is to load as much of a program as possible or is necessary in Ram, and then call in additional chunks as and when they are needed from the disc. This does slow down response times slightly, but can work in the right situation.

The processor works on the machine-code program stored in Ram by obeying one set of commands at a time. Something called the stack pointer keeps a record of where a processor has reached as it works its way through a program in Ram. These commands normally take the form of an instruction, such as telling the processor to add two numbers, followed by data, in this case the two numbers to be added. Alternatively there may be commands that instruct the micro to fetch data from memory locations, and feed them to the processor.

When this is done, data is stored temporarily on tiny memories called registers. These hold the data long enough for the processors to act on them in some way. Similarly, the result of one of these processor operations is stored on a register before it is transferred back to the main Ram memory.

The power and complexity of a processor is partly determined by how many registers it has for storing various pieces of data. The number of basic processor operations, like add, subtract and so on, also varies widely from model to model. But

perhaps the most important distinction that can be drawn between various chips is whether they are 8 or 16 bit. This distinction is becoming increasingly important in the home computer world as more powerful machines start to come through.

The numbers 8 and 16 refer to the size of the chunks of data that the processor can move around in any one operation. This includes data that is brought to the registers from memory, or data that is sent from them back to the main Ram. An eight-bit machine moves around eight binary digits at once, in other words a byte at a time. A 16-bit machine can cope with double this, two bytes.

As a very rough and ready rule, this gives 16-bit machines something like twice the speed. Machines that use eight-bit processors include the Spectrum, with a Z-80 chip, and the BBC, which uses the 6502. These two chips together account for practically all of the home micros around. Most business machines like the IBM PC use 16-bit chips, of which the most popular is the 8088.

Things are slightly complicated by the fact that a processor may move blocks of data around in eight-bit pieces, but process them in bigger chunks. Perhaps the most famous of these is the chip used by the Sinclair QL, the 68008. Although internally this super-chip carries out calculations using chunks of data 32 bits wide it can only obtain and send out data eight bits at a time.

Effectively there is a bottleneck of data coming in and out of the main calculating device. The new machines promised by Atari will use a version of the same chip that has a 16-bit data bus. Perhaps they will offer a quantum leap beyond the QL.





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## Local news

### Eyemouth

Nick Godwin may be familiar to you as the eminence grise behind ZX Exchange, the postal computer club with a human face. Well, he got an Amstrad for Christmas, and any keen programmers interested in joining a postal Amstrad User Group should contact Mr Godwin at 4 Hurkur Crescent, Eyemouth, Berwickshire, TD14 5AP, or telephone 0390 50965.

### Alcester

The Microsoft Club has worldwide membership as they communicate with each other through their cassette-based magazine. This comes out bi-monthly and is said to be an invaluable aid to anyone who wishes to learn Spectrum programming. They also have their own range of software. Write to Trev Glover, 73 Alcester Road, Moseley, Birmingham 13.

### Watford

Infomania is a rapidly growing club which has gained over 200 members since its formation in September. Lots of hardware and software is available to members and the club has fragmented into several smaller interest groups specialising in graphics, Logo, the 6502 and Z-80 processors. There is also a Multi User Dungeon (MUD) development group. The MUD runs on an Apricot and can be accessed by Econet on BBCs although it is hoped to go "down the wire" on to modems in the near future. Roger A Burg on (0923) 55122 has details of all the club's activities.

# COMPUTER

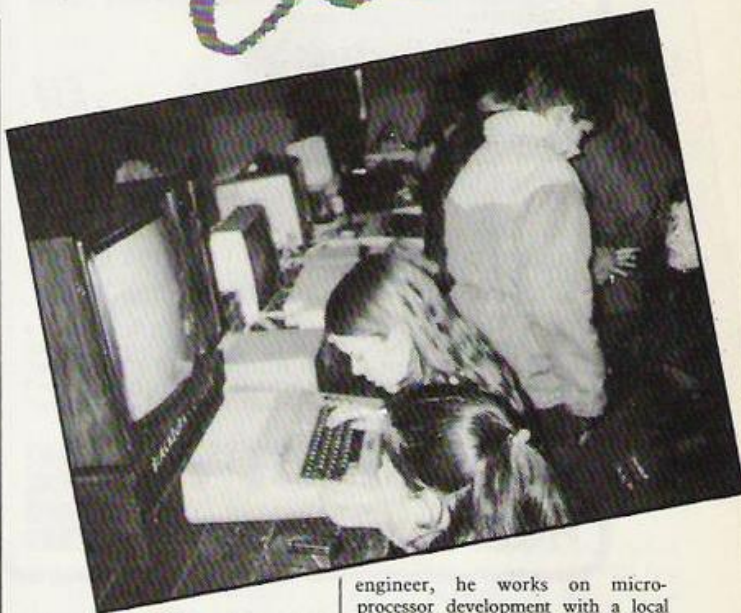
Tony Carter discovers that Blackburn's Computer Club, like its football club, is on the way up.

BLACKBURN COMPUTER Club is easy to find. Just across the road from the Darwen end of Ewood Park, home of Blackburn Rovers, is the Fernhurst Hotel; the music room of the large redbrick Fernhurst is the home of Blackburn Computer Club.

Like the Rovers, Blackburn Computer Club is on its way up. On the night that *Your Computer* visited the club most of their 30-plus membership had turned up. The hardware in use included an Atari 800 and an Atari 800XL, both with disc drives, a BBC with disc drive and second processor, a Lynx, an Amstrad CPC-464 and several Spectrums. All this and Thwaites, the native brew of Blackburn.

The aims of the club are to help the members to get the best out of their kit and to give members without a computer an opportunity to try out a variety of machines and software, explained president and founder Bob Hillyard. Certainly everyone seemed to be getting plenty of hands-on experience.

Membership is open to all without age limit. It ranges from children who are at primary school to a 70-year old gentleman who had assembled his own machine. Members include a cheese manufacturer and a market gardener who both use Spectrums to help run their businesses and several families who come to the meetings together.



On this particular night Ernie Troughton and Jimmy Wat were comparing the Tatung Einstein and the BBC B on a value for money basis. Ernie, who is a retired double-glazing manufacturer, owns an Einstein and reckons that apart from the odd review, the Einstein has been ignored in computer magazine articles. A sad fate for a UK-built machine.

Jimmy Wat's job involves him in the world of hi-tec. As a development

engineer, he works on micro-processor development with a local firm making machinery for carpet manufacturers.

Deborah, who is 10, likes the club because she gets the chance to try out a lot of different action games. Her sister Heather, who is 12 and her friend Samantha, 13, prefer the children's adventure game club — a regular club feature.

Mark, another 10-year old, was very busy with Pyjamarama on a Spectrum. The club plans forthcoming visits to computer clubs in Chorley and Preston and plans to visit the PCW show at Olympia.

Treasurer George Croft, a Blackburn policeman, made an appeal for educational BBC B software for the Dame Evelyn special school for the mentally handicapped. He also suggested that the club should challenge themselves to collect sufficient funds to present the Dame Evelyn school with a Spectrum.

The club's PR man, John Schofield, handed out part two of the machine-code course he had prepared for interested members and then it was back to the machines again.

The club meets on alternate Monday evenings. Annual membership fees are £3 for under 16s, £5 for adults and £10 for family membership, or members can pay 50p per evening. Members' machines are insured in transit to and from club meetings through the club's membership of ACC.

Details of dates of meetings and further information can be obtained from John Schofield on Blackburn 28127.





# HISOFT

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## ADD-ON EXTRA

### Screen dump

Amstrad

£17.95

SMC Supplies

Suitable for Epson, Brother and Star printer owners, this pack contains a printer cable and a short program for dumping Amstrad screen displays. Colours on the screen are represented by different densities of shading.

### Parallel interface

Commodore

£19.95

SMC Supplies

Cable and software, loaded in behind the kernel Rom, gives the CBM-64 a Centronics interface. Instructions are included for using the software with Easy Script and machine-code monitors.

### Marconi

BBC/MSX/Commodore

£60

Tracker Ball

Until now only real men who liked dressing up like Michael Heseltine were allowed to play Missile Command with Marconi track balls. That tended to be slightly expensive — not to say dangerous with real missiles — so now Marconi is launching into the home this expensive joystick which will only come into its own with computer-aided design software.

### E Interface

Spectrum

£39.95

Centronics Interface

Compatible with just about anything you can stick on a Spectrum, this new interface from Kempston comes with a metre of ribbon cable and is styled like the new Speccy +. The software in Eprom supports LPrint, LList and Copy commands.

### Floppy Wise

BBC

£29.95

Disc Utilities

This Rom is compatible with the Acorn DFS and adds 14 new commands. One of these commands "clone" claims to copy a fully protected disc in under four minutes.

# HARDWARE

## Demon modem

■ BBC

■ Demon Electronics Ltd

■ £60 by mail order

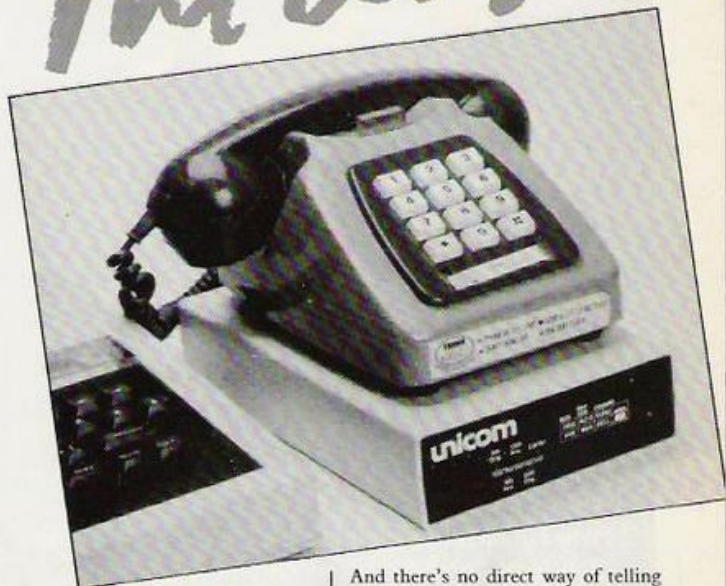
A MULTI-STANDARD modem for only £60? It's an astonishing price when other modems with the same sort of specification cost over twice as much. So does the Demon live up to its promise? Well... yes and no.

To avoid the high cost of switches, control of the Demon is delegated to your computer. Selection of signalling standard, switching on and off-line and so on is all done through the serial port, which also acts as a data highway. So it's essential to have the accompanying software.

At present the software is available only as a sideways Rom for the BBC Micro and it costs another £24. Apparently, it's still being finalised — which won't amuse those who sent off money when the Demon — *né* Unicom — was announced last autumn.

But the Rom is cleverly written and it certainly works hard. Everything is done by "star" commands: for example, \*baud 1 selects the Prestel mode and \*dial 618, for whatever, auto-dials the call for you.

It's easy enough to build the commands into your own programs. So with a bit of straightforward Basic you can create a bulletin-board which



auto-answers the telephone, selects the right baud rate automatically and can even upload or download files.

The system is undoubtedly very flexible, but it might be awkward for the beginner to master. The Demon has no extension telephone socket, so you can't check for engaged tones or crossed lines unless you spend another £5 on a two-way adapter.

And there's no direct way of telling whether your modem is holding the line.

One other snag is software clashes. The Rom is said to use legal calls only, but certain packages — such as Addcom and Computer Concepts' Graphics Rom — fight it.

But if you enjoy experimenting, the Demon will give you a lot of fun. Beware, though — it hasn't yet received BAPT approval.

## Disc drive

■ Amstrad

■ £199.95

IF YOU'RE SERIOUSLY into computing, then sooner or later you're going to need a disc drive. The flexibility and speed are so great that once you've used one, you'll wonder how you ever got along without it.

Amstrad's drive is further enhanced by the way it integrates well into the system as a whole. The drive consists of an interface, which plugs into the expansion socket in the back, a ribbon cable with two plugs, and the drive itself, which is a 3in. Hitachi unit.

When the computer is powered up, all normal tape commands control the disc. AMSDOS takes 1,280 bytes for work space, so some programs may not run with the disc installed. Apart from the tape commands, there are also several new disc commands which take the form of Basic extensions, using the "1" character as usual. Further Basic extensions can still be used normally.

Other utilities take the form of CP/M files on the supplied system disc: format, back-up and many more.

Obviously using the tape



commands to control the disc has one major advantage: programs will need little or no alteration to run on disc; file names may need to be changed, AMSDOS is fussy about repeated or null file names.

The disc format is 3in. with 40 tracks, giving 180K per side. At £5 per disc, it gives fewer bytes for your £ than some systems, but if the system catches on, this price may fall.

The system disc supplied has CP/M and the disc utilities, and a few demonstration files on one side and Dr Logo, the graphics language, on the other. Dr Logo is a fair imple-

mentation of the language, although it did seem rather slow.

The 100-page manual is clear and concise, giving all the information required on file types, transferring files from tape to disc, and giving brief notes on CP/M and the Logo language. Obviously if you were particularly interested in the last two, you'd need to buy a book.

A second drive can be added, of any type. Amstrad plans to bring out one at £169.95, but for the moment full information is available for DIY enthusiasts.

A good, no nonsense, well thought-out product, at a fair price.



# GET SORCERY OR YOU'LL TURN INTO A FROG



**"Get Sorcery or you'll turn into a frog."**

Well, that was the verdict of Which Micro on the Commodore 64 version. Now available on the 14th February is a greatly enhanced, stunning new version of Sorcery for the Amstrad and MSX. 40 screens of amazing and breathtaking graphics (50 in the case of the MSX version), with endless hours of tough and challenging game play.

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#### Available for

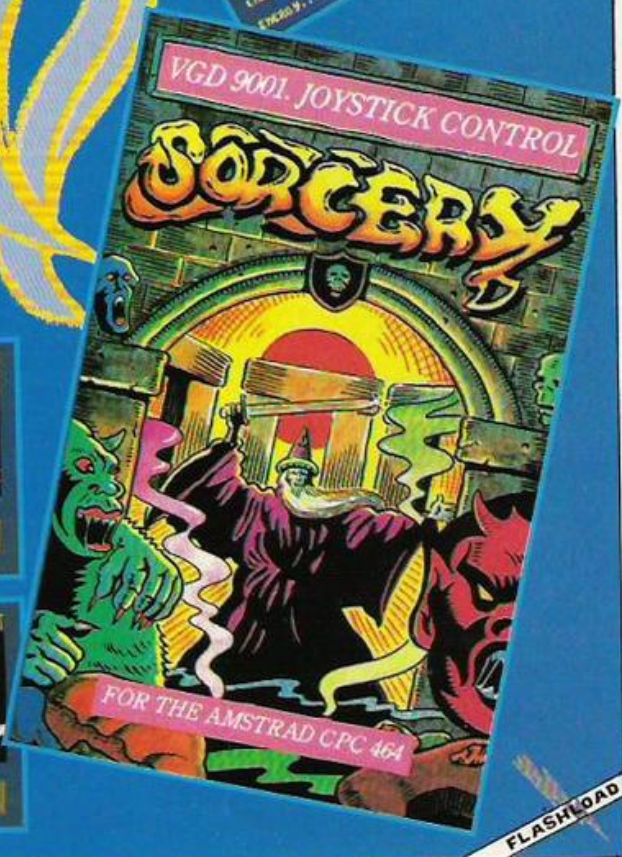
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ALL SCREEN SHOTS FROM AMSTRAD CPC 464 VERSION.





# Star★ chart

## Chopper Squad

CPC-464

£6.00

Lunajetmanesque  
Interceptor

★ ★  
Nothing to do with the Aussie whirlybird TV series, you take the part of Macho, an ace helicopter pilot etc, etc. In the style of Lunar Jet-Man you have to assemble fighter planes by collecting parts and taking them off the bottom right-hand side of the screen, without hitting UFOs. I thought it was a terrible game at first, but it grew on me.

## Aztec Tomb Revisited

CBM-64

£7.95

Alligata

★ ★  
This is a graphic adventure with a very small graphics area in one corner of the screen. The idea is to find the other three quarters of the treasure map — you already have one quarter.

Obviously a follow-up to Alligata's earlier Aztec Tomb, they seem to have compromised on graphics in order to keep the over 40-command vocabulary. I think this will appeal more to text adventurers of the old school, rather than to Hobbit fans.

## Wiggler

ZX Spectrum

£4.95

Arcade Maze  
Romantic Robot

★ ★  
Restful little game which comes with musical soundtrack "The moons of Jupiter" by Alex Goldscheider on the flip-side. In the 30 year-long maggot race you must move through four main areas: the garden, the scrubland, the underground and the mansion. You collect food and objects in the usual way. The graphics are very nice and this may appeal to people who find Atic-Atac too hectic.

# SOFTWARE

## Alien 8

■ Spectrum  
■ Ultimate Play the Game  
■ Arcade adventure  
■ £9.95

★ ★ ★ ★  
FORGET the superficial lost-in-space flavour of the packaging, this game's more Castel Gondolfo than spaceship Nostromo. Not so much Alien 8 as Knight's Lore 2.

That said, Knight's Lore is the definitive arcade adventure and Alien 8 retains the chunky three-dimensional Filimation graphics which distinguished the original. Again you have to combine manual dexterity and a quick mind to solve the problems posed by each room before you can pick up a treasure or progress to the next chamber of the maze.

If you want to approach the game unaided stop reading now — and no sneaking a look at the maze map.

The plot — such as it is — derives loosely from the film. You control a robot padding around a craft carrying cargoes of deep-frozen cryonauts. Unfortunately assorted extra-terrestrials — clockwork mice, rodent daleks and the like — have unplugged the refrigeration.

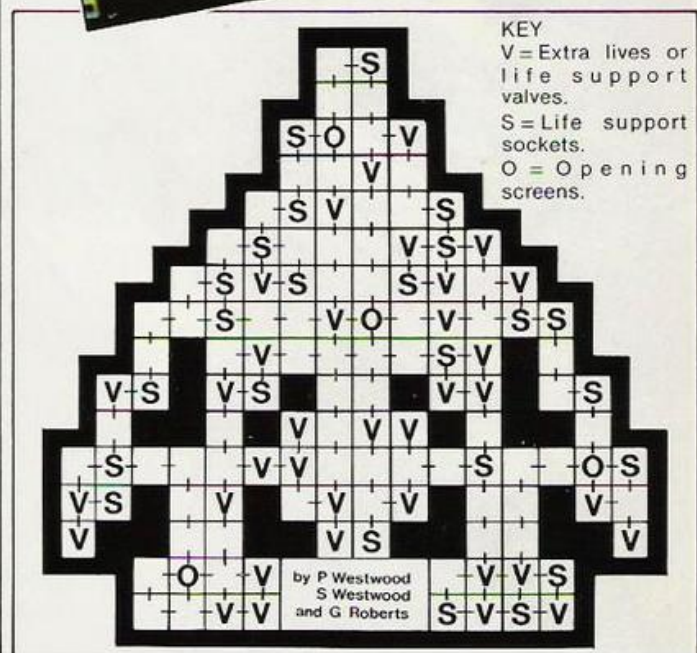
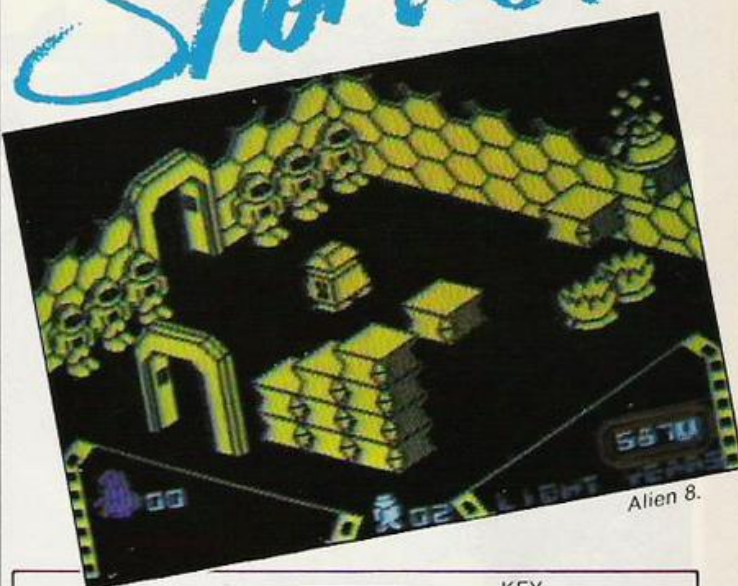
To prevent your cryonauts looking like a freezer full of fish fingers after a power cut you have to collect power packs shaped like pyramids, blocks, mushrooms and cheeses and plug them in to similarly shaped flashing sockets.

You can also use the packs as bulldozers to clear minefields or steps to help you jump higher — holding the jump key down can also help. Some of the steps vanish or sink — others are booby-trapped with an escalator effect which drifts you towards the nearest danger.

Perhaps the neatest new trick in Alien 8 is a 3D cursor pad on screen with which your android can direct another remote-controlled robot to clear a safe path.

Meirion Jones

Below: Everyone's a Wally.



## Everyone's a Wally

■ Spectrum 48K  
■ Mikro-Gen  
■ Arcade adventure  
■ £9.95

★ ★ ★  
"EVERYONE'S a wally, a charlie or a bungler or a berk" warbles Mike Berry on the "hit single" recorded on the flipside of this cassette. The song will drive you bonkers marginally quicker than actually playing the game which, it must be said, has excellent graphics and demands great perspicacity.

(continued on page 47)



Multiple Combat Scenarios  
Full Aerobatics  
3-D Graphics



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# Star★ chart

## Halaga

ZX Spectrum  
£5.50

Zalaga clone  
Interceptor

★ ★

If you've never played Galaga in a bikers' roadhouse in Winnipeg, you've probably had the opportunity to play Zalaga on the BBC Micro. Now you can play Halaga on the Spectrum. Have to be a bit careful about which keys you press — this one shows a tendency to lock up. If you can keep it going, this is a great traditional shoot'em-up.

## Alpha-Beth

ZX Spectrum  
£5.75

Educational  
A'n'F Software

★

The sort of education game that says "You're not trying" when it means "You're not trying". Don't you just hate teachers who are stupider than you are? The program assures us that Indira Gandhi is the prime minister of India. Sorry, A'n'F, some good ideas but must try harder.

## Hyper Circuit

CBM-64

£7.95  
Shoot'em-up  
Alligata

★ ★

Good graphics, but endless blasting away seems more pointless than usual. From the aerial view you seem to have been catapulted into some nightmare future city where all the trains have been privatised and are busily tooling around between city blocks shooting each other.

## Snake Kink

ZX-81

No man's land  
Eat'em-up  
£3.99

★ ★

Written by Laurent Mazo this French offering is nice and simple. Controlling your snake by 9 and 0, you must eat 10 apples and pass through the door to finish every level. If you touch your own body or slide into the wall you lose a life. Nostalgic.

(continued from page 45)

Mikro-Gen, with games of the quality of Pyjamarama, have carved themselves a niche in the market that is as distinctive in its way as that of Ultimate Play The Game. Both companies produce games that may have clear goals for players to achieve but whose appeal lies in leaving it to the player to deduce methods of attaining these goals.

The complexity of this game lies in the facility to transfer control from the central character, Wally, to other members of the gang, Wilma his wife, Dick the plumber, Tom the punk mechanic, and Harry the hippy electrician. There is also a baby called Herbert who just trips people up.

The aim of the game is to open the safe in the bank, to pay the gang's wages. The combination of the safe is discovered in the process of performing various tasks. Different members of the gang excel at different tasks. Male chauvinist pigs will be pleased to know that Wilma is best at shopping, for example. But her real job is to get three library books back to the library.

Each character's endurance level has to be maintained in the traditional way by eating food.

Paul Bond

## Superchess

3.5

■ Spectrum 48K  
■ Deep Thought — CP  
Software  
■ Board-game  
■ £9.95

If you're the sort of chess player who needs to know exactly what's going on in your opponent's mind, this is the program for you. If you also want an extremely fast, challenging game, the 1985 version of Superchess again fits the bill.

Down the left side of the board display is Plymax. It not only shows you how far ahead the computer is looking, but also details its best line of play together with your answering moves. Beginners will find this useful because it draws attention to traps and developments they might otherwise have overlooked.

The screen also displays the times the computer and the player have taken in all, as well as the time taken for the current move. As the program is working out what to do next it tells you the move it likes best so far, how many nodes or lines of play it has analysed and your last move.

Unlike most chess programs the pieces are moved round the board not with the cursor keys but by co-ordinates — for example, E2-E4.

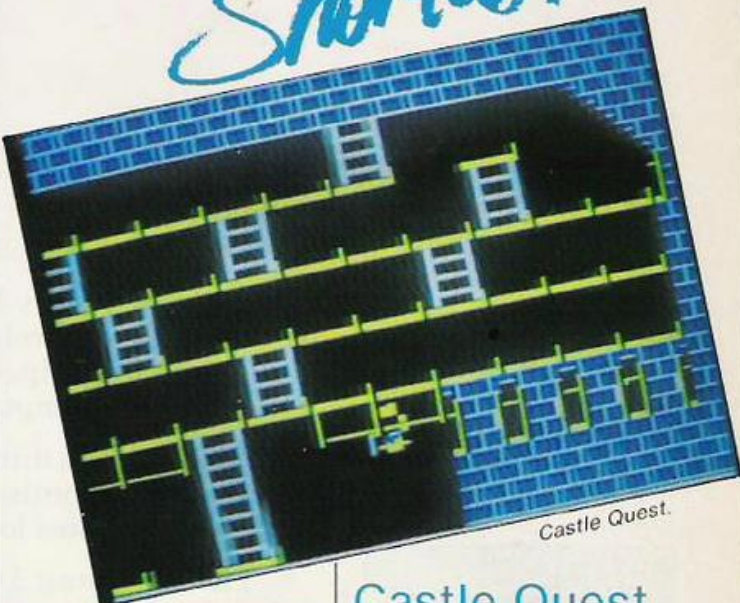
The way you set the level of play is again unconventional. With Superchess the amount of time you are prepared to give the computer to think over its moves determines the quality of the game. Obviously the more time you give it the better it will play.

Even with only an average of 10 seconds response time the program can give you a very good game.

Toby Wolpe

# SOFTWARE

## Shortlist



Castle Quest.

## Castle Quest

■ BBC  
■ Arcade Adventure  
■ Micropower  
■ £12.95

★ ★ ★ ★

THEY BET YOU a pound you can't crack it and they are likely to be right. Castle Quest presents the player with some fiendishly difficult problems to solve within the first few screens of play. It is, in fact, one of the few arcade adventures where you need the real adventure mentality to get you anywhere.

For instance, how do you escape after a patrol of green guards has frog-marched you to the dungeons? Well, we can't give too much away, but the answer lies somewhere between a torch, a stool, and a bed. And that spider that always gets you as you go through the entrance to another area? Those funny little monkeys running around just might be able to give you some help.

Text adventure fans will feel instantly at home here, but the game should also ensnare sceptics such as this reviewer, to whom the prospect of playing an adventure game normally has as much appeal as Hangman on the ZX-81. Being able to see an aqualung or a wand before you pick it up is rather more satisfactory than reading a bald description of it in print.

In addition to this the game offers excellent animation and sound together with some unusual scrolling effects. The castle itself is a multi-tiered assembly of ladders, tunnels, cakewalks, steps, platforms, and pinacles; when you approach the edge of the screen it pans smoothly upwards, downwards or sideways to reveal the next section.

Simon Beesley

(continued on page 49)



Superchess 3.5.

## Hellfire

■ Spectrum 48K  
■ Melbourne House  
■ Arcade Adventure  
■ £6.95

★ ★ ★ ★

THOSE WHOM the gods wish to destroy, they first make mad. Melbourne House's part in this universal scheme of things is to produce "Hellfire", a game which purports to be based on the trials of Ulysses.

We start out with hill trials where, stabbing deftly at the Q,S,A etc keys you help the hardpressed Greek hero negotiate the slopes of Olympus. Falling boulders conspire to reduce him to the consistency of a plate of squashed moussaka — then he has to duck the stony stare of the repulsive Gorgon. After this he finds himself in the temple of Knossos — nowadays beset no doubt by minor tourists, but then plagued by minotaurs — almost as bad, but not nearly as contrived as this last pun.

Strong graphics, comparable with those in the definitive Tir Na Nog, but this program is rather more arcade than adventure, if you follow my drift.

On the final screen you must locate the exit and use your mace to kill monsters and break exists open. Extra maces can be found in the chests scattered throughout the maze.

Paul Bond



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# Star★ chart

## Interdictor Pilot

Amstrad CPC 464

£17.95

Simulator  
Supersoft

★★★★

Perhaps a touch on the price side but, if you want the best, this is it. For your money you get a sturdy plastic case, compendious instructions, hints and "background" and of course the tape. A conversion from the C64, reviewed last November, it features improved graphics, but is substantially the same. My only gripe is that there is no keyboard option and the joystick just isn't really accurate enough for the fine control required. Still the best space flight simulator by a long chalk.

## Toy Bizarre

Spectrum 48K

£7.99

Platform  
Activision

★★★

A follow up to their smash hit Ghostbusters this game treads once more the well worn path of the platform game. Is the market for these things completely insatiable? What we have is a series of screens, one much like the next. You have the mindless task of bursting balloons before they reach the ceiling and turn into the eponymous bizarre (and hence deadly?) toys. There are a few other bits and pieces, like platforms, valves and a homicidal maniac called Hilda, but what we have is essentially the same old stuff.

## Aqua Racer

CBM-64

£6.99

Race game  
Bubble Bus

★★

Pole Position on water. Screen display depicts a rear view of a powerboat. Steer down the course, red buoys to starboard, black and white to port. Avoid crashing into other powerboats. Use firebutton to change gear. Choice of several courses. Addictive, needs fast reflexes.

(continued from page 47)

## Sorcery

- Amstrad CPC 464
- Arcade Adventure
- Virgin Games
- £8.95

★★★★

BEING A GRAPHIC designer with a software house used to be a pretty unrewarding way to earn a crust. Apart from doing a nice title screen which normally had nothing to do with the game and annoyed the punters like hell because it took ages to load, there was nothing left. They might let you design a few sprites, but as they normally ended up as a few fuzzy splodges on the screen, what was the point. Enter the Amstrad, answer to your prayers. All 40 screens and all the sprites in this game have clearly had hours of tender loving care lavished upon them. For those not merely content with watching the graphics, what's the game like?

As usual it's one man against the world. Your task, as the last free sorcerer, is to rescue your colleagues imprisoned by the evil necromancer. The objects you need to free them have been left rather carelessly strewn around the place. You can carry one object at a time, and it's just a question of sussing out which object unlocks which door.

Were life that simple. You also have to contend with various nasties which can be disposed of if you have the right object, or will dispose of you if you haven't.

Lee Paddon

## Spider-man

- ZX Spectrum
- Adventure International
- Graphic adventure
- £9.95

★★★

KEEP COOL, PILGRIM. Mary Jane, my ex, knows I'm really Peter Parker, my boss at the Daily Bugle doesn't dig the freelance photos I've been submitting, my aunt won't speak to me since I dropped out of graduate school, and my current girlfriend — the Black Cat — can't stand Peter Parker. Only likes me as Spider-man.

No-one knows better than Spider-man what a tangled web we weave when first we practise to deceive. And so we enter the wacky twilight world of Marvel comics where the characters, with their secret identities and double lives, are cathartic reflections of the schizophrenia inherent in modern Western society (*What's going on? — Ed.*)

Spider-man is the second adventure in the Questprobe series, a combination of comics and computer adventure games that allow you to become your favourite Marvel superhero.

The screen gives you a static display of the area you are standing in — watch out for piles of sand — they turn into Sandman.

Paul Bond

# SOFTWARE

## Shortlist



Sorcery.

## Dark Star

- Amstrad CPC 464
- Arcade
- Design Design
- £7.95

★★★★

IT'S CONVERSION time again. This time it's an old Spectrum game having the Amstrad experience. If you missed this one first time round, it's an arcade shoot-em-up with strategic overtones.

The galaxy is in the tyrannical grip of a militaristic dictatorship. You have to go out there and liberate planets by the simple, if rather bloody, expedient of blowing up everything in site. Sounds familiar? Well, if not hot on originality, this game scores with execution. What it boils down to is a series of linked mini-scenarios, each of which consists of getting down onto the planet, finding the enemy base, dodging the flak and steering through the holes.

After one base has been dealt with, pausing only to tank up the old shields, it's off to the next planet and more of the same. All this might seem to pall a bit after a while, but the graphics and speed are breathtaking.

There is also a design-your-own "front end" to the game which allows you to change the game to suit your tastes.

This game is going to make as much impact with the Amstrad fraternity as it did with Spectrum owners.

Lee Paddon



Dark Star.



ACE.

## Air Combat Emulator

- C-16
- Cascade
- Combat emulator
- £9.95

★★★★

THIS IS ONE of those "given the limitations of the machine" kind of reviews. ACE — I trust you to work out the acronym for yourselves — is a very fast, punchy flight simulator — except that everyone from Farnborough Air Show commentator Raymond Baxter to Nigel Stevens and Guy Wilhelmy of Cascade was very keen to say "emulator" rather than "simulator" at the launch demo.

The reason is you don't get to take off and land like you do on Fighter Pilot or Strike Eagle. You're airborne and if you want to stay that way you have to shoot down enemy aircraft.

The screen display shows how many rockets you have, about every fourth one is a smart missile and homes on its targets. The real trick to this game is co-ordinating the roll and pitch aircraft-symbol indicators so that you don't overdo any climbing or diving. Targets appear as upward arrows on the radar if they are above you; downward arrows if below. You have to get them to be squares which means they are at the same altitude as you, though even then you may not necessarily be able to see them.

Paul Bond

(continued on page 51)



# QUALITY NEVER LOOKED SO GOOD—

Now everyone with a BBC or IBM PC will want to get their paws on CUB's sleek new D series plastic cabinet — a triumph of ergonomics and up to the minute design. Within it is the CUB 653 MEDIUM RESOLUTION colour monitor — the perfect mate for computer users who wish to combine the advantages of brilliant, low cost colour graphics with 80 column processing software.

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# Star chart

## Upper Gumtree

CBM-64  
Richard Shepherd Software  
£6.50

Graphic adventure

\*\*\*

Nice graphics, a touch of humour — all the makings of the second wind that Richard Shepherd Software need to keep abreast in what is supposed to be a very competitive market. Can you save the world from the evil professor Blowtovitz? Rusting Ford Anglias, cows lying on their backs in purple fields — give the public what they want.

## Flight Simulation

Amstrad CPC 464  
Myrddin  
£11.95

Flight Simulation

\*\*\*

Myrddin can count themselves unlucky that this game has come out at the same time as Digital's Fighter Pilot. While it is a relatively competent sort of package, it doesn't compare well with its illustrious competition. You stooge around the sky, with rather wooden controls. There are a few bits of ground detail and 15 different models of plane to fly. No ILS makes landing a bit tricky and, of course, there's nothing to shoot at.

747

CBM-64  
Docsoft  
£12.95

Flight Simulation

\*\*\*

What do you get when you confront an experienced pilot but inexperienced programmer with a C64? Probably something rather like 747. The manual looks very promising with instructions on approach, holding patterns, navigation and the like. However, not all is adequately explained or, if it is, not for your average greenhorn. The disappointment starts when you load up the game. Ever tried aerobatics with a Jumbo, now's your chance.

(continued from page 49)

## Wizard's Lair

■ ZX Spectrum  
■ Bubble Bus  
■ Arcade adventure  
■ £6.99

\*\*\*

WIZARD'S LAIR by Stephen Crow is a turn-up for the books as far as Bubble Bus is concerned. It should appeal to fans of Atic Atac, which is a round-about way of saying that what it lacks in originality of inspiration, it makes up for in excellence of implementation.

The situation is certainly pretty hopeless inside, beset as you are by the usual nauseating bunch of dragons and strange blobs and if you're really unlucky a huge purple or occasionally green cut-out serpent.

Objects to be collected include treasure chests, but what you are really trying to accumulate is pieces of the golden lion. There are five of these just lion around all over the place. There are also keys, diamonds and rings.

Paul Bond



Congo Bongo.

## Congo Bongo

■ CBM-64  
■ US Gold  
■ 3D Kong Frogger  
■ £9.95

\*\*\*

BASICALLY A two-screen game, each screen has several different levels of difficulty. And although the basic inspiration behind the first game is clearly drawn from Donkey Kong and that of the second screen from Frogger, both ideas have been very artistically re-implemented.

On screen one you have to scale Jungle Mountain while the insensate simian rolls what look like purple rugby footballs at you.

The action takes place on a set created out of giant building blocks which you hop around on, hopefully not falling into the water, falling off a ledge or succumbing to a forward pass from the purple footballs. When you jump across the chasm, the cliff falls and you can't get back.

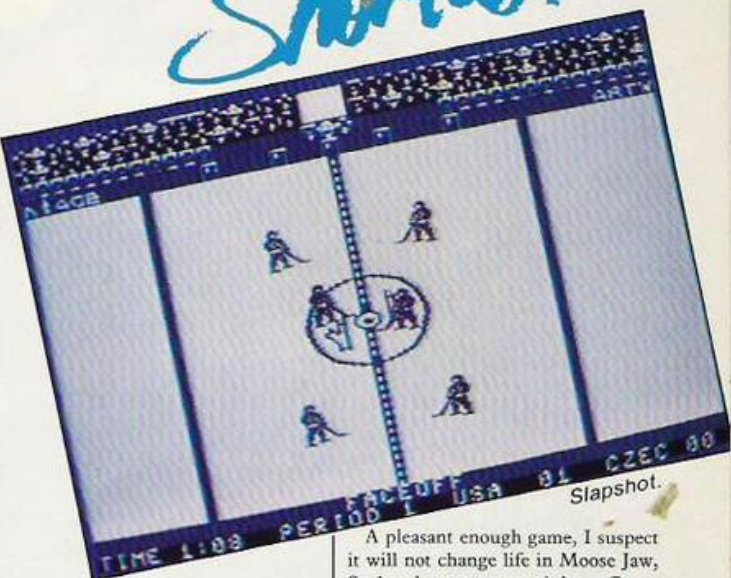
There are a lot of monkeys dodging about, but they don't bother you at the first level of play. As you get smarter, more of them start to interfere with your jungle jaunt.

When you reach Congo's perch you automatically move to the next screen. This is a river chock-full of the usual old hippos, pink alligators and lily pads. There is also a blue rhino rampaging systematically about on the far bank.

Paul Bond

# SOFTWARE

## Shortlist



## Slapshot

■ CBM-64  
■ Anirog  
■ Sport simulation  
■ £8.95

\*\*\*

"HE SCORES!" cries the computer in a way that is instantly reminiscent of Ghostbusters' "He slimed me!" This two-player ice hockey program will inevitably be compared with the excellent International Soccer game — although with Commodore's Canadian connections, ice hockey might be a natural for this machine.

## Shades

■ CBM-64  
■ Durell  
■ Arcade Adventure  
■ £6.99

\*\*\*

FROM THE PEOPLE that brought you Harrier Attack, Scuba Diver and Combat Lynx comes this foray into the world of the supernatural. The shades of the title are not hip sunglasses but unpleasant wraiths which, along with other denizens of the nether world, impede you in your quest to rid the land of said shades. The curse of the shades is that they cause people to disappear from one location and reappear somewhere they didn't expect to be. Anyone who has travelled extensively by British Rail will be able to identify with this.

Moving, fighting and pleading are options open to you in this game, as well as in your use of public transport. The joystick directs you from one location to another. As you journey on you encounter various monsters, creatures and magical objects. The objects take the form of brown chests, and you can carry a maximum of eight.

Paul Bond

A pleasant enough game, I suspect it will not change life in Moose Jaw, Saskatchewan overnight. Come winter, Pop will still flood the backyard so the kids can slither around on the ice, batting hell out of each other.

Teams are drawn from the six that competed in the 1984 Canada Cup series: Sweden, Czechoslovakia, West Germany, Canada, the Soviet Union and the USA. The player nearest to the puck is the one that the joystick controls, as in International Soccer. When you pass, control automatically moves to the player of your team who is in closest proximity to the puck, which even casts a shadow if you hit it hard enough to make it take off from the ice.

Paul Bond.



Gryphon.

## Gryphon

■ CBM-64  
■ Quicksilver  
■ Defenderesque  
■ £7.99

\*\*\*

BEAUTIFUL BLUE 3D Disneyesque scrolling graphics like that bit in Bambi when they're in the wood — sorry, let's not get too carried away.

Billed as an arcade fairy tale, the main protagonist is a delightful furry winged animal whose gold horde is threatened by Id Monsters. These are inoffensive-looking little white ghosts which you disperse in the customary way by firing bolts of pure Gryphon magic at them.

You use your gold bars to make stepping stones through the deadly waters which cover the floor of the tunnel.

Paul Bond



**SUPER**

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**UH-1X**



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**NEWS**  
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## The crystal ball

Spectrum owners now have the opportunity to play a Commodore 64 favourite, *Heroes of Karn*. It doesn't have as many graphics as the 64 version but the quality of those that have been included are far, far superior. Credit for them belongs to Terry Greer who also designed those for *Interceptor's* *Jewels of Babylon*.

Commodore owners have not been forgotten. *Interceptor* have also released a sequel, *Empire of Karn*.

Two new adventure-solution books, £3.95 each, have been published by Duckworths. The Spectrum *Adventurer* provides detailed solutions to *Snowball*, *Twin Kingdom Valley*, *Urban Upstart* and *Valhalla*.

The Commodore 64 *Adventurer* offers solutions to *Heroes of Karn*, *Lords of Time*, *The Count* and *Voodoo Castle*.

## A helping hand

Andrew Parker of Warrington has run up against a few obstacles in Infocom's *ZORK II*. For Andrew and other *Zorkers*, here's a few titbits:

Can't get past the lizard head?

YDNAC FO EGAKCAP TI  
EVIG

Red sphere proving elusive?

EGAC TFIL OT TOBOR  
LLET NEHT IT TEG

Prevented from getting the hazy object in the pool of tears.

EKAC DER EHT NI  
GNIWORHT YB LOOP PU  
YRD

Attention *Snowball* fans. Help is at hand:

Don't know how to mend the damaged droid?

(a) ODNOC ENIMAXE  
(b) SDEL TEG

(c) DIORD OT EBORP  
HCATTA

Yours in wells and woes,  
HUGO NORTH

# QUEST

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.

## Staff of Zaranol

48K Spectrum  
£5.95  
CCS (Cases Computer Simulations)

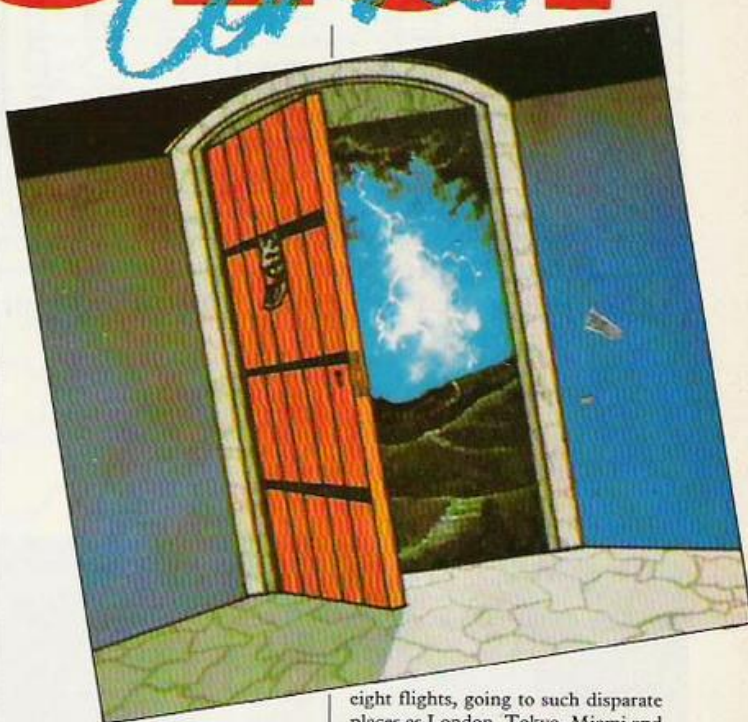
IN THIS Quilled text adventure, you play the part of a junior wizard. While your mentor is away attending the Sorcerer's annual binge, you meddle with his spells and inadvertently conjure up a demon. All your efforts at banishing the creature fail. Happily, the demon decides of his own accord to push off — less happily, he curses you as he evaporates.

You've got it all to do now. Here's the shopping list: discover the demon's name, find out the nature of the curse, seek out the Master's secret room, and finally banish the demon by using a dragon's tooth and the Staff of Zaranol. Tall order, eh? Serves you right for messing around with the sorcerer's spell books.

As if you hadn't enough woes, although your brain is telling you to get cracking, your legs have turned to lead. There you are in your own room, an open door and an interesting chest beckoning, yet your walking gear has gone on strike. At this point you'll probably be wishing you'd taken up banking, instead of wizardry, as a career.

Don't despair, help is not far away. A necromancer called Lan will appear whenever you call. Try summoning him to open the chest. He will do so, remove a knife from therein and advance towards your paralysed self... You begin to think this is going to be one of those days.

The adventure is atmospheric, there are plenty of puzzles and objects to savour and the plot is engrossing. Staff of Zaranol should keep you enjoyably engaged.



## Amazon

Commodore 64  
£19.95  
Trillium Software

INTERACTIVE FICTION is the label applied to this text and graphics adventure. The game is not cheap but it's big, coming on two double-sided discs. You get a large adventure for your money.

As I sat before the console in the communications room of a top-secret research company, a transmission started to come through. On the screen, pictures appeared from the Amazon field team — but something was horribly wrong. Those were bodies strewn around the camp. Before my startled eyes a menacing, war-painted face loomed into view and filled the screen. Then the transmission broke up.

The field team were on assignment to find a source of DV emeralds. No ordinary emeralds, these contain microscopic platinum impurities (essential for use in hush-hush projects, naturally). My mission was to follow in the footsteps of the slain Amazon team and go get them gems.

Following the transmission, I was summoned to Director Murphy's office for a briefing. He's not a man to mess around with; one cheeky answer and Murphy slung me out of his office — and the game!

I later received a sealed envelope and was told to head for the airport. But which plane to take? There were

eight flights, going to such disparate places as London, Tokyo, Miami and Cuzco. I chose Miami but had barely touched down before being mugged by a cabbie!

*Amazon* was written by Michael Crichton, author of such popular novels as *The Andromeda Strain* and *The Terminal Man*. The slowness of the Commodore 1541 disc drive is a drag but if you don't mind that, then you should get a lot of pleasure playing *Amazon*.

## The Sandman Cometh

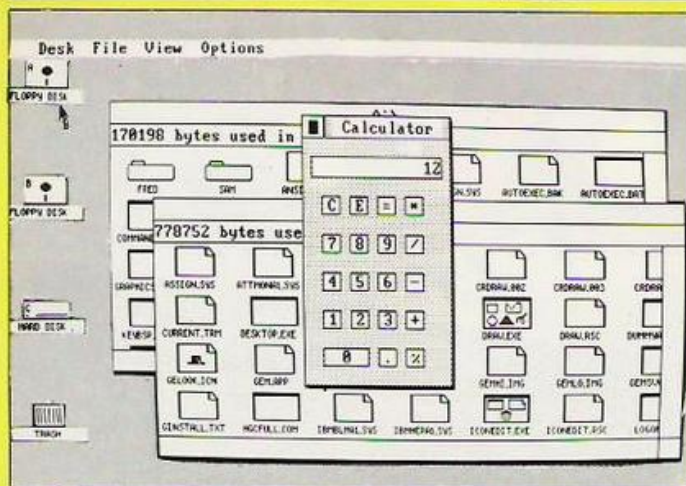
48K Spectrum  
£10.95  
Star Dreams

THIS TEXT and graphics adventure has a novel theme — it takes you through a sequence of dreams, the puzzles and clues getting tougher as you progress. It comes in two parts, one on each side of the cassette.

I began by walking down some stairs to a locked door. Having found a brass key, I could only get past the door with the unusual command combination of Use Brass — "Use Key" didn't work — then Through Door. It wasn't long before I was exploring a fairground, being challenged by a gunslinger, locked in a cell and confronted by the Cheddar — no, not Cheshire — cat.

Quite enjoyable, even though some of the commands are strange. At least a Vocab command supplies you with a list of verbs while the Help command sometimes does just that.





Call Jack Tramiel a wimp at your peril — but call his new ST micro that and he'll be delighted — he thinks these machines will change home computing.

# ATARI'S SPRAT TO

"HOME COMPUTER?" — big-talking Jack Tramiel gathers his bulldog features into an incredulous smile as if his questioner was mad even to mention such a thing — "I never heard of it — I make personal computers". If Tramiel's Atari has its way 1985 will be the last that any of us hears of home computers.

Instead, Tramiel looks to bring the power of business micros and the user-friendliness of machines like the Apple Macintosh into the sub-£400 price bracket for the first time, with his new ST range. Simultaneously, Atari will make their traditional 8-bit "home" micros more serious by packaging them with useful software or peripherals like the aggressively-priced current offer of a 64K Atari 800 XL with a disc drive and a filing program for £250.

So while the rest of the micro industry wobbles — Commodore announces falling annual sales figures for the first time, Sinclair has to delay his stock market flotation, Acorn

needs to be rescued by Olivetti and smaller companies like Oric fall into the hands of the receivers — Tramiel proudly boasts that he will produce a record five million Atari computers this year confident that the market is there for the right product at the right price.

So far Tramiel has been able to shrug off the doubts expressed by his rivals, that he will not be able to produce a machine with the promised performance without being late or having to hike the price up. When asked about sceptical comments on the new Ataris by Sir Clive Sinclair he replies with a "Who?" but so far Tramiel has only been able to show us a prototype — exciting but incomplete.

What makes the ST computers so different from today's home micros is its use of Digital Research's Graphics Environment Manager, Gem for short, to soften the barrier between the user and the machine which Tramiel thinks is a major reason for "technofear". "I have a very hard time typing with two fingers — a mouse is easier — I believe there are a lot of people like me".

The mouse, which plugs into the ST's joy-

stick port, is all part of the window, icon, mouse programs which give systems like Gem the unfortunate generic acronym Wimp. Wimps first appeared in production on Apple's £6,000 Lisa micros in 1981 before graduating to the £2,000 Macintosh in 1983. But as Tramiel points out, the ideas originated in Xerox's Palo Alto laboratory 10 years ago, where research was concentrating on doing away with the keyboard to make computers more friendly. "Xerox developed it, Apple copied it, I improved it".

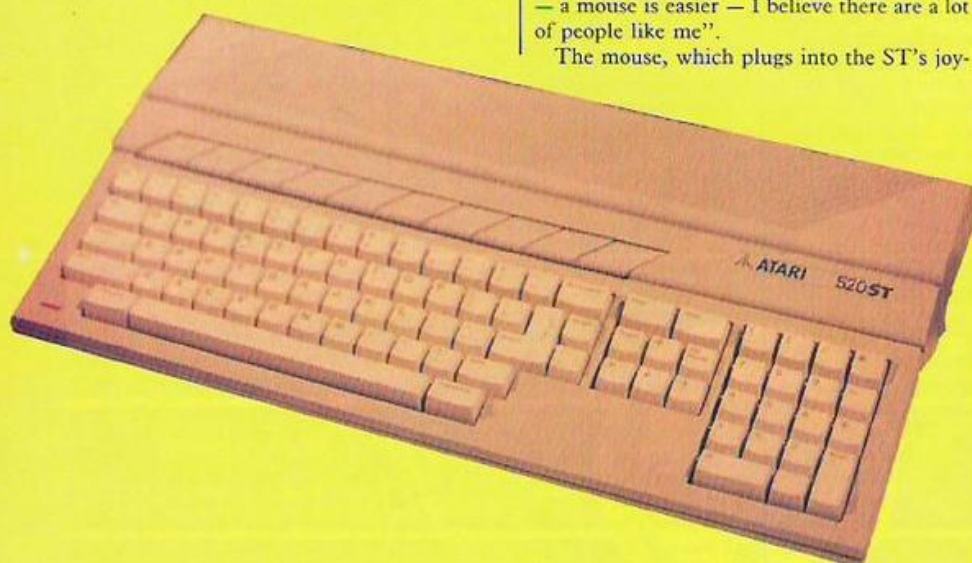
The screen on a Wimp machine is covered with "icons" — images representing the sort of objects you might find scattered across a desk, a calculator, files, even small pictures of floppy discs, hard discs, a working clock and a dustbin.

In front of you, on your desk, is a mouse which behaves like an inverted track ball with a couple of buttons on it. With its size and the "tail" — the lead which connects it to the micro — you can see how it gets its name. As you move the mouse around on your uncluttered real desk you control a pointer which runs around the simulated desk on the screen.

As you position it over an icon a touch of a button will call a file into operation or open up new possibilities. You can window sections of different files on the screen at the same time giving you the same flexibility you would have with various sheets of paper which you might want to compare on a real desk.

At best the Wimp approach makes using your micro quicker and easier as well as more fun but you still have to enter text through the keyboard and some of the icons are really just gimmicks. Using the calculator by positioning the mouse to put the pointer over each key in turn is infinitely slower and more inaccurate than using the numeric keypad of the ST.

Although the Macintosh is far more expensive, the ST does not seem to have any poorer implementation of Wimp. Indeed, whereas





the Mac only has a monochrome screen one of the new Atari slogans is "there's more to life than black and white" and so the icons are picked out in white on a green desk and red can be used as an overlay.

The STs, or Saints if you forget to type a capital T, have three graphics modes.

In high resolution, which is monochrome, and medium which gives you four colours. High is 640x400 pixels and medium 640x200 while in low resolution, 320x200, you can put 16 colours on screen at once.

The use of Gem on the new Ataris is not a trade-off for reduced Ram or processing power. Like the Macintosh, the Saints use the full Motorola 68000 16-bit chip rather than the 68008 with the sawn-off address bus used in the Sinclair QL. Even the bottom of the range 130 SL will come with 128K Ram and the Tramiel Operating System which includes Gem is all included in the massive 192K Rom. You will have a choice of Basic or Logo included with the machine or both for a small

has also been over in Britain trying to organise British companies who want to write for the ST yet encouraging 6502 specialists to keep writing for Atari's repackaged eight-bit XE computers which are variations on the 800XL.

The Infinity package for the XL is due soon — word processor, spelling checker, database and spreadsheet, which should go down well with people who have just opted for the 800 XL plus disc drive offer. Atari will be encouraging everyone to move over to discs in 1985. Siggie says cassettes are "gonna be a thing of the past. The whole market is shifting into disc drives. Prices have to come down. Why should the consumer pay £200 for them? We're leading the way in this area, as we have done in others, by making sure we volume produce at prices the consumer can afford."

Specialist software for the 128K £200 130 XE, and the portable and music micro versions of the 65 XE (AKA 800 XL) is promised as soon as those machines are released later in the year.

If Atari can keep all of Tramiel's promises for this year, the opposition will have two choices — sit back and watch Jack clean up — he aims to be Number One within a year — or bring in radical new products themselves. Despite his original misgivings about mice and men Sinclair is now thought to have authorised modifications to turn the QL into a Wimp. Although Commodore is shouting loudest about the traditional but ultra-compatible CBM 128 "Shotgun" at the moment it is expected to release its new Amiga Lorraine-based 68000 micro at the Hanover Fair later this month although at a higher price than the Ataris.

Either way the cassette-based games only home computer may be on its last legs by the end of the year. We can expect to see more controversial attacks like Sir Clive's on Tramiel as the war heats up, but Jack refuses to reply in kind because "I'm afraid I might see him in a bar so I don't want to say anything bad".

# CATCH THE MAC

extra fee.

The number of interfaces built in suggests a commitment to the real world. You can plug in a 128K cartridge — on the prototype they used this for the constantly revised operating system — but Atari insists that by the time the machine goes into production there will be no need for a QL style dongle hanging out of the side. There is a floppy-disc interface with on-board controller, and also a port for the 15 megabyte hard disc which Tramiel hopes to sell for around £400.

He points out that hard discs could change the nature of your computer into a home databank — "You could store for instance the whole records of law for the last 200 years at home". The Saint has three-channel sound plus noise generator with separate frequency, volume and envelope controls but it also has a Midi interface which will allow you to plug it into most new synthesisers and keyboards.

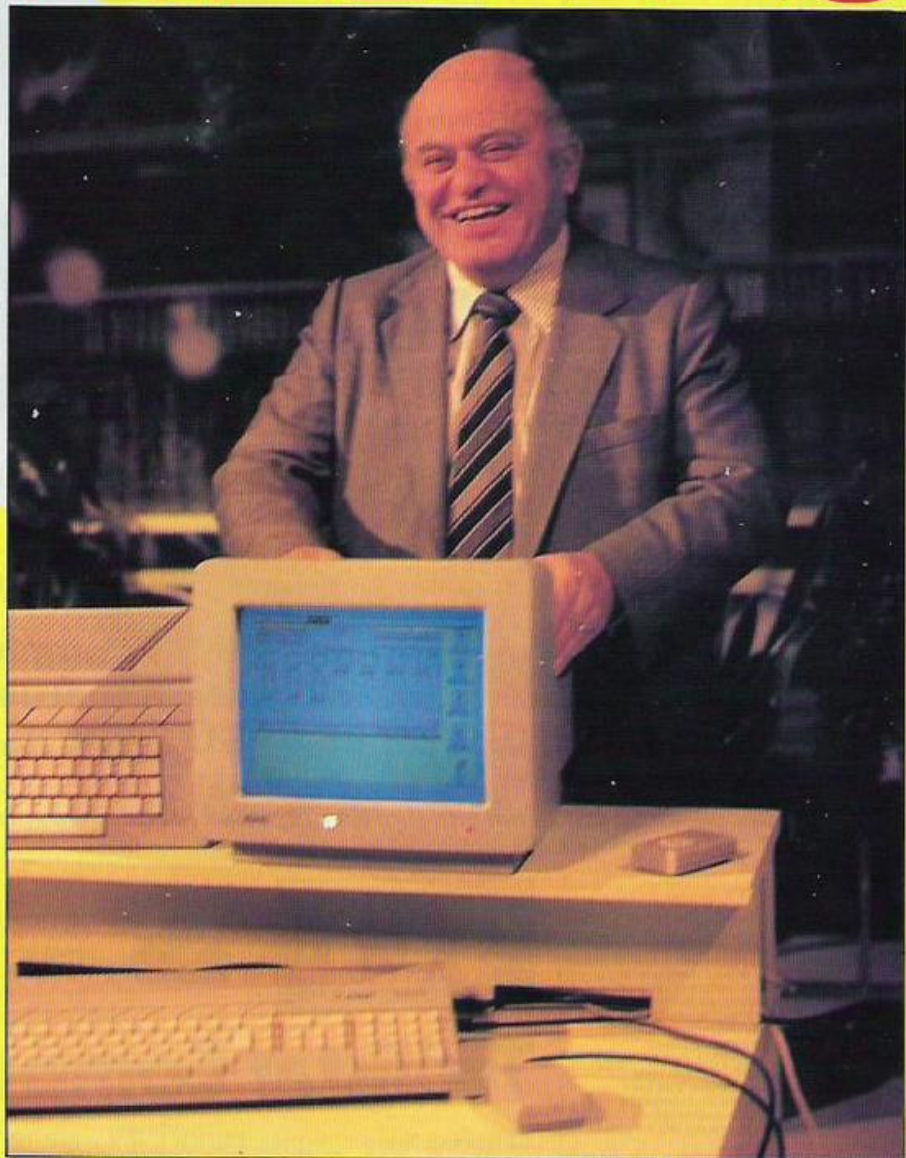
The STs also have ports for Centronics printer, RS 232 modem, two joysticks — one set up for the mouse, TV, composite video, RGB and high-res monochrome monitor.

The 130 ST will be sold with its mouse for round £350 while the £500 512K 520 ST will be mainly sold in a package with disc drive, printer and monitor for around £1,000.

For the specification these prices seem almost unbelievably cheap but Tramiel insists that there is no sting in the tail, "I don't know why you're saying it's cheap, it will be a very profitable product — every computer I've sold I've made money".

Both Sinclair and Apple have found that software houses have taken a whole year to start producing programs for their 16-bit machines. Tramiel says that 25 houses are already working on software for the ST and Digital Research distributed the Gem system to American companies in November and British companies in February so at least the work has already started.

Atari's software supremo Siggie Hartman





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Whenever Clive went to parties  
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His friends understand  
He's obsessed with Pac-Man  
And turns blue at the sight of Ataris



## RULES

- The winner of the competition will be the person who, in the view of the editor, comes up with the most apt and amusing limerick about Atari.
- The name of the winner will be printed in the July issue of *Your Computer*.
- All entries must arrive at the *Your Computer* offices by the last working day in April 1985.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
- No employees of Business Press International or their relatives may enter the competition.
- The decision of the editor is final.
- No correspondence on the result of the competition will be entered into.
- Business Press International assumes no responsibility or liability for any complaints arising from this competition.

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# DEAR HEALTHSCREEN..

John Dawson highlights the potential health problems encountered by people who work with micros.

MANY OF YOU wrote to us about your health experiences with computers following the article 'Seriously: Computers damage your Health' in the January issue. The worries you outlined included eye strain and deteriorating eyesight, inflamed sinuses, an increased susceptibility to minor allergies, headaches, mild 'panic' attacks, loss of energy, arteriosclerosis (hardening and narrowing of the arteries) in the legs, increased consumption of cigarettes, and increased abortion rates in pregnant women.

That's quite a list of problems. If some of them are in fact connected to using a Visual Display Unit, it's a serious matter.

A Visual Display Unit (VDU) is a Cathode Ray Tube (CRT) mounted in a box with some associated electronic circuits. Most of the circuits in a modern VDU use the ordinary low voltages necessary for operating transistors. The deflection coils in a VDU intended for use with a microcomputer, for example, are current operated producing a magnetic deflection field, whereas a general purpose oscilloscope uses high voltages to deflect the electron beam electrostatically.

There is one source of very high voltage in any CRT device and this is the extra high tension (EHT) voltage that accelerates the electron beam from the cathode at the back of the tube towards the screen at the front.

VDUs are used in offices, laboratories, hospitals, schools, and at home. In each of these places there will be different surroundings, different lighting conditions, different temperature and humidity, and different seat-Computers can damage your health! — Dr Chandra helps HAL 9000 in a scene from MGM/UA's 2010.

## Eyes

If you find that you experience frequent headaches or disturbance of your vision which is associated with using a visual display unit you should consult a properly qualified ophthalmic optician. The optician may be able to reassure you that the problem is not connected with using the VDU. Alternatively, you may have a hidden visual problem which is being brought out by the particular circumstances, for example, of focussing at close distances for prolonged periods. The optician may be able to correct a defect in your vision or may suggest that you see a doctor.

Generally, you can help yourself by looking round the room so that you focus on objects that are at different distances, and by moving your eyes so that you are not simply gazing straight ahead down a narrow tunnel to the screen. Try to position the VDU so that you are not troubled by reflections or glare from pinpoint sources of light. Try to adjust the lighting in the room so that it's at a comfortable level and you aren't straining to read the documents that you are typing from.

## Posture

Good office furniture, that is shaped in the right way, provides support for your back and places you at a comfortable height so that you can type or operate the computer without unnecessary fatigue in your fingers and allows room for your

ing arrangements. The motivation that goes with the use of a VDU also changes according to the surroundings and the purpose for which it is being used.

Some of the complaints against the visual display unit can be eliminated at once. I know of no rational basis for believing that arteriosclerosis is caused by exposure to some influence from a VDU. The person who wrote

thighs under the desk. Home computer arrangements will often fall short of a well designed office; however, there are some things you can do to make things better.

Make sure that you can adjust the position of the VDU in relation to the keyboard. Ideally you should be able to move the VDU up, down, side to side, and by rotating the screen. If you are copy typing for significant periods try to keep the papers you are typing from at much the same height and angle as the VDU screen. Place them as close as possible to the side of the VDU so that you don't have to twist your head to look from the screen to the papers and back again.

## Taking a break

Sitting still in a chair for hours on end never did anyone much good. Try to take a break at least once an hour for at least a couple of minutes. Two minutes every half an hour is probably a sensible ratio. Get up and walk round to get the muscle pump in your legs working again; thrombosis in your leg veins can be caused by the edge of a chair pressing on the back of your calves or thighs for long periods — as in a deck chair in summer, it isn't just work that's a health hazard!

## Smoking

Smoking will knock your ability to concentrate and will make some of the risks outlined above much greater.

that letter said that the condition appeared shortly after he had acquired his computer. He also said that his cigarette consumption is adversely affected by using the computer: "Cigarettes just disappear when I am working"

## Stop smoking

It is almost certain that smoking cigarettes for a number of years has caused his arteriosclerosis, although he is correct in saying that sitting on a hard chair which cuts into the back of his thighs will restrict the blood flow in his legs even further, possibly worsening the condition. I'm sorry but it would be wrong to attribute these health problems to the computer or the VDU.

Other correspondents wrote about soreness, redness and irritability around their eyes. When you concentrate on looking at a VDU your eyes are being asked to carry out an abnormal task. Normally you alter the tension on the lens in the eye at frequent intervals as you look around a room, look down at the papers you are working with, or gaze out of the window. This cycle of contraction and relaxation of the muscle surrounding the lens in the eye can be disrupted when you stare for a long period at a VDU screen.

The colour of the VDU screen worried one





correspondent in particular. She could work with a black and white screen quite satisfactorily but green screens gave her headaches and she blames these for a deterioration in her eyesight. As far as the colour is concerned it's possible that the green screens may have flickered more than the others.

The face of a cathode ray tube, the part on which the picture appears, is coated inside the tube with a chemical mixture with fluoresces when it is struck by electrons. The coating in different tubes is modified especially for each different purpose; a radar tube, for example, is designed so that the chemical coating (the phosphor) will continue to glow for a long time (about as long as it will take for the trace to sweep a complete circle) so that an image of a ship or the coastline will be continuously visible. An oscilloscope that will display a pulse that is a few nanoseconds wide has an entirely different type of phosphor coating.

If a high persistence phosphor is used in a VDU the display will seem stable and pleasant to use for static text or displays but you will see smudging when text scrolls or a fast moving shape bursts across the screen. Amber displays often have a slightly longer image decay time and are often recommended for word processing and other serious applications. Green displays vary greatly and you should check the manufacturer's specifications if it is important to you. Amateur colour VDUs are all built using CRTs that will handle colour television pictures. The response time has to be short enough to cope with a picture that may change totally in one twenty-fifth of a second and you may be able to detect some flicker, especially if you look at the VDU out of the corner of your eye.

## Allergic reactions

If you look at other people you can see that in ordinary circumstances we blink several times each minute. A person's blink rate may be an indicator of their state of tension but it is also altered by concentration on tasks requiring fine visual discrimination. Pat Hawker has described how early radar operators in the Second World War suffered from styes. These minor infections may have resulted from the conjunctiva, the layer of tissue covering the outer surface of the eye, suffering some damage as a consequence of changes in the normal blink rate.

There seems little doubt now that using a VDU can unmask hidden ocular conditions. If you have trouble moving your eyes so that they both point at a near object (convergence), or difficulty in producing a stereoscopic image, this may show up when you use a VDU. The outward signs that you may expect from this group of complaints could include headaches, difficulty in focussing on distant objects after using a VDU for some time and persistent soreness round the eyes. The symptoms that one reader described do suggest that she should have her eyes examined.

However, while the machinery itself produces an artificial situation that may expose pre-existing problems, it will not damage a normally sighted person.

The circumstances in which a VDU is used are also very important. The lighting in many

British offices is badly designed and may be frankly inadequate. Natural lighting from windows will be insufficient at times in the winter and may be too bright, or cause too much glare in the summer months. Artificial light should be adjusted to the nature of the work you have to do. Some tasks require much higher light levels, to help you to pick out fine detail, for example, than others.

A manual on the use of Visual Display Terminals by the Illuminating Engineering Society recommends that no more than 500 lux — a measure of the brightness of the lighting at a particular place like the surface of a desk — and no less than 300 lux illuminance should be provided as measured on the surface on which the VDU is standing (Designing Systems for People, L. Damodaran, National Computing Centre, 1980). This is rather less than a well-lit typing centre (750 lux) and more than is necessary in a filing room (300 lux). Avoiding glare and reflections from the screen of the VDU are very important if eyestrain is to be avoided.

The minor allergies that one correspondent reported may be caused by a VDU. This is not proven yet but there is a theory that the EHT voltage that drives the CRT causes a diminishing static potential in front of the face of the tube. A person sitting a couple of feet from the VDU may accumulate dust on their skin as a result of the static discharge from the tube to their face. The dust can cause irritation, and this, coupled with the abrasion caused by rubbing the face, can cause an allergic reaction. The static build up on the CRT will depend to some extent on the humidity in the office or workstation.

The X-rays produced by VDUs are a fertile source of speculation and misinformation. If you accelerate electrons from a cathode and allow them to bombard a metallic anode X-rays will be produced. Roentgen discovered X-rays almost by chance in the latter part of the last century. As X-ray technology developed, special tubes were made that produced a concentration of X-rays in one direction. Ordinary monochrome CRTs produce no significant X-ray hazard that I know of. Some studies have shown a potentially significant emission of X-rays from colour cathode ray tubes which has been ascribed to the higher accelerating voltages (EHT).

## Broken marriages

If you work with VDUs and you are concerned about X-ray emission probably the best people to advise you are the local officers of a trade union such as APEX, NALGO or ASTMS. These unions have access to research on the subject and have model policies to regulate exposure both from the point of view of women who may be pregnant and, more generally, users who may experience eye trouble. If you are pregnant, or if you are planning to become pregnant, then it makes sense to reduce the risks to the baby as far as possible. To do this sensibly you must have some idea of the size of the risk and smoking, for example, is an enormously greater health hazard to an unborn child than operating a computer. There is no comparison between the two dangers — so keep it in perspective.

One person who wrote to us mentioned, half jokingly, that when his wife divorced him it would be because of the time he spent "working" on his computer. At least he was honest. It is remarkable how compulsive programming or operating a computer can become. A study is under way at Loughborough University to examine the scale and

Dear Sir (or Madam),

In the near future my present employer introducing a system using VDU's into the office.

I am concerned about the effects that they may have on women and would be grateful if you could send me any information on this subject, especially at what may be expected and how badly. (Information on a pregnancy be affected by what would kind of a risk.)

Dear Sir,  
I read with interest your article in 'Your Computer' Jan 1985 regarding the effects of continuous use of V.D.U. health.  
I, along with several other members of staff of National Westminster Bank, are concerned about the deterioration of eyesight and the effects on pregnant women in particular. I contacted our Staff Association who are more than willing to advise us where necessary if specific matters arise.

Dear Sir/Madam,  
I read with great interest the article entitled "Seriously: computers damage your health" in the January 1985 issue of Your Computer.  
I have been working intensively for an average of 5 hours per day on an IBM PC over a period of 4 months as an accounts clerk in the finance department of a major charitable organisation. Previously I had only infrequent experience of using a microcomputer as an enthusiastic amateur.

nature of the problem. I have seen people who have become withdrawn and antisocial as a result of working on a program. If they have a regular job their work suffers, and personal relationships can be corroded beyond repair. The jokes about being up all night, not noticing the time and so on, are funny for some people and sadly accurate for others.

From isolated reports it seems that marriages really have been broken by one partner, usually the man, having access to a computer, personal or mainframe, and not being able to handle the compulsion to "just try it once more and it'll come out right".

This article has covered quite a few of the worrying or downright negative aspects of computing. It's worth remembering that small computers are being used positively to help people all over the country who are physically handicapped. Word processors with special input devices, programs to assist the development of better coordination between a child's eyes and hands, computer-based aids to help deaf children to learn to speak are among many use for computers — general purpose programmable machines — to improve health. Far more could be done by sharing information that would increase the benefits from microcomputing while simultaneously avoiding as many of the risks as possible.



# Instead of computers catching up, technology now has to catch up



The way we see it, technology has suddenly got quite a race on its hands.

There's no other home computer in the world that's so expandable or so updatable as the new Enterprise 64.

And if you're wondering quite how we've managed that, kindly take a closer look at the outputs on our remarkable new machine.

You'll notice that amongst all the usual sockets and terminals, we've gone and incorporated a special 66-way expansion port.

This will accept a whole range of new peripherals that are in the pipeline. Including those that are a mere twinkle in the eyes of our hardware designers.

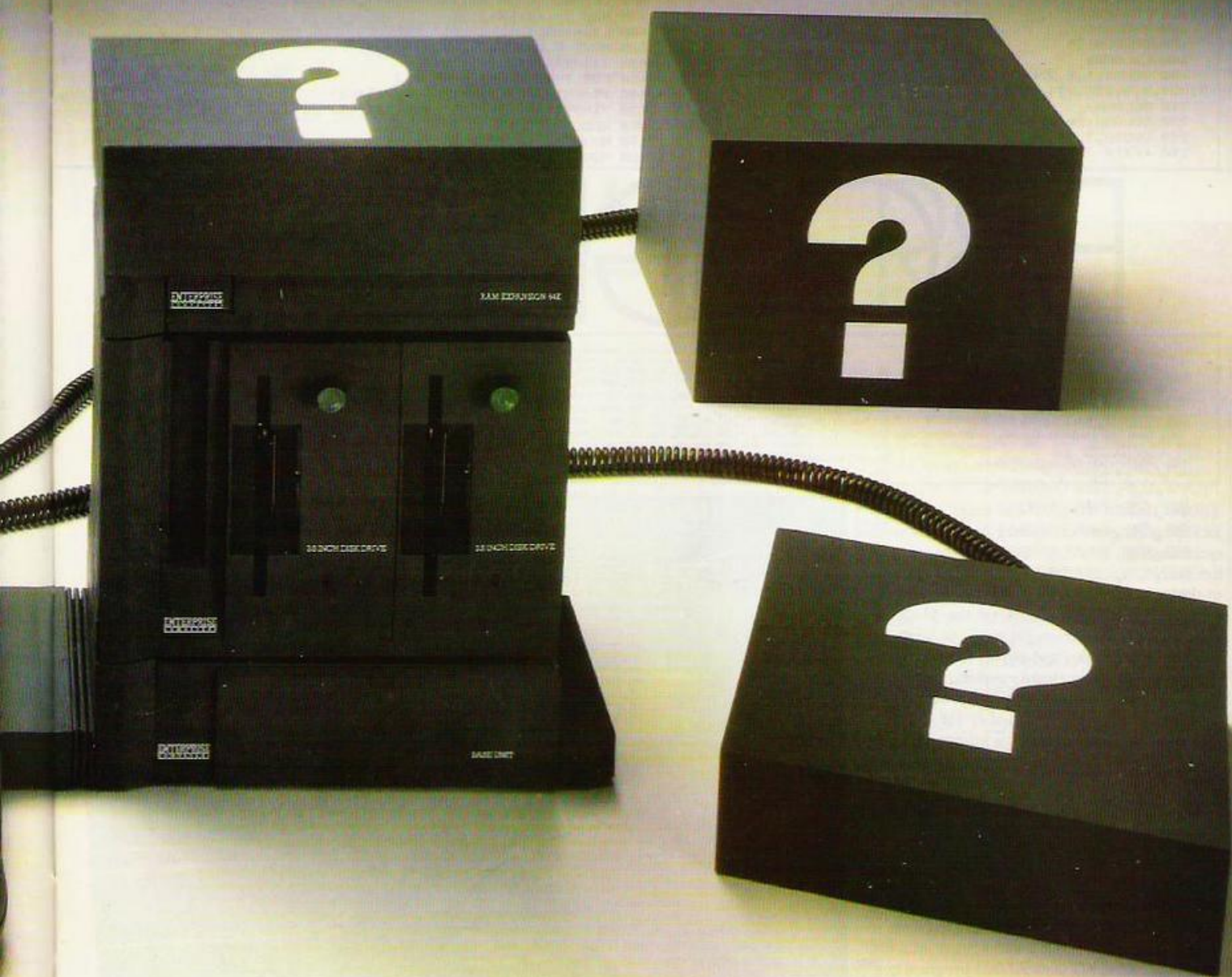
We thought this expandability principle was such a good idea, we applied it to the Enterprise's memory, too.

Even in its most basic 64K form, this puts more user RAM at your disposal than almost any other competitor.

But plug in our special Rampacks to the base unit, and you can progressively increase that figure to a truly extraordinary 3,900K.



# atching up with technology, atch up with a computer.



Not that that's the only challenge we present to today's ambitious programmers.

With a screen resolution of up to 672 x 512 pixels, 256 colours and a high speed video processor, the Enterprise will outgun all but the highest quality TV monitors.

And the sophisticated sound chip generates no fewer than 4 voices across 8 octaves in full stereo.

Combine the two and you can create effects that leave today's games looking like pub video tennis of the mid-seventies.

For anyone with literary aspirations, the Enterprise also comes complete with an integrated word processor.

Whilst the really serious user will be delighted to

discover analogue RGB and TV outputs, as well as parallel, RS423 serial and network ports.

Both Cobol and 'C' will be available with CP/M running, and you can even use Lisp, Forth and Z80 assembly language on cartridge without encroaching on user RAM.

The new Enterprise 64.

It hasn't just overtaken technology. It's left every other home computer straggling in the distance.

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# Listing 2.

```

10 REM :-----:
20 REM :-----: GRAND PRIX v1 :-----:
30 REM : (c) Michael Barter 1984 :-----:
40 REM :-----:
50 ENVELOPE1,3,0,0,0,0,0,126,-15,0,-5,126,100
60 *FX200,1
100 !&B3=!RND(!RND)
110 IF !&B3=0 THEN 100
120 MODE2
121 *FX 9,2
122 *FX 10,2
130 VDU23,1,0;0;0;0;
140 PROCvdu
150 PROCsky
160 PROCroad
170 PROCcol
180 COLOUR134
190 COLOUR4
200 VDU31,1,0,230,231,232,9,9,224,225,226,9,9,227,22
8,229,9,9,233,234,235,9
210 COLOUR7
220 COLOUR128
230 VDU28,3,31,16,29
240 *FX19

```

```

250 *FX14,5
260 *L "Chars"
270 */"Prix"
280 END
285 :
290 DEFPROCsky
300 GCOL0,6
310 MOVE0,600:MOVE0,1024:PLOT85,1280,600
320 PLOT85,1280,1024
330 FOR CLOUDS=1 TO 3+RND(4)
340 YZ=700+RND(200)
350 PROCCLCLOUD(200+RND(870),YZ,100+RND(100),30+RND(20
7,6)
360 NEXT
370 ENDPROC
380 DEFPROCCLCLOUD(XZ,YZ,SYX,SYZ,C1X,C2X)
390 VDU 29,XZ,YZ;
400 LZ=6+RND(8)
410 MOVE 0,0:MOVE SXZ+SYX/LZ,0
420 X1Z=SYX+SYZ/10:Y1Z=0
430 FOR I=0 TO 6.4 STEP 0.2
440 XZ=SYX+COS(I)+SXZ/LZ*COS(I+LZ)
450 YZ=SYZ+SIN(I)+SYZ/LZ*SIN(I+LZ)
460 GCOL 0,C1X
470 MOVE 32,12:PLOT 85,XZ,YZ
480 MOVE X1Z,Y1Z

```

# BBC GRAND

## Listing 1.

```

10REM :-----:
20REM :-----:Grand Prix :-----:
30REM : (c) Michael Barter 1984 :-----:
40REM :-----:
50MODE7:IF INKEY(256)=0 AND INKEY(256)=1 THEN PRIN
T "This program is only for a BBC Microcomputer sorry o
therwise users:END
60IF INKEY(256)=AS:MR:XS=0:YS=0:IFUSR(MFF4) AND6
F80 THEN PRINT "Tough Luck! This program won't work w
ith a second processor:END
70IF MFE4=MFE44 PRINT "IC AT missing / faulty - Pl
ease go out and buy one:END

```

```

DMSX=120:XS=0:YS=255:IF USR(MFF4) AND6F80 THEN PR
INT "Sorry but this program only works with OS 1.2:END
90PROCHeader("G R A N D P R I X")
100PROCcentre(DMSX/32,"(c) Michael Barter 1984",3)
110 PRINT
120PROCdouble(DMSX/34,"Controls")
130PROCjustify("Z - Left",0)
140PROCjustify("X - Right",9)
150PROCjustify("I - Speed up",18)
160PROCjustify("J - Speed Down",11)
170PROCjustify("O - Sound off",12)
180PROCjustify("S - Sound on",13)
190PROCjustify("P - Pause",14)
200PROCjustify("R - Resume",15)

```

```

210PRINTTAB(10,20) " You must get a Bonus of over
70 to qualify for the next stage. If you stay still to
long the other cars will crash into you."
220VDU20,18,19,20,17
230PAGE=52500
240CHAIN "Grand"
250DEFPROCcentre(A8,vpos)PRINTTAB(120-LEN(MDIV2),vpo
s):A8:ENDPROC
260DEFPROCHeader(A8)VDU30:FOR I=0TO1:PRINTCHR(850):CHR
(850):CHR(850):CHR(850):PROCcentre(A8,vpos):NEXT:ENDPROC
270DEFPROCjustify(A8,vpos)PRINTTAB(15,vpos):A8:ENDPR
OC
280DEFPROCdouble(A8)FOR I=0TO1:PROCcentre(CHR(850)+A8,
VPOS):NEXT:ENDPROC

```

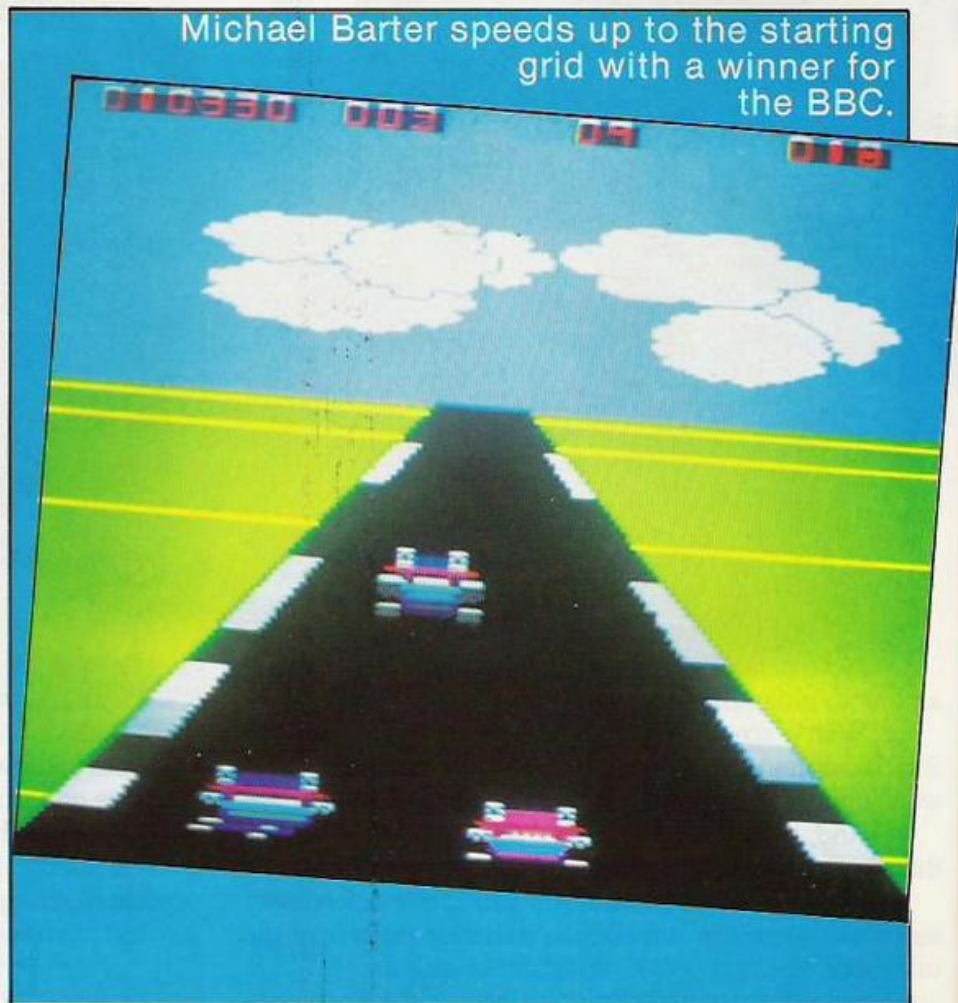
YOUR CHANCE TO join the kings of speed, jockeying for position as they push their sleek technological thoroughbreds to the utmost limits. No, it's not the South Circular at 8.30 in the morning, but a Grand Prix race simulation for the BBC Model B, or the Model A plus 32K. But restrain the urge to strap on your leather goggles and gloves for a bit; keying a program in is already awkward enough.

The number in line 10270 is the number of cars you have to pass to qualify for the next stage \*10. At the moment this number is set to 7 which means you have to pass 70 cars. This number should be lowered to make the game easier. There are five different stages to the game which include countryside, snow, desert, night and riverside scenes.

Type in listing 1 and save it on tape then set page to &2500 and type in listing 2 and save it on the same tape as listing 1. To type in listings 3 and 4 page will also have to be set to &2500. Type in listing 3 and save it on a different tape to the first two. This program contains the data for the machine-code graphics and could corrupt itself when run.

Run listing 3 and if all is well a prompt will appear. You can now press space to save the graphics data on tape along with the other two listings. This process will have to be repeated to type listing 4. The programs should be saved with the following filenames Title, Grand, Chars, Prix.

Typing in the program, especially listing 4, will be a long process so for anybody who doesn't have the time I will send it to them on a high-quality C-15 cassette if they send me a cheque for £3.50 made payable to M. Barter at 105 Lewis Street, Crumlin, Gwent NP1 5EF.





```

490 GCOL 0,C2X: DRAW X,Y,Z
500 X1X=XZ: Y1Y=YZ
510 NEXT
520 VDU 29,0;0;
530 ENDPROC
540 DEFPROC road
550 GCOL 0,2
560 MOVE 0,0: MOVE 600,600: PLOT 85,1280,0
570 MOVE 1280,0: MOVE 1280,600: PLOT 85,0,600
580 XZ=10: COL=1
590 FOR LX=1 TO 20
600 GCOL 0,11+COL
610 MOVE 0,605-XZ: DRAW 1279,605-XZ
620 XZ=XZ+XZ/2
630 COL=COL MOD 3+1
640 NEXT LX
650 GCOL 0,0: MOVE 0,0: MOVE 500,600: PLOT 85,1280,0: PLOT 85
,700,600
660 TX=1: COL=1
670 FOR N=0 TO 600
680 GCOL 0,8+COL
690 PLOT 77,650,N
700 TX=TX+1: IF TX=50 THEN COL=COL MOD 3+1: TX=0
710 NEXT
720 GCOL 0,0

```

```

730 MOVE 100,0: MOVE 600,600: PLOT 85,1180,0
740 PLOT 85,680,600
750 ENDPROC
760 DEFPROC vdu
770 VDU 23,224,247,132,132,135,244,20,20,244
780 VDU 23,225,187,162,162,187,34,34,34,59
790 VDU 23,226,184,36,36,164,36,36,36,184
800 VDU 23,227,250,170,34,34,34,34,34,34
810 VDU 23,228,139,218,170,139,138,138,138,139
820 VDU 23,229,128,0,0,128,0,0,0,128
830 VDU 23,230,247,132,132,132,244,20,20,247
840 VDU 23,231,123,74,74,75,74,74,74,122
850 VDU 23,232,156,80,80,156,80,80,80,92
860 VDU 23,233,231,148,148,228,148,148,148,231
870 VDU 23,234,165,165,165,181,173,165,165,164
880 VDU 23,235,47,40,40,47,33,33,33,207
890 ENDPROC
900 DEFPROC col
910 VDU 19,9,7;0;
920 VDU 19,10;0;0;
930 VDU 19,11;0;0;
940 VDU 19,12;0;0;
950 VDU 19,13;0;0;
960 VDU 19,14;0;0;
970 ENDPROC

```

# PRIX RACER

Listing 3.

```

10REM *** Grand Prix PART 3 **
20REM ** (c) Michael Barter 1984 **
30FOR IX=0 TO 1638
40READ Char#
50IZ=9900-EVAL("I"+Char#)
60NEXT
70PRINT "PRESS SPACE TO SAVE: REPEAT
UNTIL GETS=" "
80*SAVE"Chars"0900+0667 0900
90GOTO 00
100DATA00,00,15,3F,00,00,00,00,00,3F,2A,00,00
110DATA00,00,00,2A,00,00,00,00,00,15,00,00,00
120DATA00,00,15,33,33,33,33,33,33,2A,2A,00,00
130DATA00,00,00,00,33,33,33,33,33,00,00,00,00
140DATA00,00,15,3F,33,33,33,33,3F,2A,00,00,00
150DATA00,00,00,33,33,33,33,33,33,00,00,00,00
160DATA00,01,03,03,03,03,03,03,03,03,02,00,00
170DATA00,00,03,03,03,03,03,03,03,03,03,00,00
180DATA00,00,33,23,33,33,33,33,33,15,33,00,00
190DATA00,3F,3F,23,31,38,38,38,38,13,3F,3F,00
210DATA00,6A,6A,23,3F,3F,3F,3F,3F,13,95,95,00
220DATA00,55,55,3C,3C,3C,3C,3C,3C,3C,AA,AA,00
230DATA00,00,00,3C,3C,3C,3C,3C,3C,3C,00,00,00
240DATA00,00,00,22,00,00,00,00,00,11,00,00,00
250DATA00,00,00,36,3C,3C,3C,3C,3C,39,00,00,00
260DATA00,00,00,22,00,00,00,00,00,11,00,00,00
270DATA00,00,00,11,33,33,33,33,33,22,00,00,00
280DATA00,FF,FF,00,00,00,00,00,00,00,FF,FF,00
290DATA00,C0,C0,00,00,00,00,00,00,00,C0,C0,00
290REM "Enemy Car **
300DATA00,00,00,00,00,00,00,00,00,00,00,00
310DATA00,00,15,3F,00,00,00,00,00,3F,2A,00,00
320DATA00,00,00,2A,00,00,00,00,00,15,00,00,00
330DATA00,00,15,15,30,30,30,30,30,2A,2A,00,00
340DATA00,00,00,00,30,30,30,30,30,00,00,00,00
350DATA00,00,15,3F,30,30,30,30,3F,2A,00,00,00
360DATA00,00,00,30,30,30,30,30,00,00,00,00,00
370DATA00,01,03,03,03,03,03,03,03,03,03,02,00
380DATA00,00,03,03,03,03,03,03,03,03,03,00,00
390DATA00,00,30,21,30,30,30,30,12,30,00,00,00
400DATA00,3F,3F,21,3F,3F,3F,3F,12,3F,3F,00
410DATA00,6A,6A,2A,3F,3F,3F,3F,12,95,95,00
420DATA00,55,55,3C,3C,3C,3C,3C,3C,AA,AA,00
430DATA00,00,00,3C,3C,3C,3C,3C,3C,00,00,00,00
440DATA00,00,00,20,00,00,00,00,10,00,00,00,00
450DATA00,00,00,34,3C,3C,3C,3C,3C,00,00,00,00
460DATA00,00,00,20,00,00,00,00,10,00,00,00,00
470DATA00,00,00,10,30,30,30,30,20,00,00,00,00
480DATA00,FF,FF,00,00,00,00,00,00,00,FF,FF,00
490DATA00,C0,C0,00,00,00,00,00,00,00,C0,C0,00
500REM "Enemy Car ***
510DATA00,00,00,00,00,00,00,00,00,00,00,00
520DATA00,00,15,3F,00,00,00,00,00,3F,2A,00,00
530DATA00,00,00,2A,00,00,00,00,00,15,00,00,00
540DATA00,00,15,15,30,30,30,30,30,2A,2A,00,00
550DATA00,00,00,00,30,30,30,30,30,00,00,00,00
560DATA00,00,15,3F,30,30,30,30,3F,2A,00,00,00
570DATA00,00,00,30,30,30,30,30,00,00,00,00,00
580DATA00,01,03,03,03,03,03,03,03,03,03,02,00
590DATA00,00,03,03,03,03,03,03,03,03,03,00,00
600DATA00,00,30,21,30,30,30,30,12,30,00,00,00
610DATA00,3F,3F,21,3F,3F,3F,3F,12,3F,3F,00
620DATA00,6A,6A,21,3F,3F,3F,3F,12,95,95,00
630DATA00,55,55,3C,3C,3C,3C,3C,3C,AA,AA,00
640DATA00,00,00,3C,3C,3C,3C,3C,3C,00,00,00,00
650DATA00,00,00,20,00,00,00,00,10,00,00,00,00
660DATA00,00,00,34,3C,3C,3C,3C,3C,00,00,00,00
670DATA00,00,00,20,00,00,00,00,10,00,00,00,00
680DATA00,00,00,10,30,30,30,30,20,00,00,00,00
690DATA00,FF,FF,00,00,00,00,00,00,00,FF,FF,00
700DATA00,C0,C0,00,00,00,00,00,00,00,C0,C0,00
710REM "Enemy Car ****
720DATA00,00,00,00,00,00,00,00,00,00,00,00
730DATA00,00,15,3F,00,00,00,00,00,3F,2A,00,00

```

```

740DATA00,00,00,2A,00,00,00,00,00,15,00,00,00
750DATA00,00,15,15,30,30,30,30,30,2A,2A,00,00
760DATA00,00,00,00,30,30,30,30,30,00,00,00,00
770DATA00,00,15,3F,30,30,30,30,3F,2A,00,00,00
780DATA00,00,00,30,30,30,30,30,00,00,00,00,00
790DATA00,01,03,03,03,03,03,03,03,03,03,02,00
800DATA00,00,03,03,03,03,03,03,03,03,03,00,00
810DATA00,00,30,21,30,30,30,30,12,30,00,00,00
820DATA00,3F,3F,21,3F,3F,3F,3F,12,3F,3F,00
830DATA00,6A,6A,21,3F,3F,3F,3F,12,95,95,00
840DATA00,55,55,3C,3C,3C,3C,3C,3C,AA,AA,00
850DATA00,00,00,3C,3C,3C,3C,3C,3C,00,00,00,00
860DATA00,00,00,20,00,00,00,00,10,00,00,00,00
870DATA00,00,00,34,3C,3C,3C,3C,3C,00,00,00,00
880DATA00,00,00,20,00,00,00,00,10,00,00,00,00
890DATA00,00,00,10,30,30,30,30,20,00,00,00,00
900DATA00,FF,FF,00,00,00,00,00,00,00,FF,FF,00
910DATA00,C0,C0,00,00,00,00,00,00,00,C0,C0,00
920REM "Enemy Car *****
930DATA00,00,00,00,00,00,00,00,00,00,00,00
940DATA00,00,15,3F,00,00,00,00,00,3F,2A,00,00
950DATA00,00,00,2A,00,00,00,00,00,15,00,00,00
960DATA00,00,15,15,30,30,30,30,30,2A,2A,00,00
970DATA00,00,00,00,30,30,30,30,30,00,00,00,00
980DATA00,00,15,3F,30,30,30,30,3F,2A,00,00,00
990DATA00,00,00,30,30,30,30,30,00,00,00,00,00
1000DATA00,01,03,03,03,03,03,03,03,03,03,02,00
1010DATA00,00,03,03,03,03,03,03,03,03,03,00,00
1020DATA00,00,30,21,30,30,30,30,12,30,00,00,00
1030DATA00,3F,3F,21,3F,3F,3F,3F,12,3F,3F,00
1040DATA00,6A,6A,21,3F,3F,3F,3F,12,95,95,00
1050DATA00,55,55,3C,3C,3C,3C,3C,3C,AA,AA,00
1060DATA00,00,00,3C,3C,3C,3C,3C,3C,00,00,00,00
1070DATA00,00,00,20,00,00,00,00,10,00,00,00,00
1080DATA00,00,00,34,3C,3C,3C,3C,3C,00,00,00,00
1090DATA00,00,00,20,00,00,00,00,10,00,00,00,00
1100DATA00,00,00,10,30,30,30,30,20,00,00,00,00
1110DATA00,FF,FF,00,00,00,00,00,00,00,FF,FF,00
1120DATA00,C0,C0,00,00,00,00,00,00,00,C0,C0,00
1130REM "Explosion!
1140DATA00,00,03,0F,0F,0F,0A,00,00
1150DATA00,01,00,03,03,07,0A,00,00
1160DATA00,07,03,07,1E,00,00,00
1170DATA00,00,03,07,03,03,0F,00
1180DATA00,03,00,23,03,03,07,02
1190DATA00,00,07,00,15,03,03,0A
1200DATA00,07,0B,0B,0B,03,13,03,0B
1210DATA00,07,13,07,0B,33,07,0B
1220DATA00,0F,16,1B,13,03,0F,00
1230DATA00,0F,03,13,03,0B,00
1240DATA00,03,07,27,0B,0B,0B,00
1250DATA00,0B,03,03,03,07,02,00
1260DATA00,0B,03,07,0F,0F,0F,0B,00
1270DATA00,07,0B,07,03,03,03,00
1280DATA00,01,1B,03,0B,02,02,00
1290DATA00,01,0F,0F,03,02,03,00
1300DATA00,03,03,07,00,00,01,00
1310DATA00,00,01,01,00,00,00,00
1320DATA00,01,01,00,00,00,00,00
1330REM "Numbers 0 to 9
1340DATA00,03,03,00
1350DATA00,02,01,00
1360DATA00,02,01,00
1370DATA00,02,01,00
1380DATA00,02,01,00

```

```

1390DATA00,02,01,00
1400DATA00,02,01,00
1410DATA00,03,03,00
1420:
1430DATA00,02,00
1440DATA00,02,00
1450DATA00,02,00
1460DATA00,02,00
1470DATA00,02,00
1480DATA00,02,00
1490DATA00,02,00
1500DATA00,02,00
1510:
1520DATA00,02,00
1530DATA00,01,00
1540DATA00,01,00
1550DATA00,01,00
1560DATA00,02,00
1570DATA00,01,00
1580DATA00,02,00
1590DATA00,03,00
1600:
1610DATA00,03,00
1620DATA00,01,00
1630DATA00,01,00
1640DATA00,03,00
1650DATA00,01,00
1660DATA00,01,00
1670DATA00,01,00
1680DATA00,03,00
1690:
1700DATA00,02,00
1710DATA00,02,00
1720DATA00,02,00
1730DATA00,02,00
1740DATA00,03,00
1750DATA00,02,00
1760DATA00,02,00
1770DATA00,00,00
1780:
1790DATA00,03,00
(listing 3 continued on next page)

```



```

1800DATA02,00,00
1810DATA02,00,00
1820DATA03,03,00
1830DATA00,01,00
1840DATA00,01,00
1850DATA00,01,00
1860DATA03,03,00
1870:
1880DATA02,00,00
1890DATA02,00,00
1900DATA02,00,00
1910DATA03,03,00
1920DATA02,01,00
1930DATA02,01,00
1940DATA02,01,00
1950DATA03,03,00
1960:
1970DATA03,03,00
1980DATA00,01,00
1990DATA00,01,00
2000DATA00,02,00
2010DATA00,02,00
2020DATA01,00,00
2030DATA01,00,00
2040DATA02,00,00
2050:
2060DATA03,03,00
2070DATA02,01,00
2080DATA02,01,00
2090DATA03,03,00
2100DATA03,03,00
2110DATA02,01,00
2120DATA02,01,00
2130DATA03,03,00
2140:
2150DATA03,03,00
2160DATA02,01,00
2170DATA02,01,00
2180DATA03,03,00
2190DATA00,01,00
2200DATA00,01,00
2210DATA00,01,00
2220DATA00,01,00
2230:

```

[illegible][illegible]



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HAVE YOU EVER wanted to mindlessly massacre millions of miserable morons, shoot or severely savage stupid spaceships or even angrily annihilate all available aliens? If your answer is yes to any of these then this game is for you. In this game you may fire away at any alien in sight and they won't even shoot back. What is more once you wipe out one batch you get another batch to take your anger out on — violent isn't it?

As the aliens don't shoot back this may sound like a simple game but unfortunately there is a certain great lumbering idiot who may shoot you — yourself. This is because not only can you shoot aliens with your beastly blasting bases, you can also blast holes in your tracks reducing your mobility or even worse, you can zap your own laser base.

This is all due to the screen layout of your bases. They are mounted on tracks on each of the four sides of the screen and controls work on pairs of bases. If you move your top base you also move your bottom base and if you fire you fire from all four bases. However if

you fire and the bullet hits the opposite track, a hole forms and your laser base on that side can not move past it. If you shoot the hole again it fills it in.

The object of the game is to blast all the aliens into their component quarks, there are eight screens — freaky flying saucers, docile dunbells, artful asteroids, segmented centipedes, turning tops, bouncing balls, hysterical helicopters and slithering snakes. All these move in smooth pixel graphics and are animated.

On each screen there are eight aliens at a time. However, when you have killed, maimed or destroyed those eight, another eight appear to allow you to continue your vicious work. Each alien is worth a number of points corresponding to the level you are on. This number is also deducted from the scored titled "needed". This must be reduced to zero before you are allowed on to the next level and on each level the amount of points needed increases.

If you do not get enough points you restart the same round. You can only go on to the next level when you have lasted for 60 seconds on that screen — there is a bar chart under the

screen showing the time. The game ends when all four of your bases are destroyed. You get a new set of four bases every four rounds you survive.

To type in the game type in listing 1 and save it with

SAVE "CROSSFIRE"LINE 1

Next type in listing 2 and run it. This pokes in half of the machine code. If the program detects an error it will tell what line it was in. However, it cannot detect certain errors and so it is best to keep a back up copy of it in case the code is wrong. If the program gives a "No errors" message, save the code with

SAVE "CODE1"CODE 30200,2480

Repeat this for listing 3 but save the code with

SAVE "CODE2"CODE 30300,2500

Now clear out the computer with  
RANDOMIZE USR 0  
and load both the codes with

CLEAR 27899:LOAD "CODE1"CODE  
27900:LOAD "CODE2"CODE 30380

Then save the whole code directly after the Crossfire program with

SAVE "CODE"CODE 27900,4867

The program is now ready to play.

# SPECTRUM

# CROSS FIRE

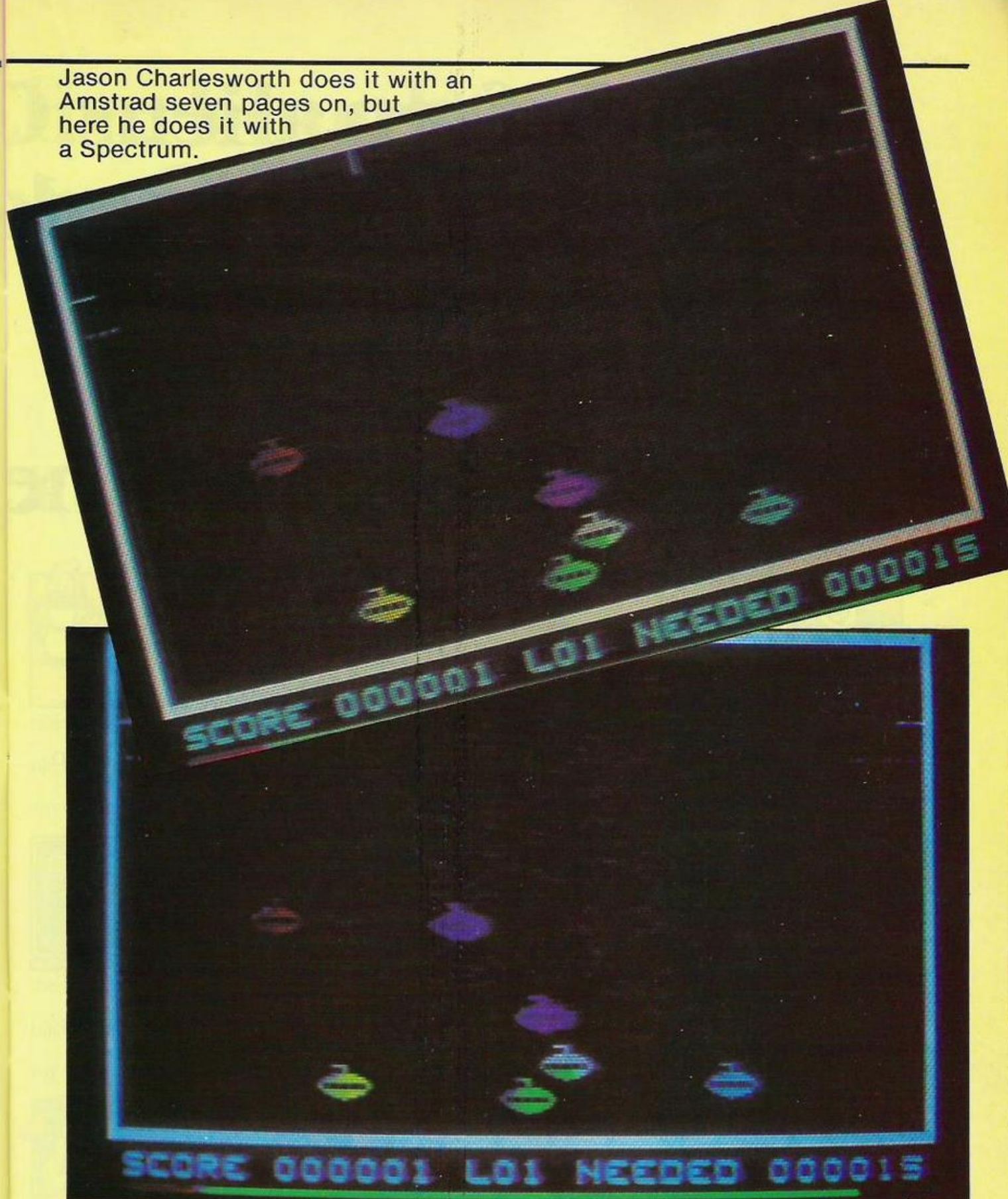
## Listing 1.

```
5 DEF FN X$(a)="WXYZ[\]^_`" (I
NT (a/16)+1)+"WXYZ[\]^_`" (a-16*I
NT (a/16)+1)
10 BORDER 0: PAPER 0: INK 7: C
LEAR 27899: PRINT AT 7,5: BRIGHT
1: "PLEASE WAIT,CROSSFIRE": AT 9,
12: "LOADING"
15 DIM a$(6,3): DIM b$(6,6): F
OR a=1 TO 6: LET a$(a)="aaa": LE
T b$(a)="UUUUU"+CHR$(94-a): NEX
T a
20 LOAD "CODE"CODE 27900
30 INK 7: POKE 23606,31: POKE
23607,124: CLS: PRINT INK 6: "CE
" "DF": AT 0,30: "CE": AT 1,30: "DF"
: AT 1,11: INK 5: BRIGHT 1: "cross
fire"
40 PRINT AT 5,8: "q": AT 5,10: "t
o": AT 5,13: "t": AT 5,20: "up"
50 PRINT INK 6: AT 7,8: "a": AT 7
,10: "to": AT 7,13: "g": AT 7,20: "do
wn"
60 PRINT INK 5: AT 9,8: "u": AT 9
,10: "or": AT 9,13: "o": AT 9,20: "le
ft"
70 PRINT INK 4: AT 11,8: "i": AT
11,10: "or": AT 11,13: "p": AT 11,20
: "right"
80 PRINT INK 3: AT 13,8: "b": AT
13,10: "to": AT 13,13: "space": AT 1
3,20: "fire"
90 PRINT INK 5: BRIGHT 1: AT 15
,8: "h": AT 15,20: "halt"
100 PRINT INK 5: BRIGHT 1: AT 17
,8: "s": AT 17,20: "halt": AT 17,25:
"off"
110 PRINT INK 2: AT 19,8: "zero":
AT 19,20: "abort"
130 FOR a=0 TO 1500: IF INKEY$=
"" THEN NEXT a: GO TO 1000
```

```
140 RANDOMIZE USR 27903: INK 7:
BEEP .1,0: BEEP .1,3
150 LET z$=FN X$(PEEK 23296)+FN
X$(PEEK 23297)+FN X$(PEEK 23298
)
160 FOR a=1 TO 6: IF z$<=b$(a)
THEN NEXT a: GO TO 200
170 IF a<>6 THEN FOR b=6 TO a+1
STEP -1: LET b$(b)=b$(b-1): LET
a$(b)=a$(b-1): NEXT b
180 GO TO 2000
200 CLS: PRINT AT 0,8: INK 6: "
highscoretable": FOR a=1 TO 6:
PRINT AT a*2+4,8: INK (8-a): a$(
a): AT a*2+4,18: b$(a): NEXT a
210 PAUSE 200: GO TO 30
1000 RANDOMIZE USR 27900: BEEP .
1,0: BEEP .1,12: GO TO 30
2000 CLS: LET c$="{}": PRINT A
T 3,4: INK 6: "wellidoneyourfini
tials": AT 5,4: INK 5: "maybeent
eredforthe": AT 7,9: INK 4: "his
corefiable"
2010 FOR c=1 TO 3: PRINT INK 3: A
T 13,9: c$: AT 13,16: z$: AT 13,8+c:
INK 2: FLASH 1: "f"
2020 LET d$=INKEY$: IF d$>="a" A
ND d$<="z" THEN LET c$(c)=d$: GO
TO 2030
2030 IF d$>="0" AND d$<="9" THEN
LET c$(c)="WXYZ[\]^_`" (VAL d$+1
): GO TO 2030
2040 IF d$=" " THEN LET c$(c)="f
": GO TO 2030
2050 IF d$=CHR$(12) AND c>1 THEN
LET c=c-2: LET c$(c+1 TO )="{}"
: GO TO 2030
2060 GO TO 2020
2080 BEEP .1,30: NEXT c: LET a$(
a)=c$: LET b$(a)=z$: GO TO 200
```



Jason Charlesworth does it with an Amstrad seven pages on, but here he does it with a Spectrum.



#### Listing 2.

```
10 DEF FN X(a$)=16*(CODE a$-48
- (39 AND a$(1)>"9"))+CODE a$(2)-
48-(39 AND a$(2)>"9")
20 CLEAR 30199: LET X=30200: P
RINT "Program 2 Poking in data"
"Please wait."
30 FOR a=100 TO 400 STEP 10: R
EAD a$: LET t=256+FN X(a$(1 TO 2)
)+FN X(a$(3 TO 4)): LET a$=a$(5
TO 7): IF LEN a$>160 THEN GO TO
60
```

```
40 FOR b=0 TO 79
50 LET z=FN X(a$(b*2+1 TO b*2+
2)): POKE X/2, LET x=x+1: LET t=
t-z: NEXT b: IF NOT t THEN NEXT
a: PRINT "Finished, no errors."
STOP
60 PRINT "Error in line ":a: S
TOP
100 DATA "2babc3e85dc3d5fcd1e6
fcd8372cde173cd2474cd9775cdf76fc
da670cd0a78cd696f3a075bfe00280f3
a085bfe00c0cd616efeff20da18d2cd7
```

```
r6efe0020c8cd1e6fcd0b73cde173cdf
974cd9775cdf76f"
110 DATA "27b7cda670cd0a78cd696
f3a075bfe00280f3a085bfe00c0cd616
efeff20da18d2cd7f6efe0020c8cd1e6
fcd8b72cde173cd2474cd9775cdf76fc
da670cd0a78cd696f3a075bfe00280f3
a085bfe00c0cd61"
120 DATA "28ed6efeff20da18d2cd7
f6efe0020c8cd1e6fcd4772cd5d73cd8
```

(listing 2 continued on page 70)



# Instead of ten aliens, Cl for his Commodore

## What happened next



### Saturday morning.

Waltzed into my local computer shop.

Packed as usual with masses of kids enjoying the arcade games.

Surely I could put my Commodore 64 to better use. Helpful assistant suggests a Commodore Communications Modem.

Tells me it comes with a year's free subscription to Compunet, a new network service, saving me a cool thirty quid.

A bargain not to be missed, so I bought a Modem.

If I knew then, what I know now, I'd have thanked that assistant more.



### Saturday (one week later).

Fantastic.

My Compunet membership came through this morning.

Hurriedly plugged the Modem into my 64's cartridge port, and hooked up to the telephone line.

Can't wait.

At last I can communicate with other Commodore 64 Modem owners and giant mainframes.

What's more, I can also access databases

throughout Europe and the U.S.A.\*

This is what home computing's all about.



### Sunday morning.

Raining.

Tapped in my Compunet I.D. and personal password.

Wow, what a directory!

Decide to pit my wits against other Modem users by entering Multi User Dungeon, an interactive on-line game.

Should stretch the old grey matter a bit.

Then a quick look in 'The Jungle.' This is an open area where other Modem owners display messages.

See a Commodore user in Fife wants to sell 'U-boat' for £3.00.

Leave message offering him 'Mighty Gork' on a straight swap.



### Monday evening.

Move on to the Compunet Software Park.

What a choice. Loads of high quality bargain programs.

Particularly interested in educational software, so I call up 'The Study.'

Download free physics package to help with my exams.



# Clive bought a Modem more 64.



## Next changed his life.



### Tuesday evening.

Dad's turn.

I don't get a look in as he's busy teleshopping.

Actually it's amazing what bargains turn up. He even finds a new house.

Mum said she doesn't want to move and anyway his dinner's getting cold.



### Wednesday evening.

Discover I can join BLAISE\*, the computer service for the British Library.

Their catalogue of books dates way back to 1950.

Should give me an interesting edge over my school chums.



### Thursday evening.

Sis has a go.

She keys into Prestel\*.

Imagine, over 300,000 pages of information and news.

What does she choose? The lonely hearts section.

She's disappointed. Couldn't find Simon le Bon's private number.



### Friday evening.

Yippee! Receive a reply from the guy in Fife.

He fancies taking on Gork.

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(listing 2 continued from page 68)

```
273cd9775cd7f6fcd6570cd0a78cd696
13a075bf00280f3a005bf00c0cd616
e7f720da18d2cd7f6e7e0020c0cd337
2c3026cdad6f05
130 DATA "27a002c5cd1e6fcd8372c
de1730600c5cd474cd596ef002852c
110f2cd1e6fcd8372cd1730600c5cd47
974cd596ef002839cd110f2cd1e6fcd8
b72cd1730600c5cd474cd596ef0028
620cd110f2cd1e6f
140 DATA "231ecd4772cd5d730600c
5cd8273cd596ef002807cd110f2cd1109
8c9cd1c1901f7e786001c93a625b0
610e603f002802060821155b7ef7fc
0232323232310f53ef7c921035b7e23b
623b6f00c63a06
150 DATA "185f5bd6012732065b3a6
25b3d32625b3e04c997328d5cd6b0d2
1090722885c21277f227b5c3e45320f5
c21885c110c6f060d1a7e20200334100
3cd4a791310f2210f0922885c0651ac
das791310f2210f
160 DATA "184e7e227b5c3e1232885
c3a065b47e6f01f1f1f1fcd4a7978e60
fcd4a7921377e786001c93a625b0
f7906047610fcd4a790604132011000031
820050e110b0415040b3a625b3c32625
b3a065b6c012732
170 DATA "20a065b21035b9777237
72377cd946cd727821d77e227b5c3a6
25b3c104721035b3a605b111916ed530
85cd6e7910f7cd567621635b0620360
02310fbc901f7cd78e610f7e10280b0
1f6d778e602fe
180 DATA "1ac30228f801f7e78e78e
601f0e128053e0132085b210a5b7e7e
60e0237ef0e06d023237ef0e06d0237ef
06d06d0132085b3e921005b977723772
37732085b32065b3d32625b3cd3372c90
0000000000000000
190 DATA "1eb300000000000000000000
0000000cd7278cd8372cd173cd3372c
d5676cd0a78cd2474cd9775cd7f6fcd7
76fcd901f7e78610f7e1fcd811095b2
16b5b131a7e06301806087ef0e028052
310f8180c1b1a7
200 DATA "1254f2313061070cd867
013217b51a13f0e06381606007ef0e002
8052310f8180a0eef711a237747cd867
01321635b131a7e0638160607ef0e002
8052310f8180c1b1a7741323069f70c
d86701321735b1a7
210 DATA "1ef3fe06d806087ef0e002
8042310f8c90e107123131a7747cd867
0c9cd50797c0f0f0e603f6586736470
1f003c102e03ed79ee102d20f997ed7
```

### Listing 3.

```
10 DEF FN X(A$)=16+(CODE AS-48
-(39 AND AS(1)>'9'))+CODE AS(2)-
48-(39 AND AS(2)>'9')
20 CLEAR 30299: LET X=30300: P
PRINT "Program 3 poking in data"
"Please wait."
30 FOR A=100 TO 390 STEP 10: R
EAD AS: LET X=256+FN X(A$(TO(2)
)+FN X(A$(3 TO 4))): LET AS=AS(TO(
1)): IF LEN AS<160 THEN GO TO 60
40 FOR B=0 TO 79
50 LET Z=FN X(AS(B+2+1 TO B+2+
2)): POKE X,Z: LET X=X+1: LET T=
1-Z: NEXT B: IF NOT T THEN NEXT A
3: PRINT "Finished,no errors": S
TOP
60 PRINT "Error in line "A: S
TOP
100 DATA "21230b5b790ee8cd8477e
4d50d5b70f06300b7e0020220697cd
477181bcdde777bf0e02813cdde777d9
6084f0604ed430d5b780597cd8477ed4
b0f5b79f0e0300bf0e028220e08cd847
7181bcdcd277bfe
110 DATA "1dc7002813cdcd27778d60
9470e04ed430f5b790e08cd84777c9ed4
b095b7e06301f0e0280f0608d4320
a5b3cd8477180cdde77e4dab05b79f
063010f0e0280f0e083d320b5b3cdcd8
4771803cdcd277ed
120 DATA "1c454b0d5b78f0e063010f
e00280f06973d320e5b3cdcd771803c
d8e77ed4b0f5b79f0e03010f0e0280f0
e083d320f5b3cdcd84771803cdcd277c92
1b3775f3e04935f15001919195e23562
3f7e6328f5cdcd
130 DATA "1e1d797dfe37c821fa001
7171717f1600191180500cd8503c9577
e47777f06977f0637f7e0237746c5cd6
67c975f7e02821013ef7fae777c0f0f0
f6603f65867365f1c9c5cd466747368
02804e71f10f06
140 DATA "1b0f084f1e007ea128021
e017e9a772410f4257c0f0f0f6603f65
8673607c1c93a785c7e32d063232785
cd1978c93a075b3cd32075b7f171c60
84f06b1e04cd587904cd5879050cd1d2
0f421fa00000000
150 DATA "1e15110400cd8503c9212
77f227b5c21637847f0e028087e23f7e
f20fa10f87e23f7efcd8da7918f6120
d5e1104f0bf060484030d3f197320
d5c4cd6b94cd32790684cd8e790684cd8
e793e4732005321
160 DATA "1a32071622085c21d77e2
27b5c21005b97cd6e7921101622885c2
1035b6cd6e79210f1622885c3a065b5ef
01f1f1f1fcd4a793a065b5ef0fcd4a792
1277f227b5c21011622885c97cd43783
e01210e1622885c
170 DATA "1d77cd43783e022112162
2885cd437821e15a3e427723723770
61b2364410f3c32075b5f5cd1978f
1320f03c3c32075b5c90e08cd667c36f
```

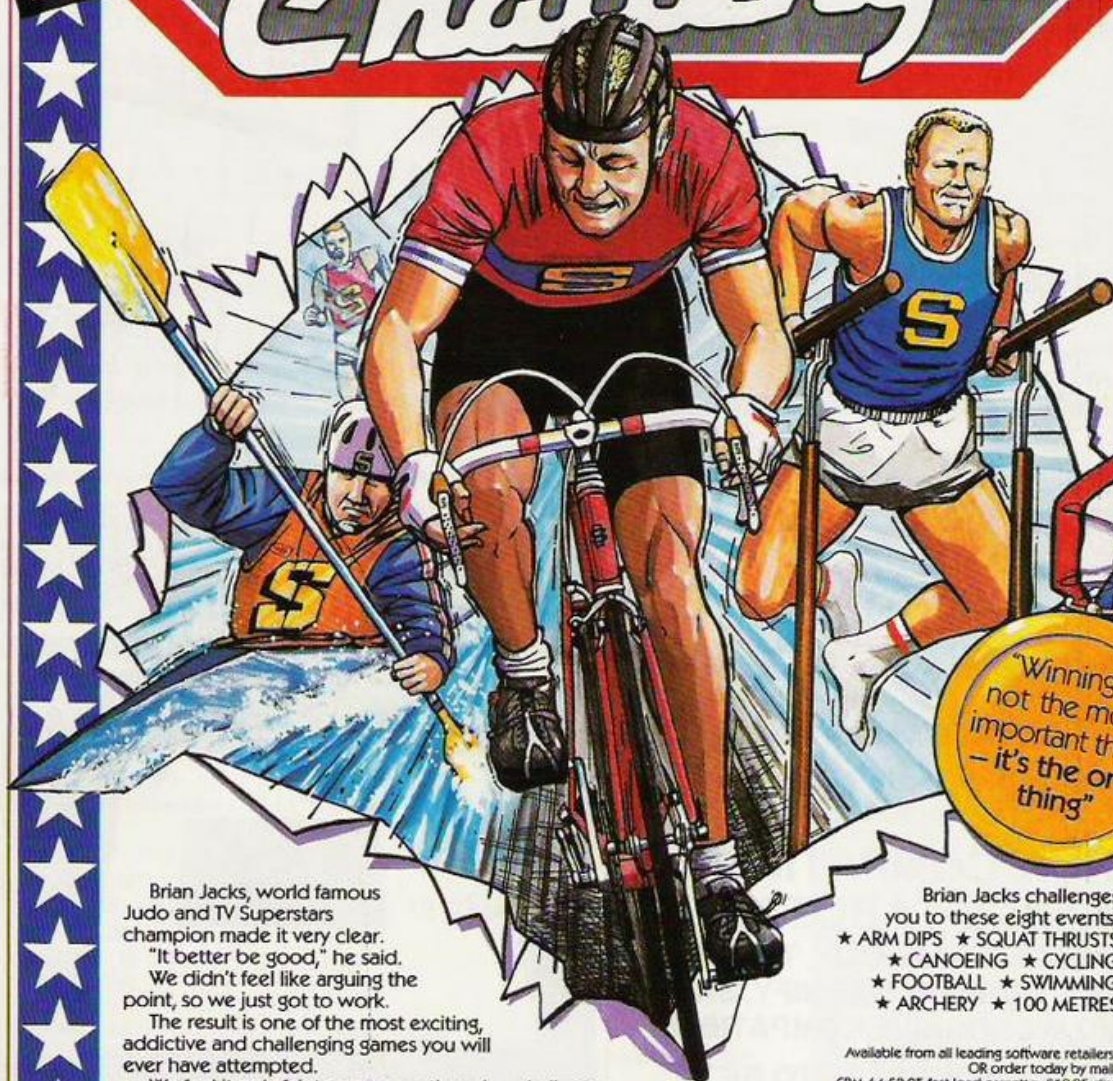
```
9c921635b06107ec52323fe0028094f2
b4623e5cd5879e1f
220 DATA "1e17c110ec21635b11fc0
0cd4e70216b5b110400cd4e7021735b11
10004cd4e7021735b1100fcd4e70c90
604c5d5e57ef002033e4f2345b7805f7
a8157f7e063003110000f7a380311000
078f0e030031100
230 DATA "21d600f7a38031100007f
32b727bb2280e4a43cd4f7c1002805c
1cd3471e5cd8570e12323d1c110b3c9c
5e51e08dd2115b3a62e6603f0e0328b
bdd7e03f7b285479dd9600fe10304c7
8dd9601f0e03844
240 DATA "1f0be136002336002be5c
d5879dd4d00dd4501dd7e04dd36037bd
d3604cd45a753e03cd8477210716228
85c21d77e227b5c21005b3a625b3cd6
e793a065b57cd0072e1c1c9dd23d23d
d23dd23d23d1d20
250 DATA "227698e1c1c91e10dd7e0
3fe7b283779dd9600f0e0302f78d950
1f0e03027e1e59777237fcd5879dd4e0
0dd4601dd36037bddd360403211f7e3a
25b60417855fcd9d7b188b5dd23d23d
d23dd23dd23d1d20
260 DATA "1d78b5e1c1c921035b7e2
3b6f0e0281d377e9227730082b7e460
1277378f821191622885c21035b7cd6
e79c237fe0e030b3a625b3cd6e6213
f7211095b010800e0b0c9808f75780a
008571115b06
270 DATA "1c3dcd672783d87874f8
781c61e1213783de60c171717f628121
3783de60c1f1f60923d87121312137de
60728043a785c3c607121310cac9111
15b0603cd672783d8787878c628121
37d6e5f62d1213
280 DATA "1d3cd7e60f12137ce6031
2137cd60720053a785c601e0671717f
502121310ce9c11115b0608cd672783
d61078787878780c62812137de65f6c1
412133efcd612137cd6e023d12137d84e
60720033a785c6
290 DATA "2012071717f602121310c
bc9d5227a5c5e5b785c1916011911e10
61922765cd1c9dd2115b0608cd6727
83d171717f628d4770084e65f6c1cd
d77017e6015f78783834603d477027
cde604d602d47
300 DATA "1f6b037d84e60720043a7
85c3c6071717f602d7704dd23dd23d
d23dd23dd23d10b5c921115b0610c54e2
3462323237e3cd32323e5211f7e3a625
be60417085fcd9d7b1c110e1c921115
b0610c5cd9473cd
310 DATA "1f66232323232310f4c94
e2346235e2356237efcd73e5328f5c2
```

```
11f7e3a625be50417855fcd9d7b7882f
e0a3000f31602f9e9e38037816fe47798
3f0a3003791e02fee3803791ef7e4fcd
d87b12b722b73
320 DATA "21ee2b702b71c90508211
15b5e5a623462323237efcd5a75e1c12
32323232310b7c9e5083e7bba20108f
ef72812f5c53d773cd8477f1f13dfe7
f2803cd8477e12b2b2b2b2b2b2b2b2b2
1115b06085cd36
330 DATA "1d7974c1232323232310f
4c94e2346235e2356237efcd73cd5a7
5e6f577e6033c7e03200197b2772b5
623cb4228167ad602870f7e0a3003781
603f993803781602f7e15157e07021
481f0a30037916
340 DATA "1f2902f7e538037916004
f7b1d200e3a785c603573a785c607c
6085f7e7cd5a75e2b722b732b702b71c92
1115b06085cd36b74c12323232310f
4c94e2346235e2356237efcd73cd5a7
5e6f577e6033c
350 DATA "1effe03200197b2772b5
623782f7e0a30023e98f9938023e094
77983f0a30023e74f7cd5a752b2b2
b702b71c92115b06085cd36b75c1232
323232310f4c94e2346235e2356237ef
d7c73cd5a75e6f
360 DATA "21d8577e6033cfe03200
197b2772b567882f7e0a3003160278f9
a380316f7e78477983f0a30031e0379f
ee638031f794f237e2b6cd5a752b2b7
32b702b71c9e5d5c5e5b1f1f1328f5
c1f5e603171717
370 DATA "1c85f17835f160021617
c193a625b5c57280411d80019e603171
71715f1919191f15f19cdca7a1f1cd
1e1c9d3cd377cd672621095b4e23463e
6b83010798282f7e103811f7e0300d4f0
807cd47f7e8020
380 DATA "1d38032b7123234e23463
e06b3016788383f7e103801f0300300
70efcd4f7c7e030020170234e23463e0
6b83013798282f7e103811f7e0300d06a
84fcd4f7c7e03002032b7123234e23467
8f0e638158383f
390 DATA "23c110380f7e0300b0e0
747cd4f7c7e030020170cd567c901f7e
b110000ed73e61f1f128021e1f01f7e
d77e6e1f1f28021e0101f7e0d778e
605f0e028021601e478e60af0e0a31ef
f9e4d4095b78fe
400 DATA "1f4806300bf0e0282060
8cd8477181bcdde777bfe00231cdcd67
779d6084f0604ed430d5b780597cd847
7ed4b0b5b79f0e0300bf0e02820e63c
d8477181bcdcd277bfe002813cdcd277
846084780e4ed43
```

```
080f0f7e9393fe
290 DATA "21a6fcd0800f01010f3f7
fd2d773f0f01808080f0f7e0f6b4f6f
f080030707c7ef7f7f7f7f7f7f7f7f7f7
c1e6e7f1f1f1f73e1e0c0000183c7e7ef
fff7e7e3c180000183c7e7ef7f7f7e7e3
c18000001070f1f
300 DATA "20ecfff1f0f070100000
0e0f0f8f7f7f7f7f7f7f7f7f7f7f7f7f7f
fcd787d381e00000700c1002700cc3
08000001d7c7d7f8fcd978d3c1a00000
0d00c1082700d430800000a7d7cfaf
cf9787d3cd1a0000
310 DATA "19da00a6300508240930c
08000010103030f7e7e0f03030101080
0c0c0f07e7ef0c08080010103030f1e
1e0f03030181808080c0f07e7ef0c0
08000010103030f06060f03030101080
0c0c0f06060f0c0
320 DATA "23b4c0808030e0e1f3f2
7273f1f0e0e03c07070f3fcd4e4fcd87
070c030f0f172337f3f1d00d03c0c
010b5fcdcfcc4e8f0f0c030f0b113b3
f3f3b110b0f0c0f0d08dcdcfcd83d
0f0c0f013f080
330 DATA "270c90a1a37bf927f7e0
000c2fae7fac20000000f0103140809
0a1a37bf927f7e0000c1fae7fac4000
0000003013f408090a1a37bf927f7e0
000c4fae7fac100000008187e7e7e7e7e
7e48f7e9997e7e
340 DATA "1a5199997e3c1899f1f1f9
9183c01010719112020f8f8202011190
701018080e088804041f1f04048898e
0808000000000000061d3b3b3f1f0d0
0000000000000000f0e0dcdcfcd8f00
0000000000000000
350 DATA "18c603b37f7f3f3b1c070
0000000000000f0ecf7ef7ef7ef7ef7ef7
00000000000070f1f1860e1e0700d0c0
000000000000f0f006c3e30f00b0e0c
00000000000070e109060c0c06404060
000000000000
360 DATA "1882300643e306c006060
000003c7e665665667e3c18381818181
83c3c7c7e66567e607e7e7f030f0f0
37f7e0e1e36657f7f06067f7f0e7f0f0
37f7e3f7f7f0e7f7f637f7e3f7f7f0e60c0
c18183e7f637f7f
380 DATA "1f15637f363e7f637f3f0
37f7e3f7f637f7f6363637f7f637e7e6
37f7e3f7f606060607f3f7f7f636363
37f7e3f7f60778607f3f3f7f607786
060603f7f606063f7f3f36363637f7e6
363637f7f181818
390 DATA "1f4f187f17f7f06066666
673c63666c78786c66660606060606
07f3f777f666363636363637f7b6f6
763637e7636363637f3e7f763637f7f
e60603e7f63637f3e037e7f637f7e6
66633f7f607e3f
390 DATA "12d3037f7f7f7f0c0c0c0
c0c0c63636363637f3e63636363633
610663636363637f7f6363636363c1c3
63636363637f3f3f3f7f7f7f7f1c1387
07f7f00000000000000000000000000
0000000000000000
```



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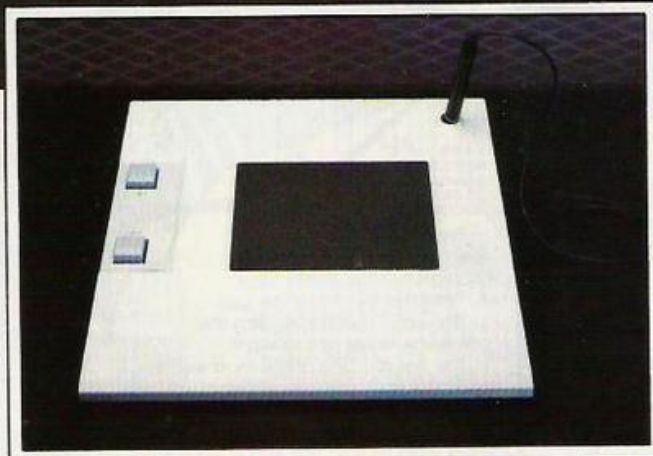
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CROSS FIRE is a totally new game which should zap the mega zappers, freak out the froodies and generally blow your mind — and hopefully several alien nasties. The game follows the normal shoot-'em-up idea of zap, maim or destroy everything in sight and as such requires fast reflexes.

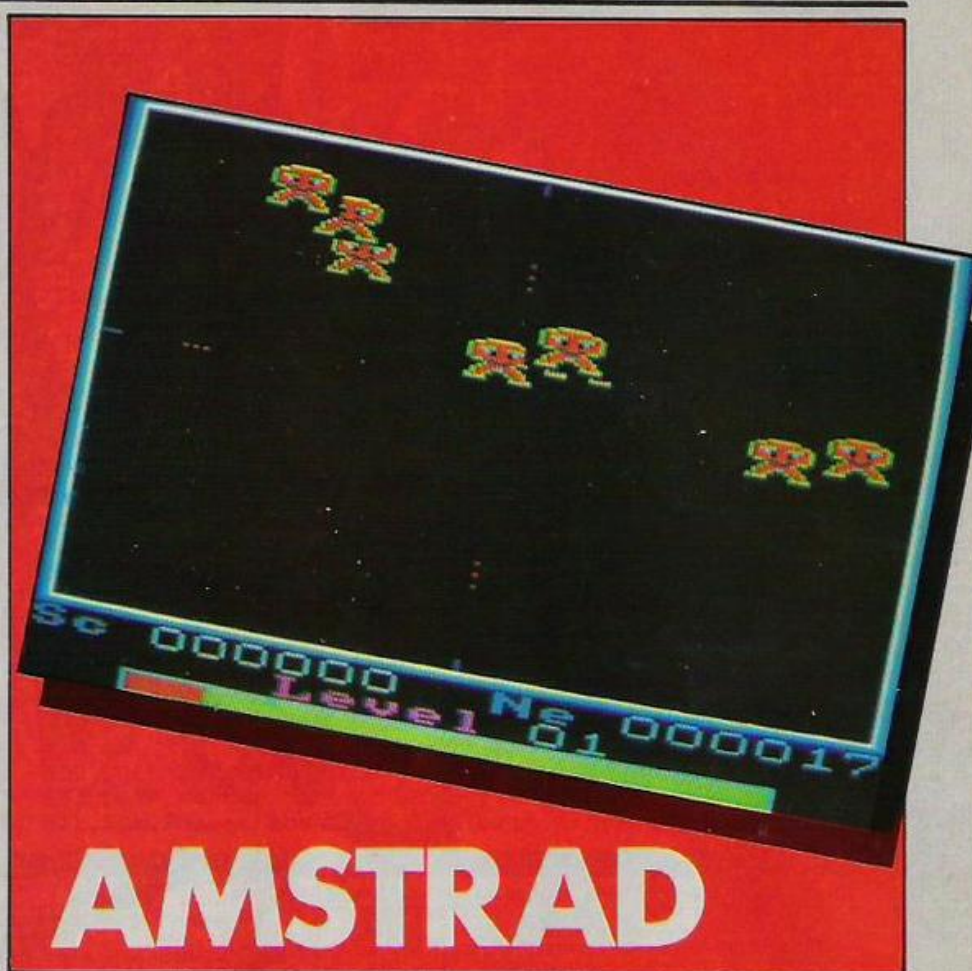
But what do the aliens do while all this is going on? Do they fire back with super deadly plasma bolts? Do they mercilessly hunt you down? Or do they set hideous traps for you? No, all they do is continue wandering round the screen blundering into your bases.

With no enemies this may sound like a simple game but unfortunately you do have something far worse to contend with — yourself. Not only can you shoot aliens, you can also shoot holes in your tracks or even worse, you can shoot yourself.

This is all due to the layout of your bases. These are mounted on tracks on each of the four sides of the screen and the controls move each pair of bases simultaneously.

That means you cannot just move your left laser without also moving the right as well. The fire button works on all four lasers at once. However if you shoot an opposite track

The game where the most dangerous thing on the screen is you. Jason Charlesworth with a froody freaker for the CPC464.



# CROSS FIRE

## Listing 1.

```
100 MEMORY 32767
110 DEF FN x(n)=10*INT((PEEK(n)/16))+PEEK(n)-16*INT(PE
EK(n)/16)
120 BORDER 0:INK 0,0:PAPER 0:CLS:LOAD ""
121 POKE 34257,196
130 DIM N$(5):DIM N(5):FOR A=1 TO 5:READ N$(A),N(A):NEXT A
140 GOSUB 320
150 GOSUB 210
160 GOSUB 180
170 GOTO 140
180 MODE 1:PEN 3:PRINT,"Cross Fire"
190 FOR a=1 TO 5: LOCATE 5,2*a+5:PEN 2:PRINT n$(a):LOC
ATE 30,2*a+5:PRINT n(a):NEXT a
200 LOCATE 10,25:PRINT"Press any key please":IF INKEY#
="" THEN 200 ELSE RETURN
210 INK 0,0:INK 1,0:INK 5,24:INK 8,15:INK 9,16:INK 11,
7:INK 13,3:INK 14,8:INK 15,1
220 ENV 1,5,3,1,1,0,20,15,-1,2
230 ENV 2,5,3,2,5,-1,1,5,-2,3
240 CALL 34000:sc=FN x(37328)+100*FN x(37329)+10000*FN
x(37330)
250 FOR a=1 TO 100:a$=INKEY$:NEXT a
260 FOR a=1 TO 5:IF sc<n(a) THEN NEXT a:GOTO 300
```

(listing 1 continued on page 75)

a hole forms in it and your laser on that track cannot go past it.

The object of the game is to shoot all the aliens, there are eight screens — Space Invaders, Balls, Helicopters, centipedes, Dumbbells, Ultra friendly aliens, Suitcases and a Scottish snake. All these move in smooth pixel graphics.

On each screen eight of 16 aliens appear — depending on the round — though when you have wiped out that batch, another batch appears.

Each alien shot earns you a number of points corresponding to the level you are on and this number of points is deducted from score titled "Needed". This amount must be reduced to zero before you are allowed on to the next screen and on each new screen, the amount of points needed increases.

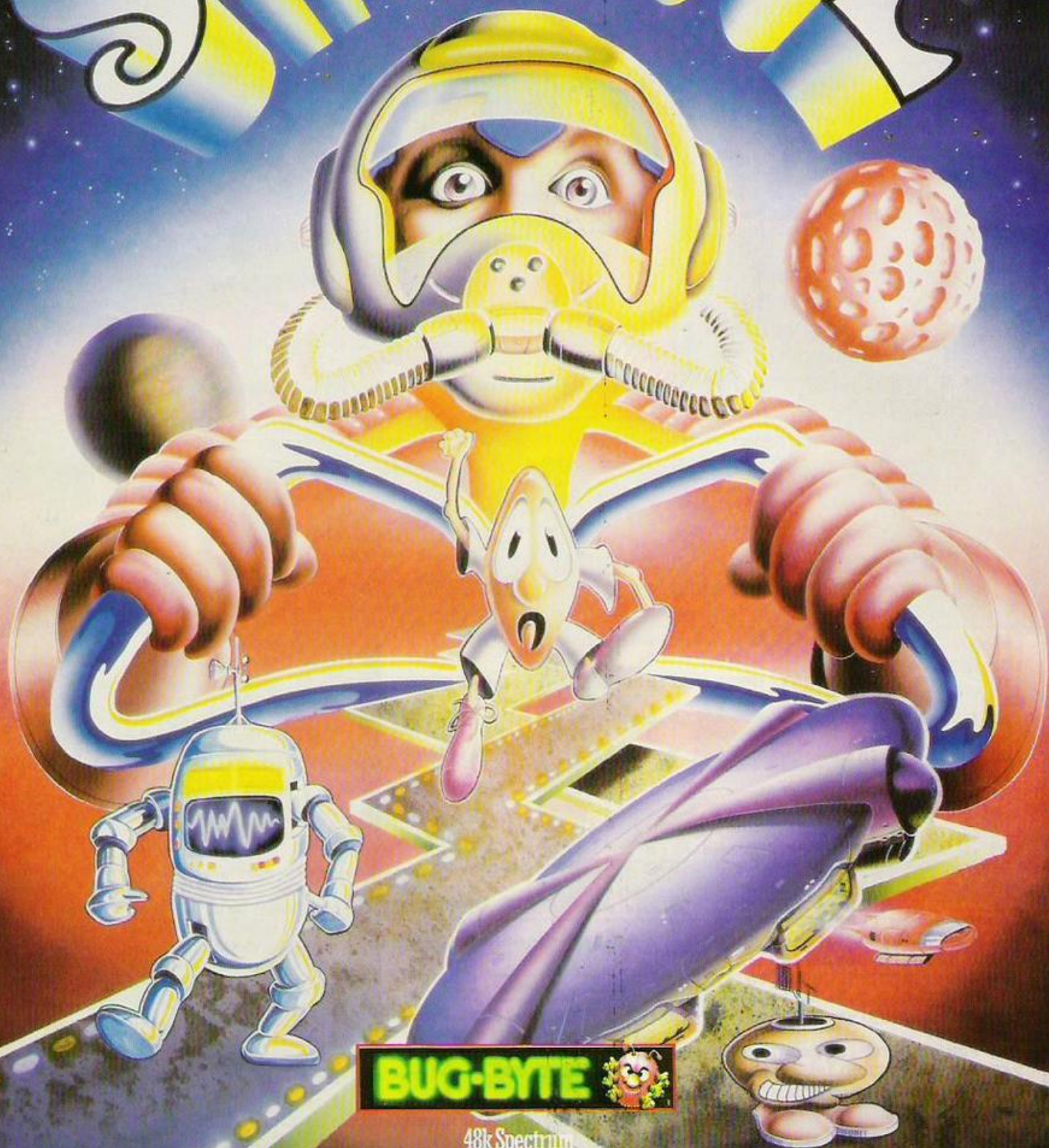
If you do not get enough points within the time limit — the bar at the bottom of the screen counts off 60 seconds — you restart the same screen. You can only go onto the next screen when you have lasted the 60 seconds and reduced the "needed" score to zero.

The game ends when all four bases have

(continued on page 75)



# SPY KOP



**BUG-BYTE**



48k Spectrum

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Finally a few tips for playing the game. At the start of the game you should move your base very rapidly otherwise you may find the aliens wipe some out. When you fire, if you move the base whilst firing, it spreads the bullets out and so they are more likely to hit an alien. Perhaps the most important tip is to turn the sound down otherwise the constant tick of the clock may drive you mad.

```

270 IF a<>5 THEN FOR b=5 TO a+1 STEP -1:n$(b)=n$(b-1):
n(b)=n(b-1):NEXT b
280 FOR b=0 TO 1000:NEXT b:PEN 3:MODE 1:PRINT"Please e
nter your name for the high      score table.":INPUT n$(
a)
290 n(a)=sc
300 GOSUB 180
310 GOTO 140
320 MODE 1: PEN 3:PRINT"          Cross Fire By J.Charleswo
rth":PEN 2:PRINT:PRINT:PRINT,"a          Up":PRINT:PRINT,
"z          Down"
330 PRINT:PRINT,"/          Right":PRINT:PRINT,".          L
eft":PRINT:PRINT,"SPACE          Fire"
340 PRINT:PRINT,"0          Abort":PRINT:PRINT,"h          H
old":PRINT:PRINT,"s          Start (from hold)"
350 PRINT:PRINT:PRINT"          Press J for Joystick or K for
Keys"
360 FOR a=1 TO 3000:a$=INKEY$:IF a$="J" OR a$="j" THEN
380
370 IF a$<>"k" AND a$<>"K" THEN NEXT a:GOTO 390 ELSE P
OKE 34766,47:POKE 36124,69:POKE 36134,71:POKE 36151,31
:POKE 36142,30:RETURN
380 POKE 34766,76:POKE 36124,72:POKE 36134,73:POKE 36
151,74:POKE 36142,75:RETURN
390 INK 0,0:INK 1,0:INK 5,24:INK 8,15:INK 9,16:INK 11,
7:INK 13,3:INK 14,8:INK 15,1
400 ENV 1,5,3,1,1,0,20,15,-1,2
410 ENV 2,5,3,2,5,-1,1,5,-2,3
420 CALL 34288:GOTO 320
430 DATA Danger Mouse,500,Penfold,400,The Bat out of h
ell,300,Shaggy the Yak,200,Albert Aadvark,100

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10 MEMORY 3276:RESTORE:DIM t(62):FOR a=0 TO 62:READ T(A)
20 NEXT A
30 FOR a=0 TO 62:READ a#:t:=0:FOR b=0 TO 79: c:=VAL("&"+MID$(a#,b*2+1,2)):t:=t+c:POKE 34000+80*a+b,c:NEXT b
30 IF t<t(A) THEN PRINT"Error in lines 100-130 or line "
:130+a:=10:END
40 NEXT a
50 PRINT"Finished, no errors":END
100 DATA 12116,11042,11499,8403,10699,8515,7608,7750,7593
,8128,5707,8005,7017,8963,9596,8113,9136,8540,10051,7272,
8056,9082,7433,8723,8471
110 DATA 7387,7274,8647,7804,8967,8355,10056,7606,6253,80
20,8863,11218,9006,8883,9227,10895,6615,957,2999,12527,11
656,10811,10761,11740,11692
120 DATA 10463,9077,17547,15439,14468,12867,13847,13898,1
5264,15198,11410,5904,0
130 DATA CDB687CD1287CDE789CDB985CD1C8ACD8E8CCDCD87CD5988
CDDA8ECD75873AD791FE0280F3ADB91FE00C0CD68B6FEFF20DA18D2C
DB986FE0020C8CD1287CD3E8CCDB985CDB68BCDE8CCDCD87CD5988
140 DATA CDDA8ECD75873AD791FE0280F3ADB91FE00C0CD68B6FEFF
20DA18D2CDB986FE0020C8CD1287CD40B8BCDB985CD438BCDBE8CCDCD8
7CD5988CDB687CD75873AD791FE0280F3ADB91FE00C0CD68B6FEFF
150 DATA 20DA18D2CDB986FE0020C8CD1287CD40B8BCDB985CD438BCDBE8CCDCD8
7CD5988CDB687CD75873AD791FE0280F3ADB91FE00C0CD68B6FEFF
160 DATA 1E040E9ACD1DBCC04AC36002310FBF13CFEC320E7CDB38D21
0000110000CD10BDC921E785C6A8C020206401140F1400CDB687060
2C5CD1287CDE789CDB600C5CD1C8ACDABECD6186FE002852C110EFC
D
170 DATA 1287CD3E8CCDB600C5CD1C8ACDABECD6186FE002839C110EFC
CD1287CD40B8BC600C5CD438BCDABECD6186FE002820C110EFCD1287C
DA08A0600C5CDEE8ACDABECD6186FE002807C110EFC11098C9C1C1
180 DATA C93E20CD1EB83E00CD3C93A459206110E603F6320022608
21E5917FE00C0232323232310F53EFFF921D3917E23B623B6FE00C83
AD691D6012732D6913A45923D324592C0497CD08BC3E0CCD908B
190 DATA 21020522439111FB86060E1ACDBE901310F921036224391
60891109871ACDBE901310F93A00D9147E6F01F1F1FC630CD8E978E
60FC630CD8E978E90FE06000E0020F0D5E20F83D20F3C95072657061
200 DATA 726520D746F206469654F4E2066C6576656C203A45923CFE09
20023E013245923AD691C6012732D69121E1910666236002310FB21D39
1977723772377CDA786CD1A8F3A4592C6104721D3913AD691110E10
210 DATA ED534391CD969110F7CDB8D21469206263002310FB21000
00110000CD10B03E3C32D791C97E2CCD1EB82810E3CCD1EB8289F210
000110000CD10B03E20CD1EB828053E0132DB99121DA917E0FE060E023
220 DATA 7EF606023232323237FEF6060237FEF60603E132DB91C921D0
91977723360023732DB9132D691324592C9DF08C93E4CCD1EB8C811D
991214E92131AFE06381806087FEF002052310F81800C1B1A774F23
230 DATA 13060870CD55881321E921A1FE06381806087FEF0020805
2310F8180A0E48711A237745205881321462131AFE06381506087FE
E0208052310F8180B18A7723134FC0A6A70132156921AFE06080608
240 DATA 7FEF0028042D310FBC90E0A77123131A7747CD5588C96CD6791
C921469206107EC52323FE0028094F284623E5CD8091E1C10EC21469
211FC00CD9788214E92110400CD9788215692110001CD9788215E92
250 DATA 1100FFCD9788C9060A4C5D5E57FEFE0285C4F234678805F7A
8157FE01200B0E0145CD0891110000182CFAE4200B0E4E43CD8091111

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[illegible]

(listing 2 continued on next page)



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008747E0E4D43DF91790E02CD748EC95F3C0E493A71F1E00CB185721
440 DATA 7C9519CD64190C93579875F1600623EC7906FD1DBC1E00CD
A68EE3C77232468EE3C77C1C97EFE08CBFCED0A98CBAF40C81E0
1C9C579875F1600623EC7906FCD1DBC1E000604CD0A68EE28772424
450 DATA 2424242424241080C1C9CD00B0D7CFE01070DFE2CD08112C01
A7ED52CD10BD0CD01BF21FBFCDEAAB8C90101002F0000063200A07913
D3D7915F16006218AC1911000006063630001910FBC93E00CD0EBC3E
460 DATA 060606CD1A903E0A0602CD1A903E02604CD1A903E0A060
CD1A903E0ACD90BB210016224391060D2106907ECDEB902310F93E0EC
D90BB21061722439121159006057ECDEB902310F93E01622439121
470 DATA D0913E00CDF969121061622439121D3913E00CDF9691210C17
2243913A0D91E6F01F1F1FC630CDFBE903AD691E60FC30CDE903E0
2CDEBB210000114C00CDEBB210000113002CDF6BB210E00113002
480 DATA CDF6BB210E00114C00CDF6BB210000114C00CDF6BB060C5
3E03CDDDEB11500006268E3CDEABEE1118C00E3C0DF6BB3E0CCDDEBBE11
12E0CDF6BB817B3D304720D62120000CD10BD9C536320A02020A200
490 DATA 2020A0E654C6567656563CDDDEB78874F68306F16005962
D5C5CDEABBC1D126013E8E906F6E5C5CDF6BB81E116023E7E915FD5C5
DF6BB81D1260078C6306F5E5C5CDF6BB81E15459CDF6BB3E01CDDDEB
500 DATA C9F5C5D5E5E579B7160062B53CEC7906FCD1DBC10610C5E5
60081AFE00280171732310F810CD2683C10EBE1D1C1FC9F5C5D5E5E
579B71600625F3CEC7906FCD1DBC10600E00E5D51AFE0001772313
510 DATA 02020FCD1C2D6BC10ECE1D1C1FC9E5D505F5E30385F5E3A
3058D630171717F52A43917D8787875F16003E1894878787C6076F260
0CD1DBC1C6C616975F30011406071AD50E081E00A717CB1317CB13
520 DATA 5797CB48280235E0BC843280C260477237AD028E311FD0719
D11310D721439134FC1D1E1C92A43913E15C5D5A8B27CD05ABB247CC
D5ABB1CD5ABB21439134C1D1E1C91416E5D5C5CDF7906F6C0055479
530 DATA 875FCD1DBC7EFE002808FE0328043E80180197C1D1E1C9D5
C53CE7906F26005479875FCD1DBC77EEFFA6F688771CD1C9D5303E3CE
7906F26005479875FCD1DBC77EE1C1D1C9E5D5C5F5E862773500E
540 DATA 233E0186277F3066233CE01862771E12323060374E4F60F01
1F1F1FC630CDFBE97E60FC30CDBE972B10E8F1C1D1E1C90000000000
100053C00280C4C5028A80A503B4B020F804545030A802F45020180
550 DATA 2A240221089302A0101801026303800E10000480130D0102
80000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000
560 DATA 02020FCD1C2D6BC10ECE1D1C1FC9E5D505F5E30385F5E3A
02000000000000000000000000000000000000000000000000000000
02000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000
570 DATA CC9962C0C066CCCCCCCC99C0C06604C8C0C99C0C066844
884C99C0C0666C4488C0C99C0C066CCCCCCCC99C0C991666C9962C0C
0C9919C6C62C0C0C066CCCC99C0C0C991CC9966C62C0C991CC62
580 DATA 91CC62C0C06699C0C06699C0C0333C0C0333C0C0C0C0C0C
C0C0C0C0040C0C0C080C0C0C0930C030360C0C0C090303F3F3060C0C
090CC9D6ECC6C0C030C09D6ECC30C0C3035DBB57AE43AC0C35DBA4
590 DATA 58E43AC0C35F3F4DBE3F3AC0C035F3F4DBE3F3AC0C35DBA4
5BE43AC0C35DBB57AE43AC0C30CC9D6ECC30C0C090C90C9D6ECC6C0C

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```

0090303F3F3860C0C0C090303860C0C00040C0C0C0C0000C0C0C0C0
600 DATA C0C0B00003030303060000C0C0B4C0C0C0C000C0C0C0C0C0
C0B00000C0C0C4C0C0C0C0C0B4C04D8E4B9749C0B4C04DCF8E4B6B4C
8C04DFCFC8E6C0C4B84CFCFCFCFC0C04B4DFCFCFC0C68C0B4CFCFCFC
610 DATA C0C060C0B4CFCFC8EC97494C0C0C0C4C0C0C0C4281811C0
C0B000000103030342800000C0C0C0C0C0C0B00000C0C0C0C0C0C0C0
C0C0C0C0C0F0C0C0C003CE0D03CE0C0C0D03CE0D03CE0C0C0B43CE0
620 DATA D03C7B0C0B843D7AB53C77B0C0B3F8C4C3F78C0C0B3743C
83C778C0C0B43F4C8C3F78C0C0B3F8C4C3F78C0C0B43D7AB53C77B0C
0B43CE0D03C78C0C0C03CE0D03CE0C0C0D03CE0D03CE0C0C0C0F0C0
630 DATA C0F0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
3C943CC0C0296894169416C0C0296894169416C0C029689416943CC0C
029689416C0C0C0C029689416943CC0C0296894169416C0C029689416
640 DATA 169416C0C0296894169416C0C0296894169416C0C0296894
169416C0C0296894169416C0C0296894169416C0C03C68943C943CC0
C0C0C0C0C0C0C00000C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
650 DATA 95C4000C0C042C0B1C0C0C0D1D9E7F3D8E6E2C0F3D9E7F3
D8E6F3C0CCF3E7F3DBF3CCC0F3F3F2F0F1F3F3C0F3F3F3F3F3F3C0F
3F3F3F3F3F3F3C0F3F3F3F3F3F3F3F3F3F3F3F3F3F3F3F3F3F3F3F3
660 DATA F3F3CCC0F3D9F3F3F3E6F3C0D1D9F3F3F3E62C0C0C0C0C0
C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
C0C0C0909090C0C0C090C0906060C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
670 DATA B06090C0C09090DBD890C0C0C0C0D0F0F0E0C0C0C060C064
E0E060C0C0C0C0C06090C0C0C090C090C0C0C0C0C0C0C0C0C0C0C0C0C0
C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
680 DATA C0C0C0C0C0C0C0C06090C0C0C0C0C0C0C0906060C0C090C0
608116C0C0B190D070C060C060C0C0D0C87C0C0C09090A146E0B0C0C
0C0F05289646C0C0C06090B95252C0C0C0C0C090607046C0C0C0C0C0
690 DATA 6E460C0C08190C0B042C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
60C090C0C0C0C0C06090C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
C0C090C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
700 DATA C0C0C0C0C0C060C4C060C0C0C0C0C0C0C06042E090C0C060C4
E042C0C0C060C060C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
606090C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
710 DATA C060C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
720 DATA C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
730 DATA C0D8FCE4C0B058F0A4C0B8ECC4DCC0C058F0A4C0C0D8FCE4C0
C0B0543C78C0C06D9A34C0C06D9A34C0C038659EC0C038659EC0C0B43
C78C0C0C0C0C0C078484848484780010301010101010107C0C07884078
740 DATA 80B4FC0078840438048478001182048888F08000F0C8480F8
04847800788480F0B84847800FC8404001020200070B848478048478007
884847C0484780000000000000000000000000000000000000000000000
750 DATA 000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000

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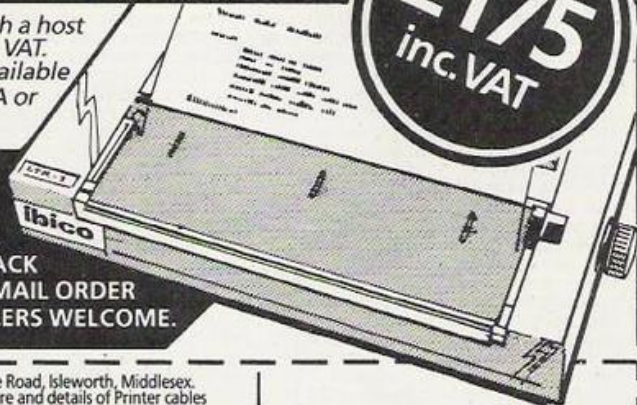
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Sinclair QL	£349										
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Brother QL630	£335										
Brother QL640	£355										
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Brother QL660	£395										
Brother QL670	£415										
Brother QL680	£435										
Brother QL690	£455										
Brother QL700	£475										
Brother QL710	£495										
Brother QL720	£515										
Brother QL730	£535										
Brother QL740	£555										
Brother QL750	£575										
Brother QL760	£595										
Brother QL770	£615										
Brother QL780	£635										
Brother QL790	£655										
Brother QL800	£675										
Brother QL810	£695										
Brother QL820	£715										
Brother QL830	£735										
Brother QL840	£755										
Brother QL850	£775										
Brother QL860	£795										
Brother QL870	£815										
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Brother QL890	£855										
Brother QL900	£875										
Brother QL910	£895										
Brother QL920	£915										
Brother QL930	£935										
Brother QL940	£955										
Brother QL950	£975										
Brother QL960	£995										
Brother QL970	£1015										
Brother QL980	£1035										
Brother QL990	£1055										
Brother QL1000	£1075										
Brother QL1010	£1095										
Brother QL1020	£1115										
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Brother QL1040	£1155										
Brother QL1050	£1175										
Brother QL1060	£1195										
Brother QL1070	£1215										
Brother QL1080	£1235										
Brother QL1090	£1255										
Brother QL1100	£1275										
Brother QL1110	£1295										
Brother QL1120	£1315										
Brother QL1130	£1335										
Brother QL1140	£1355										
Brother QL1150	£1375										
Brother QL1160	£1395										
Brother QL1170	£1415										
Brother QL1180	£1435										
Brother QL1190	£1455										
Brother QL1200	£1475										
Brother QL1210	£1495										
Brother QL1220	£1515										
Brother QL1230	£1535										
Brother QL1240	£1555										
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Brother QL1320	£1715										
Brother QL1330	£1735										
Brother QL1340	£1755										
Brother QL1350	£1775										
Brother QL1360	£1795										
Brother QL1370	£1815										
Brother QL1380	£1835										
Brother QL1390	£1855										
Brother QL1400	£1875										
Brother QL1410	£1895										
Brother QL1420	£1915										
Brother QL1430	£1935										
Brother QL1440	£1955										
Brother QL1450	£1975										
Brother QL1460	£1995										
Brother QL1470	£2015										
Brother QL1480	£2035										
Brother QL1490	£2055										
Brother QL1500	£2075										
Brother QL1510	£2095										
Brother QL1520	£2115										
Brother QL1530	£2135										
Brother QL1540	£2155										
Brother QL1550	£2175										
Brother QL1560	£2195										
Brother QL1570	£2215										
Brother QL1580	£2235										
Brother QL1590	£2255										
Brother QL1600	£2275										
Brother QL1610	£2295										
Brother QL1620	£2315										
Brother QL1630	£2335										
Brother QL1640	£2355										
Brother QL1650	£2375										
Brother QL1660	£2395										
Brother QL1670	£2415										
Brother QL1680	£2435										
Brother QL1690	£2455										
Brother QL1700	£2475										
Brother QL1710	£2495										
Brother QL1720	£2515										
Brother QL1730	£2535										
Brother QL1740	£2555										
Brother QL1750	£2575										
Brother QL1760	£2595										
Brother QL1770	£2615										
Brother QL1780	£2635										
Brother QL1790	£2655										
Brother QL1800	£2675										
Brother QL1810	£2695										
Brother QL1820	£2715										
Brother QL1830	£2735										
Brother QL1840	£2755										
Brother QL1850	£2775										
Brother QL1											



# Listing 1.

```
10 REM HEXLOADER - ENTER THE
20 REM STRING OF HEX DIGITS FIRST
30 REM AND THEN THE CHECKSUM
40 PRINT "ENTER START ADDRESS ":"INPUT START
50 PRINT "ENTER FINISH ADDRESS":"INPUT FINISH
60 FOR N = START TO FINISH STEP 8
65 PRINT N;":":
70 TT=0:INPUT A$:Z=0
```

80 FOR G=1 TO LEN(A\$) STEP 2

90 P=VAL("&H"+MID\$(A\$,G,2))

100 TT=TT+P:POKE (N+Z),P

110 Z=Z+1:NEXT

120 PRINT " = ":

130 INPUT T\$

150 IF VAL(T\$)<>TT THEN PRINT "ERROR - ENTER LINE AGAIN"

N=6070

160 NEXT

SPIX IS NOT a game — it's a real story about power, slavery... and chips! On the planet earth, light years away, a worldwide soft war is going on. You, as the last surviving Dragon computer, have to defend the name of your murdered manufacturer against the powerful Softwar Industry. You do this by surrounding parts of the software market, thus obliging them to work for you.

The Softwar Industry tries to stop you of course, by electrocuting your circuits, while the involved firms, struggling to avoid colonisation, chase your trail with their evil droids: the Comm, Sing, Orié and Corna computers. These will kill you as soon as they find you. Going backwards while you're

surrounding a part causes your death too.

If you can annexe more than 75 percent of the soft war market, then you will receive a bonus chip and move to another country of W-Europe, where you will encounter more and stronger competitors.

At 10,000 points, you will receive an extra fuse to survive an electrocution. You can battle with either the keyboard or a joystick as help. Keyboard control uses the four arrow keys and the spacebar. This last key is used to start drawing a line while surrounding a part — the fire button in the case of joystick owners.

A high-score table, and display of score, level, percentage of surface annexed and lives

are provided.

You can alter the maximum number of lives with POKE 7348,X

Normally, X=3 but any number between 1 and 15 will do.

To enter the program, type in listing 2, using the hex loader. Type PClear8 before running the hexloader. Save the whole program when finished as

CSAVEM"SPIX",4608,13072,5941

You can type it in in parts too, saving each part as described, but replacing 13072 with the address you reached. Make sure you have a copy of the program before executing it. To play the game, use

CLOADM"SPIX":EXEC

# Listing 2.

```
4608 : 0105454000000000 = 139
4616 : 0015000000150404 = 50
4624 : 0054541500000100 = 190
4632 : 0000000000000001 = 1
4640 : 0104040400000000 = 13
4648 : 0011000000110010 = 50
4656 : 0004040404000500 = 141
4664 : 0000000000000001 = 1
4672 : 0105440000000000 = 74
4680 : 0011000000110040 = 98
4688 : 0054500400000100 = 169
4696 : 0000000000000001 = 1
4704 : 0100440400000000 = 73
4712 : 0011000000110100 = 35
4720 : 0004400404000100 = 77
4728 : 0000000000000001 = 1
4736 : 0105454000000000 = 139
4744 : 0015000000150404 = 50
4752 : 0054540400000100 = 173
4760 : 0000000000000001 = 1
4768 : 1504151511151515 = 147
4776 : 1515000000000000 = 42
4784 : 0000000000000003 = 3
4792 : 0000CF3F0CF0CF0C = 1119
4800 : 1114010111101001 = 89
4808 : 1111000000000003 = 252
4816 : 0A0000000F000000 = 197
4824 : 0A00303030C0C0C0 = 1084
4832 : 1184150515151501 = 111
4840 : 1515000000000000 = 472
4848 : 2000000000000000 = 138
4856 : 0A00303030F0F0F0 = 098
4864 : 1104100101011010 = 50
4872 : 1101030020000000 = 53
4880 : 0000000000000000 = 620
4888 : 2020303030C0C0C0 = 624
4896 : 1504151501151501 = 111
4904 : 1515000000000000 = 421
4912 : 020000C0C0200000 = 004
4920 : 2002333030F0C0C0 = 1017
4928 : 0A0A000000000000 = 370
4936 : 002A0C3003C0C0B2 = 451
4944 : A002300A20300302 = 449
4952 : A202000000000000 = 164
4960 : 2555602555009625 = 607
4968 : 0096300FFC0C0C2A = 659
4976 : A002C02AC0200300 = 623
4984 : A200000000000000 = 162
4992 : 9555602555009625 = 727
5000 : 62563003F0C0C0C0 = 602
5008 : 0F02C0002C000000 = 099
5016 : 2A00000000000000 = 42
5024 : 95A00095A0000025 = 930
5032 : 95560002F0C0C002 = 501
5040 : 00C03000C0000002 = 768
5048 : 0A00000000000000 = 314
5056 : 9600007607500009 = 406
5064 : 5550020000000002 = 409
5072 : 20300A023000003C = 372
5080 : 22000030F0C0C0C0 = 850
5088 : 95A0007625500202 = 726
5096 : 556000A00C200020 = 553
5104 : 2030002202000000 = 244
5112 : 220000F0C0C0C0C0 = 077
5120 : 955000955000A000 = 990
5128 : 9500000203000000 = 426
5136 : 000C000000000000 = 428
5144 : 000C0030F0C0C0C0 = 1136
5152 : 2555600955A00250 = 672
5160 : 9560000203000020 = 260
5168 : 8330200020000000 = 637
5176 : 00C000300C0C0C0C = 468
5184 : 0A0A6255A0025000 = 733
5192 : 255002000C300000 = 203
5200 : 00C00A0220000000 = 396
5208 : 30C00030F0C0C0C0 = 1044
5216 : 0009625500025500 = 535
5224 : 955600A0F0000002 = 637
5232 : 0000000000000000 = 128
5240 : 0F00000000000000 = 15
5248 : 2A0A625500095562 = 710
5256 : 5556FF30C0C0C0C0 = 968
5264 : F0C0C0FF30C0C0C0 = 1671
5272 : F30C0C0C0F0C0C0C = 1509
5280 : 9556625500095562 = 737
5288 : 5656C030CF30C0C0 = 874
5296 : 00C0C0C030C0300C = 678
5304 : 330C3030C030300C = 228
5312 : 9550825600025502 = 667
5320 : 5096CF30C0C0C0C0 = 1159
5328 : 00C0C0C030F0C0C0 = 1176
5336 : F30C0C0C0F0C0C0C = 537
5344 : 2A0A000A00000A02 = 352
5352 : A02AC330C0C0C0C0 = 856
5360 : 00C330C0C0C0300C = 345
5368 : 330C0C000C300C0C = 147
5376 : 0000000000000000 = 0
5384 : 0000FF30C0C0C0C0 = 774
5392 : F0C0C0FF30C0C0C0 = 996
5400 : 33F0C0C030F0C0C0 = 573
5408 : 00007E23547E2357 = 463
5416 : 000015101505A007 = 147
5424 : 4003400150010001 = 424
5432 : 5054745400000000 = 364
5440 : 0000000A0F797374 = 569
5448 : 69636006F720008 = 899
5456 : 6579626F61726A00 = 070
5464 : 78607C6A7D000073 = 700
5472 : 7067700068766768 = 081
5480 : 0073636F72650074 = 912
5488 : 61626C650000656E = 615
5496 : 74657200796F7572 = 922
5504 : 00696E697469616C = 874
5512 : 7300000101013030 = 214
5520 : 3030303030303030 = 243
5528 : 3030303030303030 = 337
5536 : 0101303030303030 = 290
5544 : 3001010130303030 = 243
5552 : 3030300101013030 = 243
5560 : 3030303030020100 = 243
5568 : 0202000204000304 = 17
5576 : 0004040002010102 = 14
5584 : 0202020404030404 = 26
5592 : 04040478637D0074 = 603
5600 : 6F6D06669657273 = 085
5608 : 0062656C6769756D = 869
5616 : 0000000000000007 = 126
5624 : 32327E1A357E1900 = 504
5632 : 7E20077E20727E1F = 082
5640 : F457454C434F4D45 = 768
5648 : 20544F204C455645 = 527
5656 : 4C007E205A00224F = 621
5664 : 325435631354356 = 526
5672 : 3C4356313546456 = 540
5680 : 3C45563135474641 = 523
5688 : 4F3343563C455632 = 546
5696 : 4356313522000000 = 209
5704 : 0000000000000000 = 0
5712 : 0000000000000000 = 0
5720 : 00007E2E687E2579 = 563
5728 : 7E2A0A7E30300228 = 746
5736 : F70C203331313033 = 603
5744 : 292CF70C20333131 = 669
5752 : 303429292C332C32 = 371
5760 : 00000052007E2000 = 442
5768 : 0010007401D00074 = 470
5776 : 001004001D007740 = 232
5784 : 100004001D000740 = 105
5792 : 1D00074001000040 = 375
5800 : 01D0077401D00040 = 605
5808 : 0000224F33543545 = 554
5816 : 444543444454F32 = 539
5824 : 424F334444F3254 = 544
5832 : 3241503054344345 = 523
5840 : 4154324250305434 = 537
5848 : 454723424F335432 = 505
5856 : 435031303054344F = 507
5864 : 32454F33454442345 = 490
5872 : 44454F32424F3344 = 530
5880 : 434F325432415030 = 531
5888 : 5434434541543242 = 537
5896 : 50305434454F3343 = 538
5904 : 4F32425431412200 = 427
5912 : 0B0012B7FFC5B7FF = 1400
5920 : C2B7FFC0B7FFC9B7 = 1646
5928 : FFC7B6FF2204C7B6 = 1394
5936 : C0B7FF2239B071B = 957
5944 : 00C000C000000001 = 718
5952 : 8C120025F9201C0E = 646
5960 : 1202100006414FE = 742
5968 : 04EFA4EE02EF2230 = 1096
5976 : 002031A0204C010F = 637
5984 : 25E2590006000655 = 690
5992 : C620A7890000A700 = 1064
6000 : 5A26F70062006400 = 753
6008 : C60A78A078B1F30 = 944
6016 : 0020011E025F320 = 861
6024 : 120E6000100E0600 = 556
6032 : ECA1E001100C1200 = 937
6040 : 25F6390000000000 = 977
6048 : 100E13400000000E = 603
6056 : A14CE0F1010525F7 = 1023
6064 : 4F31A0163000165C = 616
6072 : C10E25E00E704D10 = 826
6080 : 0E120AC0000000EA = 949
6088 : 4CE0F1010325F7AF = 939
6096 : 31A01A30001A5CC1 = 738
6104 : 0F25E00E6E4E100E = 775
6112 : 149C5FE22EF00E2E = 1022
6120 : A4EFA4E00000001E = 968
6128 : 20C0C10525E00D17 = 008
6136 : 4706010775307F75 = 790
6144 : 31B7754300040B77 = 054
6152 : 427C7543CC00007F = 705
6160 : 756006100775617C = 084
6168 : 75420010C00D1007 = 947
6176 : 067542016C25F006 = 1061
6184 : 7543015022000001 = 703
6192 : 1F020E6C410D174E = 638
6200 : 0675430005077543 = 877
6208 : 0150223A06000775 = 746
6216 : 307A75420D10C00D = 950
6224 : 100706754201042 = 691
6232 : F0067543C6203DC3 = 1092
6240 : 06011F020E6C410D = 544
6248 : 174E067543000507 = 794
6256 : 7543015022000001 = 570
6264 : 0775307E10170D15 = 751
6272 : F70D150F7E15F7C = 1251
6280 : 7560067560010A25 = 704
6288 : 077575607C75618E = 875
6296 : 75618D103900D139 = 627
6304 : 34100E0190301F26 = 472
6312 : FC351039C63FF7FF = 1141
6320 : 237FF20077546C6 = 1017
6328 : 0673FF200675464A = 051
6336 : 26F05A26F4063707 = 1035
6344 : FF2339CE7530A0C8 = 1004
6352 : 125F81042505000A = 420
6360 : 5C20F7E7C017A7C8 = 1192
6368 : 18A6C01634426FCB = 041
6376 : 16A6C013C6203DC3 = 093
6384 : 0600EC08161F0235 = 541
6392 : 02A7C01610AFC01B = 009
6400 : A6C0100103273101 = 739
6408 : 012741010227338E = 468
6416 : 120234000174E35 = 623
6424 : 00A6C427375F810A = 706
6432 : 2204313F20023124 = 269
6440 : A6A96200A7A431A8 = 1109
6448 : 205CC11025F2201C = 672
6456 : 0E12060D174E3540 = 749
6464 : 20120E120A0D174E = 674
6472 : 35A020000E120A0D = 676
6480 : 174E354007E25202 = 463
6488 : 010A220531A0C020 = 619
6496 : 0431A901E00CA962 = 950
6504 : 00EDA4E0A9620000 = 1429
6512 : A020E0A962A20A0D = 1270
6520 : 22E0A9620E22239 = 995
6528 : 0D19C000031600A0 = 657
6536 : 0E0401069CC693E7 = 1013
6544 : 0901C0E70901E0A7 = 1090
6552 : 000C041F25F18695 = 864
6560 : C69A0701A78A3000 = 1067
6568 : 200C060025F4069E = 751
6576 : 070400A0B7041F06 = 613
6584 : 90B705E000703C0006 = 1001
6592 : 0707050F0705FF39 = 1062
6600 : 0E0A000600A7000C = 843
6608 : 000025F939000A25 = 532
6616 : 0F00000E155C0D90 = 917
6624 : E50E05A30F00000E = 1008
6632 : 15420900E500E06 = 1026
6640 : 0F00000E150A0D90 = 1041
6648 : E50631070634C07 = 957
6656 : 0A434CB704E34CB7 = 916
6664 : 05234CB70535F00E = 640
6672 : 0469100E150000EA = 829
6680 : EFA0A622A702E223 = 1013
6688 : EFA0A625EFC0E223 = 1052
6696 : EFA0E300040312A5C = 684
6704 : C10525E23900000E = 1123
6712 : 261C7C7567C756F = 769
6720 : 756E0E10420037F = 710
6728 : 756E0E756F010626 = 010
6736 : C47F756F200F77F5 = 1002
6744 : 4F010206037C754F = 644
6752 : 06780D10AC7E1C9A = 947
6760 : 0E0600100E000010 = 322
6768 : 4F010C120025F00E = 889
6776 : 0601CC555E000000 = 766
6784 : E000090120E00001 = 1006
6792 : 00E0000000000001 = 1147
6800 : 061E25E9A78A4789 = 909
6808 : 0120A0700100A070 = 770
6816 : 0000A70000000001 = 813
6824 : C1000E070A0A704E = 1053
6832 : 013000200C110025 = 539
6840 : F406110E070A0A70 = 1007
6848 : 1F3000200C110025 = 569
6856 : F506010E1100A070 = 934
6864 : A70020A7000A0A70 = 1005
6872 : 5FA700A0A7007FA7 = 1091
6880 : 0F00000E00000A70 = 712
6888 : 1F09E0003FA70020 = 939
6896 : E000000F000000FF = 1226
6904 : E000011FA7000140 = 775
6912 : E000015F0000017F = 972
6920 : 065107079F07119F = 923
6928 : 0615071101070701 = 003
6936 : 0E0640100E120006 = 554
6944 : A0A700000E025F7 = 1109
6952 : 0D10E07F7564065A = 1019
6960 : 0775630002077565 = 936
6968 : 0A0F077562390602 = 740
6976 : 0775300775320601 = 033
6984 : 0775310775330D1C = 917
6992 : 7EC00FF775610D1C = 1016
```



Tom Fiers  
defends his  
dragon to the  
death in the  
Soft war to end  
all Soft wars.

# SPiX



7000	: 13B01C56B6754610	= 707	7600	: 7546C17022105454	= 726	8200	: 8B86008E05E0A780	= 1064	8800	: 270C86756B271086	= 694
7008	: 2400997E30B0CC08	= 766	7608	: 4FF37560C306001F	= 767	8208	: 8C60025F798E1A08	= 604	8808	: 756E010226096A21	= 544
7016	: F3FD7904B6754610	= 1134	7616	: 018655A7018A05A7	= 694	8216	: 8D90E5B675350B70	= 1165	8816	: 860A72016FEFD6C	= 901
7024	: 260099B67560C004	= 772	7624	: 048040B01D9EB675	= 945	8224	: 8704F8B0205A5F0E	= 903	8824	: 218A04A72016FEF4	= 090
7032	: 3DF77542F7754486	= 1105	7632	: 63B87546B15A2259	= 815	8232	: 0400A48B20A7800C	= 773	8832	: 86756C270A86756E	= 865
7040	: 7561B77543B77545	= 950	7640	: C6203DF07560F675	= 1120	8240	: 05E025F65C100E27	= 801	8840	: 810226E016FFBCB6	= 1051
7048	: CE75308D18CECE75	= 1113	7648	: 62B0325CC006F175	= 985	8248	: 10313F26FCC10F75	= 663	8848	: 756E010226D816FF	= 889
7056	: 32B018CE8601B775	= 904	7656	: 46251EF075465434	= 732	8256	: E639B032483A100E	= 808	8856	: 02B6756E01021027	= 773
7064	: 50B775547F75747F	= 951	7664	: C30602F375601F01	= 691	8264	: 16B28F00A6A6041C	= 883	8864	: FFA9B10127D120C6	= 1032
7072	: 75597F755B7F755D	= 878	7672	: B635A71F6B50A704	= 930	8272	: FEBDAD8D3510BF00	= 1065	8872	: 7F756B7F756C7F75	= 747
7080	: 7F755F8E7551CC19	= 908	7680	: B610308900C8B01D	= 745	8280	: A639RE00A634100E	= 789	8880	: 60C1042706A6C962	= 816
7088	: 1EA704E702A704E7	= 964	7688	: 9EF675625658F875	= 1163	8288	: 161EDF00A6A6041C	= 735	8888	: 802004A6C962C004	= 953
7096	: 06B603B77550B775	= 831	7696	: 46C170221C54544F	= 692	8296	: FEBDAD8D3510BF00	= 1065	8896	: 30811026037C756D	= 504
7104	: 5AB644B77576B775	= 1043	7712	: B635A7018605A704	= 825	8304	: A639BE1680100E06	= 607	8904	: A6C962A0840F8105	= 706
7112	: C0B6EAB776BF7F75	= 1296	7720	: 8604308900C8B01D	= 733	8312	: 594FF67538C10427	= 823	8912	: 26837C756CA6C962	= 855
7120	: 677F75687F797D7F	= 951	7728	: 9E397F754610B675	= 804	8320	: 0AC103270CC10227	= 491	8920	: A0B4C0814026037C	= 842
7128	: 797EB604B7755CB7	= 960	7736	: 50B00E7C7546B675	= 845	8328	: 13201CEB4EFA420	= 884	8928	: 756B86756D271CB6	= 801
7136	: 755E861F877552B7	= 941	7744	: 463122B1756625F1	= 827	8336	: 05CE0000EFA4EE84	= 984	8936	: 756CB8756B010227	= 806
7144	: 7556598E0720100E	= 599	7752	: 39A621C6203DC306	= 748	8344	: EF222005CE0000EF	= 755	8944	: 5381012735C10327	= 540
7152	: 69A0EC81EDA10C12	= 1186	7760	: 001F01A63F3A026F	= 426	8352	: 22EE84EF242005CE	= 922	8952	: 056C2116FE766A21	= 679
7160	: 0025F7397C7560B6	= 868	7768	: 3F1F10E33F1F0135	= 405	8360	: 0000EF244C3402B6	= 539	8960	: 16FE71B6756C270C	= 047
7168	: 7560011B1025FF4E	= 755	7776	: 02A73F4F3080E034	= 771	8368	: 01870600350231A0	= 462	8968	: 86756B2714B6756E	= 874
7176	: 7C75618602B77560	= 870	7784	: 02EC89627ED01FEC	= 1104	8376	: 203002010525BE39	= 500	8976	: 010226008602A728	= 525
7184	: 16FF43B6755F3402	= 792	7792	: 096281E00135024C	= 733	8384	: C63F34026F3FA621	= 656	8984	: 8603A726A0A16FE	= 891
7192	: 86207F755FF67561	= 965	7800	: 308820810525E830	= 667	8392	: C16203DC30600E33F	= 702	8992	: 538601A7286C2716	= 596
7200	: 3DC30600F3755F1F	= 748	7808	: 8880A62926037E1E	= 668	8400	: 1F833502A73F397F	= 503	9000	: FEAAB6756C270A86	= 966
7208	: 0235082B7755F39A	= 675	7816	: 9F7E1E89F179951F	= 1027	8408	: 75707C799AB799A4	= 1085	9008	: 756E010226E016FF	= 708
7216	: A4B0D0A6218D09A6	= 833	7824	: 22068E7C757591F	= 671	8416	: 81799725007F799A	= 896	9016	: BC86756E01021027	= 783
7224	: 22B0D5A6230D0139	= 580	7832	: A68962BFA78B3FA6	= 1124	8424	: 8D1E32B675702703	= 722	9024	: F7F320D086756E81	= 1212
7232	: 81A02611815526D0	= 619	7840	: 040403BA1539A704	= 030	8432	: 8D1E32B675702703	= 722	9032	: 021027FFA8B01127	= 649
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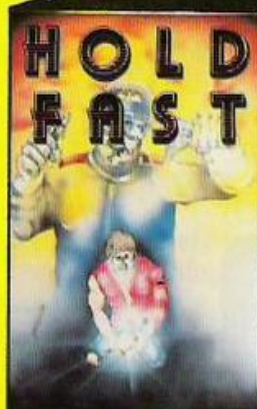
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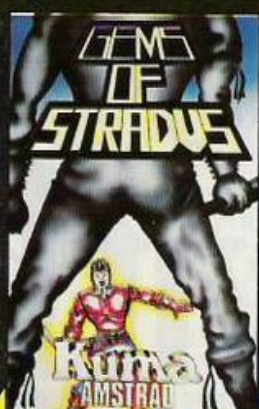
# Kuma

## AMSTRAD CPC464

software



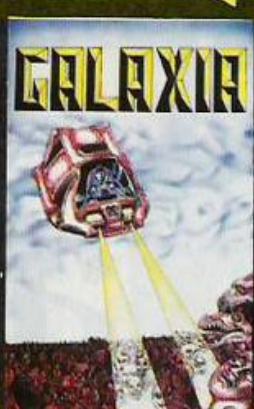
Holdfast



Gems of Stradus



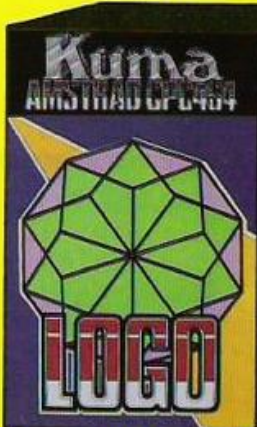
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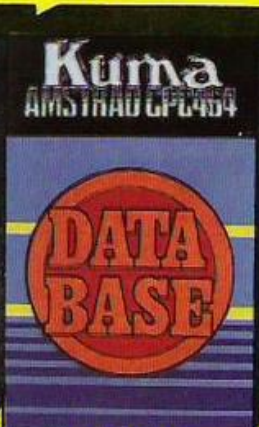
Galaxia



Music Composer



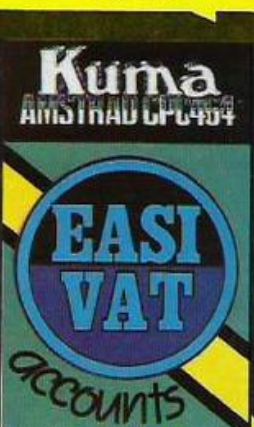
Logo



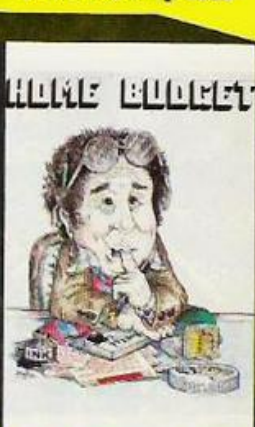
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complete with colour monitor (CTM640)

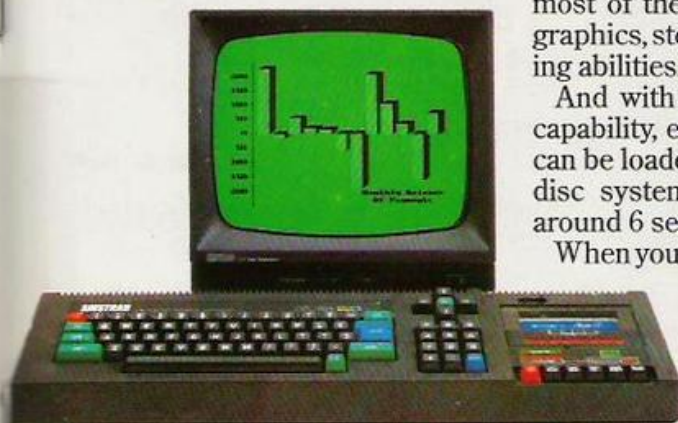


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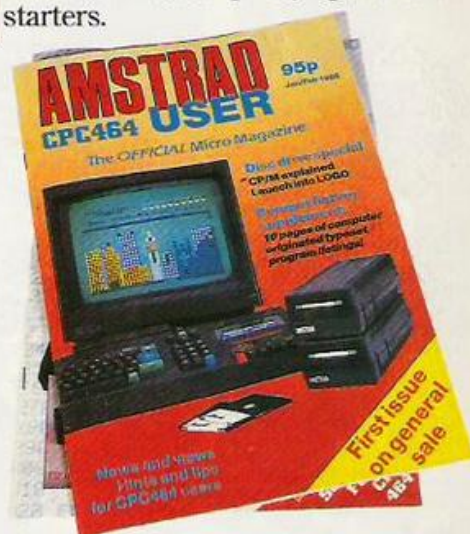
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## AMSTRAD

### CPC 464

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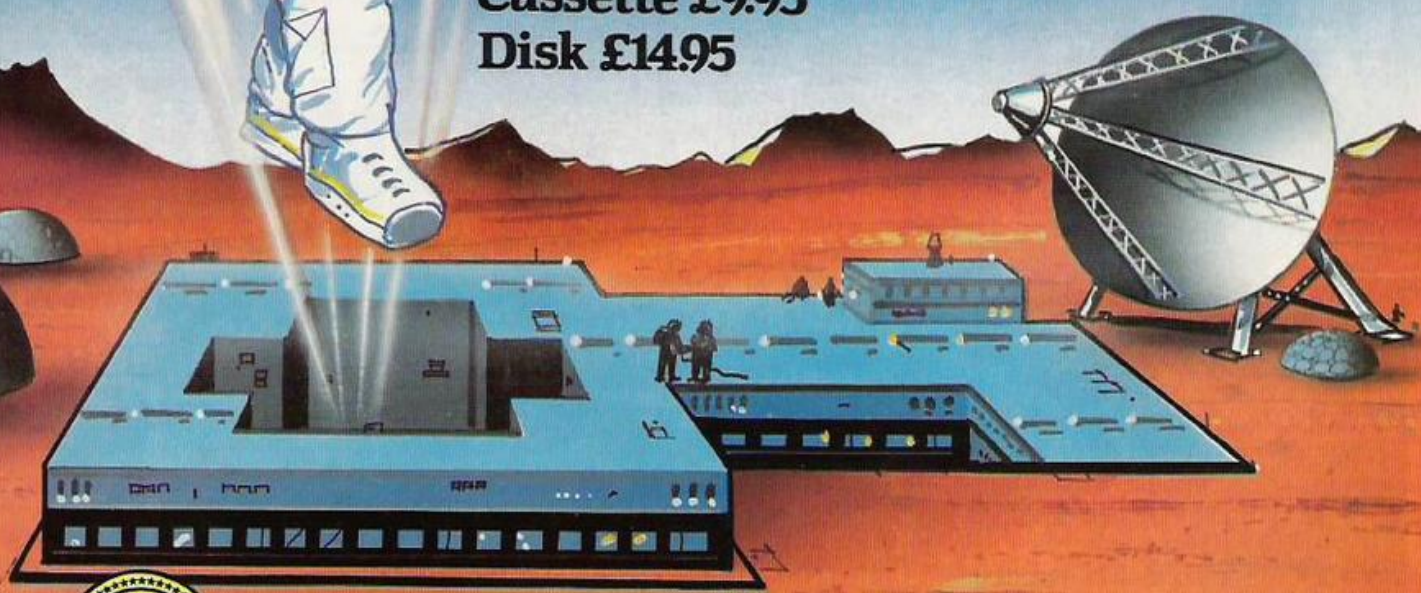
back-pack system which will make you invisible and indestructible for short periods of time. You must succeed, the future of the human race depends on you alone!

4

ATARI



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# Memory Map (in Hex)

## Start Finish Comments

0800	0FFF	Character set 1.
1000	17FF	Characters for planet animation.
1800	10FF	Characters for landscape.
1E00	23FF	Colours for landscape.
2400	37FF	Sprite data.
3800	3FFF	Character set 2.
4000	7BC8	Main machine code with various data in between, this includes data for music and different sheets and text.

# Entry points to important routines

Address (Hex)	Purpose of Routine/Description
410D	Start of interrupt routine.
4256	Start of music operating system.
43A9	Animation of satellites.
443A	Animation of planet characters.
4580	Clear screen downwards.
45EC	Clear screen upwards.
476B	Scroll planet left.
481A	Scroll planet right.
4909	Start of a series of sprite manipulation routines.
4AF0	Start of first title screen.
5352	Start of second title screen.
5307	Set up registers for a new

5590	game.
559E	Plot landscape on screen.
56FE	Explode ship on to the screen.
5838	Handle joystick control.
592F	Set up registers for another go, after losing a life.
5989	Plot satellites on screen.
5AA1	Clear satellites on screen.
5B6D	Handle the bullets from your ship.
5FE6	Handle junkies, troopers and stormers.
6032	Put sprites on screen if within range.
60D7	Plot multicoloured block on radar.
6770	Clear radar.
	Begin game.



# SPACE JUNK

## Nalin Sharma continues his excellent shoot'em up for the CBM-64.

SPACE JUNK WAS written with an assembler and it took about three months. Also I used a variety of graphics programs to produce the characters, sprites and animation.

The actual code for the gameplay is something extra special because it is almost entirely raster-interrupt driven. This accounts for the ultra-smooth graphics. Why? Because the interval between graphic movements is always equal and this makes the graphics very slick indeed. The sound effects during play and the music soundtrack are also interrupt-driven which make them far more effective.

A disassembly of the code would obviously be beyond the scope of this magazine, so instead I will give a basic breakdown of the program consisting of a rough memory map and the addresses of various important routines such as the scrolling — see memory map.

I very much hope that the memory map together with the entry points to important routines will prove both interesting and useful. I also hope that it gives you an insight into the depth and complexity of the task of writing a machine-code game of this length.

## Listing 3.

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1950: 1C1FD4207D797A7A 319	1A58: 77EDD8C9CCCFD2C6 638	1B70: F2F2F2F2F2F2F2F2 6A9	1C88: 2020202020202020 14F
1958: 797E20D7C8CED1C5 51D	1A60: C9CCCFD2C6C9CCCF 660	1B78: 2020F7F7F7F7F7F7 60A	1C90: 2020202020202020 14F
1960: C8C8CED1C5C8C8CE 658	1A68: D2C6C9CCCFD2C6C9 65D	1B80: F7F7F7F7F7F7F7F7 60A	1C98: 2020202020202020 37B
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19B0: 2020202020202020 23A	1AB8: 2020202020202020 175	1BD0: 8084848820202020 290	1CE8: 2020202020202020 1E0
19B8: 2020202020202020 1C5	1AC0: 2020202020202020 100	1BD8: 2020202020202020 100	1CF0: 0A68202020202020 132
19C0: 9AEEFEFEFEFEFEFE 532	1AC8: 98EEEEEEEE9D2020 100	1BE0: 2020202020202020 100	1CF8: 2020202020202020 2F5
19C8: 2020202020202020 1C6	1AD0: 2020202020202020 100	1BE8: 2072202020202020 1F3	1D00: 2020202020202020 14C
19D0: 9420202020202020 208	1AD8: 9532020202020202 2B2	1BF0: 0908692020202020 0DE	1D08: 202020121416181A 0CE
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	1B48: 8084848488202020 150	1C60: F3F3F3F3F3F3F3F3 61B	1D78: F9F9F9F9F9F9F9F9 7C8
	1B50: 2020702020202020 150	1C68: F3F3F3F3F3F3F3F3 783	
	1B58: 20DAF2F2F2F2F2F2 6A6		

(continued on page 87)



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## THE ULTIMATE CHALLENGE!



B  
S

C  
T



(continued from page 85)

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2998: 0000000000000000 000	2E80: 0000000000000000 000	3098: DAAFFC3DAAFFC3D 741	3298: 41203589A8330084 2A4
2998: 0000000000000000 000	2E88: 0000000000000000 000	3098: FFFC3DAAFFC3DAAFF 740	3298: 89A8A83534412059 283
2998: 0000000000000000 000	2E90: 0000000000000000 000	3098: DAAFFC3DAAFFC3D 741	3298: 4C44412023313530 1A8
2998: 0000000000000000 000	2E98: 0000000000000000 000	3098: FFFC3DAAFFC3DAAFF 740	3298: 009E348E8A535441 2D2
2998: 0000000000000000 000	2EA0: 0000000000000000 000	3098: DAAFFC3DAAFFC3D 741	3298: 205989A835008B34 2F0
2998: 0000000000000000 000	2EA8: 0000000000000000 000	3098: FFFC3DAAFFC3DAAFF 740	3298: 938A535441205989 320
2998: 0000000000000000 000	2EB0: 0000000000000000 000	3098: DAAFFC3DAAFFC3D 741	3298: A836008634988A4C 338
2998: 0000000000000000 000	2EB8: 0000000000000000 000	3098: FFFC3DAAFFC3DAAFF 740	3298: 444120233500FF34 230
2998: 0000000000000000 000	2EC0: 0000000000000000 000	3098: DAAFFC3DAAFFC3D 741	3298: 908A535441204849 2C0
2998: 0000000000000000 000	2EC8: 0000000000000000 000	3098: FFFC3DAAFFC3DAAFF 740	3298: 34A28A4C44412023 274
2998: 0000000000000000 000	2ED0: 0000000000000000 000	3098: DAAFFC3DAAFFC3D 741	3298: 3300E334A78A5354 322
2998: 0000000000000000 000	2ED8: 0000000000000000 000	3098: FFFC3DAAFFC3DAAFF 740	3298: 4120484947484889 282
2998: 0000000000000000 000	2EE0: 0000000000000000 000	3098: DAAFFC3DAAFFC3D 741	3298: A83400EE34AC8A4C 382
2998: 0000000000000000 000	2EE8: 0000000000000000 000	3098: FFFC3DAAFFC3DAAFF 740	3298: 444120233500FF34 230
2998: 0000000000000000 000	2EF0: 0000000000000000 000	3098: DAAFFC3DAAFFC3D 741	
2998: 0000000000000000 000	2EF8: 0000000000000000 000	3098: FFFC3DAAFFC3DAAFF 740	
2998: 0000000000000000 000	2F00: 0000000000000000 000	3098: DAAFFC3DAAFFC3D 741	
2998: 0000000000000000 000	2F08: 0000000000000000 000	3098: FFFC3DAAFFC3DAAFF 740	



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Table 1.  
Examples of  
use of  
VDU 23, 2,

Text parameters				Graphics parameters			
Text area		Text colours		Graphics area		Graphics colours	
Start	End	Fore-ground	Back-ground	Start	End	Fore-ground	Back-ground
TXS,	TXF,	TFC,	TBC,	GCS,	GCF,	GFC,	GBC
VDU 23, 2,	0,	24,	129,	130,	255,	0,	0,
Start at line 0 end at line 24 i.e. cover all screen with text colour				Ignore graphics parameters — no part of screen is given graphics colouring			
Red foreground background							
VDU 23, 2,	255,	0,	0,	0,	24,	145,	151
Ignore text parameters no part of screen will have text colours — all screen can be used for graphics				Start at line 0 end at line 24 i.e. cover all screen in graphics colour			
				Red foreground background			
VDU 23, 2,	0,	4,	131,	132,	5,	24,	146,
Start text at line 0 and end at line 4 — small text area for messages				Start graphics at 5 end at 24 — most of screen is for graphics			
Yellow Blue fore- back-ground ground				Green Yellow fore- back-ground ground			
VDU 23, 2,	0,	24,	131,	0,	255,	0,	0,
Start at line 0 end at line 24 — text covers all screen				Ignore graphics parameters			
Yellow Default fore- back-ground ground colour i.e. black							

Teletext colour control codes.

Text colours	Graphics colours
129 Red	145
130 Green	146
131 Yellow	147
132 Blue	148
133 Magenta	149
134 Cyan	150
135 White	151

IN MODES 3, 6 and 7 on the BBC Micro and Electron you can't use graphics commands. Modes 3 and 6 would be much more attractive if graphics were available, especially if there were no ugly stripes between lines. The use of graphics in Mode 7 requires tedious calculations and the awkward manipulation of teletext codes — a plot command would make things much easier.

With this in mind I decided to provide some graphics commands for these modes. The commands automatically adjust for the different modes and are Tube-compatible.

The screen resolutions are as follows:

Mode	X range	Y range
3	0 to 639	0 to 199
6	0 to 319	0 to 199
7	0 to 73	0 to 74

Mode 3 thus offers a similar resolution to Mode 0, and Mode 6 offers a similar resolution to Mode 4 but both at a saving of 4K. The new commands will accept any of the usually allowed variables as parameters.

PLOT 69,X,Y

sets pixels at given co-ordinates to current foreground colour. Unplotting is achieved by

plotting in the background graphics colour which should always be

GCOL0

The foreground graphics colour may be changed by means of the usual GCOL command — see page 262 of the user guide.

GCOLx,1

sets foreground graphics colour and

GCOLx,0

sets background graphics colour.

GCOL0,x

sets ordinary plot mode,

GCOL1,x

sets Or plot mode,

GCOL2,x

sets And plot mode, and

GCOL3,x

sets EOr plot mode, and

GCOL4,x

sets inverse mode. The Colour command must not be used to change actual screen colours but the VDU19 command should be used if the new Plot commands are to work properly.

In Mode 7 \*FX1,x determines whether Plotting will set or clear pixels. Plotting after

# BBC

Chris Bowerman's  
routine allows graphics  
in Modes 3, 6 and 7.



Table 2.

Machine code routine to read status of  
pixel stored at PX and PX + 1 and PY.  
PX = &8D:PY = &8F

```
[...]
.readpoint
LDA #&60:STAParameter:LDA #4:
STAParameter + 1:LDA PX:JSRpoke
INCParameter:LDA PX + 1:JSRpoke
LDA #&64:
STAParameter:LDAPY:JSRpoke
JSRpoint:RTS
A contains state of pixel
[...]
```

1. Store the low byte of the X co-ordinate at PX.
2. Store the high byte of the X co-ordinate at PX + 1.
3. Store the Y co-ordinate at PY.
4. A jump to subroutine 'readpoint' — i.e. JSR readpoint — will return the status of the pixel — 0, 1, or - 1 — in the accumulator.

\*FX1,1 will set pixels and Plotting after \*FX1,0 will clear them.

A new VDU command has been provided to colour the Mode 7 screen until it is next coloured — this command is VDU23,2 <text start line>, <text finish line>, <teletext foreground colour>, <teletext background colour>, <graphics start line>, <graphics finish line>, <teletext graphics foreground colour>, <teletext graphics background colour>.

The command colours the screen in two sections: a text section from the text start line to the text finish line <in the teletext foreground and background colours passed to it, and a graphics section in the graphics foreground and background colours sent to it.

The text or graphics areas may be as little as one line or may cover the whole screen. The start and finish lines are vertical screen "y" co-ordinates — as used by Tab(X,Y) — from the origin at the top-left of the screen.

If the text start line is set to 255 then the text parameters will be ignored and only the graphics background area will be coloured — this allows the screen to be used for graphics



# GRAPHICS

only. Similarly if the graphics start line is set to 255, the graphics parameters will be ignored and only the text area will be coloured by the text commands.

The text colours are the usual teletext alpha colours, i.e., 129 to 134 — see user guide page 151 — and the graphics colours are determined by the usual teletext graphics colour code numbers in the range 145 to 151 — user guide page 155.

If the command sets text foreground colour to 0, the routine will set foreground to white. If the background colour is set to 0 by the command the routine will set the background to black. This also applies to the graphics foreground and background colours. For examples of the use of the command see table 1.

To enable printer graphics dumps and area fill algorithms I have also supplied a Point(X,Y) type command. It works in all modes, as do the other commands and returns 0 if the pixel is off, 1 if the pixel is on, and -1 — i.e., 255 — if the pixel is off the screen. The command is:

X% = <X co-ordinate> : Y% = <y co-ordinate> :

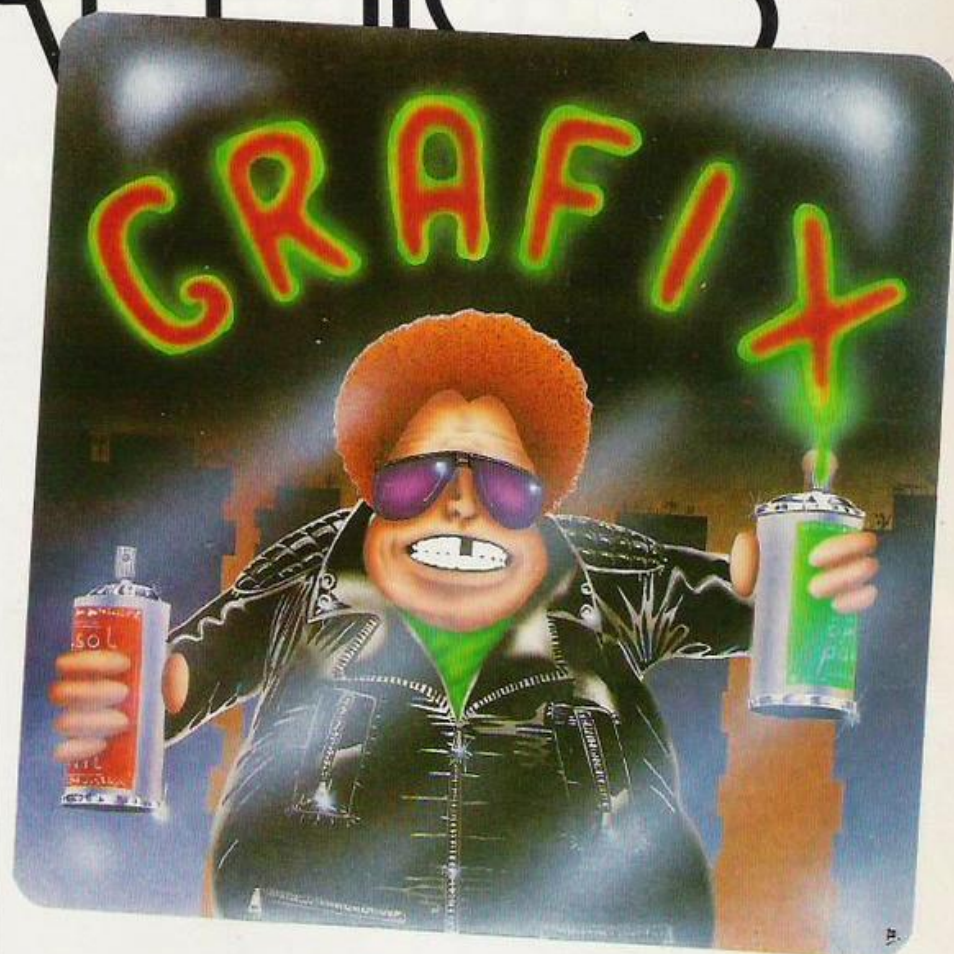
COLOUR = (USR(Point) AND 255)

The state of the pixel will be returned in the variable Colour. The resident integer variables X% and Y% must contain the X and Y co-ordinates respectively of the pixel to be examined before the USR call is made. The new Plot commands may be accessed from machine code in the normal way by sending the equivalent bytes to OSWRCH of the VDU25,69,xlo,xhi,ylo,yhi command.

The Point routine may also be accessed from machine code. The assembly language given in table 2 returns the state of the pixel whose co-ordinates are stored at PX and PX+1, PY in the accumulator. To use the new Plot commands or the point subroutine the machine code in listing 1 must be merged with your own code — user guide page 402.

To start you off with graphics in these modes I have provided a set of procedures to use in all of them. Merge them into your own programs as needed:

- **PROCDRAW(X1,Y1,X2,Y2)** draws a line from co-ordinate (X1,Y1) to (X2,Y2).
- **PROCBOX(X,Y,L1,L2)** draws a box with its left-hand bottom corner at (X,Y) with a width of L1 pixels and height of L2 pixels.
- **PROCELIPSE(X,Y,L,INC,MF1,MF2)** plots a circle or ellipse from (X,Y) with a radius of L and, for ellipses, tilted INC degrees clockwise. MF1 is a modifying factor in the X direction and MF2 for the Y direction. This allows ellipses to be stretched or squashed. MF factors of 1 allow true circles in modes with square pixels, e.g., Mode 6. Factors less than one will squash circles and factors greater than 1 will stretch circles.
- **PROCPAINT (X,Y)** flood-fills a shape,



with the currently selected graphics colour, to a boundary. It commences filling from the point (X,Y).

- **PROC\_DUMP** is a printer graphics dump for the Seikosha GP-100A printer.

For other printers your favourite Mode 0 and 4 dumps should work in Modes 3 and 6 with little modification. The principal difference is that the screen resolution is equal to the actual number of screen pixels. Therefore the number of pixels stepped in the X and Y directions should be 1. The actual number of pixels in the Y direction is only 199, not 256 as in Modes 4 and 0. Any Point (X,Y) statements should be converted to their equivalent USR call given.

The routines can easily be extended by assembly language programmers, so here is how they work. The Plot commands work by intercepting the VDU vector — advanced user guide, page 261. On entry to the vector the carry flag is set if a VDU23,n, command occurred with n in the range 2 to 31.

If it did and n is equal to 2, control passes to vdu23 — my routine for colouring the Mode 7 screen.

This routine retrieves the parameters passed in the VDU call by using a Tube-compatible Peek and deposits them in the array vdu where it can manipulate them. It then clears the Mode 7 screen, prints the teletext codes down the left-hand side of the screen and sets

a text window to protect them.

If carry is not set a Plot command has occurred in a non-graphics mode and the accumulator will contain the plot number. If this number is 69 my routine is called else an error message is issued.

The plot routine first sets itself up according to whether it is in Mode 3, 6 or 7 and then examines the GCol colour by Peeking. It then sets its colour masks accordingly. The byte arrays Dimmed at the start of the program are multiplication and division tables to make plotting faster. The tables are mode specific and are therefore selected each time a new command is called.

If the routine is in Mode 7 it goes to the Mode 7 plot otherwise it goes to the mode 3/6 plot routine. The routine then calculates the address of the pixel to be set or cleared — depending on the current GCol — and ORs this with those currently set.

The point routine also sets itself up depending on the current mode and immediately transfers the contents of X/ and Y% to its own variables X1 and Y1. It then calls the routine it shares with the Plot commands to calculate the address of the pixel to be examined.

The accumulator is then loaded with a value depending on the state of the pixel returned  
(continued on next page)



by this routine before returning to Basic. You should note that the Mode 7 point routine will return the ascii value of the character at the co-ordinate if it is not a graphics character. This enables the user to avoid Plotting over control codes.

Finally, the demonstration program, listing 1, and a few cautions. Once Run the program repeats a graphics demonstration using most of the graphics procedures in mode 3 then 6 and then 7. Hitting any key, after the demonstration has finished in a particular mode, will send it on to the next mode.

The code assembles from &900 onwards — this may be inconvenient as no user-defined characters and no function keys may be defined. The code is relocatable and may be assembled at any address. It may alternatively be Dimmed as indicated on line 3060.

```

10HODET
150RM MODES, 6, 7 GRAPHICS
20RDM (c) 1994 Chris. Bowerman.
300HQX (200), QY (200)
40RPOCODE
50HODES:V0U23:0764:0:0:23:7607:0:0:23:1001:0:0:
0:19,0,1:0:19,1,7:0:PROCDemonstration(639,199)
60AA-GET
70HODES:V0U23:0764:0:0:23:7607:0:0:23:1001:0:0:
0:19,0,1:0:19,1,7:0:PROCDemonstration(319,199)
80AA-GET
90HODES:V0U23:2,235:0,0,0,0,24,591,597:*FX,1
100RPOCDemonstration(71,74)
110AA-GET
120END
130DEFPPOCODEparameter(xmax,ymax)
140FORM=0T0100:PLOT69,RND(xmax),RND(ymax):NEXT
150RPOBOX(0,0,xmax,ymax)
160RPOPIXELPSE(xmax/3,ymax/2,xmax/10,0,1,1):PROCLIPS
E(xmax/3,ymax/2,xmax/10,0,2,1):PROCLIPSE(xmax/3,ymax/
2,xmax/10,0,1,2)
170RPOBOX((xmax/3)*2,ymax/4,xmax/6,ymax/4)
180RPOPIXELPSE((xmax/3)*2,5,ymax/1,275,xmax/10,0,1,1)
190RPOPAINT((xmax/3)*2,5,1,ymax/1,275,1)
200ENDPROC
210DEFPPOCODE
220DIM TABLE48 49,TABLE08 49,parameter 4,dot 7,TABLE
74,4,dot 74,vdot 7
230!dot=00084201:dot!4=4010
240FORM=0 TO 49:TABLE487A=0:TABLE087A=0:NEXT
250C=1:FORA=0 TO 49:STEP2:C=C+1:val=C+40:TABLE487A=
val:MOD256:TABLE087A=(A+1)val:DIV256:NEXT
260C=1:FORA=0 TO 49:STEP2:C=C+1:val=C+40:TABLE087A=
val:MOD256:TABLE087A=(A+1)val:DIV256:NEXT
270C=25:FORA=0 TO 74:STEP3:C=C+1:TABLE77A=C:TABLE77(
A)=1:TABLE77(A+2)=C:NEXT
280C=1:FORA=0 TO 74:step=74-A:MOD5:NEXT
290line=570:table=671:save=673:value=674:work=676:is
creen=678:pixel=67A
300byte=679:temp=67C:mask=67D:n=640:y=646:x1=67E:y
1=680:tube=681:char=675
310for=671:out=677:index=678:yp=67A:xp=67B:chr=672:x
=673:ys=674:count=671:whi=672
320tube=235
330ifscreen=1 to 1:if screen< 0 then ox=0:lx=40
000:dx=0:dy=0:screen=32
340P=LX:LOPT=0X
350RPOjump1
360RPO=0:BNEnd:JHPVdu23
370end
380RTS
390jump1 CPM69:JHPDGO_on
400JHPerror
410_goto_on
420LDAT6A:LDA6A20:JSRFFF4
430TX X1:STYX1+1
440LDAT6A:LDA6A22:JSRFFF4
450STX Y1
460LDAT6A:JSRJSRFF4
470CPY#7:BNEnd:jumpplot7
480_jump CPM#3
490BNEnd_jump2
500JSRlighty
510JHPstart:JHPrest
520_jump CPM#6
530BNEnd_jump3
540JSRfourty
550JHPstart:JHPrest
560_jump5
570RTS
580_start LDA#F1:LDA#E:LDA#255:JSRFFF4
590CPY#0:BNEnd:colourzero:LDAT6A:STACarryon:LDA#120:STA
Carryon:LDA#0:STAConcal+1:JHPafter
600_colourzero LDA#L25:STACarryon:LDA#120:STA
Carryon:LDA#255:STAConcal+1
610_after LDA#160:LDA#0C9:JSRFFF4
620TXA:CPY#255:BNEnd:ys:JHPno
630_ys LDA#L25:STAHide
640_LDA#0:STAAesk
650_LDA#0:STAAesk
660_LDA#160:LDA#0B:JSRFFF4
670TXA:CPY#2:BNEnd_jump4
680CPY#0:BNEnd_jump5
690CPY#4:BNEnd_jump5
700_LDA#25:STAHide
710_LDA#FF:STAAesk
720_LDA#45:STAHide
730RTS
740_jump4 LDA#45:STAHide
750_LDA#FF:STAAesk
760_LDA#25:STAHide
770_ys RTS
780_no LDA#25:STAHide
790_LDA#FF:STAAesk
800_LDA#0:STAHide
810_LDA#160:LDA#0B:JSRFFF4
820TXA:CPY#2:BNEnd_jump6
830_LDA#25:STAHide
840RTS
850_jump6 CPM#3:BNEnd_jump7
860CPY#4:BNEnd:atbit
870_jump7 LDA#45:STAHide
880_lastbit RTS
890_rest JSRcalculate
900_LDA#0:STAParameter
910_LDA#0:STAParameter+1
920_LDA#pixel
930_hide EDAAesk
940_code DRAMbyte
950JHPpoke
960RTS
970_calculate LDA#199:SEC:SBCTY:STAAve
980_LDA#1:LDA#1:LDA#1:LDA#1:STAValue
990_LDA#1:AND#67
1000_LDA#1:ASLA:ASLA:ASLA:ASLA
1010_RDA#0:STAValue
1020_LDA#1+1
1030_LDA#1:LDA#1:LDA#1
1040_STAValue+1
1050_LDA#ave
1060_LDA#ave
1070_JHPwork
1080_ASLA
1090_STAWork
1100_TAY
1110_LDA#table,y
1120_STAWork
1130_TAY
1140_LDA#table,y
1150_STAWork+1
1160_LDA#value
1170_CLC
1180_ADRwork
1190_STAScreen
1200_LDA#value+1
1210_ADRwork+1
1220_STAScreen+1
1230_ASLA:ASLA:ASLA
1240_STASave
1250_LDA#1:LDA#1:LDA#1
1260_ASLA
1270_JHPwork
1280_ASLA
1290_STAWork
1300_TAY
1310_LDA#table,y
1320_STAWork
1330_TAY
1340_LDA#table,y
1350_STAWork+1
1360_LDA#value
1370_CLC
1380_ADRwork
1390_STAScreen
1400_LDA#value+1
1410_ADRwork+1
1420_STAScreen+1
1430_ASLA:ASLA:ASLA
1440_STASave
1450_LDA#1:LDA#1:LDA#1
1460_ASLA
1470_JHPwork
1480_ASLA
1490_STAWork
1500_TAY
1510_LDA#table,y
1520_STAWork
1530_TAY
1540_LDA#table,y
1550_STAWork+1
1560_LDA#value
1570_CLC
1580_ADRwork
1590_STAScreen
1600_LDA#value+1
1610_ADRwork+1
1620_STAScreen+1
1630_ASLA:ASLA:ASLA
1640_STASave
1650_LDA#1:LDA#1:LDA#1
1660_ASLA
1670_JHPwork
1680_ASLA
1690_STAWork
1700_TAY
1710_LDA#table,y
1720_STAWork
1730_TAY
1740_LDA#table,y
1750_STAWork+1
1760_LDA#value
1770_CLC
1780_ADRwork
1790_STAScreen
1800_LDA#value+1
1810_ADRwork+1
1820_STAScreen+1
1830_ASLA:ASLA:ASLA
1840_STASave
1850_LDA#1:LDA#1:LDA#1
1860_ASLA
1870_JHPwork
1880_ASLA
1890_STAWork
1900_TAY
1910_LDA#table,y
1920_STAWork
1930_TAY
1940_LDA#table,y
1950_STAWork+1
1960_LDA#value
1970_CLC
1980_ADRwork
1990_STAScreen
2000_LDA#value+1
2010_ADRwork+1
2020_STAScreen+1
2030_ASLA:ASLA:ASLA
2040_STASave
2050_LDA#1:LDA#1:LDA#1
2060_ASLA
2070_JHPwork
2080_ASLA
2090_STAWork
2100_TAY
2110_LDA#table,y
2120_STAWork
2130_TAY
2140_LDA#table,y
2150_STAWork+1
2160_LDA#value
2170_CLC
2180_ADRwork
2190_STAScreen
2200_LDA#value+1
2210_ADRwork+1
2220_STAScreen+1
2230_ASLA:ASLA:ASLA
2240_STASave
2250_LDA#1:LDA#1:LDA#1
2260_ASLA
2270_JHPwork
2280_ASLA
2290_STAWork
2300_TAY
2310_LDA#table,y
2320_STAWork
2330_TAY
2340_LDA#table,y
2350_STAWork+1
2360_LDA#value
2370_CLC
2380_ADRwork
2390_STAScreen
2400_LDA#value+1
2410_ADRwork+1
2420_STAScreen+1
2430_ASLA:ASLA:ASLA
2440_STASave
2450_LDA#1:LDA#1:LDA#1
2460_ASLA
2470_JHPwork
2480_ASLA
2490_STAWork
2500_TAY
2510_LDA#table,y
2520_STAWork
2530_TAY
2540_LDA#table,y
2550_STAWork+1
2560_LDA#value
2570_CLC
2580_ADRwork
2590_STAScreen
2600_LDA#value+1
2610_ADRwork+1
2620_STAScreen+1
2630_ASLA:ASLA:ASLA
2640_STASave
2650_LDA#1:LDA#1:LDA#1
2660_ASLA
2670_JHPwork
2680_ASLA
2690_STAWork
2700_TAY
2710_LDA#table,y
2720_STAWork
2730_TAY
2740_LDA#table,y
2750_STAWork+1
2760_LDA#value
2770_CLC
2780_ADRwork
2790_STAScreen
2800_LDA#value+1
2810_ADRwork+1
2820_STAScreen+1
2830_ASLA:ASLA:ASLA
2840_STASave
2850_LDA#1:LDA#1:LDA#1
2860_ASLA
2870_JHPwork
2880_ASLA
2890_STAWork
2900_TAY
2910_LDA#table,y
2920_STAWork
2930_TAY
2940_LDA#table,y
2950_STAWork+1
2960_LDA#value
2970_CLC
2980_ADRwork
2990_STAScreen
3000_LDA#value+1
3010_ADRwork+1
3020_STAScreen+1
3030_ASLA:ASLA:ASLA
3040_STASave
3050_LDA#1:LDA#1:LDA#1
3060_ASLA
3070_JHPwork
3080_ASLA
3090_STAWork
3100_TAY
3110_LDA#table,y
3120_STAWork
3130_TAY
3140_LDA#table,y
3150_STAWork+1
3160_LDA#value
3170_CLC
3180_ADRwork
3190_STAScreen
3200_LDA#value+1
3210_ADRwork+1
3220_STAScreen+1
3230_ASLA:ASLA:ASLA
3240_STASave
3250_LDA#1:LDA#1:LDA#1
3260_ASLA
3270_JHPwork
3280_ASLA
32
```



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## SPECTRUM INTERFACE

## SPECTRUM UPGRADE KIT

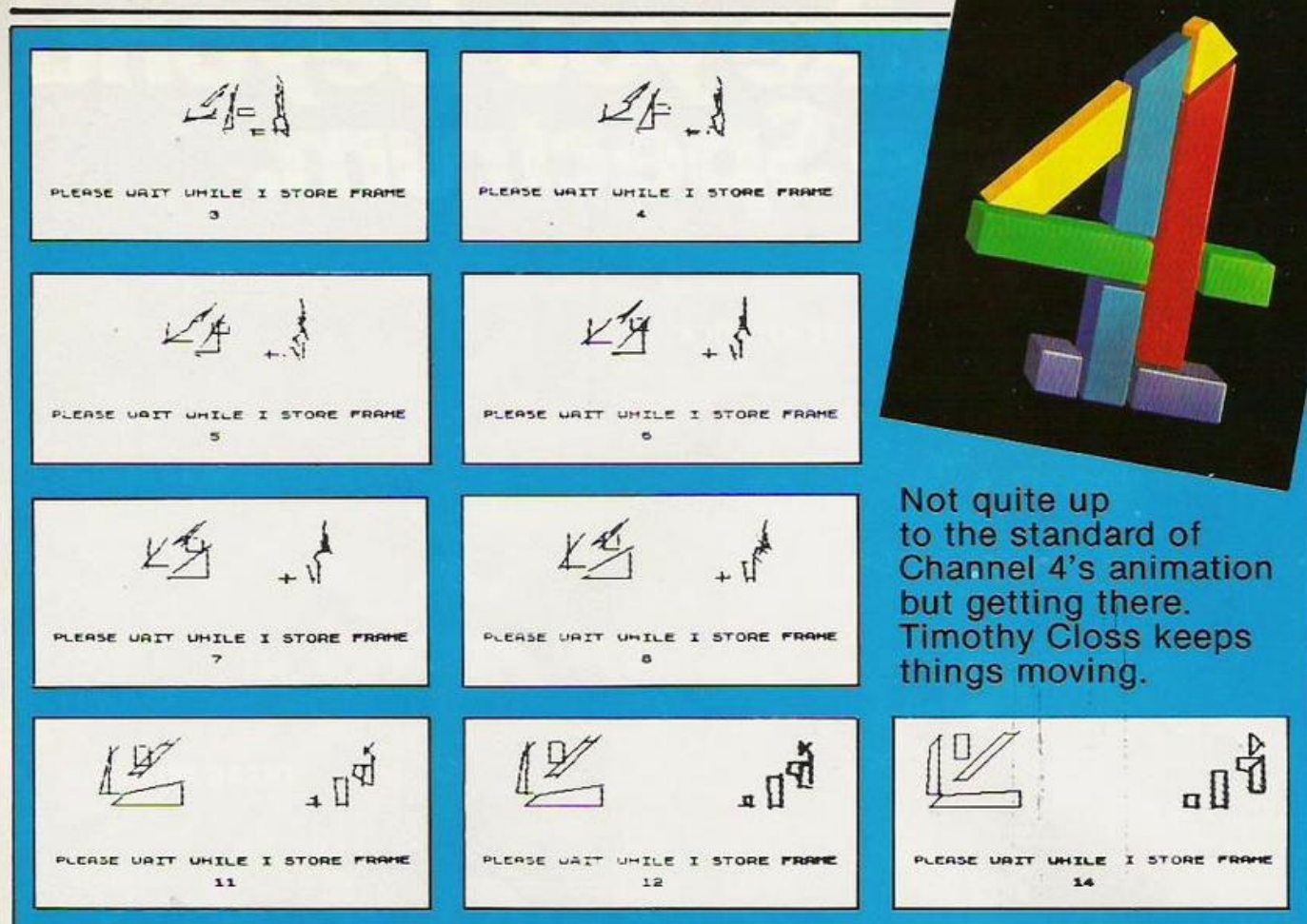
## TURBO INTERFACE

Trade and Export enquiries welcome.





Not quite up to the standard of Channel 4's animation but getting there. Timothy Cross keeps things moving.



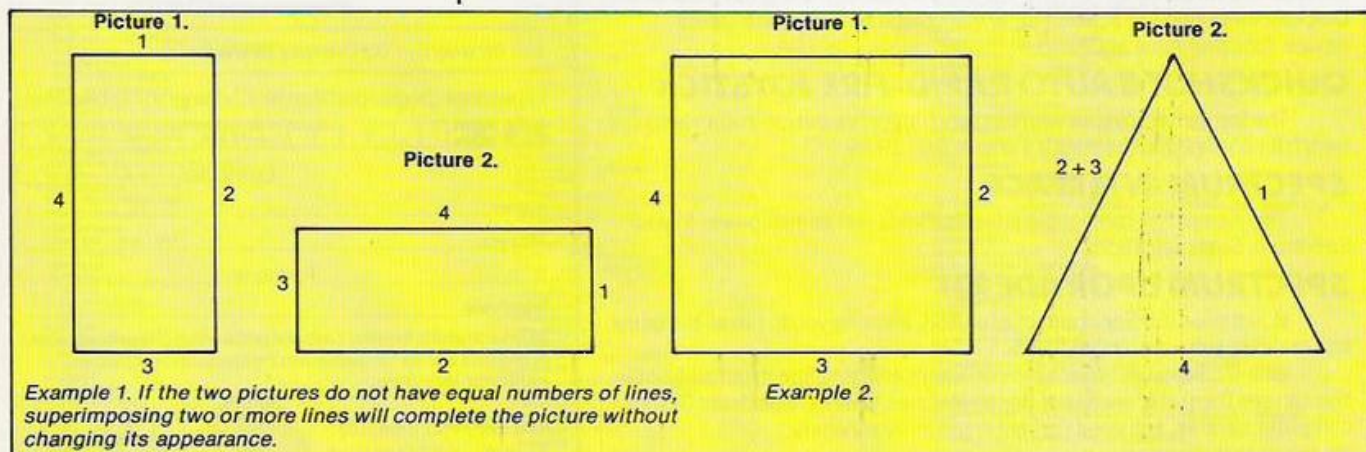
# PIKCHACHANJA

Available on



Telsoft.

# FOR YOUR SPECTRUM





```

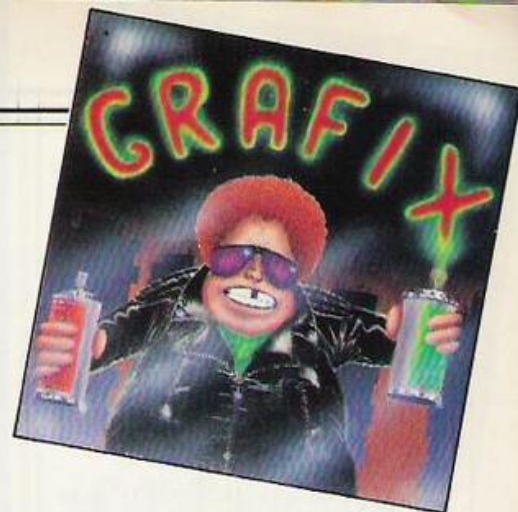
4 GO SUB 3500
5 POKE 23658,8: PAPER 7: INK
0: BORDER 7: BRIGHT 0: FLASH 0:
CLS
6 PRINT "PRESS S TO SAVE PRESENT
DATA": PRINT "
L TO LOAD DATA": PRINT "
A TO SEE ANIMATION": PRINT
: PRINT "
ANY OTHER KEY TO
CONTINUE"
7 PAUSE 0: IF INKEY$="L" THEN
GO TO 3400
8 IF INKEY$="S" THEN GO TO 33
00
9 IF INKEY$="A" THEN GO TO 30
00
10 CLS : LET KO=0: INPUT "NUMB
ER OF LINES ? ";N
11 DIM D(N): DIM E(N): DIM Z(N
): DIM V(N)
12 POKE 31000+N*8+1,N
17 LET Z=150: LET X=150
18 LET NN=10
20 FOR G=0 TO N-1
25 LET TI=1: GO SUB 2000: POKE
31000+G*4,Z: POKE 31000+G*4+1,X
: LET TI=2: GO SUB 2000: POKE 31
000+G*4+2,Z: POKE 31000+G*4+3,X
30 NEXT G
31 LET HU=USR 32024: LET HU=US
R 32036
32 FOR G=0 TO N-1
35 LET TI=1: GO SUB 2000: POKE
31000+N*4+G*4,Z: POKE 31000+N*4
+G*4+1,X: LET TI=2: GO SUB 2000:
POKE 31000+N*4+G*4+2,Z: POKE 31
000+N*4+G*4+3,X
40 NEXT G
41 FOR G=10 TO 20: BEEP .05,G:
NEXT G
42 CLS
50 FOR G=0 TO N-1
60 LET D(G+1)=(PEEK (31000+N*4
+G*4)-PEEK (31000+G*4))/14
70 LET E(G+1)=(PEEK (31000+N*4
+G*4+1)-PEEK (31000+G*4+1))/14
72 LET Z(G+1)=(PEEK (31000+N*4
+G*4+2)-PEEK (31000+G*4+2))/14
75 LET V(G+1)=(PEEK (31000+N*4
+G*4+3)-PEEK (31000+G*4+3))/14
76 NEXT G
80 DIM C(N): DIM U(N): DIM S(N
): DIM N(N)
90 FOR G=0 TO N-1: LET C(G+1)=
PEEK (31000+G*4): LET U(G+1)=PEE
K (31000+G*4+1): LET S(G+1)=PEEK
(31000+G*4+2): LET N(G+1)=PEEK
(31000+G*4+3)

```

```

100 NEXT G
105 LET NUM=128
110 FOR M=1 TO 15
115 PRINT AT 12,0:"PLEASE WAIT
WHILE I STORE FRAME ";AT 14,14;M
120 FOR G=1 TO N
130 PLOT C(G),U(G): DRAW S(G)-C
(G),N(G)-U(G)
140 NEXT G
150 FOR G=1 TO N
160 LET C(G)=C(G)+D(G)
170 LET U(G)=U(G)+E(G)
180 LET S(G)=S(G)+Z(G)
190 LET N(G)=N(G)+V(G)
200 NEXT G
205 POKE 32002,NUM: LET A=USR 3
2000
206 LET NUM=NUM+8
210 LET HU=USR 32036: NEXT M
211 CLS
215 GO TO 3000
220 GO TO 50
1000 FOR G=1 TO N: PRINT G;" ";:
PRINT X(G),Y(G),A(G),B(G)
1010 NEXT G
1020 STOP
2000 IF INKEY$="5" AND Z>NN-1 TH
EN LET Z=Z-NN
2005 IF KO=10 THEN GO TO 3210
2010 IF INKEY$="6" AND X>111+NN
THEN LET X=X-NN
2020 IF INKEY$="7" AND X<176-NN
THEN LET X=X+NN
2030 IF INKEY$="8" AND Z<256-NN
THEN LET Z=Z+NN
2035 IF INKEY$="1" THEN LET NN=1
2036 IF INKEY$="2" THEN LET NN=1
0
2040 IF INKEY$="0" THEN BEEP .2,
20: GO TO 3230
2045 IF INKEY$="9" THEN BEEP .2,
25: PLOT Z,X: DRAW LZ-Z,LX-X: GO
TO 3200
2050 PLOT Z,X
2052 PRINT AT 10,0:"X COORD - ";
Z;" ";AT 10,16:"Y COORD - ";X;"
";AT 12,8:"JUMP VALUE - ";NN;" "
2053 PRINT AT 14,8:"LINE NUMBER
- ";G;" ";PAUSE 0
2055 OVER 1: PLOT Z,X: OVER 0
2060 GO TO 2000
3000 FOR H=1 TO 20: NEXT H: FOR
G=1 TO 15
3010 POKE 32017,G*8+120: LET A=U
SR 32012
3011 IF INKEY$<>" " THEN GO TO 5
3015 PAUSE 2
3020 NEXT G

```



```

3030 PAUSE 20
3040 FOR G=15 TO 1 STEP -1
3050 POKE 32017,G*8+120: LET A=U
SR 32012
3051 IF INKEY$<>" " THEN GO TO 5
3055 PAUSE 2
3060 NEXT G
3070 PAUSE 5
3080 GO TO 3000
3200 LET NZ=Z: LET NX=X: LET Z=L
Z: LET X=LX: LET KO=10: RETURN
3210 LET Z=NZ: LET X=NX: LET LZ=
Z: LET LX=X: LET KO=0: RETURN
3230 IF TI=2 THEN PLOT Z,X: DRAW
LZ-Z,LX-X
3240 LET LZ=Z: LET LX=X: RETURN
3300 CLS : INPUT "NAME OF FILE ?
";N$: IF LEN (N$)>10 THEN GO TO
3300
3310 POKE 30999,N: SAVE N$CODE 3
0999,N*8+1
3320 VERIFY N$CODE
3330 GO TO 5
3400 CLS : INPUT "FILE NAME ? ";
N$: IF LEN (N$)>10 THEN GO TO 34
00
3410 LOAD N$CODE
3411 LET N=PEEK (30999): DIM D(N
): DIM E(N): DIM Z(N): DIM V(N)
3420 GO TO 41
3500 FOR G=32000 TO 32049: READ
A: POKE G,A: NEXT G
3505 RESTORE
3510 RETURN
3520 DATA 17,0,240,33,0,64,1,0,8
,237,176,201,17,0,64,33,0,208,1,
0,8,237,176,201,17,0,80,33,0,64,
1,0,8,237,176,201,33,0,64,54,0,1
7,1,64,1,255,7,237,176,201

```

THANKS TO A technique like the one American animation experts use, Pikchachanja allows one picture to be transformed into another in a smooth, 15-frame animation sequence.

The pictures consist of a series of straight lines, with each line having a partner in the other picture. By changing each line into its partner you can achieve up to 125 lines, and by pairing lines differently the animation can be changed, so prior planning can add a lot to the finished product.

When you've finished typing in the program, run it and you'll see the main menu:

```

PRESS S TO SAVE PRESENT DATA
L TO LOAD DATA
A TO SEE ANIMATION
ANY OTHER KEY TO CONTINUE

```

Press any key other than S, L and A and the computer will ask how many lines are required in the pictures—it must be the same number for each picture as every line must have one partner, but see note with example 1.

The screen will then clear and the cursor will appear, together with information concerning the cursor position, the number of

lines entered and the present cursor jump in pixels.

The pictures are confined to the upper third of the screen for memory reasons. Now you can enter the first picture lines in one of two ways:

1. Plot a point, move cursor and plot another point. A line is drawn from one point to the other.
2. Draw a line from the last point plotted on the previous line to the cursor.

Apart from using the cursor keys to move the cursor, here are the other controls:

- 1 sets cursor jump to one pixel
- 2 sets cursor jump to 10 pixels
- 0 plots a point
- 9 draws a line from last point plotted

When all the lines have been entered, a short beep transfers the first picture to the lower third of the screen. Now you can draw the second picture in the same way, entering lines in the appropriate order so that pairing is automatic.

The Spectrum will then proceed to draw up each intermediate frame on the screen and store them in its memory. When all 15 frames have been stored, the screen will clear and the

pictures are transformed back and forth in a smooth sequence, during which the main menu can be recalled by the touch of a button.

The Spectrum will then proceed to draw up each intermediate frame on the screen and store them in its memory. When all 15 frames have been stored, the screen will clear and the pictures are transformed back and forth in a smooth sequence, during which the main menu can be recalled by the touch of a button.

The data held in the computer can be saved by pressing S while the main menu is displayed.

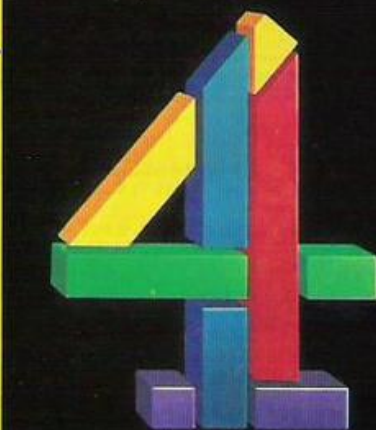
Data can be loaded by pressing L while the menu is displayed. Having entered the file name the Spectrum will search for the file and, if found, will begin to draw up the frames and store them in its memory as mentioned earlier. The animation sequence present in memory can be viewed by pressing A.

For a copy of Pikchachanja together with many other novel applications, contact me at 5 Western Drive, Shepperton, Middlesex, TW17 8HJ. Simply send a blank tape and an SAE together with 99p for recorded data which can be loaded directly into your Spectrum.



# Listing 1.

```
5 s=7497:en=8017:sm=0:chk=69229:q$=chr$(34)
10 for x=sto:en:ead: poke x,a
20 sm=sat:next
30 if sm<chk then print "data error":end
100 d$="1" : nom$="d$="8" for disk ***
110 print "8" : "q$="cart" : q$d$
120 poke 631,19: poke 632,131: poke 198,2
130 end
10000 data 165, 248, 74, 74, 41, 254
10010 data 168, 185, 236, 30, 133, 252
10020 data 185, 235, 30, 133, 251, 165
10030 data 248, 41, 7, 168, 165, 250
10040 data 41, 7, 170, 165, 250, 41
10050 data 248, 24, 101, 251, 133, 251
10060 data 165, 252, 101, 249, 133, 252
10070 data 96, 32, 73, 29, 189, 29
10080 data 31, 17, 251, 145, 251, 96
10090 data 32, 73, 29, 189, 37, 31
10100 data 49, 251, 145, 251, 96, 169
10110 data 0, 133, 249, 133, 251, 169
10120 data 32, 133, 252, 165, 250, 10
10130 data 10, 10, 24, 105, 64, 133
10140 data 250, 160, 0, 177, 251, 145
10150 data 24, 169, 0, 145, 251, 230
10160 data 249, 230, 251, 208, 242, 230
10170 data 250, 230, 252, 165, 252, 201
10180 data 40, 208, 232, 96, 165, 1
10190 data 41, 254, 133, 1, 169, 0
10200 data 133, 249, 133, 251, 169, 32
10210 data 133, 252, 165, 250, 10, 10
10220 data 10, 24, 105, 64, 133, 250
10230 data 160, 0, 177, 249, 145, 251
10240 data 230, 249, 230, 251, 148, 246
10250 data 230, 250, 230, 252, 165, 252
10260 data 201, 40, 208, 236, 165, 1
10270 data 9, 1, 133, 1, 96, 169
10280 data 0, 133, 251, 169, 32, 133
10290 data 252, 169, 192, 133, 249, 169
10300 data 40, 133, 250, 160, 0, 177
10310 data 251, 145, 249, 165, 249, 24
10320 data 105, 1, 133, 249, 165, 250
10330 data 105, 0, 133, 250, 230, 251
10340 data 208, 235, 230, 252, 165, 252
10350 data 201, 40, 208, 227, 96, 32
10360 data 189, 30, 32, 162, 30, 120
10370 data 169, 81, 141, 20, 3, 169
10380 data 30, 141, 21, 3, 169, 1
10390 data 133, 247, 141, 26, 208, 173
10400 data 17, 208, 41, 127, 141, 17
10410 data 208, 169, 162, 141, 18, 208
10420 data 169, 255, 141, 25, 208, 169
10430 data 0, 141, 14, 220, 88, 96
10440 data 165, 247, 201, 2, 240, 36
10450 data 173, 17, 208, 41, 223, 141
10460 data 17, 208, 169, 21, 141, 24
10470 data 208, 230, 247, 169, 129, 141
10480 data 25, 208, 173, 17, 208, 41
10490 data 127, 141, 17, 208, 169, 49
10500 data 141, 18, 208, 76, 49, 234
10510 data 173, 17, 208, 9, 32, 141
10520 data 17, 208, 169, 29, 141, 24
10530 data 208, 196, 247, 169, 129, 141
10540 data 25, 208, 173, 17, 208, 41
10550 data 127, 141, 17, 208, 169, 162
10560 data 141, 18, 208, 104, 168, 104
10570 data 170, 104, 64, 169, 0, 133
10580 data 251, 169, 32, 133, 252, 160
10590 data 0, 169, 0, 145, 251, 230
10600 data 251, 208, 248, 230, 252, 165
10610 data 252, 201, 64, 208, 240, 96
10620 data 169, 0, 133, 251, 169, 4
10630 data 133, 252, 165, 249, 10, 10
10640 data 10, 10, 5, 248, 133, 248
10650 data 165, 248, 145, 251, 165, 251
10660 data 24, 105, 1, 133, 251, 165
10670 data 252, 105, 0, 133, 252, 201
10680 data 6, 208, 235, 165, 251, 201
10690 data 48, 208, 229, 96, 0, 32
10700 data 64, 33, 128, 34, 192, 35
```



# CBM-64 PIKCHAC

```
10710 data 0, 37, 64, 38, 128, 39
10720 data 192, 40, 0, 42, 64, 43
10730 data 128, 44, 192, 45, 0, 47
10740 data 64, 48, 128, 49, 192, 50
10750 data 0, 52, 64, 53, 128, 54
10760 data 192, 55, 0, 57, 64, 58
10770 data 128, 59, 192, 60, 0, 62
10780 data 128, 64, 32, 16, 8, 4
10790 data 2, 1, 127, 191, 223, 239
10800 data 247, 251, 253, 254, 120, 169
10810 data 49, 141, 20, 3, 169, 234
10820 data 141, 21, 3, 88, 169, 1
10830 data 141, 14, 220, 169, 21, 141
10840 data 24, 208, 173, 17, 208, 41
10850 data 223, 141, 17, 208, 169, 0
10860 data 141, 26, 208, 96, 253
```

## Listing 2.

```
10 POKE53281,15
40 POKE55,70:POKE51,70:POKE56,29
:POKE52,29:CLR
50 POKE650,128
58 MOVEDN=7664
60 LODFRAME=7689
62 PLOT=7540
64 SAVFRAME=7562
66 UNPLOT=7551
68 SETUP=7712
70 ZP=240
80 N=70
100 REM** X,Y = LAST POINT **
110 REM** X1,Y1 = NEXT POINT **
120 REM** T=TANGENT Y'/X' **
150 REM** N = NUMBER OF POINTS *
*
160 REM** DI = PIXEL INCREMENTS
**
165 REM** F = NUMBER OF FRAMES *
*
170 REM**
175 REM**
180 REM**
185 REM**
200 DIMA%(N,4)
210 FORCP=0TON:FORJ=0TO4
220 A%(CP,J)=0:NEXT: NEXT
```

Channel 4 spent £50,000 to get that pixel-spinning logo. Nalin Sharma adapts Tim Closs' program for an economy version for your CBM-64.

SO IMPRESSED were we by Timothy Closs' Pikchachanja program for the Spectrum — on page 94 — that we asked Nalin Sharma to convert it for the CBM-64. His version works in the same way as the Spectrum program except that it offers 18 rather than 15 frames

```
230 X=50:X1=X:Y=25:Y1=Y:DI=5:F=1
7
240 PRINT "*****
1=DRAW PICTURES"
250 POKEZP,1:POKEZP+1,0:SYS SETU
P:REM***PAPER(ZP)***INK(ZP+1)***
270 PRINT" 2=SAVE DATA
"
280 PRINT" 3=LOAD DATA
"
290 PRINT" 4=SEE ANIMA
TION"
300 GETAS:IFAS=""THEN300
310 A=VAL(AS):IFA<10RA>4THEN300
313 PRINT"U":POKEZP,1:POKEZP+1,0
:SYS SETUP:REM***PAPER(ZP)***INK
(ZP+1)***
317 C=X:D=Y:GOSUB1000
320 ON A GOSUB2910,4000,5000,600
0
330 GOTO400
350 END
360 REM ***
365 REM *** DRAW 1ST PICTURE ***
368 REM ***
370 FORCP=0TON:PRINT"*****
*****"TAB(25)CP"II " :PRINTTAB(25
)DI"II "
400 GOSUB700
405 IFAS="E"THEN 405:REM**FINISH
**
410 IFAS="I"THEN 450:REM**LINE(F
5)***
415 REM*** HANDLE PLOT (F1) ***
420 C=X1:D=Y1:GOSUB1000
430 A%(CP,4)=0:REM**JUST PLOT**
440 GOTO480
445 REM*** HANDLE LINE (F5) ***
450 IF CP=0THEN420:REM**CHECK**
455 GOSUB800
460 A%(CP,4)=1:REM**PLOT & LINE*
*
480 X=X1:Y=Y1:A%(CP,0)=X:A%(CP,1
)=Y:NEXT
485 A%(CP,4)=2:CP=N+1:RETURN
492 REM ***
495 REM *** DRAW LAST PICTURE **
```



of animation.

When the program is run, a menu appears with four options: 1 Draw Picture; 2 Save Data; 3 Load Data; 4 See Animation. Details of these options are given below. For a more general introduction to this cartoon facility you are advised to consult Timothy Closs' article.

Controls for drawing are:

- A/Z = Up/Down
- Cursor up/Cursor left = Left/Right
- \* = Decrease Pixel Jump
- ↑ = Increase Pixel Jump
- £ = Finish
- F1 = Plot Point
- F5 = Draw line from last point

Once the £ key has been pressed, you must draw the last picture using the same number of points. However, this time the £, F1 and F5 keys will have the same function — either a point will be plotted, a line will be drawn or the program will return to the menu according to how the first picture was drawn. Once completed, the program will draw and store frames 1 to 16 and will then return to the

menu.

**Save data** — saves the contents of the array A% (CP,G) to tape or disc. Then it returns you to the menu.

**Load data** — loads data from tape or disc, and then draws or stores frames 0-17, followed by a return to the menu.

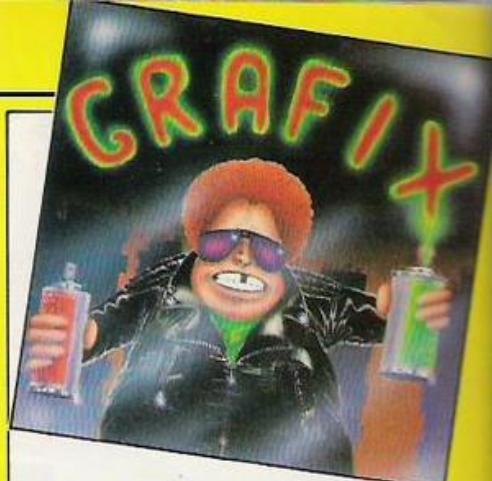
**See animation** — shows all 18 frames in forward and then backward sequence. This continues until Return is pressed.

To enter the program:

1. Type in listing 1 — check and alter for cassette/disc and then save "CLOADER".
2. Type in listing 2 — check and save "CART" after "CLOADER". Please note in line 80 in listing 2, N is the maximum number of points available. It can be increased from 70 by cutting out all the Rem statements. Each frame takes up 2,048 bytes. Four frames are stored under the Basic Rom.

Memory map.

\$0800—\$1D45 = Basic program  
\$1D49—\$1F51 = Machine code  
\$2000—\$3FFF = Hi-res screen  
\$4000—\$CFFF = Storage for 18 frames



# 4 CHANJA

```

*
498 REM ***
500 FORCP=0TON:PRINT"*****
*****"TAB(25)CP"II":PRINTTAB(25
)DI"II"
510 IFAX(CP,4)=2THEN620
520 GOSUB700
530 IFAX(CP,4)=1THEN590
540 REM*** HANDLE PLOT (F1) ***
550 C=X1:D=Y1:GOSUB1000
570 GOT0610
580 REM*** HANDLE LINE (F5) ***
590 IFCP=0THEN550:REM**CHECK**
595 GOSUB
610 X=X1:Y=Y1:AX(CP,2)=X:AX(CP,3
)=Y:NEXT
620 CP=N+1:RETURN
632 REM ***
696 REM *** GET KEY SUB ***
699 REM ***
700 GETAS:IFAS=""THEN700
705 C=X1:D=Y1:GOSUB2000:REM**UNP
LOT**
710 IFAS="A"THENY1=Y1-DI:GOT0774
:REM **UP**
720 IFAS="Z"THENY1=Y1+DI:GOT0776
:REM **DN**
730 IFAS="J"THENX1=X1+DI:GOT0772
:REM **RT**
740 IFAS="K"THENX1=X1-DI:GOT0770
:REM **LF**
750 IFAS=" "ORAS="I"ORAS="E"THEN
RETURN:REM **F1=PLOT & F5=LINE
& £=FINISH **
755 IFAS="*"THENDI=DI-1:IFDI<1TH
ENDI=1
760 IFAS="+"THENDI=DI+1:IFDI>10T
HENDI=10
762 PRINTTAB(25)DI"II"
765 C=X1:D=Y1:GOSUB1000:GOT0700
770 IFX1<0THENX1=319:GOT0702
772 IFX1>319THENX1=0:GOT0702
774 IFY1<0THENY1=0:GOT0702
776 IFY1>47THENY1=47:GOT0702
782 C=X1:D=Y1:GOSUB1000:REM**PLO
T**
784 GOT0700
790 REM ***
799 REM *** DRAW LINE SUB ***

```

```

800 IF X1=X THEN 865
805 IF Y1=Y THEN 900
810 T=(Y1-Y)/(X1-X):H=SQR((X1-X)
^2+(Y1-Y)^2)
820 S=(X1-X)/H:REM **AUTO STEP D
IFF**
830 FORI=XTOX1STEP S
840 Y3=INT(Y+(T*(I-X))+.5)
850 C=I:D=Y3:GOSUB1000
860 NEXT:RETURN
862 REM *** HORIZONTAL LINE ***
865 IF Y1=Y THEN RETURN
870 FOR Y3=YTOY1STEP SGN(Y1-Y)
880 C=X:D=Y3:GOSUB1000
890 NEXT:RETURN
895 REM *** VERTICAL LINE ***
900 FOR I=XTOX1STEP SGN(X1-X)
910 C=I:D=Y:GOSUB1000
920 NEXT:RETURN
990 REM*** PLOT SUB ***(C,D)***
1000 POKEZP,D:POKEZP+1,0:IFC<256
THEN1020
1010 POKEZP+1,1:C=C-256
1020 POKEZP+2,C:SYSLOT:RETURN
1990 REM*** UNPLOT SUB ***(C,D)*
**
2000 POKEZP,D:POKEZP+1,0:IFC<256
THEN2020
2010 POKEZP+1,1:C=C-256
2020 POKEZP+2,C:SYSUNPLOT:RETURN
2900 REM*** DRAW PICTURES ***
2910 PRINT"*****
*****"
2920 PRINT"PIXEL JUMP
=□"
3000 GOSUB370:SYSMOVEDN
3010 POKEZP+2,0:SYSSAVFRAME
3016 C=X:D=Y:GOSUB1000
3020 GOSUB500
3030 POKEZP+2,17:SYSSAVFRAME
3090 FORW=1TO(F-1)
3100 FORCP=0TON
3110 IFAX(CP,4)=2THEN3105
3120 X1=AX(CP,0)+INT(((AX(CP,2)-
AX(CP,0))*W/17)+.5)
3130 Y1=AY(CP,1)+INT(((AY(CP,3)-
AY(CP,1))*W/17)+.5)

```

```

3140 IFAX(CP,4)=0THENC=X1:D=Y1:G
OSUB1000
3160 IFAX(CP,4)=1THENGOSUB800
3180 X=X1:Y=Y1:NEXT
3185 CP=N+1:SYSMOVEDN
3190 POKEZP+2,W:SYSSAVFRAME
3200 NEXTW:RETURN
3990 REM*** SAVE DATA ***
4000 SYS7981
4002 PRINT"*****
*****"SAV
ING DATA
4005 PRINT"ENTER FILE NAME"
4010 INPUTNMS
4020 PRINT"TAPE OR DISK?"
4030 GETXS:IFXS=""THEN4030
4040 IFXS="T"THEN4080
4050 IFXS="D"THEN4030
4060 OPEN1,8,4,"0:"NMS+",S,W"
4070 GOT04090
4080 OPEN1,1,1,NMS
4090 FORCP=0TON:FORG=0TO4
4100 BT=AX(CP,6):PRINT#1,BT
4110 NEXT
4120 NEXT:CLOSE1
4130 RETURN
4990 REM*** LOAD DATA ***
5000 SYS7981
5002 PRINT"*****
*****"LOA
DING DATA
5005 PRINT"ENTER FILE NAME"
5010 INPUTNMS
5020 PRINT"TAPE OR DISK?"
5030 GETXS:IFXS=""THEN5030
5040 IFXS="T"THEN5080
5050 IFXS="D"THEN5030
5060 OPEN1,8,4,"0:"NMS+",S,R"
5070 GOT05090
5080 OPEN1,1,0,NMS
5090 FORCP=0TON:FORG=0TO4
5100 INPUT#1,BT:AX(CP,6)=BT
5110 NEXT
5120 NEXT:CLOSE1
5125 POKEZP,1:POKEZP+1,0:SYS SET
UP
5130 FORW=0TOF
5140 FORCP=0TON
5150 IFAX(CP,4)=2THEN5210
5160 X1=AX(CP,0)+INT(((AX(CP,2)-
AX(CP,0))*W/17)+.5)
5170 Y1=AY(CP,1)+INT(((AY(CP,3)-
AY(CP,1))*W/17)+.5)
5180 IFAX(CP,4)=0THENC=X1:D=Y1:G
OSUB1000
5190 IFAX(CP,4)=1THENGOSUB800
5200 X=X1:Y=Y1:NEXT
5210 CP=N+1:SYSMOVEDN
5220 POKEZP+2,W:SYSSAVFRAME
5230 NEXTW:RETURN
5990 REM*** SEE ANIMATION ***
6000 PRINT"*****
*****"ANI
MATION
6005 FORW=0TOF
6010 POKEZP+2,W:SYSL0DFRAME
6030 NEXT
6035 GETAS:IFAS=CHR$(13)THENRETU
RN
6040 FORW=FT00STEP-1
6050 POKEZP+2,W:SYSL0DFRAME
6070 NEXT
6100 GOT06005

```



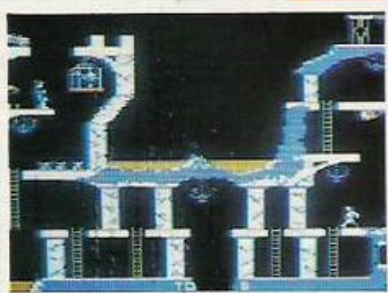
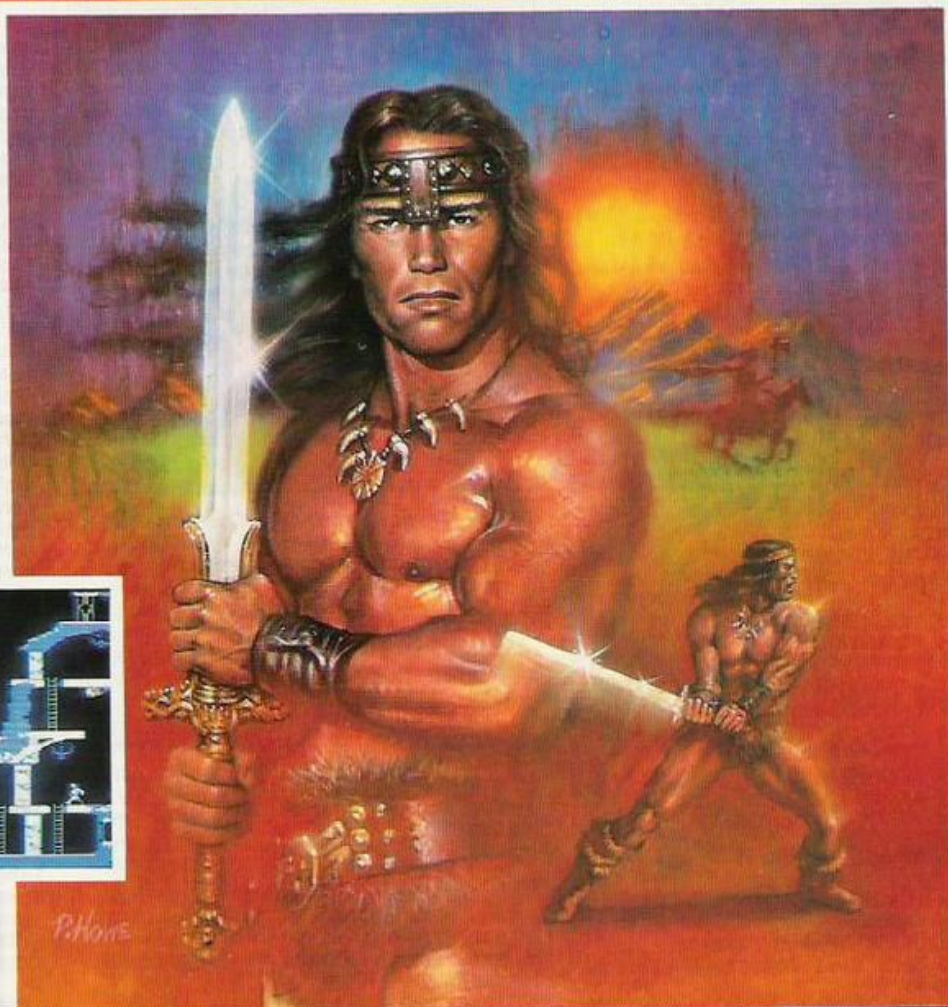
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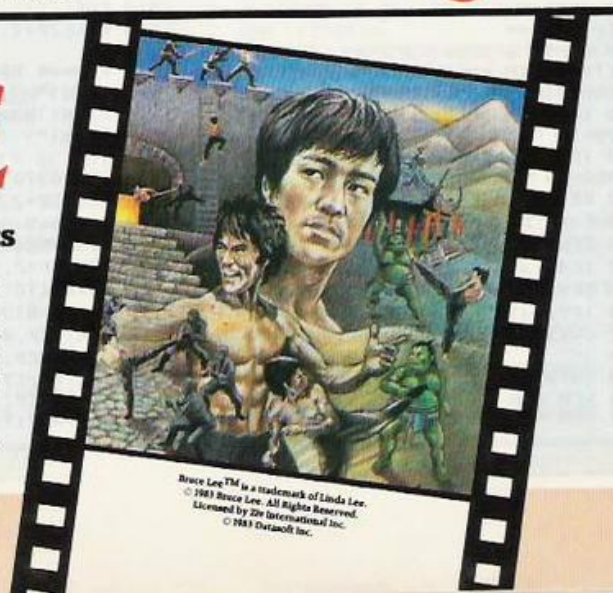
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Yee-ha! Git those screen blocks movin'.  
Mart Stenlake cuts  
those screen-handling  
problems down to size.



# ZX-81 SCREEN LASSO

Listing 1.  
Hex loader.

```

10 REM HEX LOADER
20 GOSUB 240
30 FOR N=S TO F STEP 8
40 SCROLL
50 LET T=0
60 PRINT N; "-";
70 INPUT A$
80 PRINT A$; "=";
90 INPUT TOT
100 PRINT TOT
110 LET Z=0
120 FOR K=1 TO LEN A$ STEP 2
130 LET C=(CODE A$(K)-28)*16
    + CODE A$(K+1)-28
140 LET T=T+C
150 POKE N+Z, C
160 LET Z=Z+1
170 NEXT K
180 IF TOT=T
    THEN
    GOTO 220
190 SCROLL
200 PRINT "ERROR -
    PLEASE INPUT
    AGAIN"
210 GOTO 40
220 NEXT N
230 STOP
240 PRINT "START ADDRESS"
250 INPUT S
260 PRINT "FINISH ADDRESS"
270 INPUT F
280 RETURN

```



SCREEN is a machine-code program for the 16K ZX-81, enabling the creation, editing, moving and storing of any rectangular block of the screen. The following facilities are included.

- Any block size from one character to a full screen may be defined on the screen.
- There is full on-screen editing, and all single characters — including graphics and inverse — are available directly from the keyboard.
- The whole block is stored in a Rem which is automatically adjusted in size.
- Cursor movement may be selected as either automatic increment which is useful for text input and character repeats, or cursor key dependent which will assist in the creation of graphic designs.

■ Once defined, the block may be moved on screen using the cursor keys. It may be erased, printed in its last position, or the print position may be altered to any part of the screen.

■ Also included is a fast screen clear.

Possible uses for Screen include creating and storing graphics pictures, animation of games, saving and printing text and data.

The program is 1,066 bytes long and is contained in two Rem statements. To enter the program, first type in 1 Rem and 535 characters. This is best done in fast mode, repeating one character until three short of a full line on the 17th line.

If correct, Print Peek 17049 should give 118. Edit this line to 2 Rem and delete four characters. Print Peek 17586 should give 118. Type in the hex loader program in listing 1.

Using this, first enter the machine code in listing 2 — start 16514, finish 17048. Then run again to enter listing 3 — start 17055, finish 17585.

To save time in the event of a crash it is wise to save the program at this stage.

Testing can only be effectively carried out by following the instructions.

If a crash or problems occur, then the machine code may be checked using the program in listing 4. Hold down any key and listing will progress. The program line following 2 Rem cannot be removed at any time, but it may be edited to a minimum length or used with this program, e.g., 3 Rem.

To enable the program to run, an existing Rem statement must be specified. The Rem (continued on page 101)



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```
10 MEMORY HIMEM-10
20 start=HIMEM+1
30 !ASSEMBLE, start
40 *get start
50 *limit &FFFF
60 *ORG start
70 *CP 10:SCF:RET Z
80 *RST 1,&B/F2
90 *ORG &BD2B
100 *JP start
110 *END
```

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(continued from page 99)

should initially contain no characters, and any line number, except 1 and 2 of course, may be used.

To specify the line number N, if N is less than 256, then enter:

POKE 17055, N

POKE 17056, 0 (DEFAULT 0)

If N is greater than 255 then enter:

POKE 17055, N - 256 \* INT (N/256)

POKE 17056, INT (N/256)

Call the program with Rand USR 17254.

When a Rem is used for the first time, key 1 must be pressed next to enter the edit screen mode. Subsequently, when a question mark appears in the bottom left-hand corner one of the following 1 to 6 functions may be selected by pressing the corresponding number key and 7 by pressing Newline.

1. Edit screen
2. Erase and move block
3. Move block without erase
4. Erase block
5. Erase screen
6. Print block
7. Return to Basic

Function 1 enables the editing of the whole screen, definition of the block size and copying the block into a Rem. The cursor position is shown by a flashing character, a blank will flash as a black square. This position may be moved anywhere on the screen using the cursor control keys with shift.

Moving horizontally, on reaching the end of a line, the next position will be at the opposite end of the next line vertically, depending on the direction of travel. Initially, when a character is entered the cursor will move to

the next print position thus allowing faster input of text and data and also resulting in character repeat at flash speed if the key is held down.

By pressing shift and function together, this automatic increment is cancelled and movement is by cursor control keys only. This will enable easier construction of graphic figures etc. Pressing shift and function again will return to automatic increment. The cursor will not move out of the confines of the screen.

The mode letter will appear in the bottom left-hand corner of the screen. Initially N, this indicates that the normal single-character face values of all keys are available. Pressing shift and graphics characters will have those as face value.

Shift and rub out will give an inverse I, indicating that all keys are now the inverse of face value. Shift and edit will return mode to N. The mode may be changed at any stage and in any sequence.

The definition of the print position and block size is achieved as follows. To the right of the mode letter is a number, 1-3, which indicates the next print position or block size value that is to be defined. A1 indicates the top left-hand corner of the block. To define this, move the cursor to the required position and press Newline. A2 will now appear, indicating that following this last procedure you may define the top right-hand corner of the block. A2 then indicates that you may define the height or number of lines in the block and only vertical movement is necessary for this.

Once the 3 has appeared, editing the screen can be carried out at any stage up to Newline,



when the block is copied into the designated Rem which is adjusted in size to suit.

Once entered, the whole procedure must be completed. Any attempt to define impossible positions in stages 2 and 3 will result in a return to stage 1, but all data on screen will be retained. The block size may range from a single character through any rectangular form to a full screen. After Newline on 3 there is a return to a choice of function.

On pressing the key, for function 2, "M.E." will appear in the bottom left-hand corner and the top left-hand corner character of the block will flash. Using Shift and the cursor keys the whole block is moved and the previous position is erased.

The block will disappear off the right-hand edge of the screen until the flashing character is at the extreme right. The next move will result in the whole block being printed one line down at the far left of the screen.

With left-hand movement the reverse will

(continued on next page)

#### Listing 2. 1 Rem.

16514 1D011E021F872004 = 264	16690 FE7928CDE147C640 = 1178	16874 ED52FD353DC901FA = 1138
16522 2105228323032485 = 410	16698 7838EC112100FE70 = 828	16882 02180301F802E52A = 551
16530 36813C822A073784 = 609	16706 2821FE712822FE72 = 882	16890 0C400977E1C93E15 = 713
16538 39063E862608380A = 371	16714 2823FE732824FE74 = 890	16898 4690D8233E1F4690 = 772
16546 29092B8A2C892D88 = 593	16722 28BDFE7528BCFE77 = 1201	16906 D8237E060190D83E = 806
16554 2A0C40233E33CDF5 = 716	16730 28BB3DFE7528023C = 761	16914 204690D8237E0601 = 630
16562 41CD29411803CD1A = 634	16738 C9C1C9CDE44118BF = 1308	16922 90D83E164690C9CD = 1064
16570 41FE7520F9CD2241 = 1021	16746 CDD64118BACDBE41 = 1154	16930 A142E506047E3DFE = 907
16578 3EAECDF541CD2941 = 1062	16754 18B5CDA94118B07E = 970	16938 75286A2310F7E1E5 = 1015
16586 1803CD1A41FE7720 = 728	16762 F5FE0028043E0018 = 629	16946 CD004230052E16CD = 597
16594 03CD2241E63FC680 = 926	16770 023E80770E300600 = 379	16954 BF42E146E5112100 = 831
16602 18F03EACCDF541CD = 1218	16778 10FE0D20F9F1770E = 938	16962 2A0C402378FE0028 = 567
16610 29411803CD1A41FE = 683	16786 30060010FE0D20F9 = 618	16970 031910FDEBE1234E = 870
16618 742003CD2241E506 = 690	16794 C9CDBB02444D5114 = 841	16978 EB09EB47234E237E = 824
16626 1621814023BE2328 = 548	16802 C8CDBD077E15C9FD = 1202	16986 23C9CD2142F5D504 = 1002
16634 0410F918017EE118 = 669	16810 7E3EFE1F2009CDD3 = 930	16994 C506007EFE76282B = 784
16642 E3211C413E00BE20 = 637	16818 41D823FD363EFF23 = 975	17002 EDA0E280421A3DFE = 1158
16650 023E0C77E11818C1 = 661	16826 FD343EC9FD7E3EFE = 1263	17010 75280218EE41237E = 647
16658 18C8C11897C118A8 = 977	16834 002009CDE141D82B = 795	17018 FE76281710F8C1D1 = 1101
16666 771800CDA9411807 = 613	16842 FD363E202BFD353E = 812	17026 F1EBD511210019EB = 999
16674 E3010700ED42E3CD = 970	16850 C9110000FD7E3DC6 = 856	17034 E13DC8F53E159038 = 1014
16682 7941E5CD9B4128DC = 1100	16858 EBD819FD343DC911 = 1060	17042 0418CBC1C1C1C9 = 1011
	16866 0000FD7E3DD601D8 = 871	



(continued from previous page)

occur. Also the block will disappear from the bottom of the screen, but only until the top line is on the bottom line of the screen. The print position is automatically altered so subsequent printing of the block will be in the last position. If the block is only partly shown on screen, the whole block is retained.

Newline will exit from the routine and return to the choice of function.

Function 3 is the same as function 2 except that the previous position is not erased. An M will appear at the bottom left-hand corner. Function 4 erases only the specified block. Function 5 fast-erases the whole screen. Function 6 prints the block at the specified position. Function 7 exits from the routine and returns to Basic control.

## Delete the hex loader

At this stage, if all of the routines have been checked then the hex loader program may be deleted but do not remove the line following line 2.

Several of the routines in the program may be used directly and therefore be of assistance in programs. Their addresses are as follows:

16554 Screen edit and block definition only  
16988 Prints block  
17057 Returns address of the first character in the designated Rem  
17197 Clears screen  
17216 Erases block

The following are useful addresses:

17254 Start of main program  
17055, 17056 Designate Rem — low, high  
16775, 16786 Flash speed — off, on

The Rem statements containing a block will

have an extra four characters at the beginning. The first two define the top left-hand corner of the block and use the same values as a Print At command. The third is the length of the line, width, and the fourth is the number of lines, height.

These numbers may be altered directly and a routine is included to find the address of the first number, therefore

LET X=USR 17057

will give X that value and so Poke X, Peek (X + 1) will print the block one step down the next time the print routine is called and Poke (X+1), Peek (X+1) + 1 will print the block one step to the right. A blank line included when the block is defined will provide trailing

### Listing 4. Hex check.

```
290 GOSUB 240
300 FOR A=S TO F STEP 8
310 SCROLL
320 PRINT A: " ";
330 IF INKEY$ = "" THEN GOTO 330
340 FOR G=0 TO 7
350 LET P=PEEK (A+G)
360 LET B=INT (P/16)
370 LET C=P-16*B
380 LET A$=CHR$(B+28)+CHR$(C+28)
390 PRINT A$;
400 NEXT G
410 NEXT A
```



blanks to erase the previous position. Out-of-range values will stop the program and give an error N.

The flash speed may be altered to suit you. The byte address 16775 controls the character off time and 16786 the on time. Initially both have the value 48 but may be Poked with any number between 1 and 255 — the larger, the slower.

## Controlled by timing

Other functions are controlled by this timing and so too fast a speed may result in loss of program control. Although the program is essentially crash-proof, beware of the following. When using a Rem for the first time, always use the Edit screen mode, key 1, first and do not use the program while scroll is effective.

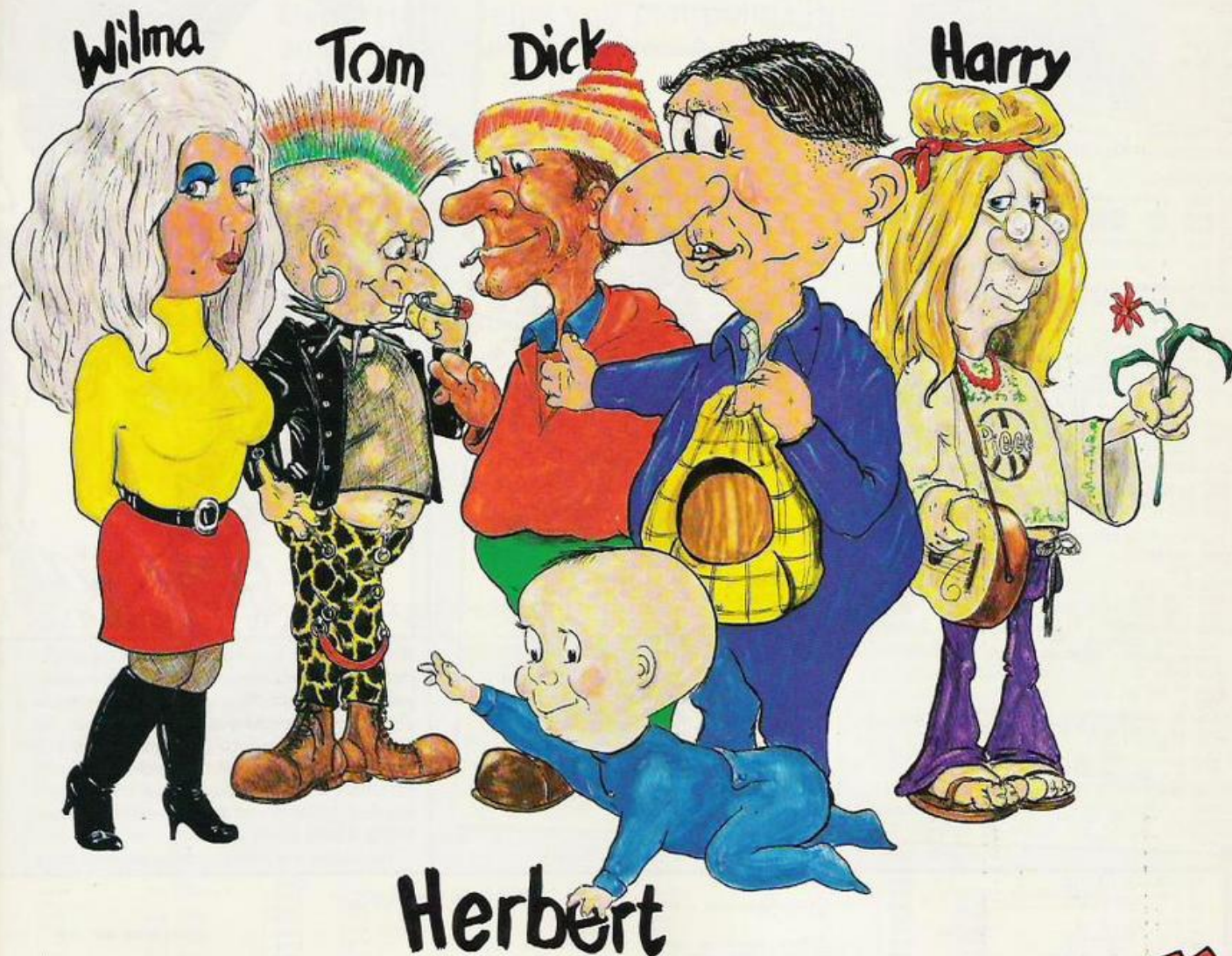
Cassette including a copy of Screen and a full renumber program may be obtained for £3 from E M Stenlake, 162 Brooks Lane, Whitwick, Leicester LE6 4DF.

### Listing 3. 2 Rem.

17055 0000217D40ED5B9F = 709	17231 7EFE76280210F6E1 = 1027	17415 4B1C400923A7ED72 = 729
17063 4246234EEBA7ED42 = 954	17239 19C1043E16903805 = 511	17423 300AE1D1732372CD = 961
17071 2816EB234E234609 = 524	17247 F13DC818E4C1C9CD = 1353	17431 230F1807060A3310 = 164
17079 237EFE7620E72E1A = 868	17255 5C42210000223D40 = 350	17439 FD1884ED4B41402A = 892
17087 FD7500ED7B0240C9 = 997	17263 3E00CDF0413E0FCD = 854	17447 3F40A7ED42E5282A = 908
17095 210300193EEABE20 = 579	17271 F541CD7941E5CD9B = 1290	17455 E5F5CDA1422A4140 = 1077
17103 ED23444DC93E2ACD = 927	17279 41E128F6FE1DCCA7 = 1230	17463 092B2BEB2A1C40A7 = 631
17111 F0410600180206C9 = 544	17287 43FE1ECCD442FE1F = 1118	17471 ED52444D03F1380A = 774
17119 213F43703E32CDF5 = 837	17295 CCDD42FE20CC4043 = 1112	17479 19D1EB19EB03EDB8 = 1153
17127 41CD5C42CDA1424E = 938	17303 FE21CC2D43FE2228 = 931	17487 1808E1D5EB19D1EB = 1174
17135 2346ED433D40CD21 = 772	17311 C63DFE7520C4C9E1 = 1284	17495 EDB0010209210C40 = 534
17143 42EBCD7941E5CD9B = 1281	17319 210000223D40CD5C = 489	17503 5E235623E5C5D5CD = 1094
17151 41E128F6112100FE = 880	17327 423E1DCDF041CDA = 1042	17511 A142D1C1A7ED5230 = 1163
17159 70CCE441FE71CCD6 = 1394	17335 40E5FD4E3EFD463D = 1070	17519 0FE1E3E519EBE1E3 = 1408
17167 41FE72CCBE41FE73 = 1261	17343 C53E1ECDF041CDAE = 1178	17527 2B722B7323231801 = 410
17175 CCA9413DFE75C8CD = 1275	17351 40C1FD7E3E9138D7 = 1114	17535 E110DD2129400D06 = 619
17183 3F43CDA142ED4B3D = 935	17359 5714C5D53E1FCDF0 = 1055	17543 0120D5CDA142C1D1 = 1080
17191 4071237018BB2A0C = 589	17367 41CDAE40D1C1FD7E = 1289	17551 722373D123722373 = 772
17199 40230E1606203600 = 227	17375 3D9038C33C5FD5C5 = 1021	17559 C506004A7B23D1E3 = 871
17207 2310FB230DC818F4 = 818	17383 435A160021000019 = 237	17567 19D1C5E5EDB00121 = 1107
17215 00CD2142EB041121 = 593	17391 10FD1E0619E5E522 = 822	17575 00E109C13D20F3CD = 968
17223 00F5C541E5360023 = 825	17399 3F40CDA1422B2B46 = 715	17583 2B0FC9 = 259
	17407 2B4EED434140E3ED = 1018	



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# QUICKPLOT

## Program 1.

```
10 REM *****
20 REM ** C64 QUICKPLOT **
30 REM ** G.HATTO JAN'85 **
40 REM *****
50 :
60 :
70 POKE631,131:POKE198,1
80 POKE64*256,0:POKE44,64:NEW
```

## Program 2.

```
10 REM *****
20 REM ** QUICKPLOT LOADER **
30 REM ** G.HATTO JAN'85 **
40 REM *****
50 :
60 :
70 MAXNUMBER = 40
80 DEF FN LINENUMBER(A) = PEEK(63)+PEEK(
64)*256
90 :
100 READ ADDRESS
110 FOR COUNT=1 TO MAXNUMBER:GOSUB 230:R
EAD CHECKSUM
120 IF SUM <> CHECKSUM THEN PRINT"CHECKS
UM ERROR IN ";FN LINENUMBER(0):END
130 L = FN LINENUMBER(0):PRINT L
140 IF ADDRESS <> L+B THEN PRINT"LINE NU
MBER";L;" NOT IN ORDER":END
150 NEXT COUNT
160 :
170 PRINT:PRINT" HIRES ="
180 PRINT" SYS4096,INK,PAPER,GCLEAR
"
190 PRINT:PRINT" PLOT ="
200 PRINT" SYS4318,X,Y,PLOT/UNPLOT"
210 END
220 :
230 SUM = 0
240 FOR I=1 TO 8:READ ENTRY#
250 GOSUB 310
260 POKE ADDRESS,ENTRY
270 ADDRESS = ADDRESS+1:SUM = SUM+ENTRY
280 NEXT I
290 RETURN
300 :
310 IF LEN(ENTRY#) <> 2 THEN 400
320 AS = RIGHT$(ENTRY#,1):GOSUB 360:ENTR
Y = V
330 AS = LEFT$(ENTRY#,1):GOSUB 360:ENTR
Y = ENTRY+V*16
340 RETURN
350 :
360 IF AS<"0" OR AS>"F" OR (AS>"9" AND A
```

```
$<"A") THEN 400
370 V = ASC(AS)-48+7*(AS>"9")
380 RETURN
390 :
400 PRINT"DATA ERROR IN ";FN LINENUMBER(
0):END
410 :
420 DATA 4096
4096 DATA AD,86,02,85,98,AD,21,D0,1011
4104 DATA 29,0F,85,9C,20,19,10,20,450
4112 DATA 62,10,20,9D,10,20,0A,10,505
4120 DATA 60,A0,00,A9,2C,D1,7A,D0,1000
4128 DATA 24,20,98,B7,86,9B,A0,00,855
4136 DATA A9,2C,D1,7A,D0,17,20,9B,962
4144 DATA B7,8A,29,0F,85,9C,A0,00,826
4152 DATA A9,2C,D1,7A,D0,07,20,9B,946
4160 DATA B7,E0,00,F0,03,20,49,10,771
4168 DATA 60,A9,00,A0,20,85,4E,84,800
4176 DATA 4F,A9,00,AA,AB,91,4E,C8,1009
4184 DATA D0,FB,E6,4F,E8,E0,20,D0,1464
4192 DATA F4,60,A5,9B,0A,0A,0A,0A,700
4200 DATA 05,9C,A0,00,99,00,00,99,635
4208 DATA 00,09,99,00,0A,99,00,00,1099
4216 DATA C0,D0,F1,60,A9,14,8D,10,1099
4224 DATA D0,AD,11,D0,29,0F,85,9B,767
4232 DATA D0,60,AD,1B,D0,29,0F,85,767
4240 DATA 28,8D,1B,D0,AD,11,D0,09,820
4248 DATA 28,8D,11,D0,60,7B,A9,D5,996
4256 DATA A0,10,8D,00,03,BC,01,03,829
4264 DATA A9,8A,A0,10,8D,14,03,BC,518
4272 DATA 15,03,5B,60,20,0A,10,4C,518
4280 DATA 31,EA,AS,C5,C5,FE,05,FE,1403
4288 DATA F0,0E,C9,03,D0,0A,AD,11,866
4296 DATA D0,29,20,F0,04,20,7C,10,697
4304 DATA 60,20,0A,10,60,0A,50,03,567
4312 DATA 20,7C,10,4C,8B,E3,20,FD,899
4320 DATA AE,20,EB,87,86,9B,20,F1,1186
4328 DATA B7,86,02,38,A9,C7,E5,9B,1127
4336 DATA D0,05,A2,0E,4C,D5,10,05,795
4344 DATA 9C,4A,4A,4A,AB,AS,15,4A,806
4352 DATA D0,F0,AS,14,90,06,2C,C2,1021
4360 DATA E1,D0,E7,18,29,FB,79,30,1154
4368 DATA 11,05,4E,AS,15,79,51,11,633
4376 DATA 85,4F,AS,9C,29,07,AB,AS,914
4384 DATA 14,29,07,AA,AS,02,F0,00,653
4392 DATA 8D,6A,11,11,4E,91,4E,60,766
4400 DATA 8D,72,11,31,4E,91,4E,60,766
4408 DATA 00,40,00,C0,00,40,80,C0,768
4416 DATA 00,40,00,C0,00,40,80,C0,768
4424 DATA 00,40,00,C0,00,40,80,C0,768
4432 DATA 00,20,21,22,23,25,26,27,248
4440 DATA 28,2A,2B,2C,2D,2F,30,31,358
4448 DATA 32,34,35,36,37,39,3A,3B,438
4456 DATA 3C,3E,80,40,20,10,00,04,374
4464 DATA 02,01,7F,BF,DF,EF,F7,FB,1281
4472 DATA FD,FE,00,00,00,00,00,00,507
```



When a BASIC error occurs in the high-resolution mode on some Basic extension packages, the resulting error message is displayed in an unreadable form because of the way in which the video chip works. This can be a real problem when developing Basic programs. It is also difficult to switch between one display mode and another without remembering a long series of Pokes.

The following machine-code program runs

## Assembly listing.

10 :PROG C64 QUICKPLOT G.HATTO	400 :	960 :	1440 :	RTS
20 :	490 :	970 :	1450 :	
30 :	500 :	980 :	1460 :	
40 :	510 :	990 :	1470 :	
50 :	520 :	1000 :	1480 :	**** SCREENDF ****
60 :	530 :	1010 :	1490 :	
70 :	540 :	1020 :	1500 :	SETS DEFAULT TEXT MODE.
80 :	550 :	1030 :	1510 :	
90 :	560 :	1040 :	1520 :	SCREENDF LDA #14
100 :	570 :	1050 :	1530 :	STA VIDEOCHIP+*10
110 :	580 :	1060 :	1540 :	LDA VIDEOCHIP+*11
120 :	590 :	1070 :	1550 :	AND #0F
130 :	600 :	1080 :	1560 :	STA VIDEOCHIP+*11
140 :	610 :	1090 :	1570 :	RTS
150 :	620 :	1100 :	1580 :	
160 :	630 :	1110 :	1590 :	SETS BITMAP MODE.
170 :	640 :	1120 :	1600 :	
180 :	650 :	1130 :	1610 :	SETBITMAP LDA VIDEOCHIP+*10
190 :	660 :	1140 :	1620 :	AND #0B
200 :	670 :	1150 :	1630 :	ORA #20
210 :	680 :	1160 :	1640 :	STA VIDEOCHIP+*10
220 :	690 :	1170 :	1650 :	
230 :	700 :	1180 :	1660 :	SETS BITMAP MODE.
240 :	710 :	1190 :	1670 :	
250 :	720 :	1200 :	1680 :	SETBITMAP LDA VIDEOCHIP+*10
260 :	730 :	1210 :	1690 :	AND #0B
270 :	740 :	1220 :	1700 :	ORA #20
280 :	750 :	1230 :	1710 :	STA VIDEOCHIP+*10
290 :	760 :	1240 :	1720 :	
300 :	770 :	1250 :	1730 :	LDA VIDEOCHIP+*11
310 :	780 :	1260 :	1740 :	ORA #20
320 :	790 :	1270 :	1750 :	STA VIDEOCHIP+*11
330 :	800 :	1280 :	1760 :	RTS
340 :	810 :	1290 :	1770 :	
350 :	820 :	1300 :	1780 :	**** SETVECTS ****
360 :	830 :	1310 :	1790 :	
370 :	840 :	1320 :	1800 :	
380 :	850 :	1330 :	1810 :	1840 CINV EOU #0314
390 :	860 :	1340 :	1820 :	1850 IERR EOU #0300
400 :	870 :	1350 :	1830 :	
410 :	880 :	1360 :	1840 :	
420 :	890 :	1370 :	1850 :	
430 :	900 :	1380 :	1860 :	1880 SETVECTS SEI
440 :	910 :	1390 :	1870 :	LDA #ERR
450 :	920 :	1400 :	1880 :	LDY IERR
460 :	930 :	1410 :	1890 :	STA IERR
470 :	940 :	1420 :	1900 :	
	950 :	1430 :	1910 :	



# Program 3.

```
10 REM *****
20 REM *
30 REM * QUICKPLOT DEMO GH'85 *
40 REM *
50 REM * ITERATIVE SOLUTION OF *
60 REM * 1-2*Y*Y/(X*X) *
70 REM *
80 REM *****
```

```
100 :
110 HIRES=4096:PLOT=4318
120 POKES3280,6:SYS HIRES,1,6,1
130 DEF FNA(X)=1-2*Y*Y/(X*X)
140 :
150 FOR X=0 TO 319 STEP 0.1
160 Y=FNA(X/1000+1)
170 SYS PLOT,X,100+85*Y,1
180 NEXT X
190 END
```

Geoff Hatto helps you plot points and switch quickly between hires and character displays.

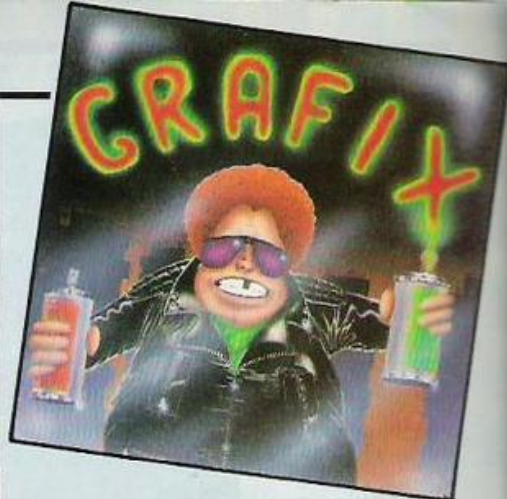


on a standard Commodore 64 computer and allows Basic to plot pixels on a high-resolution screen without any of these problems described. The first routine sets up the high-resolution display, IRQ and error handler. The second is the plot/unplot routine itself. To increase the overall speed of the pixel plotting, I chose a direct call to the machine-code routines, rather than trying to implement two new commands in Basic.

To initialise the high-resolution screen and the mode key — function key F7 — the following command is required;

SYS 4096, ink, paper, gclear

Where ink and paper are the colour values 0 to 15. A non-zero value for gclear will clear the high-resolution screen, a value of zero will leave the current screen intact. These parameters may be completely or partly eliminated to obtain default values — that is, SYS4096



would assume current screen editor colours and would clear the existing high-resolution screen. Gclear is assumed to be 1.

After this command has been issued, the function key F7 allows switching in and out of high-resolution mode — even if a Basic program is running. If any Basic error should occur, the screen will automatically revert to text mode, displaying the error message.

The plot command has the usual syntax, although all of the parameters must be specified:

SYS4318,x,y,p

Where x and y are the pixel co-ordinates and p is either zero, (unplot), or non-zero, plot.

To enter Quickplot, type in program 1 and save it, followed by program 2. Program 1 automatically loads and runs program 2. Simple error-checking is performed on program 2's data statements. If typing errors are found, they are reported and must be corrected. The final copy of program 2 is then resaved on tape.

Program 3 demonstrates the use of both the Hires and Plot facilities given by the quick-plot program. The demonstration will only work if programs 1 and 2 have been previously loaded and executed.

An assembly listing of the main program is also included and has been written in a structured manner to allow for future program development.

1920	STY IERR+1	2790	JSR SCREENDF	2860	STX Y	3330	LDA PLOTST
1930		2800	RTS	2870	JSR GETPLOTST	3340	BEG UNPLT
1940	LDA #IRQ	2810		2880	STX PLOTST	3350	
1950	LDY #IRQ	2820	JSR SETBITMAP	2890		3360	LDA TB1T1,X
1960	STA CINV	2830	RTS	2900		3370	ORA (MEM),Y
1970	STY CINV+1	2840		2910		3380	STA (MEM),Y
1980	CLI	2850		2920		3390	RTS
1990	RTS	2860		2930		3400	
2000		2870	**** ERR ****	2940	PLOT	3410	LDA TB1T2,X
2010		2880		2950	LDA #C7	3420	AND (MEM),Y
2020		2890		2960	SBC Y	3430	STA (MEM),Y
2030	**** IRQ ****	2900	MAIN ERROR HANDLER.	2970	BCC PTBLE	3440	RTS
2040		2910		2980		3450	
2050		2920		2990	ILLQUANT	3460	
2060	MAIN IRQ ROUTINE.	2930	TXA	3000	JMP ERR	3470	YTABLEL
2070		2940	BMI NOERR	3010		3480	DFB #00,#40,#80,#C0
2080		2950	JSR SCREENDF	3020	PTBLE	3490	DFB #00,#40,#80,#C0
2090	STDIR	2960		3030	LSR	3500	DFB #00,#40,#80,#C0
2100	EDU #EA31	2970	NOERR	3040	LSR	3510	DFB #00,#40,#80,#C0
2110		2980	JMP #E3B8	3050	TAY	3520	DFB #00,#40,#80,#C0
2120	IR	2990		3060		3530	DFB #00
2130	INDEXIT	3000		3070		3540	
2140		3010	**** PLOT ****	3080	LDA XH	3550	
2150		3020		3090	LSR	3560	YTABLEL
2160		3030		3100	BNE ILLQUANT	3570	DFB #0+2,#0+2
2170	**** F7CHECK ****	3040		3110		3580	DFB #0+5,#0+6
2180		3050		3120	LDA XL	3590	DFB #0+7,#0+8
2190		3060		3130	BCC NOTH	3600	DFB #0+10,#0+11
2200	CHECKS FOR MODE KEY AND	3070		3140	BIT MASK	3610	DFB #0+12,#0+13
2210	TOGGLES BETWEEN BITMAP	3080		3150	BNE ILLQUANT	3620	DFB #0+15,#0+16
2220	AND TEXT MODE IF KEYED.	3090		3160	CLC	3630	DFB #0+17,#0+18
2230		3100		3170		3640	DFB #0+20,#0+21
2240		3110		3180	NOTH	3650	DFB #0+22,#0+23
2250	LSTX	3120		3190	ADC YTABLEL,Y	3660	DFB #0+25,#0+26
2260	LSTKEY	3130		3200	STA MEM	3670	DFB #0+27,#0+28
2270	EDU #FE	3140		3210	LDA XH	3680	DFB #0+30
2280		3150		3220	ADC YTABLEL,Y	3690	
2290	F7CHECK	3160		3230	STA MEM+1	3700	
2300	CHP LSTKEY	3170		3240		3710	TB1T1
2310	STA LSTKEY	3180		3250	LDA Y1	3720	DFB #00,#40,#20,#01
2320	BEG NOFKEY	3190		3260	AND #07	3730	
2330	CHP #03	3200		3270	TAY	3740	
2340	BNE NOFKEY	3210		3280		3750	TB1T2
2350	LDA VIDEOCHIP+11	3220		3290	LDA XL	3760	DFB #7F,#0F,#0F,#EF
2360	AND #20	3230		3300	AND #07	3770	
2370	BEG SETBMM	3240		3310	TAX	3780	
2380		3250		3320		3790	
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		3300					
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# COMPACTOR



## Listing 1.

```
60000:33 / 60017:0
60001:0 60018:95
60002:64 60019:25
60003:58 60020:30
60004:254 60021:58
60005:255 60022:252
60006:71 60023:255
60007:58 60024:184
60008:255 60025:32
60009:255 60026:240
60010:79 60027:58
60011:10 60028:253
60012:119 60029:255
60013:3 60030:185
60014:10 60031:32
60015:50 60032:234
60016:22 60033:201
```

A FEW MONTHS ago, several routines which stored a screen in memory and then recalled it were published. This takes up much memory, and only three screens may be stored on a 48K Spectrum in this way. This routine compacts the screen by not storing all the blank spaces, but by counting up how many of them there are. The resulting data is stored by a Basic program, and then recalled from any area of memory by the machine-code routine.

The advantages of this technique are that it takes up about a tenth of the memory for a normal picture, is faster to draw, and several images may be superimposed.

To store a picture, the Basic program must be run — use Goto 100, as Run will wipe the screen. The compacted data will be put into locations 50000 onwards, depending on the complexity of the picture.

The length of the data will be indicated by the final value of the number at the bottom left-hand corner of the screen. The data may then be saved using

SAVE "data" CODE 50000

and the length number.

Once the data has been saved it may be

James Higgo steals space on the Spectrum.

## Listing 2.

```
10 LET t=0
20 FOR x=50000 TO 60033
30 INPUT "value ";(x);";a
40 POKE x,a
50 PRINT x;" ";a
60 LET t=t+a
70 NEXT x
80 IF t<3968 THEN PRINT "ERROR
  - start again"
```

reloaded into a new location using

LOAD "data" CODE  
and the value of the desired location.

To recall the picture, the machine-code routine must be loaded, and the values of the start and finish addresses of the data must be Poked into the locations 65532 to 65535, by converting the number to hex and Poking the high and low bytes as follows:

65532: end location high byte  
65533: end location low byte  
65534: start location high byte  
65535: start location low byte  
For example, if the data is left at location 50000 — not saved and reloaded —  
POKE 65532,200 end locations (ave. picture length)  
POKE 65533,180  
POKE 65534,195  
POKE 65535,000 start locations

Using these values for the end locations may chop off or add on something to your picture if it is longer or shorter than the average. Once this had been done, to recall the picture, you need only type

RANDOMISE USR 60000

Listing 1 is the data for the machine-code

## Listing 3.

```
100 LET x=16384: FOR y=50000 TO
60000: PRINT AT 20,0: OVER 0:y-
50000
105 IF x>=22528 THEN STOP
110 POKE y,PEEK (x): POKE x,255
  LET x=x+1: LET y=y+1: LET in=0
120 IF in=255 OR PEEK (x)<>0 TH
EN POKE y,in: NEXT y: GO TO 140
130 LET in=in+1: IF x<22528 THE
N LET x=x+1: GO TO 120
140 PRINT "ended"
145 POKE y+1,66: POKE y+2,66: P
OKE y+3,66
150 STOP
200 REM
  LINES 200 ONWARD PERFORM
  THE SAME FUNCTION AS THE MAC
  HINE CODE ROUTINE BUT MUCH SLOWE
  R AND BASIC
205 CLS: LET xs=16384: FOR x=5
0000 TO 60000
210 POKE xs,PEEK (x)
220 LET xs=xs+PEEK (x+1)+1
225 IF xs>=22528 THEN STOP
230 LET x=x+1: NEXT x
```

routine. Listing 2 is a loader for listing 1. Listing 3 is the compacting program.

Here's how to enter the program:

1. Type in machine-code loader and enter data by running it
2. Delete the loader line by line, and type in the compactor program
3. Draw a picture, then run the computer by typing Goto 100. Commands for drawing the picture may be entered in lines 1-99, or a picture may be loaded from tape
4. Save the compacted code on tape by typing SAVE "data" CODE 50000 and the length of the data, which is given at the bottom left of the screen after compacting
5. Reload the data into the desired area, and Poke the start and finish locations into stores 65532 to 65534, as described earlier.
6. Type RANDOMISE USR 60000

If the start and end locations have not been calculated correctly, the screen will be filled with a portion of the picture, or garbage. The locations for finish are different for each screen, and are found by hexing the length of the data plus 50000, or whatever the start location is.



# Demo listing.

```
10 REM**THIS LINE WILL BE REMOVE
D COMPLETELY*****
**
20 T=TI
30 IFX>100THEN130
40 X=X+1:GOSUB1000:GOTO30
130 PRINT"U"
140 PRINT"0000THIS LINE AND ALL
THE"
150 PRINT"THE FOLLOWING PRINT
STATEMENTS WILL BE"
160 PRINT"REDUCED TO A SINGLE"
170 PRINT"LINE"
200 T1=TI:FR=FR*(8)
210 PRINT"00 THIS DEMONSTRATION"

220 PRINT"PROGRAM HAS TAKEN"
230 PRINT(T1-T)/60 "SECONDS TO R
UN"
250 PRINT
260 PRINT"AND USES"19967-FR" BYT
ES"
270 END
1000 REM**THIS LINE WILL BE RE
DUCED TO THEWORD REM
1010 PRINT"XXXXXXXXXXXXX"X:REM*
*THIS REM WILL GO
1020 RETURN
```

# Program 1.

```
1 REM*****RE
MOVE SPACES P.J.MEW 9/1/85*****
*****
5 PRINT"00 LOADING DATA"
10 I=0:A=0:CS=0
20 READA:IFA>255THEN50
30 POKE24390+I,A:I=I+1:CS=CS+A
40 GOTO20
50 IFIC>183THENPRINT"000077 WRO
NG NUMBER OF 0 DATA STATEME
NTS"END
60 IFCS>20583THENPRINT"000077
DATA ERROR"END
70 PRINT"0000 SY824390
0 TO REMOVE SPACES"END
100 DATA165,122,72,165,123,72,16
5,43
110 DATA133,122,165,44,133,123,3
2,197
120 DATA95,32,197,95,32,197,95,1
65,45
130 DATA197,122,165,46,229,123,1
44,64
140 DATA32,197,95,162,32,32,11,2
01,32
150 DATA251,200,32,203,95,200,6,
32,197
160 DATA95,76,84,95,165,122,133,
36,165
170 DATA123,133,87,32,197,95,201
,32
180 DATA240,249,165,122,133,34,1
65,123
190 DATA133,35,56,165,36,233,1,1
33,122
200 DATA165,37,233,0,133,123,32,
200,95
210 DATA76,98,95,32,51,197,104,1
33,123
220 DATA104,133,122,165,55,164,5
6,133
230 DATA51,132,52,165,45,164,46,
133,47
240 DATA132,48,133,49,132,50,96,
230
250 DATA122,200,2,230,123,160,0,
177
260 DATA122,96,160,0,165,45,197,
34,165
270 DATA46,229,35,144,19,177,34,
145,36
280 DATA230,34,200,2,230,35,230,
36,200
290 DATA2,230,37,76,210,95,56,16
5,36
300 DATA233,1,133,45,165,37,233,
0,133
310 DATA46,96,20583:REM CHECKSUM
```

# Demo listing.

```
20 T=TI
30 IFX>100THEN130
40 X=X+1:GOSUB1000:GOTO30
130 PRINT"U":PRINT"0000THIS LINE
AND ALL THE"PRINT"THE FOLLOWING PR
INT STATEMENTS WILL BE"PR
INT"REDUCED TO A SINGLE"PRINT"L
```

```
INE" T1=TI:FR=FR*(8) PRINT"00 TH
IS DEMONSTRATION" PRINT"PROGRAM
HAS TAKEN"PRINT(T1-T)/60"SECON
DS TO RUN" PRINT PRINT"AND USES"
19967-FR" BYTES" END
1000 REM
1010 PRINT"XXXXXXXXXXXXX"X:RETI
RN
```

# Program 2.

```
1 REM*****RE
MOVE REMS P.J.MEW 9/1/85*****
*****
5 PRINT"00 LOADING DATA"
10 I=0:A=0:CS=0
20 READA:IFA>255THEN50
30 POKE24050+I,A:I=I+1:CS=CS+A
40 GOTO20
50 IFIC>337THENPRINT"000077 WRO
NG NUMBER OF 0 DATA STATEME
NTS"END
60 IFCS>39933THENPRINT"000077
DATA ERROR"END
70 PRINT"0000 SY824050
0 TO REMOVE REMS"END
100 DATA165,122,72,165,123,72,16
5,43
110 DATA133,122,165,44,133,123,3
2,236
120 DATA94,32,236,94,133,3,32,23
6,94
130 DATA133,4,165,45,197,122,165
,46
140 DATA229,123,144,75,32,236,94
,240
150 DATA20,201,143,200,41,32,120
,94
160 DATA165,251,240,15,32,236,94
,32
170 DATA247,94,32,22,95,32,236,9
4,76,0
180 DATA94,56,165,122,233,5,133,
36,165
190 DATA123,233,0,133,87,32,255,
94,76
200 DATA45,94,32,236,94,240,226,
201
210 DATA143,200,247,56,165,122,2
33,1
220 DATA133,122,165,123,233,0,13
3,123
230 DATA76,42,94,32,51,197,104,1
33,123
240 DATA104,133,122,165,55,164,5
6,133
250 DATA51,132,52,165,45,164,46,
133,47
```

```
260 DATA132,48,133,49,132,50,96,
165
270 DATA122,72,165,123,72,169,0,
133
280 DATA251,165,43,133,122,165,4
4,133
290 DATA123,32,236,94,32,236,94,
32,236
300 DATA94,165,45,197,122,165,46
,229
310 DATA123,144,47,32,236,94,201
,137
320 DATA240,18,201,141,240,14,20
1,167
330 DATA240,10,201,0,200,227,32,
236,94
340 DATA76,146,94,32,115,0,32,10
7,201
350 DATA165,3,197,20,200,17,165,
4,197
360 DATA21,200,11,169,255,133,25
1,104
370 DATA133,123,104,133,122,96,3
2,242
380 DATA94,201,44,240,220,201,50
,240
390 DATA181,32,236,94,76,146,94,
230
400 DATA122,200,2,230,123,160,0,
177
410 DATA122,96,165,122,133,36,16
5,123
420 DATA133,37,32,9,201,32,251,2
00,165
430 DATA122,133,34,165,123,133,3
5,165
440 DATA36,133,122,165,37,133,12
3,96
450 DATA160,0,165,45,197,34,165,
46,229
460 DATA35,144,19,177,34,145,36,
230,34
470 DATA200,2,230,35,230,36,200,
2,230
480 DATA37,76,24,95,56,165,36,23
3,1
490 DATA133,45,165,37,233,0,133,
46,96,39933:REM CHECKSUM
```

P J Mew squeezes more in to your 20.



THESE THREE programs allow you to compact your Basic programs into much less memory than they would normally take.

The advantages of compressing your programs are that they use up fewer bytes of memory, on average about 10 percent less, they run faster because the interpreter does not have to search through so many line numbers, and, because lines longer than 88 characters are almost impossible to edit, a compacted program offers a measure of security against unauthorized tampering.

The three programs printed here may be used individually or together for various stages of text compression.

Program 1 is a simple space remover. It removes all spaces outside quotes but leaves spaces inside quotes intact.

The second program is used for removing Rem statements. However, rather than just remove all Rems regardless of their position in the program, a selective approach has been adopted, and this works as follows:

- Any line containing only a Rem statement and which is not the target line of a Goto or Gsub is removed completely.
- A line containing only a Rem statement but which is the target for a Goto or Gsub, is reduced to the word Rem only, the line number being retained.
- Any line containing Basic text followed by a Rem on the same line, has the Rem removed.

The third and most complex program actually joins the lines of Basic text together to make new lines which can contain up to 250 Basic characters. These 250 characters plus the 2 byte link address, the 2 byte line number and the zero byte at the end of the line make up a total maximum length of 255 bytes per Basic line.

This limit of 255 bytes is imposed by the Rom routine Rechain Lines at \$C533 which is used by the operating system during editing and loading and by these programs to relink the new longer lines together.

Lines of Basic cannot just be joined together without taking into account certain conditions which would alter the structure of the program, so the following situations are allowed for:

- Line numbers which are the targets for Gotos and Gosubs are retained.
  - Lines containing the keywords If, Then, Goto, Return, End, Rem have nothing added to the ends of them.
  - Lines which would become longer than 255 characters are not allowed.
- There is no built in protection for the machine code so if you want the code to stay in memory and not be overwritten by Basic it is necessary to enter the following:
- POKE56,92:POKE52,92:POKE55,75:  
POKE51,75

This lowers the top of Basic below the code. When the programs have been entered and run and the machine code is in memory, you

can if you wish, save the code as a file, saving you the bother of reloading the Basic loaders each time. This is done by entering the following instructions:

POKE43,75:POKE44,92:POKE45,0:  
POKE46,96  
SAVE'FILENAME',1,1

This saves the area from 23627 to 24576 as a program with a header specifying a forced load, so that any Load instruction will reload the code back into the area it was saved from. After saving in this way it is necessary to enter SYS64802 to reset all the Basic pointers, however the code will stay in memory.

The before and after demonstration programs show some of the features of the compactor programs and if entered and run will indicate a time saving of about 5.5 percent and a reduction in memory usage of about 30 percent.

These programs are designed to locate into the top of Ram on a 16K expanded Vic-20 but can easily be moved elsewhere in memory, for example to start at \$A000 if you have a 32K expanded Vic-20, using my program machine-code Mover in the January 1985 issue of *Your Computer*. The programs use a number of the Vic Rom routines between \$C000 and \$DFFF. If these are isolated and changed to the corresponding Rom locations for the CBM-64, between \$S000 and \$BFFF the programs should also run on that machine.

In spite of being in machine code the third program in particular may take several minutes to run.

# COMPACTOR

## Program 3.

```
1 REM*****CO
MPACTOR P.J.MEW 9/1/85*****
*****
5 PRINT"LOADING DATA"
10 I=0:A=0:CS=0
20 READ:IFA>255THEN50
30 POKE23630+I,A:I=I+1:CS=CS+A
40 GOTO20
50 IFIC>417THENPRINT"WRONG NUMBER OF DATA STATEMENTS":END
60 IFCS<49685THENPRINT"DATA ERROR":END
70 PRINT"SYS23630 TO COMPACT BASIC":END
100 DATA165,122,72,165,123,72,165,43
110 DATA133,122,165,44,133,123,169,0
120 DATA133,252,32,150,93,32,150,93,32
130 DATA150,93,32,150,93,32,9,20,1,200
140 DATA132,252,165,45,197,122,165,46
150 DATA229,123,176,3,76,250,92,162,0
160 DATA134,253,189,233,93,170,3,2,11
170 DATA201,177,122,200,96,166,2,53,232
180 DATA224,6,208,236,32,9,201,3,2,251
190 DATA200,165,122,133,36,165,1,23,133
200 DATA37,32,150,93,133,3,32,15,0,93,5
```

```
210 DATA3,240,75,32,150,93,133,3,32
220 DATA150,93,133,4,32,206,93,165,252
230 DATA240,172,32,24,93,165,251,240,7
240 DATA169,0,133,252,76,108,92,165
250 DATA122,133,34,165,123,133,3,5,169
260 DATA58,145,36,230,36,208,2,2,30,37
270 DATA165,36,133,122,165,37,13,3,123
280 DATA32,161,93,76,114,92,32,9,201
290 DATA32,251,200,32,150,93,76,96,92
300 DATA32,51,197,104,133,123,10,4,133
310 DATA122,165,55,164,56,133,51,132
320 DATA52,165,45,164,46,133,47,132,48
330 DATA133,49,132,50,96,165,122,72
340 DATA165,123,72,169,0,133,251,165
350 DATA43,133,122,165,44,133,12,3,32
360 DATA150,93,32,150,93,32,150,93,165
370 DATA45,197,122,165,46,229,12,3,144
380 DATA47,32,150,93,201,137,240,18
390 DATA201,141,240,14,201,167,2,40,10
```

```
400 DATA201,0,208,227,32,150,93,76,42
410 DATA93,32,115,0,32,107,201,1,65,3
420 DATA197,20,208,17,165,4,197,21,208
430 DATA11,169,255,133,251,104,1,33,123
440 DATA104,133,122,96,32,156,93,201
450 DATA44,240,220,201,50,240,10,1,201
460 DATA137,240,212,201,141,240,208
470 DATA201,0,240,6,32,150,93,76,110
480 DATA93,32,150,93,76,42,93,23,0,122
490 DATA208,2,230,123,160,0,177,122,96
500 DATA160,0,165,45,197,24,165,46,229
510 DATA35,144,19,177,34,145,36,230,34
520 DATA208,2,230,35,230,36,208,2,230
530 DATA37,76,163,93,56,165,36,2,33,1
540 DATA133,45,165,37,233,0,133,46,96
550 DATA32,150,93,32,9,201,200,1,52,24
560 DATA101,252,133,252,176,7,16,5,252
570 DATA201,249,176,1,96,169,0,1,33,252
580 DATA96,139,167,137,128,142,1,43,49685:REMCHECKSUM
```



# Listing 1. The loader program.

```

10 DATA 0,255,255,0,0,216,214,6,
207,55,92,0,0,1,1,0,0,0,0,0,1307
30 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,205,154,209,6,2,576
40 DATA 128,31,31,31,31,230,15,2
46,48,254,56,56,2,198,7,215,126,
16,242,201,2164
50 DATA 62,2,205,1,22,33,34,207,
221,33,254,207,14,7,221,94,0,221
60 DATA 221,2094
70 DATA 36,0,205,43,207,20,20,20
80 DATA 205,154,209,213,197,94,22,0,
90 DATA 205,30,2209
100 DATA 1,24,252,205,42,25,1,
110 DATA 205,42,25,14,246,205,42,
120 DATA 205,2127
130 DATA 221,225,193,209,221,6
140 DATA 221,359,205,154,209,175,86
150 DATA 6,6,6,243,205
160 DATA 205,243,1,60,215,15,246
170 DATA 13,32,170,42,13,207,1,12,0,9
180 DATA 30,1371
190 DATA 21,22,30,205,43,207,43,2
20 DATA 32,249,30,2,22,1,14,4,33,19,20
21 DATA 35,1248
22 DATA 205,43,207,43,20,20,205
23 DATA 207,43,20,20,20,13,32,240,33
24 DATA 207,175,1823
25 DATA 70,30,18,22,11,205,242,
26 DATA 20,20,205,242,207,20,20,2
27 DATA 203,0,1965
28 DATA 203,0,205,242,207,20,20
29 DATA 20,203,0,205,242,207,201,205,15
30 DATA 209,62,48,203,2858
31 DATA 0,48,1,60,215,201,6,1,6
32 DATA 11,10,11,14,1,14,11,10,1,6
33 DATA 40
34 DATA 62,1,24,2,62,0,50,21,20
35 DATA 33,13,207,52,201,19,71,26,254,
36 DATA 233,194,1732
37 DATA 220,209,120,254,253,40,
38 DATA 221,110,0,221,102,1,24,6,253,1
39 DATA 10,0,253,102,2507
40 DATA 1,34,13,207,201,237,75,
41 DATA 13,207,62,255,24,8,237,75,13,207
42 DATA 3,42,15,1926
43 DATA 207,43,112,43,113,34,15
44 DATA 207,230,56,111,38,0,34,13,207,2
45 DATA 01,237,91,13,2005
46 DATA 207,26,254,251,40,170,2
47 DATA 54,243,40,170,251,16,40,102,254,
48 DATA 233,40,123,254,8,2979
49 DATA 190,202,60,209,254,217,202,
50 DATA 64,209,33,97,211,1,5,0,237,177,4
51 DATA 0,115,1,18,2372
52 DATA 0,237,177,202,254,210,1
53 DATA 2,0,237,177,40,137,1,9,0,237,17
54 DATA 7,202,254,2554
55 DATA 210,1,6,0,237,177,40,16
56 DATA 1,254,237,194,220,209,19,26,254,
57 DATA 70,6,0,40,2363
58 DATA 220,25,254,86,6,1,40,19,254
59 DATA 94,6,2,40,13,254,77,202,235,210
60 DATA 254,69,2141
61 DATA 202,235,210,195,252,209
62 DATA 120,50,22,207,33,13,207,52,52,2
63 DATA 01,58,27,207,111,2631
64 DATA 229,241,58,30,207,61,50
65 DATA 30,207,245,225,125,50,27,207,20
66 DATA 3,119,40,66,24,2444
67 DATA 55,33,33,207,17,13,207,
68 DATA 1,2,0,237,176,201,33,27,207,254,
69 DATA 4,40,45,2812
70 DATA 254,56,32,6,203,70,40,2
71 DATA 24,35,254,48,32,6,203,70,40,27
72 DATA 24,16,1463
73 DATA 254,40,32,6,203,118,40,
74 DATA 3,24,15,203,118,40,11,24,0,42,13
75 DATA 207,35,1433
76 DATA 35,34,13,207,201,42,13,
77 DATA 207,35,78,35,6,0,203,121,40,2,6,
78 DATA 255,9,1542
79 DATA 34,13,207,201,62,2,205,
80 DATA 1,22,6,2,33,27,207,17,55,207,205
81 DATA 1,138,209,1833
82 DATA 33,134,209,6,2,195,105,
83 DATA 209,62,2,205,1,22,6,6,33,29,207,
84 DATA 17,37,1520
85 DATA 207,205,138,209,33,122,
86 DATA 209,6,94,35,86,35,205,148,209,
87 DATA 62,39,215,16,2279
88 DATA 244,33,13,207,52,201,12
89 DATA 14,12,4,8,14,8,4,4,14,4,16,14
90 DATA 882
91 DATA 18,4,26,78,235,18,113,3
92 DATA 5,19,16,247,201,62,21,215,62,1,2
93 DATA 16,62,22,1668
94 DATA 215,123,215,122,215,201
95 DATA 237,75,13,207,42,15,207,43,112,
96 DATA 43,113,34,15,207,2454
97 DATA 237,87,103,58,23,207,11
98 DATA 1,78,35,70,237,67,13,207,201,33,
99 DATA 13,207,53,42,2092
100 DATA 13,207,34,24,207,125,50
101 DATA 26,207,58,23,207,119,205,89,208
102 DATA 42,24,207,58,2134
103 DATA 26,207,119,201,205,104,
104 DATA 210,42,13,207,17,10,210,237,176,
105 DATA 34,13,207,221,42,2501
106 DATA 19,207,253,42,17,207,23
107 DATA 7,75,29,207,237,91,31,207,42,27,
108 DATA 207,229,241,42,2647
109 DATA 33,207,237,115,11,207,2
110 DATA 37,123,15,207,0,0,0,0,251,237,11
111 DATA 5,15,207,237,2454
112 DATA 123,11,207,221,34,19,20
113 DATA 7,253,34,17,207,237,67,29,207,23
114 DATA 7,83,31,207,34,2465
115 DATA 33,207,245,225,34,27,20

```

## Ian Potts with a small step for your micro, a giant leap for you.

SINGLESTEP ALLOWS YOU to run through machine-code routines one instruction at a time, thus helping you to learn machine-code programming or to de-bug machine-code routines.

The contents of the main registers are displayed in hex, decimal and binary and thus the effect of any operation, especially the logical operations, is easily seen. Register contents, program counter and the flag register can be changed at any stage, with numbers being input in either hex or decimal.

One breakpoint address can be set which allows a long routine or loop to be executed at full speed. Interrupts in all three modes can be simulated. A simple machine-code loader is included which allows machine-code routines to be inserted at the program counter address.

Type in the machine-code loader program which can then be run and saved if correct. Now type New. The Basic can now be typed in, and both Basic and machine code can be saved by entering Go To 9900.

The A, B, C, D, E, H and L registers each have their contents displayed in binary, hex and decimal. the IX, IY, SP — stack pointer — and PC — program counter — register contents are displayed in the boxes in hex. Down the right-hand side of the display is a printout of some of the contents of memory in hex with the current value of the program counter displayed in decimal and pointing to the correct memory location — see figure 1.

Also displayed is the current value of the breakpoint address, BR. The F or Flag register shows the current status of the sign flag, S, zero flag Z, parity or overflow flag P/V, and the carry flag C. If an exchange register instruction is carried out then an apostrophe will be displayed by the registers affected.

First, let's look at the single-letter commands:

S Singlestep, i.e., carry out next machine-code instruction.



- R Restart program. Clear all registers and reset SP and PC.
- Q Quit program and exit to basic. Go To Start will restart the program.
- I Simulate an interrupt.
- K Continue program at full speed up to breakpoint address.

Here are the commands requiring a value to be input:

- P Change program counter to value input
- P+ Add value to program counter.
- P- Subtract value from program counter.
- BR Set breakpoint address to value input.
- HEX Inserts hex code starting at program counter address.
- F Set flag register to value input — this

```

7,33,0,0,34,10,210,34,12,210,201
42,9,207,1980
420 DATA 126,50,8,207,54,201,237
75,13,207,34,13,207,62,205,50,1
0,210,207,67,2273
430 DATA 11,210,205,234,209,58,6
207,42,13,207,119,201,58,27,207
230,58,246,0,2550
440 DATA 50,27,207,201,237,91,13
207,26,254,237,32,14,1,2,0,19,2
6,230,199,2073
450 DATA 254,67,192,1,4,0,201,33
139,211,1,20,0,237,177,1,2,0,20
0,1,1741
460 DATA 8,0,237,177,1,3,0,200,1
2,0,237,177,1,1,0,192,19,26,33,
1315
470 DATA 169,211,1,5,0,237,177,1
4,0,200,1,11,0,237,177,1,3,0,19
2,1627
480 DATA 1,2,0,201,42,13,207,35,
203,72,32,2,35,35,34,13,207,201,
203,72,1610
490 DATA 32,33,203,64,40,17,237,
75,13,207,3,3,3,42,15,207,43,112
43,113,1505
500 DATA 34,15,207,42,13,207,35,
78,35,70,237,67,13,207,201,42,15
207,78,35,1838
510 DATA 70,35,34,15,207,237,67,
13,207,201,24,188,24,200,6,0,203
79,32,6,1850
520 DATA 6,1,203,87,32,2,6,2,203
71,32,236,230,56,33,27,207,254,
0,32,1720
530 DATA 6,203,118,40,223,24,219
254,8,32,6,203,118,40,211,24,21
1,254,16,32,2242
540 DATA 6,203,70,40,203,24,199,

```

```

254,24,32,6,203,70,40,191,24,191
254,32,32,2098
550 DATA 6,203,86,40,183,24,179,
254,40,32,6,203,86,40,171,24,171
254,48,32,2092
560 DATA 6,203,126,40,163,24,159
203,126,40,155,24,155,24,32,40,
48,56,194,195,2013
570 DATA 196,202,204,205,210,212
218,220,226,228,234,236,242,244
250,252,253,201,216,4470
580 DATA 208,200,192,232,224,248
240,199,207,215,223,231,239,247
255,6,14,16,22,30,3448
590 DATA 38,46,54,62,198,203,206
211,214,219,222,230,238,246,254
1,17,33,34,42,2768
600 DATA 49,50,58,221,253,203,33
34,42,54,9,25,35,41,43,57,249,2
33,225,227,2141
610 DATA 229,0,0,0,0,0,0,0,0,0,0,0,0
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1000 REM 48K LOADER PROGRAM
1010 CLEAR S2999: RESTORE
1020 FOR i=0 TO 600 STEP 10
1030 LET t=0
1040 FOR j=0 TO 19
1050 READ a: POKE (53000+i+j),
a
1060 LET t=t+a
1070 NEXT j
1080 READ a: IF a<>t THEN PRINT
FLASH 1:"ERROR AT LINE ";i+10: P
LASH 0: STOP
1090 NEXT i
1100 CLS
1110 SAVE "s/step40K"CODE 53000,
1200
1120 VERIFY ""CODE

```



IX	IY	SP	PC	BR	FE
0000	5C3A	CF08	EA6C	65535d	FF
H reg	L reg				47
01000000b	00000000b				3A
40H	64d	00H	0d		FF
D reg	E reg			PC	4F
00000000b	00000000b			60012d	0A
00H	0d	00H	0d		77
B reg	C reg				03
00111100b	00000000b				0A
3CH	60d	00H	0d		3C
A reg	S Z P/U C				15
11111111b	0 0 0 0				00
FFH	255d				5F
					19
					03
					3A
					FC
					FF
					B8

Figure 1. The screen display.

# SPECTRUM

## SINGLESTEP

must be four digits, each digit either 0 or 1.

Any register letter or register pair will set that register to the value input. If the value input ends in H then the number is interpreted as hex, otherwise it is taken to be decimal. Help will display a summary of the commands.

The stack pointer is initially set to point to the start of the code. The machine code is not relocatable.

On entry, interrupts are enabled and IM1 is selected. Interrupts can be disabled in a program — Singlestep will still work. When IM0 or IM2 is selected in a program then if an interrupt is simulated, the data that the

interrupting device supplies must be input. It is assumed that the Spectrum supplies FF when in IM2 or IM3.

Here are some simple programs to illustrate the use of Singlestep. First, load the program. This will produce a display similar to the one shown in figure 1.

**Hex Mnemonic Comment**  
06 02 LD B,2 Load B with 2  
00 LOOP: NOP Do nothing  
10 FD DJNZ LOOP Subtract 1 from B, if result is non-zero jump FD, i.e. -3

To enter this program type Hex followed by Enter. Then type 06020010FD, Enter. The machine code will now be inserted. Note that each byte must be entered as two digits, i.e. 02 for 2 etc. Now type P-, Enter followed by 5 to move back to the start of the program. Press S, Enter and the B register will now contain 2. Press S, Enter and all that will happen is that the program counter increases by 1. Press S, Enter and the program counter will now point to the start of the loop, and the B register will now contain 1.

Continue pressing S followed by Enter until the program counter contains 55005. You have now exited from the loop.

Here is another example program.

**Hex Mnemonic Comment**  
06 FF LD B,255 Load B with 255  
00 LOOP: NOP Do nothing  
10 FD DJNZ LOOP Loop as before

To change the first example program, type in P 55001. This moves PC to point to the byte to be changed. HEX FF — FF is now inserted. P- 2 means that PC now points to start of the program.

Enter S several times. As you can see it will take a long time to exit from the loop. To execute the code at speed, enter BR 55005, which sets the breakpoint address. K now executes the program at full speed.

Now for the third example:

D9 EXX Exchange registers  
D9 EXX Exchange registers

To enter this program type HEX D9D9  
H 32 — puts 32 decimal into register H  
D 32H — puts 32 Hex into register D  
P- 2 — moves PC to point to start of program

Now singlestep twice, observing the display.

This fourth program simulates an interrupt in Mode 2.

3E 09 LD A,9 Load I with the value 9  
ED 47 LD I,A Set interrupt Mode 2  
ED 5E IM2

Load this program starting at address 54994 so that it precedes the second program. When you simulate an interrupt you will supply the byte FF so that the interrupt is vectored via the contents of 09FF to FE69. So enter the following:

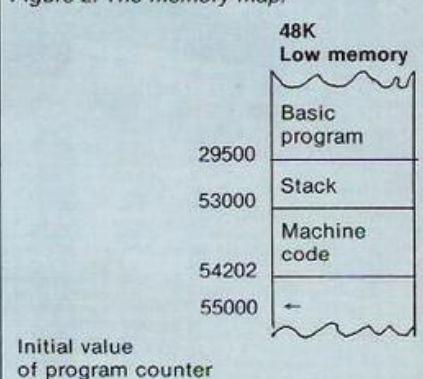
P FE69H PC now points to FE69  
HEX 00ED4D m/code NOP, RETI is loaded.  
P 54994 Return to start of program 4

## Singlestep through the loop

Enter S three times to set up interrupt values. Now singlestep some way through the loop of the second program and enter I. In response to the prompt, enter FF. You will now jump to 65129, FE69, you can now continue singlestepping and you will return to the point where the routine was called.

For those who balk at typing in all the data, I would be prepared to supply copies of the tape at £3 each provided the name and address is clear. Ian Potts, 1 Bramston Close, Oundle, Peterborough PE8 4DP.

Figure 2. The memory map.



Listing 2. The Basic program.

```

30 DEF FN H(X)=INT (X/256)
40 DEF FN L(X)=X-256*FN H(X)
50 DEF FN H(HS)=CODE HS-48-7*16
HS="P"
100 LET P=256+PEEK (addr+5)+PEEK (addr+6)
120 PRINT AT 2,22;" "AT 2,
27-LEN STR$ BR,0R
130 PRINT AT 9,22;" "AT 9,
27-LEN STR$ P,P
140 RANDOMIZE USR (addr+60) RE
TURN
3000 GO SUB 100
3100 POKE 20650,0: INPUT "COMMAN
D? " LINE 25
3110 RESTORE 3500: PRINT AT 21,0
"
3120 FOR I=1 TO 8 READ AS,A
3130 IF Z=AS THEN GO TO A
3140 NEXT I
3150 FOR I=1 TO 18 READ AS,A,C
3160 IF Z=AS THEN NEXT I: PRIN
T AT 21,0;"WRONG COMMAND": GO TO
3100
3170 INPUT "VALUE? " LINE Y5
3180 IF Y5="" THEN GO TO 3170
3200 IF Z="F" THEN GO TO A
3210 IF Y5(LEN Y5)="H" THEN GO T
O 5500
3220 FOR I=1 TO LEN Y5 IF Y5(I)
<"0" OR Y5(I)>"9" THEN GO TO 601
0
3230 NEXT I
3240 LET B=VAL Y5
3250 IF B<0 OR B>65535 THEN GO T
O 6000
3260 GO TO A
3270 IF B=255 THEN GO TO 6000
3310 POKE (addr+CL,B: GO TO 3000
3340 LET P=P+8: IF P>100 THEN LE
T P=P-8 GO TO 6000
3350 LET B=P: GO TO 3450
3360 LET P=P-B: IF P<0 THEN LET
P=P+8: GO TO 6000
3370 LET B=P: GO TO 3450
3380 IF B>100 THEN GO TO 6000
3390 LET P=B: GO TO 3450
3400 IF B>100 THEN GO TO 6000
3410 LET B=B-8: GO TO 3000
3450 POKE (addr+CL,B: FN L(B): POKE
(addr+CL+1),FN H(B): GO TO 3000
3500 DATA "3100","B",3000,"S",4
100,"0","9999","4500","K",4110,"
HELP","7500","HEX","5000
3510 DATA "P+",3340,"S","P",3360,"
S","P",3380,"S","AR",3400,"I",
3520 DATA "F",6500,"0","SP",3450,"7
",0C",3450,"21","DE",3450,"23","HL",
3450,"25","IX",3450,"11","IV",3450,"9
3530 DATA "A",3300,"20","C",3300,"2
1","B",3300,"22","E",3300,"23","D",3
00,"24","L",3300,"25","H",3300,"26
4100 RANDOMIZE USR (addr+307): G
O TO 3000
4110 RANDOMIZE USR (addr+317): G
O TO 3000
4500 IF PEEK (addr+13)=0 THEN GO
TO 6040
4500 IF PEEK (addr+14)=1 THEN RA
NDOMIZE USR (addr+305): GO TO 30
00
4505 INPUT "DEVICE DATA (in hex)
LINE 55
4520 LET B=16*FN H(Z5(1))+FN H(Z
5(2))
4530 IF B=255 THEN GO TO 6000
4540 POKE (addr+15),B: IF PEEK (
addr+15)=0 THEN GO TO 4600
4550 RANDOMIZE USR (addr+666): G
O TO 3000
4600 RANDOMIZE USR (addr+695): G
O TO 3000
5000 INPUT "CODE? " LINE Y5
5005 FOR I=1 TO LEN Y5 IF Y5(I)
<"0" OR Y5(I)>"F" OR Y5(I)>"A"
AND Y5(I)>"9" THEN GO TO 6020
5007 NEXT I
5010 FOR N=1 TO LEN Y5/2 LET B5
=Y5(2*N-1 TO 2*N)
5020 LET B=16*FN H(B5(1))+FN H(B
5(2))
5025 IF B=255 THEN GO TO 6000
5030 POKE P,B: LET P=P+1: NEXT N
5040 POKE (addr+6),FN H(P): POKE
(addr+5),FN L(P): GO TO 3000
5500 LET B=0: LET Y5=Y5+1: LEN
Y5
5505 FOR I=1 TO LEN Y5 IF Y5(I)
<"0" OR Y5(I)>"F" OR Y5(I)>"A"
AND Y5(I)>"9" THEN GO TO 6020
5506 NEXT I
5510 FOR I=0 TO LEN Y5-1
5520 LET B=B+FN H(Y5(LEN Y5-I))+
16*I
5530 NEXT I: GO TO 3250
5530 PRINT AT 21,1;"0000-FFFF:
5540 GO TO 3100
5540 PRINT AT 21,1;"0000-FFFF:
5550 GO TO 3100
5560 IF LEN Y5=4 THEN GO TO 603
0
5581 FOR I=1 TO 4 IF Y5(I)<"0"
OR Y5(I)>"F" THEN GO TO 6030
5602 NEXT I
5605 LET FLAG=128+VAL Y5(1)+64+V
AL Y5(2)+4+VAL Y5(3)+VAL Y5(4)
5610 POKE (addr+889),FLAG
5620 RANDOMIZE USR (addr+653): G
O TO 3000
7000 CLS: PLOT 4,20: DRAW 0,151
10000 LET 159,0: DRAW 0,-151: DRAW
-159,0
7010 FOR I=52 TO 148 STEP 32
7020 PLOT 4,I: DRAW 159,0: NEXT
I
7040 PLOT 84,20: DRAW 0,151
7050 PLOT 44,148: DRAW 0,23
7060 PLOT 124,148: DRAW 0,23
7070 LET B5="C3": RESTORE 7120
7090 FOR I=0 TO 6: READ B5,X,Y
PRINT AT X,Y+2;B5+AS
7100 PRINT AT X+1,Y+6;"b": PRINT
AT X+1,Y+8;"h": PRINT AT X+2,Y+
8;"d": NEXT I
7120 DATA "H",4,1,"L",4,11,"D",6
2,1,"E",6,11,"B",12,1,"C",12,11,"
7130 PRINT AT 16,13;"F":AS
7140 PRINT AT 1,2;"IX":AT 1,7;"I
Y":AT 1,12;"SP":AT 1,17;"PC":
7150 PRINT AT 1,24;"BR":AT 2,27;"
d":AT 8,24;"PC":AT 9,27;"d":
7160 PRINT AT 17,11;"S Z P/U C"
7170 RESTORE 7200
7200 CLS: PRINT AT 0,9;"*****
*****"
7220 PRINT AT 3,0;"0 QUIT":R
ESTART;"I SIMULATE AN INTERRU
PT"
7230 PRINT AT 6,0;"S SINGLESTEP
"
7240 PRINT AT 9,0;"P SET FLAG:
"
7250 SET BREAKPOINT:"P SET P/C
OUNTER"
7260 PRINT AT 14,0;"REGISTER LET
TER(S) THEN A:"
7270 PRINT AT 14,0;"NUMBER LOADS THE
REGISTER"
7280 PRINT AT 20,0;"PRESS ANY KE
Y TO CONTINUE"
7290 PAUSE 0: GO TO 8000
8000 CLEAR 29500: BORDER 1: PAGE
P 1: CLS: INK 7: POKE 23650,0
8010 POKE 23659,100: LET START=8100
8020 LET TOP=65535: LET addr=5300
00
8030 PRINT AT 3,8: FLASH 1;"DO N
OT STOP TAPE AT 10,18: 3000
8100 GO SUB 7000: GO TO 3000
8200 DATA 255,255,0,0,216,214,8,
207,58,92,0,0,1,1
9900 CLS: SAVE "S/STEP48K" LINE
8000
9910 RESTORE 8200: FOR I=addr+1
1202: PRINT AT 10,0;"*****
*****"
9920 VERIFY "": VERIFY "CODE
9999 CLS

```



**BASIC LIGHTNING**

**WHITE LIGHTNING**

**MACHINE LIGHTNING**

# LIGHTNING STRIKES AGAIN

**ORFIS SOFTWARE**

Totally dedicated to writing very fast, video games, BASIC Lightning is a fully structured extension to the Commodore BASIC which adds a staggering 200 reserved words. It allows up to five tasks to run concurrently (one in foreground and four in background). Most of the commands are dedicated to games writing and the sound and graphics commands are unparalleled. Procedures and PASCAL type structured programming commands are also a feature of BASIC Lightning.

As well as the Commodore's own 8 hardware sprites, BASIC Lightning has its own software sprites. Up to 255 can be defined with user selectable dimensions. These can even be several screens wide. They can be scrolled, spun, mirrored, enlarged or inverted with phenomenal speed and smoothness.

A Sprite Generator Program (written in BASIC Lightning) is also supplied and can be used to design, edit and store all your sprites for use in your main program.

White Lightning is a complete games writing package comprising a high level, Forth based, multi-tasking games writing language, the extended BASIC (see BASIC LIGHTNING) and a powerful sprite Generator Program. Programs can even be written in a combination of Forth and Commodore BASIC and the final program, which will run independently of White Lightning, can be marketed with no restrictions whatsoever.

The Basic Lightning part of the package can be used to experiment quickly and easily before the Forth program is developed.

The speed of White Lightning has to be seen to be believed and a full demo is included. As with Basic Lightning, hardware sprites are supported, together with 255 software sprites which can be scrolled, spun, reflected, enlarged or inverted.

**MULTI-TASKING** Without doubt the most powerful feature of the Lightning series of languages is the multi-tasking facility. This allows two programs to be run concurrently and makes those smooth landscape scrolls etc. effortless.

The BASIC Lightning Sprite Generator Program is also included in the package.

Commodore 64 Machine Lightning is probably the most advanced games writing utility available on any micro. It comes in 4 parts:

**MACRO ASSEMBLER/MONITOR/DISASSEMBLER** This is probably the most comprehensive machine code development system available for the Commodore 64 with features too numerous to mention.

**BASIC LIGHTNING BASIC** Lightning, the multi-tasking BASIC is also provided to facilitate experimentation in preparation for later assembly.

**SPRITE GENERATOR** Used to develop all the graphics for the final game. The Sprite Generator has numerous functions including enlargement, rotation and reflection.

**OBJECT LIBRARY** This is Machine Lightning's most powerful feature. 10k of re-entrant code with more than 130 documented entry points. These are the routines that provide all the superfast graphics routines in White and Basic Lightning. They contain virtually every routine you'll ever need to write an Arcade Game and multi-tasking in Machine Lightning is covered in the comprehensive accompanying manual.



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# TELSOFT



## A reminder of how to use the Telsoft service.

THE PROGRAMS given here will enable Spectrum and BBC owners to download via Your Computer's Telsoft service. First type the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. On the BBC you call the service by entering

CALL 86A00

while Spectrum owners must type

RANDOMIZE USR 60000

So far OE Ltd's Telemod 2 and VTX 5000

modems have been tested with the service, but it also works with a number of other makes.

To find out what is available on Telsoft and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is available, make sure your modem is set up and dial the number appropriate to your modem's

speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received, you will see "OK" printed if there were no errors, otherwise the program will wait for the blocks to come round again.

When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HIMEM=65536
20 CLS:PRINT
30 INPUT "START ADDRESS (Hex)";A$
40 A=VAL("0"+A$)
50 IF A>65536 THEN 200
60 IF A<52480 OR A<5672 THEN 20
```

```
70 PRINT "A=";A
80 INPUT "B=";B$;C$
90 IF LEN(B$)<>16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X$=MID$(B$,2*N+1,1):GOSUB 300
130 IF E=1 THEN 260
140 X$=MID$(B$,2*N+2,1):GOSUB 300
150 IF E=1 THEN 260
```

```
160 B$=VAL("0"+MID$(B$,2*N+1,2))
170 A=A+B*(A DIV 16)+T
180 NEXT N
190 FOR M=1 TO LEN(C$)
200 X$=MID$(C$,M,1):GOSUB 300
210 IF E=1 THEN A=A-1:GOTO 260
220 NEXT M
230 IF T=VAL("0"+C$) THEN 50
240 PRINT "CHECKSUM ERROR!"
```

```
250 A=A-GOTO 50
260 PRINT "TYPING ERROR!"
270 A=B*(A DIV 8):GOTO 50
280 SAVE "DOWNLOAD" A&0000 6F07
290 END
300 E=0:IF ASC(X$)<48 THEN E=1:RETURN
310 IF ASC(X$)>58 THEN RETURN
320 IF ASC(X$)<65 THEN E=1:RETURN
330 IF ASC(X$)>71 THEN E=1
340 RETURN
```

Figure 2. BBC.

```
6A00 :A9C8A0FEA20120F4,4C6
6A01 :FF20616C2048ADC9,39A
6A02 :31F080C934F8E9C9,4C8
6A03 :35F080C4C06A4C47,20B
6A04 :6A9A9C283F4A9B,4B2
6A05 :A08A2FF220FAFFA9,4FD
6A06 :A3A20820F4FFA9B2,365
6A07 :A2020820F4FFA9B2,4C0
6A08 :FEA20820F4FFA9B2,4B8
6A09 :0C20820F4FFA9B2,459
6A0A :FEA20820F4FFA9B2,459
6A0B :A9F8B8956F8D8F,587
6A0C :A915A20120F4FF20,394
6A0D :0C6C90F820820F4C,380
6A0E :7904708A47085782,30B
6A0F :05A0A57820F4C9B9,4B9
6A10 :D0E220820F4C9B99,45B
6A11 :7100C0820F4C9B99,364
6A12 :D0E220820F4C9B99,422
6A13 :D0E220820F4C9B99,354
6A14 :1D65730577200C6C,289
6A15 :080520820F4C9B99,524
6A16 :080520820F4C9B99,524
6A17 :080520820F4C9B99,524
6A18 :080520820F4C9B99,524
6A19 :080520820F4C9B99,524
6A1A :080520820F4C9B99,524
6A1B :080520820F4C9B99,524
6A1C :080520820F4C9B99,524
6A1D :080520820F4C9B99,524
6A1E :080520820F4C9B99,524
6A1F :080520820F4C9B99,524
6A20 :080520820F4C9B99,524
```

```
6C20 :496CC6B0D0023B60,374
6C21 :A5BAC9020062079,369
6C22 :6E80EC6A991A201,447
6C23 :20F4FF90A47E80DF,55C
6C24 :608A8A900047E8A0,55A
6C25 :20496C8000FAA7E,449
6C26 :608A8A900047E8A0,55A
6C27 :4FFA9022080F4C,580
6C28 :208C3F708A0A0A,3E4
6C29 :20808A900047E8A0,55A
6C2A :6F850A8000280F,39C
6C2B :20150DC941F000C9,370
6C2C :42F011C94F0174C,362
6C2D :616CA908A20120F4,355
6C2E :FF4C87A908A20120F4,355
6C2F :20F4FF4C87A908A2,433
6C30 :020420F4FF4C87A908A2,433
6C31 :7C20820F4FF4C87A908A2,433
6C32 :608A8A900047E8A0,55A
6C33 :608A8A900047E8A0,55A
6C34 :608A8A900047E8A0,55A
6C35 :608A8A900047E8A0,55A
6C36 :608A8A900047E8A0,55A
6C37 :608A8A900047E8A0,55A
6C38 :608A8A900047E8A0,55A
6C39 :608A8A900047E8A0,55A
6C3A :608A8A900047E8A0,55A
6C3B :608A8A900047E8A0,55A
6C3C :608A8A900047E8A0,55A
6C3D :608A8A900047E8A0,55A
6C3E :608A8A900047E8A0,55A
6C3F :608A8A900047E8A0,55A
6C40 :608A8A900047E8A0,55A
```

```
6D40 :A90C20820F4C9B99,459
6D41 :A90C20820F4C9B99,459
6D42 :A90C20820F4C9B99,459
6D43 :A90C20820F4C9B99,459
6D44 :A90C20820F4C9B99,459
6D45 :A90C20820F4C9B99,459
6D46 :A90C20820F4C9B99,459
6D47 :A90C20820F4C9B99,459
6D48 :A90C20820F4C9B99,459
6D49 :A90C20820F4C9B99,459
6D4A :A90C20820F4C9B99,459
6D4B :A90C20820F4C9B99,459
6D4C :A90C20820F4C9B99,459
6D4D :A90C20820F4C9B99,459
6D4E :A90C20820F4C9B99,459
6D4F :A90C20820F4C9B99,459
6D50 :A90C20820F4C9B99,459
6D51 :A90C20820F4C9B99,459
6D52 :A90C20820F4C9B99,459
6D53 :A90C20820F4C9B99,459
6D54 :A90C20820F4C9B99,459
6D55 :A90C20820F4C9B99,459
6D56 :A90C20820F4C9B99,459
6D57 :A90C20820F4C9B99,459
6D58 :A90C20820F4C9B99,459
6D59 :A90C20820F4C9B99,459
6D5A :A90C20820F4C9B99,459
6D5B :A90C20820F4C9B99,459
6D5C :A90C20820F4C9B99,459
6D5D :A90C20820F4C9B99,459
6D5E :A90C20820F4C9B99,459
6D5F :A90C20820F4C9B99,459
6D60 :A90C20820F4C9B99,459
```

```
6E60 :09C08208056A8A4C,2C1
6E61 :0C6AA57CA67DA47E,3DC
6E62 :608A7E8067DA996A2,446
6E63 :0020F4FF902901F0,3CD
6E64 :00A996A20920F4FF,40B
6E65 :9810900138A67DA4,348
6E66 :7E60444F574E4C4F,2B1
6E67 :4144444F47204D45,215
6E68 :4E5580312020820F,173
6E69 :4543454545454545,1F2
6E70 :2020820F4C9B99,459
6E71 :16175A42052617465,2E6
6E72 :0035202020202020,18B
6E73 :5420544F20424153,28D
6E74 :494380454E54552,21F
6E75 :5204545454545454,1F6
6E76 :2020820F4C9B99,459
6E77 :524C2D4720544F20,1E5
6E78 :524C5455262054,254
6E79 :4F204D454E552029,1CD
6E80 :0035455420545421,20B
6E81 :4E55304954204241,24E
6E82 :175A42052617465,292
6E83 :4120202020202020,1C4
6E84 :16175A4042202020,1FC
6E85 :3320204261754640,289
6E86 :100F812047F0C920B0,3C3
6E87 :08C908A20820F4C9B99,459
6E88 :08C908A20820F4C9B99,459
6E89 :08C908A20820F4C9B99,459
6E90 :08C908A20820F4C9B99,459
6E91 :08C908A20820F4C9B99,459
6E92 :08C908A20820F4C9B99,459
6E93 :08C908A20820F4C9B99,459
6E94 :08C908A20820F4C9B99,459
6E95 :08C908A20820F4C9B99,459
6E96 :08C908A20820F4C9B99,459
6E97 :08C908A20820F4C9B99,459
6E98 :08C908A20820F4C9B99,459
6E99 :08C908A20820F4C9B99,459
6E9A :08C908A20820F4C9B99,459
6E9B :08C908A20820F4C9B99,459
6E9C :08C908A20820F4C9B99,459
6E9D :08C908A20820F4C9B99,459
6E9E :08C908A20820F4C9B99,459
6E9F :08C908A20820F4C9B99,459
6F00 :08C908A20820F4C9B99,459
```

Figure 1. Spectrum.

```
80 INPUT "A=";A$
90 IF B$="END" THEN GO TO 200
95 IF LEN(B$)<>20 THEN GO TO 260
100 LET T=A-256*INT(A/256)
110 FOR N=0 TO 7
120 LET X$=B$(2*N+1 TO 2*N+1)
125 GO SUB 300: LET Y$=X$
130 IF E=1 THEN GO TO 260
140 LET X$=B$(2*N+2 TO 2*N+2)
145 GO SUB 300: LET Y$=X$
```

```
150 IF E=1 THEN GO TO 260
170 POKE A+1:LET A=A+1
180 LET T=T+Y$ NEXT N:LET Y$=0
190 FOR M=1 TO 3
200 LET X$=B$(17*M TO 17*M)
205 GO SUB 300: LET Y$=X$
210 IF E=1 THEN LET A=A-1:GO TO 260
220 NEXT M
230 IF T=0 THEN PRINT "A=";A$;GO TO 50
240 PRINT "CHECKSUM ERROR"
```

```
240 PRINT "CHECKSUM ERROR"
250 LET A=A-1:GO TO 50
260 PRINT "TYPING ERROR"
270 LET A=INT(A/8):GO TO 50
280 SAVE "DOWNLOAD" CODE 60000,1136
290 POKE 23568,0:STOP
300 LET E=0:LET X$=A-48-7*(X$*9)
310 IF X$<0 OR X$>15 THEN LET E=1
320 RETURN
```

```
60000 :CD15EDC307ECCD15,4C7
60001 :EDC307ECCD15,4C7
60002 :EDC307ECCD15,4C7
60003 :EDC307ECCD15,4C7
60004 :EDC307ECCD15,4C7
60005 :EDC307ECCD15,4C7
60006 :EDC307ECCD15,4C7
60007 :EDC307ECCD15,4C7
60008 :EDC307ECCD15,4C7
60009 :EDC307ECCD15,4C7
60010 :EDC307ECCD15,4C7
60011 :EDC307ECCD15,4C7
60012 :EDC307ECCD15,4C7
60013 :EDC307ECCD15,4C7
60014 :EDC307ECCD15,4C7
60015 :EDC307ECCD15,4C7
60016 :EDC307ECCD15,4C7
60017 :EDC307ECCD15,4C7
60018 :EDC307ECCD15,4C7
60019 :EDC307ECCD15,4C7
60020 :EDC307ECCD15,4C7
60021 :EDC307ECCD15,4C7
60022 :EDC307ECCD15,4C7
60023 :EDC307ECCD15,4C7
60024 :EDC307ECCD15,4C7
60025 :EDC307ECCD15,4C7
60026 :EDC307ECCD15,4C7
60027 :EDC307ECCD15,4C7
60028 :EDC307ECCD15,4C7
60029 :EDC307ECCD15,4C7
60030 :EDC307ECCD15,4C7
60031 :EDC307ECCD15,4C7
60032 :EDC307ECCD15,4C7
60033 :EDC307ECCD15,4C7
60034 :EDC307ECCD15,4C7
60035 :EDC307ECCD15,4C7
60036 :EDC307ECCD15,4C7
60037 :EDC307ECCD15,4C7
60038 :EDC307ECCD15,4C7
60039 :EDC307ECCD15,4C7
60040 :EDC307ECCD15,4C7
```

Figure 2. Spectrum.

```
60200 :E0EE12133E0012CD,348
60201 :D7ECCDA6ECC3AAEA,6B1
60202 :CD1FEDDA6A6A2178,518
60203 :EFBE20E121E5EE3A,524
60204 :60F8B56F3E000C67,3CC
60205 :3E00BE2000CD07EC,40F
60206 :3E2132085CC3FEF,402
60207 :3E00326FEF3270EF,3C7
60208 :ED5B86FE0E00CD1F,40C
60209 :EDDA6A6A327FECD,634
60210 :EDC3A60E0FE0020,506
60211 :053A69FE6A08A75,432
60212 :0F12130C6A6EFB9,3FC
60213 :200CDD1FEDDA6A6A,508
60214 :214FEFBECC22DEBD,504
60215 :1FEDDA6A6A2178FE,509
60216 :BEC22DEBD3EAF32E2,509
60217 :E3E6A83E3E3E3E00,498
60218 :3E2FE63A885CFE21,501
60219 :2083CDD15ECCDD7EC,553
60220 :CDA6ECC21E5EE3A68,5C5
60221 :E0F56F3E000C6736,421
60222 :0021E5FEEDD48A6EF,562
60223 :0C7FE00C20DEA23,4FC
60224 :0020F63EACD84ED,589
60225 :3E8103FEC366EACD,594
60226 :1FED5FBC80DEAF3,594
60227 :0683AF03FF10F83E,50B
60228 :4803FF3E5FF3FF3E,56F
```

```
60440 :31D3FF3E3020F5C,358
60441 :32B0D32405C30B1,205
60442 :03FE21915CC99EFB,56B
60443 :CD50ED366A6CD15,32F
60444 :21608A900047E8A0,55A
60445 :608A8A900047E8A0,55A
60446 :21608A900047E8A0,55A
60447 :21608A900047E8A0,55A
60448 :21608A900047E8A0,55A
60449 :21608A900047E8A0,55A
60450 :21608A900047E8A0,55A
60451 :21608A900047E8A0,55A
60452 :21608A900047E8A0,55A
60453 :21608A900047E8A0,55A
60454 :21608A900047E8A0,55A
60455 :21608A900047E8A0,55A
60456 :21608A900047E8A0,55A
60457 :21608A900047E8A0,55A
60458 :21608A900047E8A0,55A
60459 :21608A900047E8A0,55A
60460 :21608A900047E8A0,55A
60461 :21608A900047E8A0,55A
60462 :21608A900047E8A0,55A
60463 :21608A900047E8A0,55A
60464 :21608A900047E8A0,55A
60465 :21608A900047E8A0,55A
60466 :21608A900047E8A0,55A
60467 :21608A900047E8A0,55A
60468 :21608A900047E8A0,55A
60469 :21608A900047E8A0,55A
60470 :21608A900047E8A0,55A
60471 :21608A900047E8A0,55A
60472 :21608A900047E8A0,55A
60473 :21608A900047E8A0,55A
60474 :21608A900047E8A0,55A
60475 :21608A900047E8A0,55A
60476 :21608A900047E8A0,55A
60477 :21608A900047E8A0,55A
60478 :21608A900047E8A0,55A
60479 :21608A900047E8A0,55A
60480 :21608A900047E8A0,55A
60481 :21608A900047E8A0,55A
60482 :21608A900047E8A0,55A
60483 :21608A900047E8A0,55A
60484 :21608A900047E8A0,55A
60485 :21608A900047E8A0,55A
60486 :21608A900047E8A0,55A
60487 :21608A900047E8A0,55A
60488 :21608A900047E8A0,55A
60489 :21608A900047E8A0,55A
60490 :21608A900047E8A0,55A
60491 :21608A900047E8A0,55A
60492 :21608A900047E8A0,55A
60493 :21608A900047E8A0,55A
60494 :21608A900047E8A0,55A
60495 :21608A900047E8A0,55A
60496 :21608A900047E8A0,55A
60497 :21608A900047E8A0,55A
60498 :21608A900047E8A0,55A
60499 :21608A900047E8A0,55A
60500 :21608A900047E8A0,55A
```

```
60672 :EEFE183246FEF321,3D5
60673 :66FECB1623C816D0,358
60674 :20E2C1E1C9118501,394
60675 :21608A900047E8A0,55A
60676 :963277EFC047EDDA,329
60677 :2EED0F1C366A6EAC,5C0
60678 :ED7BE681F602B3FE,348
60679 :AF2177E7F3520B23,2FC
60680 :C9C077F3520B23,2FC
60681 :47EED0FEC80C37C9,5E6
60682 :F508FF3A81E9FE00,3C7
60683 :20843E3610823E37,107
60684 :D3FFD877F1C9F53A,675
60685 :81E1FEF028043E36,376
60686 :D3FFD877F1C9F53A,675
60687 :0008FF6E0037C8D0,591
60688 :FFE6237C808F6A,626
60689 :38004087F07A39A,3E0
60690 :B1E8FE020043E37,397
60691 :188F5E36D320F4FE,452
60692 :C9C047ED3A73E0D,50E
60693 :F1C36A6F53E0D3D,3DE
60694 :20FDF1C9C0D3C2D,62A
60695 :20FAC9C5D5E5F5FE,700
60696 :7F2B13C0F9E0FE0C,357
60697 :200CFE020053E20,28A
60698 :D73E00D718103E28,34F
60699 :D73E00D73A005CF,4C0
60700 :212083E00073E5F,2E6
```

```
60904 :073E00D7F1E1D1C1,640
60905 :09FE07281C9E0B28,4F3
60906 :19FE07281C9E0B28,38B
60907 :10FE07281C9E0B28,38B
60908 :08FE07281C9E0B28,38B
60909 :08FE07281C9E0B28,38B
60910 :08FE07281C9E0B28,38B
60911 :08FE07281C9E0B28,38B
60912 :08FE07281C9E0B28,38B
60913 :08FE07281C9E0B28,38B
60914 :08FE07281C9E0B28,38B
60915 :08FE07281C9E0B28,38B
60916 :08FE07281C9E0B28,38B
60917 :08FE07281C9E0B28,38B
60918 :08FE07281C9E0B28,38B
60919 :08FE07281C9E0B28,38B
60920 :08FE07281C9E0B28,38B
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60922 :08FE07281C9E0B28,38B
60923 :08FE07281C9E0B28,38B
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60938 :08FE07281C9E0B28,38B
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60944 :08FE07281C9E0B28,38B
60945 :08FE07281C9E0B28,38B
60946 :08FE07281C9E0B28,38B
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60967 :08FE07281C9E0B28,38B
60968 :08FE07281C9E0B28,38B
60969 :08FE07281C9E0B28,38B
60970 :08FE07281C9E0B28,38B
60971 :08FE07281C9E0B28,38B
60972 :08FE07281C9E0B28,38B
60973 :08FE07281C9E0B28,38B
60974 :08FE07281C9E0B28,38B
60975 :08FE07281C9E0B28,38B
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60977 :08FE07281C9E0B28,38B
60978 :08FE07281C9E0B28,38B
60979 :08FE07281C9E0B28,38B
60980 :08FE07281C9E0B28,38B
60981 :08FE07281C9E0B28,38B
60982 :08FE07281C9E0B28,38B
60983 :08FE07281C9E0B28,38B
60984 :08FE07281C9E0B28,38B
60985 :08FE07281
```



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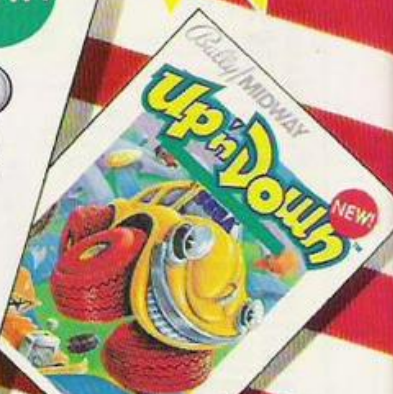
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Phil Holliday  
concludes his  
short course on  
assembly language.

# TUTORIAL

THIS ARTICLE on QL assembly language rounds off the series by presenting a long program example. It is machine code monitor which allows you to examine and alter registers and memory, and test another program by stepping through it one instruction at a time. You can even single step through the routines in Rom.

The program is position independent and is loaded by typing 'EXEC W MDV1\_DEBUG\_EXC' assuming that it is on a cartridge in Microdrive 1. Note that the QL should be in monitor mode rather than TV mode. (I find the resolution perfectly satisfactory when used with a TV however). All numbers are entered and printed in hex, and all commands and numbers can be entered in either upper or lower case. Spaces between command/parameter fields in general are not necessary and will be ignored. The program accepts the following commands:

**Display registers** — R or r. This command takes no arguments and displays the contents of all address and data registers, the program counter and the status registers. The status register is displayed in binary.

**Change address register** — A or a. This command takes the form An=x where n is the register number, between 0 and 7, and x is the new contents of the register in hex. So the command A7=40000 will set the stack pointer (i.e. address reg 7) to point to top of

memory in the QL, i.e. \$40000.

**Change data register** — D or d. The syntax for this command is identical to the change address register command above.

**Change program counter** — P or p. The syntax for this command is of the form P=x where x is the new contents of the program counter e.g. P=34000 sets the program counter to \$34000.

**Change flags** — F or f. This command toggles the state of one of the five flags and takes the form FX, FN, FZ, FV and FC to change the extend, negative, zero, overflow or carry flag as appropriate.

**Change/Display memory** — M or m. This command can have an optional suffix of .b, .w or .l to indicate the size of the memory location to be changed, or the size of the location or block of memory to be displayed. Size word is assumed when no size specifier is given. Only one memory location can be changed at a time. The command is in the form M(s) a=x where .s is the optional size specifier, a is the address of the memory location and x is the new contents of that location. So the command M.b 26000=FF will change the byte at \$26000 to \$FF. The commands to display a single memory location or a block of memory are of the form M(s) a and M(s) a,b where a and b are start and end addresses. If a is greater than b then the block from b to a will be displayed. A dump of a block of

memory can be interrupted by hitting any key.

**Load an executable program** — L or l. This enables a program to be loaded into the transient program area. It takes the form L MDV1\_PROG\_TEST. After it has been loaded the program counter will be loaded with the start address of the program and A7 (the stack pointer) will be loaded with the top address of the associated data area. To examine these type R. If the program is loaded correctly then 'ok...' is printed to the screen, else one of the normal QDOS error messages will be printed. To try it you can even type L MDV1\_DEBUG\_EXC and single step through the debug program!

**Single step** — S or s. This command takes no parameters. Every time it is used the a single instruction will be executed. Using the R command enables a display of the new state of the processor after executing the command.

**Quit** — Q or q. Takes no arguments but just returns you to basic.

For those of you who do not wish to type it all out, or for those of you who do not have an assembler, I will be happy to provide a copy of both the source and executable program on your supplied Microdrive cartridge. Just send three pounds to cover my time, postage and packing to P.A. Holliday, 44 Lennard Road, London SE20 7LX.

LOC	OBJECT	SOURCE STATEMENT	HEX	LOC	OBJECT	SOURCE STATEMENT	HEX
0000	0000	1 *Debug for QL 4 Feb 1980	0000	0000	0000	1 *Debug for QL 4 Feb 1980	0000
0001	0001	2 *Assembled with RETACODE assembler	0001	0001	0001	2 *Assembled with RETACODE assembler	0001
0002	0002	3	0002	0002	0002	3	0002
0003	0003	4	0003	0003	0003	4	0003
0004	0004	5	0004	0004	0004	5	0004
0005	0005	6	0005	0005	0005	6	0005
0006	0006	7	0006	0006	0006	7	0006
0007	0007	8	0007	0007	0007	8	0007
0008	0008	9	0008	0008	0008	9	0008
0009	0009	10	0009	0009	0009	10	0009
0010	0010	11	0010	0010	0010	11	0010
0011	0011	12	0011	0011	0011	12	0011
0012	0012	13	0012	0012	0012	13	0012
0013	0013	14	0013	0013	0013	14	0013
0014	0014	15	0014	0014	0014	15	0014
0015	0015	16	0015	0015	0015	16	0015
0016	0016	17	0016	0016	0016	17	0016
0017	0017	18	0017	0017	0017	18	0017
0018	0018	19	0018	0018	0018	19	0018
0019	0019	20	0019	0019	0019	20	0019
0020	0020	21	0020	0020	0020	21	0020
0021	0021	22	0021	0021	0021	22	0021
0022	0022	23	0022	0022	0022	23	0022
0023	0023	24	0023	0023	0023	24	0023
0024	0024	25	0024	0024	0024	25	0024
0025	0025	26	0025	0025	0025	26	0025
0026	0026	27	0026	0026	0026	27	0026
0027	0027	28	0027	0027	0027	28	0027
0028	0028	29	0028	0028	0028	29	0028
0029	0029	30	0029	0029	0029	30	0029
0030	0030	31	0030	0030	0030	31	0030
0031	0031	32	0031	0031	0031	32	0031
0032	0032	33	0032	0032	0032	33	0032
0033	0033	34	0033	0033	0033	34	0033
0034	0034	35	0034	0034	0034	35	0034
0035	0035	36	0035	0035	0035	36	0035
0036	0036	37	0036	0036	0036	37	0036
0037	0037	38	0037	0037	0037	38	0037
0038	0038	39	0038	0038	0038	39	0038
0039	0039	40	0039	0039	0039	40	0039
0040	0040	41	0040	0040	0040	41	0040
0041	0041	42	0041	0041	0041	42	0041
0042	0042	43	0042	0042	0042	43	0042
0043	0043	44	0043	0043	0043	44	0043
0044	0044	45	0044	0044	0044	45	0044
0045	0045	46	0045	0045	0045	46	0045
0046	0046	47	0046	0046	0046	47	0046
0047	0047	48	0047	0047	0047	48	0047
0048	0048	49	0048	0048	0048	49	0048
0049	0049	50	0049	0049	0049	50	0049
0050	0050	51	0050	0050	0050	51	0050
0051	0051	52	0051	0051	0051	52	0051
0052	0052	53	0052	0052	0052	53	0052
0053	0053	54	0053	0053	0053	54	0053
0054	0054	55	0054	0054	0054	55	0054
0055	0055	56	0055	0055	0055	56	0055
0056	0056	57	0056	0056	0056	57	0056
0057	0057	58	0057	0057	0057	58	0057
0058	0058	59	0058	0058	0058	59	0058
0059	0059	60	0059	0059	0059	60	0059
0060	0060	61	0060	0060	0060	61	0060
0061	0061	62	0061	0061	0061	62	0061
0062	0062	63	0062	0062	0062	63	0062
0063	0063	64	0063	0063	0063	64	0063
0064	0064	65	0064	0064	0064	65	0064
0065	0065	66	0065	0065	0065	66	0065
0066	0066	67	0066	0066	0066	67	0066
0067	0067	68	0067	0067	0067	68	0067
0068	0068	69	0068	0068	0068	69	0068
0069	0069	70	0069	0069	0069	70	0069
0070	0070	71	0070	0070	0070	71	0070
0071	0071	72	0071	0071	0071	72	0071
0072	0072	73	0072	0072	0072	73	0072
0073	0073	74	0073	0073	0073	74	0073
0074	0074	75	0074	0074	0074	75	0074
0075	0075	76	0075	0075	0075	76	0075
0076	0076	77	0076	0076	0076	77	0076
0077	0077	78	0077	0077	0077	78	0077
0078	0078	79	0078	0078	0078	79	0078
0079	0079	80	0079	0079	0079	80	0079
0080	0080	81	0080	0080	0080	81	0080
0081	0081	82	0081	0081	0081	82	0081
0082	0082	83	0082	0082	0082	83	0082
0083	0083	84	0083	0083	0083	84	0083
0084	0084	85	0084	0084	0084	85	0084
0085	0085	86	0085	0085	0085	86	0085
0086	0086	87	0086	0086	0086	87	0086
0087	0087	88	0087	0087	0087	88	0087
0088	0088	89	0088	0088	0088	89	0088
0089	0089	90	0089	0089	0089	90	0089
0090	0090	91	0090	0090	0090	91	0090
0091	0091	92	0091	0091	0091	92	0091
0092	0092	93	0092	0092	0092	93	0092
0093	0093	94	0093	0093	0093	94	0093
0094	0094	95	0094	0094	0094	95	0094
0095	0095	96	0095	0095	0095	96	0095
0096	0096	97	0096	0096	0096	97	0096
0097	0097	98	0097	0097	0097	98	0097
0098	0098	99	0098	0098	0098	99	0098
0099	0099	100	0099	0099	0099	100	0099

(listing continued on next page)



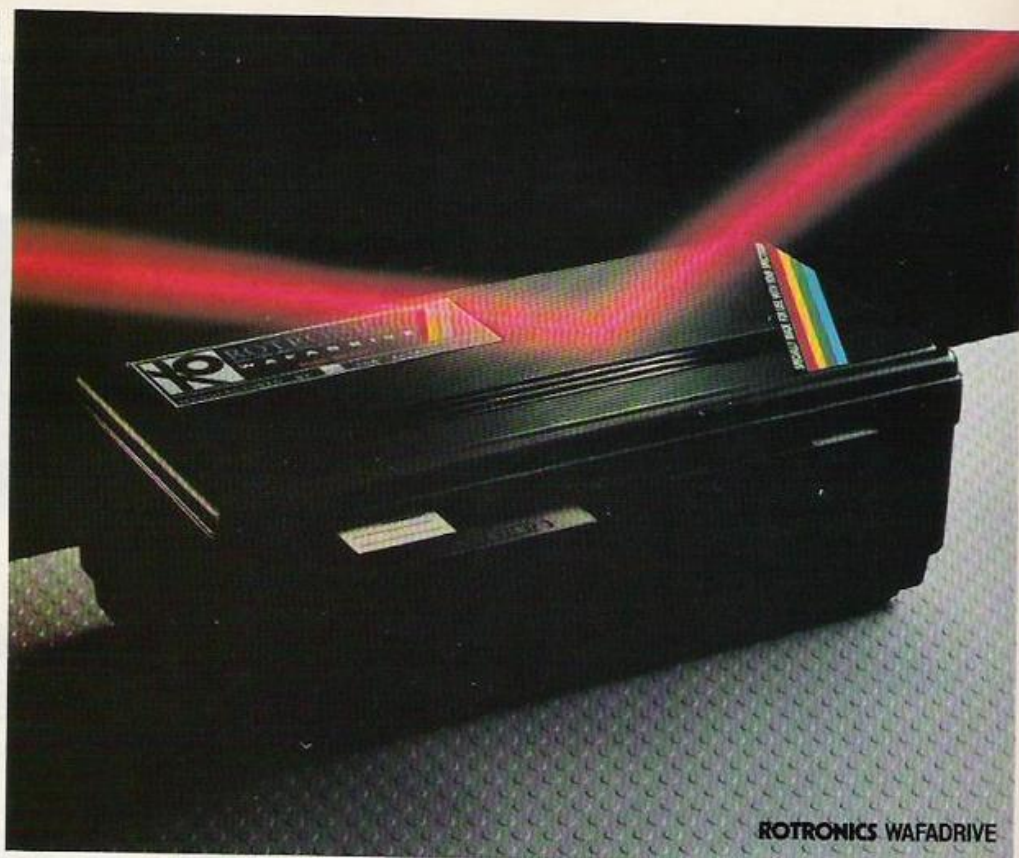
(listing continued from previous page)

[illegible]



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VC 7/4/85

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(listing continued from page 116)

[illegible]

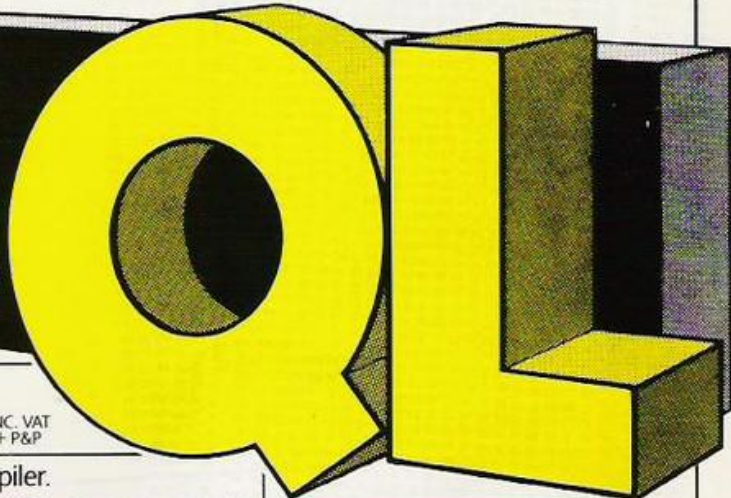
Table 1. Mean and standard deviation of the variables of the study.



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--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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**YC3**



# Listing 2.

```

41767 43073E072F072B072607 = 292
41777 0C07070707070707070707 = 540
41787 C060B060B060B060B060B0 = 937
41797 8F067C065906490645064 = 528
41807 3D0638063506290623062 = 276
41817 20067F05710568056505 = 383
41827 5F055805340533052605 = 501
41837 1B05F904F604B904B204 = 1007
41847 D604CF04C804490449804 = 835
41857 AD04A804A5047F047804 = 699
41867 950490048B044A044A004 = 447
41877 75045A0452044A044004 = 166
41887 3A0420041B0412040B04 = 929
41897 0304FC03903DC03CD03 = 929
41907 8D017C01320143013C01 = 407
41917 62015F01250120011B01 = 193
41927 33012901250120010801 = 87
41937 180110201F00FA00F700 = 759
41947 05010201F00FA00F700 = 1097
41957 F400ED00D800D400BC00 = 486
41967 8A006C0064005B003100 = 154
41977 2C002900240021000000 = 864
41987 2124FF194E23462346E5 = 915
41997 2814E56B62094E1702B71E1 = 1077
42007 6B62094D44E1702B3D1 = 911
42017 18E401290021B1103C3D1 = 804
42027 BCA401C345000C00E1196 = 615
42037 01CD78BB25204050513 = 1233
42047 131ACD5ABB1310F9C9DD = 1053
42057 E5E1FE023BE20E002B07 = 1070
42067 FE0320DA4E23233EC0A1 = 1167
42077 32BF03CB95E2356ED53 = 942
42087 B903235E2356ED53B503 = 1018
42097 CB412017CD11BCD83E07 = 921
42107 CDB4BB47C52100001118 = 1049
42117 27CD66B8C11813217007 = 1547
42127 237EFEF7280A064BCD2B = 1264
42137 BD3BF310F9C9C5CD06B9 = 682
42147 57CB49CC09B9CD12B95F = 1448
42157 CB1280ACB590E012601 = 1366
42167 C8CD0F97C1D5C5CDD0E0 = 1718
42177 C1CB41200CC2D78BB78E5 = 1313
42187 CDB4BBE1CD755BBC1C318 = 674
42197 B92AB503ED4BB703A7ED = 1440
42207 42C90640CB4120070618 = 1032
42217 C5CD6CBBC1C521BF037E = 819
42227 E6CC772AB50322B70321 = 791
42237 5E0722BB030FECD1104 = 957
42247 21470722BB03CDD30028 = 766
42257 2309ED43B50322B703C = 1470
42267 EA062ABB032322B703C = 1470
42277 E5AFCD8E06D1CDD30028 = 1470

```

```

42287 05EB232318EB2AB9030B = 810
42297 ED42C130053ABF03E40C = 1043
42307 282DCD6F010428A30510 = 630
42317 AOCB41280F3E07CD9001 = 902
42327 CD18BBEBAFFFE432881C9 = 1485
42337 21500722BB031E25CD09 = 833
42347 060DCD6F0118E3214707 = 700
42357 16287E36201B8E3214707 = 792
42367 90011803CD5AB8231520 = 742
42377 EDCB41C67E23CD90017E = 1342
42387 CD2BBD30FBC90D0A5379 = 1164
42397 6E746178206572726F72 = 1029
42407 444953415353454D424C = 743
42417 45D20080C2C3C4C3C8CC = 1593
42427 28484CA9C1C148CCC142 = 1278
42437 C344C58A53D041C622842 = 1258
42447 43A9284445A92804A928 = 835
42457 04A94EDADA44EC3C350CF = 1442
42467 50C5D0CD41444420A041 = 1148
42477 444320A05354220A053 = 836
42487 424320A0414E4420A043 = 816
42497 4F5220A04F5220A045 = 805
42507 502020A052452020A0A9 = 800
42517 58D84A5020203502C8A4F = 773
42527 4C442020208448414CD44F = 659
42537 502020208448414CD44F = 812
42547 55542020412C2802A945 = 826
42557 4E20202020285350292C8A = 863
42567 5820202020204452C48CC = 610
42577 43582020204452C48CC = 710
42587 44C45C94E4FD0455820 = 1093
42597 202041462C4146A2444A = 682
42607 4E5A20834A52202020A0 = 714
42617 4A522020A04A5020A0 = 758
42627 43414C4CA04C4420A0 = 812
42637 494E4320A044454320A0 = 806
42647 504F5020A05035348A0 = 911
42657 494E2020A04F5220A0 = 815
42667 524C4320A052522020A0 = 840
42677 524C2020A052522020A0 = 770
42687 534C4120A053524120A0 = 838
42697 494E56414C20A0420434F = 697
42707 44C553524C20A0284958 = 897
42717 2B02A92849582B02A952 = 712
42727 535420A049D849D94CC4 = 1210
42737 43D049CE4FD4C9C449D2 = 1525
42747 44D2B0B1B2B3B4B5B6B7 = 1714
42757 42495420A052455320A0 = 641
42767 53454524CC4CEC9D28 = 802
42777 5252C4524CC4CEC9D28 = 1371
42787 43A9444154C1524C43C1 = 1064
42797 525243C1524C43C15252C1 = 1132
42807 4441C14350CC5343C643 = 1092
42817 43C643414C4C20B44E45 = 960

```

# AMSTRAD DS

# Whump!



WILPINC.

Kevin Probert with a more subtle way of disassembling than the picture shows.

## Listing 1.

```

10 MEMORY 41766:LOAD *CODE*,41767:GOTO 110
20 SAVE *HEX LOADER*:SAVE *CODE*,D,41767,2136:END
100 MEMORY 41766
110 MODE 1
120 DIM check(2)
130 LOCATE 1,24:INPUT*START ADDRESS *address:CLS
140 LOCATE 1,24:PRINT address
150 INPUT *CODE,CHECKSUM *,a,check(2)
160 check(1)=0
170 FOR n=1 TO LEN(a) STEP 2
180 a=VAL(*a*MID$(a,n,2))
190 check(1)=check(1)+a
200 POKE address+n-1,a
210 NEXT
220 IF check(1)=check(2) THEN 240
230 LOCATE 1,24:PRINT *CHECKSUM ERROR.PLEASE INPUT AGAIN*:GOTO 260
240 address=address+10
250 LOCATE 10,24:PRINT SPACE$(41)
260 LOCATE 1,25:PRINT SPACE$(41)
270 GOTO 140

```



42827 C74C524F4D204FCE4C52 = 988  
 42837 4F4D204F46C655324F4D = 858  
 42847 204F4E4A055524F4D204F = 763  
 42857 4646A0305245332022 = 636  
 42867 432220544F20434F4E54 = 945  
 42877 494E55C5524F4D20A052 = 409  
 42887 4F4D2020A0000200020E = 703  
 42897 0E20240404040404040B = 576  
 42907 40404040404040404040 = 691  
 42917 0800002A020002FFAFCF = 520  
 42927 8FCF8F0C0F0000000000 = 174  
 42937 00000000000000000000 = 1061  
 42947 78E6F8180378E638F0F = 878  
 42957 0FC9C0C035F16001978 = 802  
 42967 E6070707070707070707 = 1056  
 42977 CB00C920161AFEF0F183D = 717  
 42987 CD970411736E0F0F183D = 1094  
 42997 CBDE11736F18401E71C3 = 767  
 43007 89061E660C0C0C0C0C0C0C = 1351  
 43017 FE07CBED3DB90337ED52 = 1151  
 43027 C821BF03C8562834CB96 = 1312  
 43037 3ABD0347ED5BB703FEDF = 944  
 43047 30BB1BFED72811A1173 = 874  
 43057 70CB7F28011CCB772801 = 1020  
 43067 14C34306EB1E77CD8904 = 1151  
 43077 7EE6C007076F37C3DE06 = 1251  
 43087 CB5EC89E7ECD97044328 = 1068  
 43097 081E76CD89066818E9CB = 1031  
 43107 77209BCB6F2839CB4728 = 827  
 43117 084478E607FE06203928 = 966  
 43127 22B703CD003F1807 = 575  
 43137 CDC10320050D1E3F1807 = 848  
 43147 1E5BCD67061E54CD5806 = 699  
 43157 1E01CD64062AB7035E23 = 921  
 43167 22B703CD003F1807 = 910  
 43177 03CDCC0320497C97041E = 1211  
 43187 45C38906C867283DCDC0 = 1116  
 43197 03FE143812FE1830ECCB = 837  
 43207 5020E8114C4CCD44060D = 1025  
 43217 C34706CB5F28DA21A103 = 1166  
 43227 CDCC0328D211980578E4 = 866  
 43237 0F6F2600EB195E19E55E = 857  
 43247 19E3235E23562366C911 = 948  
 43257 410521BF0378FEC0381D = 1569  
 43267 FEED2814FECB280EFEFD = 1571  
 43277 2804FEDD20D0C8CEBC6 = 1164  
 43287 1804CBEECB6E6C3110428 = 935  
 43297 0AFEB030C12E111DD08 = 1039  
 43307 FE403809FE7A20B41E2A = 1121  
 43317 C38906E60720A7CB6828 = 753  
 43327 A32E1018A3404244748 = 889  
 43337 48D409384A3CF4048CC = 786  
 43347 010249CD89067832BD03 = 1475  
 43357 D6C76F37CDDE0678D681 = 1475

43367 324B0521BE03CB00C823 = 826  
 43377 CDD6CDBA0678FED72806 = 1449  
 43387 3E0430023E06C3BE06C2 = 769  
 43397 2515BF3B8CDD361504BD = 905  
 43407 29B7371504B23C8CB4A5 = 1027  
 43417 B26E101316191C1D1F29 = 499  
 43427 080B1E21001500218C3D = 337  
 43437 0145903E65018C200E8C = 736  
 43447 8838138C90708925268 = 1013  
 43457 5FD47C1E0E8C28041E5C = 942  
 43467 04386308CB6854266118 = 814  
 43477 1874CB60285C54266118 = 310  
 43487 5F121316191C1D1F220A = 368  
 43497 2225281315171A262959 = 822  
 43507 3153386C044F3891884A = 575  
 43517 398C473901443A014238 = 579  
 43527 01024267341D0E8C3838 = 977  
 43537 889101041D080C2D5806 = 400  
 43547 380101041D080C2D5806 = 1128  
 43557 CDC5035AFE04DC89060C = 842  
 43567 5CCB70201E1D1830CD43 = 940  
 43577 06CD8806184DCD89066A = 853  
 43587 5418010DCD89066ACD58 = 750  
 43597 060CD05CC07CFE012810 = 1188  
 43607 FE053866C0C503CB7B28 = 944  
 43617 08CB8B1F160378E60783 = 978  
 43627 5FFE07280EFA0A280AFE = 541  
 43637 0F2014CB782810180D3A = 1243  
 43647 BF03CB472807C0BF3CB4F = 1023  
 43657 20011CE5D5C0E6421B0 = 1000  
 43667 0123CB7E28FBD1D20F823 = 1151  
 43677 7ECB7F2013CDA40618F5 = 1384  
 43687 CBBFF0A28B63010E5CD = 1624  
 43697 BE06E1C9CDA406C1D1E1 = 1074  
 43707 0CC03E2C187ECD9704FE = 849  
 43717 03281D3816FE0653CD97 = 1104  
 43727 04636A3819CB0CBB428 = 1103  
 43737 13CBFCBF4180D6B2600 = 468  
 43747 18091600CB728011519 = 853  
 43757 A73ABF03CB7F283110711 = 781  
 43767 30010D11F0D6C8110711 = 1155  
 43777 18FCCD1107119CFFCD11 = 846  
 43787 071EF6CD11072D180AAF = 826  
 43797 3C1938FCE523D28010C = 1083  
 43807 5FAFB9CB7818113803CD = 962  
 43817 2907637CCDC0131FCB3A = 922  
 43827 077CE60FC630F33A3802 = 1041  
 43837 C607E52AB803772322BB = 653  
 43847 03E1C920202020202020 = 320  
 43857 20202020202020202020 = 320  
 43867 20202020202020202020 = 320  
 43877 20202020202020202020 = 374  
 43887 20202020202020202020 = 0  
 43897 00000000000000000000 = 0

# DISASSEMBLER

THIS DISASSEMBLER occupies less than 2K once loaded and can be located anywhere in memory. It can be called from within Basic as an external command and (a) correctly disassembles all Z80 op codes using standard mnemonics including the RST instructions as implemented in the 464 Operating System (OS); (b) disassembles routines in Rom or Ram; (c) sends output in hex or decimal to either screen or printer.

Those who have tried to Peek the Rom to get a glimpse of the O.S. will appreciate option (b) since Peek always returns the contents of Ram. The program can be altered to a certain degree to suit user requirements.

The program has been implemented as an

RSX — Resident System Extension — and once loaded sits above Himem. However, since Himem can vary dependent on space reserved for expansion Roms, for example, disc Rom or user machine-code routines then an RSX needs to be relocatable. This is achieved by an additional routine which is called before the program is "logged on" with the OS and makes use of the fact that a Call from within Basic enters the routine with the DE register pair containing the argument of the Call instruction. For those interested in using the RSX facility, the following illustrates how "logging on" is achieved:

LD BC,NNNN Address of Command  
 Table Pointer  
 LD HL,NNNN Address of 4 bytes for  
 OS to use as

JP BCD1 workspace  
 Log on external  
 command(s) with OS  
 COM TAB  
 POINTER 2 bytes holding start  
 address of keyword  
 table  
 JP NNNN FLASH routine  
 JP NNNN INVERSE routine  
 etc  
 FLAS H + 80h Last letter in each  
 keyword has bit 7 set  
 INVERS E + 80h  
 etc  
 0 End of keywords  
 marker

Once logged on an external command server is recognised by preceding the keyword with shifted @

:FLASH

Parameters can also be passed to the external command server routine in the following fashion:

:FLASH,400,23

On entry to the routine the A register holds the number of parameters being passed, the index register IX points to an area in memory where the parameters are stored in two-byte integer form in the reverse order to that in which they were entered, that is, from the above example:

A = 2  
 IX + 0 = 23  
 IX + 1 = 0  
 IX + 2 = 144  
 IX + 3 = 1 (1\*256 + 144 = 400)

Strings can also be passed to the external command server routine: in this case IX (continued on page 123)

Table 1.

	SET (1)	RESET (0)
Bit 0 (1)	Output to printer	Output to screen
Bit 1 (2)	LROM On	LROM Off
Bit 2 (4)	UROM On	UROM Off
Bit 3 (8)	Disc ROM	BASIC ROM
Bit 4 (16)	Not used	
Bit 5 (32)	Not used	
Bit 6 (64)	Output as DATA	Output as code
Bit 7 (128)	Output in decimal	Output in hex

Bit 0. Self-explanatory.

Bit 1. Selects what will be disassembled (LROM or Ram) when addressing memory between 0000h and 3FFFh.

Bit 2. Selects what will be disassembled (UROM or Ram) when addressing memory between C000h and FFFFh.

Bit 3. When Bit 2 is Reset, this Bit is ignored. When Bit 2 is Set, this Bit selects the UROM which will be addressed.

Bit 6. When Reset memory between the start and finish addresses is disassembled; when Set this memory area is output as Data.

Bit 7. Self-explanatory.



# The next move is up to you...



All American Adventures Ltd., Unit 10, Parkway Industrial Estate,  
Heneage Street, Birmingham B7 4LY. Telephone: 021-359 3020.



### Listing 3.

```
300 MODE 1
310 LOCATE 1,25:INPUT;"START ADDRESS ";address:CLS
320 LOCATE 1,25
330 c$="":check=0
340 FOR n=0 TO 9
```

```
350 a=PEEK(address+n)
360 check=check+a:c$=c$+HEX$(a,2)
370 NEXT n
380 PRINT address;TAB(10);c$;TAB(32);" ";check
390 a$=INKEY$:IF a$="" THEN 390
400 address=address+10:GOTO 330
```

(continued from page 121)

points to an address which in turn points to a three-byte string descriptor where byte 0 holds the length of the string, bytes 1 and 2 hold the address where the string is stored.

I have selected a method of entering the program often seen in this magazine, because I have found this method to produce the least number of errors. The program should be entered with all expansion Roms disconnected. This can be checked by:

PRINT HIMEM

which should return the value 43903. Enter the hex loader program in listing 1 and when complete type Run 100. Input as prompted the code in listing 2, code and Checksum being separated by a comma. The code can be Saved at any stage of its development by Escaping from the loader program and typing Run 20. It can then be reLoaded at a later date by

RUN"

Once all code has been entered, delete the loader program and enter the Basic Load/Save program in listing 4. Save the completed program to tape by typing Run 4. Enter as a direct command

CALL 41987

and if the ready prompt appears go on to use the program as described later in this article. If the system crashes, reset the system then enter:

MEMORY 41766: LOAD

"DISASSEMBLER":LOAD "ICODE", 41767  
Once Loaded, check the code by entering listing 3 and Run 300. Compare the results to listing 2 and, after all errors have been corrected, reSave as above.

\* Once the program has been Saved in its

final form it can be recalled by

RUN"

if no other program is in memory or by CHAIN MERGE "DISASSEMBLER"  
if a program in memory is to be retained. To use the disassembler the following syntax is required:

!disassembler, <start address>,  
<finish address>, <output state>

The start and finish addresses are mandatory, the output state optional defaulting to zero if omitted. All parameters can be either numeric or variable expressions.

For example, if it is required to send output to the printer, LRom on, URom off, as code in decimal, then the output state value is as follows:

$(1*1) + (1*2) + (0*4) + (0*64) + (1*128) = 131$

When output to the screen is selected, the disassembler uses stream 7 and sets a window size on this stream 40 characters wide and 25 high. The disassembler must be used in Mode 1 or 2 or it will not operate.

As it stands, the disassembler produces mnemonics using upper case. For those who prefer mnemonics in lower case the program in listing 5 should be entered and run before saving the disassembler in its final form.

For those who intend to use a printer with the disassembler, various options are available. If using cut sheet paper then the number of lines per sheet can be set by Poking the value to 42210 — A4E2h. The disassembler will then wait at the end of the sheet for "C"

### Listing 4.

```
1 a$=HEX$(2137:MEMORY a$:LOAD "ICODE", a$+1:CLOSEIN
2 CALL a$+221:REM RELOCATE AND LOG ON DISASSEMBLER
3 MEMORY a$+261:DELETE 1-4:END
4 SAVE "DISASSEMBLER":SAVE "ICODE", a$+1767, 2136:END
```

to be pressed giving time to change the sheet.

If using continuous paper this value should be set to 255 — FFh. The area from 43893 (AB75h) to 43903 (AB7Fh) has been set aside for up to 10 control codes which the user can enter and are sent before printing starts. The control codes must be terminated by a marker byte 255 — FFh.

The only non-standard results produced by the disassembler are those of the RST 08h, 10h, 18h and 28h instructions. The 464 OS implements these op codes as "extensions" to the instruction set. When executed, the following two bytes are taken as an inline address; the RST 08h uses bits 14 and 15 to select the Rom state, the RST 10h uses these bits for Rom select.

The RST 18h instruction takes a third byte for Rom state/select but is thus able to jump to any location in memory in any Rom. Typical examples of the output produced by the disassembler for each of these RST instructions are given below plus their interpretation.

Mnemonic	Remark
RST 08,3B0F	JP 3B0F
UROM OFF LROM ON	Upper ROM disabled, Lower ROM enabled
RST 10,DFCC	CALL DFCC
ROM + 2	Side CALL to an expansion ROM
RST 18,OD17	CALL OD17
UROM ON LROM OFF	Upper ROM enabled, Lower ROM disabled
ROM 199	Select ROM 199
RST 28,224C	JP 224C
LROM ON	Lower ROM enabled

### Listing 5.

```
10 FOR address=42421 TO 42828 AND a<219) THEN 40 ELSE 50
20 a=PEEK(address)
30 IF (a>64 AND a<91) OR (a>192 40 a=a+32:POKE address,a
50 NEXT
```

### Memory map.

Address	Routine	Address	Routine	Address	Routine
41767 (A327h)	Data for relocating routine.	42236 (A4FCh)	Set up print position in print buffer.	42958 (A7CEh)	Check for valid IX/IY and ed op codes routine.
41987 (A403h)	Relocating routine.	42244 (A504h)	Call build up mnemonic in print buffer.	42980 (A7E4h)	RST 18/28 handler.
42019 (A423h)	Log on disassembler with OS.	42253 (A50Dh)	Print address, op code and operand to print buffer.	43009 (A801h)	Data handler.
42028 (A42Ch)	Data for log-on.	42327 (A557h)	Wait for key press.	43028 (A814h)	Entry to build up mnemonic in print buffer.
42033 (A431h)	Print syntax error.	42354 (A572h)	Copy print buffer to current screen line/printer: return.	43035 (A81Bh)	RST 08/10 handler.
42056 (A448h)	Entry to disassembler: check syntax.	42393 (A599h)	Data for syntax error.	43114 (A86Ah)	CB op code handler.
42074 (A45Ah)	Set up output state, finish and start address.	42407 (A5A7h)	Data for log-on assembler.	43175 (A8A7h)	IX/IY op code handler.
42101 (A475h)	Set up stream and window size.	42420 (A5B4h)	Mnemonic keyword list/control codes.	43195 (A8BBh)	Ed op code handler.
42124 (A48Ch)	Check if printer connected: send control codes.	42892 (A78Ch)	Data for valid IX/IY op codes.	43253 (A8F5h)	Check for CB,ED and IX/IY op codes.
42143 (A49Fh)	Set up required rom state.	42924 (A7ACH)	Data for valid ed op codes.	43295 (A91Fh)	Op codes <64.
42174 (A4BEh)	Call disassembler start.	42932 (A7B4h)	Workspace for OS.	43332 (944h)	Data for op codes >= 192.
42177 (A4C1h)	Restore previous Rom state and stream: return.	42936 (A7B8h)	Start, current and finish addresses.	43419 (A99Bh)	Data for ed op codes.
42198 (A4D6h)	Check if start = current address.	42942 (A7BEh)	Print position in print buffer.	43488 (A9EOh)	Data for op codes <64.
42209 (A4E1h)	Disassembler start: set up No. of lines for screen/printer.	42944 (A7COh)	RST flags.	43575 (AA37h)	Various print routines.
		42946 (A7C2h)	Disassembler flag.	43660 (AA8Ch)	Find mnemonic keyword and print to print buffer.
		42947 (A7C3h)	Conversion routines.	43713 (AAC1h)	Print decimal/hex number to print buffer.
				43850 (AB4Ah)	Print buffer.
				43890 (AB72h)	Carriage return: line feed.
				43892 (AB74h)	Control codes.
				43903 (AB7Fh)	End.



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# SINCLAIR C5 CLIVEN MOBILE

## RESULTS

MODEL T FORD, Volkswagen Beetle, E-Type Jaguar, Austin Mini, Rolls Royce... Sinclair C5? Perhaps not. Sinclair's electric vehicle seems unlikely to take its place in the pantheon of automotive greats. It has already received a buffeting at the hands of the national press which has gleefully reported its mishaps — from the first case of drunken driving on a C5 to the first accident on a C5.

But the company can take comfort in the fact that almost 2,000 *Your Computer* readers would like to own a C5. That is how many people entered our February competition which offered the supertrike as a prize. We asked them to place five features in order of preference and then to invent a computerised gadget which would make driving easier or more fun. Our panel's preference were as follows: 1. Low purchase price; 2. Low running costs, 3. Can be driven by 14-year olds; 4. Easy to park; 5. Lightweight.

The great majority of the entries made serious sounding suggestions. They included radar devices to warn of other cars, satellite-based navigation systems, gadgets to assist parking, devices to monitor the state of the vehicle, and a variety of VDU units — P. Kolenbrander's Super Guide consists of a flat screen display linked to database containing information on Britain's motorways. Its purpose is to direct the driver along the

quickest and most economical route.

Other entries were aimed mainly at the C5 rather than motoring in general and took a lighter and more irreverent approach. A. Hartley's gadget — named the Pinking Engine — is a programmable squeaker cum knocker and muffled sound generator, designed to restore character to the vehicle. K. Ciscombe suggested a pump for bailing out the C5 when it rains. There were also several mother-in-law jokes which we mention here only to express our disapproval — The Worsley Patent, for example, feeds back mother-in-law's voice, anti-phase, to the back seat.

Best of all, we thought, was the Roadbot from P. Carrahar Gwynfa, Llanarmon Rd, Llanferres Mold, Clwyd, which wins him the prize. Roadbot takes us back to the days around the turn of the century when cars were restricted to a fast walking pace. It is robot which walks in front of the C5 waving a red flag.



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# TOP TIPS

## REM-LITE

Ever written a program on a Commodore 64, filled it with Rem statements for easy reading and then tried to find the relevant statement as it flashes by on listing?

Sure, you can surround your remarks by lines of asterisks, but what an unnecessary waste. Here is a Basic program which will generate some machine code to sit in memory, away from Basic, and solve this problem.

Having loaded and run this program, then any Basic program may be loaded, and by typing SYS 50000 all of the Rem statements will be inverted. Try listing it and see!! The program may then be saved as normal. Its Rem statements will always show as inverted whenever the program is subsequently loaded and listed.

Richard Lievers

```
5 PRINT CHR$(147) "SYS 50000"
  PRINT "HIGHLIGHTS REM STATEMENTS"
10 DATA 165,43,133,98,165
20 DATA 44,123,51,165,98
30 DATA 208,41,165,91,240
40 DATA 59,166,3,208,177
50 DATA 90,201,0,240,13
60 DATA 201,143,200,245,200
70 DATA 177,90,240,4,169
80 DATA 16,145,90,160,0
90 DATA 177,90,72,200,177
100 DATA 90,133,91,184,133
110 DATA 90,103,1,208,209,96
120 FORH=0 TO 55:REM POKE 50000+H,R:NEXT
```

## LINE DELETE

The following machine-code program for the Spectrum makes the job of deleting a block of Basic program lines almost instantaneous. To use this facility simply merge lines 9000 to 9090 with the program you want to trim and type GOTO 9000. Alternatively you could save the machine code itself with SAVE "DELETE" CODE 32000,53

and then type in lines 9030 to 9080.

The code is relocatable and can be loaded into any other part of Ram by changing line 9005. As it stands Clear 31999 should be entered as a direct command before the program is run.

Rodney Francis

```
9000 LET T=0
9005 FOR R=32000 TO 32053
9010 PERC 4:POKE T,R:LET T=T+4
9015 NEXT R
9020 IF T=32053 THEN PRINT "DATA ERROR"
9025 STOP
9030 INPUT "First line" L
9040 INPUT "Last line" H
9050 POKE 255,INT ((H-L)/255)
9060 POKE 256,INT ((H-L)/255)
9070 RANDOMIZE USP 32000
9080 DATA 87,91,0,91,42,4,91,22
91,107,27,62,25,216,122,179,200
62,39,198,218,24,4,92,18
9090 DATA 109,210,232,210,205,21
25,229,194,25,229,194,25,229,194
209,198,210,91,58,94,38,88,38,28
209,205,229,25,201
```

# RESPONSE

*Frame*

## SPRITE CONTROL

I have recently acquired a Commodore 64, and have been writing programs involving sprites. I've come up against the problem of being able to control the sprite by using the keyboard. I want to press, for example, the Z key to move left and the X to move right.

R King,  
Rochester, King.

THIS IS FAIRLY easy to do. You read the keyboard with Get\$, and then Poke the relevant character and colour locations of your object with their addresses plus one, to move right, and minus one to move left. If char was the current character address, and col was the current colour address, your program could look like this:

```
10 GET AS$
20 IF AS$ < "Z" AND AS$ < "X" THEN 10
30 IF AS$ = "Z" THEN POKE char-1,n:POKE col-1,n
40 IF AS$ = "X" THEN POKE char+1,n:POKE col+1,n
50 GOTO 10
```

## NO PRINT

I have had a Vic-20 for some time, and have written a number of programs for it. I have recently bought a 16K expansion, and found that the games which included screen memory mapping do not print anything where a screen character is supposed to be. Why is this, and how can I fix it?

N G Watkin,  
Dereham, Norfolk.

WHEN YOU ADD 8K or more to the Vic, the screen locations change. The character memory map moves from 7680 to 4096. Therefore, to get your old programs to run, you need to subtract 3584 from each character Poke to the screen. Colour Pokes do not change.

## ZX-81 DATABASE

I have a 16K ZX-81 and would like to be able to keep records of my bird's breeding sessions on it. I don't really know a lot about programming, and would appreciate it if you could suggest a way of storing my records on computer. I have enclosed a record card showing the information I keep. I have 20 pairs of birds.

Ralph Martin,  
Gillingham, Kent.

THE IMPORTANT question to settle, when trying to set up a database, is what you want to be able to get out of it. This is not meant to be facetious. I assume you would need to store

Do you have a problem related to your micro? Tim Hartnell will do his best to help. Please include only one question per letter and mark it "Response Frame". Alternatively, perhaps you have an idea you'd like to pass on to others. Why not write to us with your top tips?

information so it could be accessed by the identity of its parents, so you could ask, in effect, questions like "How many eggs have birds A and B laid this year?", and then go on to find out such things as how many female chicks were born, and so on. A database is essentially, a multi-dimensional array, which can be cross-referenced. Your prime arrays could hold the identity of the parents, with the other information you need tagged to these. The subject is too vast for me to be able to answer adequately in a column like this one, but I can point you in the right direction. Three books on databases which I recommend are *The Database Primer*, Rose Deakin (Century, 1983); *Database, A Primer*, C J Date (Addison-Wesley, 1983); and the rather oddly titled *Databases for Fun and Profit*, Nigel Freestone (Granada, 1983). I hope these can help.

## SHARP MOVES

I am the owner of a Sharp MZ-80K and am interested in making up my own games. I can't find out how to do such things as move a base cannon, fire a laser, and move alien ships. I would be very pleased if you could help me.

Nigel Russell,  
Beckingham,  
Doncaster.

THE SHARP has little arrow characters which you can include in Print statements to locate objects at particular positions on the screen, and move them around. The simplest way to achieve the movement you want would be to go to a subroutine which prints in the arrows, ending with a semicolon. So the subroutine includes, say,

```
FOR J=1 TO 10:PRINT
  "arrow-right";NEXT J
```

before returning to the main program where the actual character is printed. If the end of the loop — the 10 in the example line — was a variable, then you could assign it before calling the subroutine, and thus get it to move — in this case — the character as

many positions to the right as you want. You can emulate a firing laser by moving a full stop, or a dash, across the screen, again with the embedded arrow characters.

## BREAK-PROOFING

I own an Atari 400. I am writing a program in which a password must be entered to run another program. As the program is written in Atari Basic, it is easy for someone to list the program, and discover the password. Could you please tell me how to prevent the listing of the program?

Philip Chandler,  
Mossley Hill, Liverpool.

THERE IS NO way, in Basic, to force an auto-run on the Atari machines. However you can ensure that — once running — the program can't be listed by adding the line

```
POKE 16,64:POKE 53774,64
```

into the program. This must appear in the program after each and every use of a Graphics call. I suggest you hide the code in some way, perhaps by checking half of the ASCII code of each letter, and adding a value to it which comes from somewhere else (such as hidden within a long set of data). Make it so that the password cannot be instantly spotted when the program is listed, and you'll have a good chance of ensuring it is secure.

## ATARI MERGE

I have an Atari 600XL and am very happy with it. Unfortunately, I cannot make it merge a program from tape, with one which is already in the computer's memory.

A S Dewdney,  
Durham.

SIMPLY SAVE the second program listing with List "C", filename for cassette or List "D", filename for disc. Then, get the first program back in the computer, and load in the second one with the command Enter "C", or "D", filename. This should do the trick.



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(continued from previous page)

```

"K":AT VR-1,HR+1: INK 0;"J": LET
NO=0: GO TO 2800
2780 IF HPB=0 THEN GO TO 1000
2785 RETURN
2790 IF HR=1:6 THEN PRINT AT VR,
HR: INK 0;"S":AT VR-1,HR: INK 2;"S":
AT VR-1,HR-1: INK 7;"": RETURN
2792 PRINT AT VR-1,HR: INK 2;"C":
AT VR-1,HR-1: INK 0;"B":AT VR-1,
HR+1: INK 7;"": IF ATTP (VR-1,
HR-2)=49 THEN LET HPB=HPB-1: BEE
P .1,20: BEEP .1,10: LET HR=HR-1:
HR+3: PRINT AT VR,HR: INK 0;"S":
AT VR-1,HR: INK 2;"S":AT VR-1,HR+
1: INK 7;"": PRINT AT VB,HB: IN
K 0;"E":AT VB,HB-1: INK 1;"F":AT
VB-1,HB: INK 7;"": FOR I=1 TO
4: NEXT I: PRINT AT VB,HB-1: INK
0;"E":AT VB,HB-2: INK 1;"F":AT
VB,HB: INK 7;"": FOR I=1 TO 8:
NEXT I: PRINT AT VB,HB-2: INK 0.
"E":AT VB,HB-3: INK 1;"F":AT VB,
HB-1: INK 7;"": GO SUB 3000: LE
T HB=HB-3: FOR I=1 TO 20: NEXT I
PRINT AT VB,HB: INK 0;"S":AT VB
-1,HB: INK 1;"S":AT VB,HB+1: INK
7;"": GO TO 2780
2794 LET NO=NO+1: IF NO=3 THEN L
ET HR=HR-1: GO SUB 2780: PRINT AT
VR,HR: INK 0;"S":AT VR-1,HR: IN
K 2;"S":AT VR-1,HR+1: INK 7;"":
RETURN
2796 LET HR=HR-1: FOR I=1 TO 4:
NEXT I: GO TO 2792
2800 IF HR+1=21 THEN PRINT AT VR,
HR: INK 0;"S":AT VR-1,HR: INK 2;"
S":AT VR-1,HR+1: INK 7;"": RETU
RN
2802 PRINT AT VR-1,HR: INK 2;"K":
AT VR-1,HR+1: INK 0;"J":AT VR-1,
HR-1: INK 7;"": IF ATTR (VR-1,
HR+2)=49 THEN LET HPB=HPB-1: BEE
P .1,20: BEEP .1,10: LET HR=HR+1

```

```

HR(27): PRINT AT VR,HR: INK 0;"S":
AT VR-1,HR: INK 2;"S":AT VR-1,HR
-1: INK 7;"": PRINT AT VB,HB: IN
K 0;"M":AT VB,HB+1: INK 1;"N":A
T VB-1,HB: INK 7;"": FOR I=1 TO
4: NEXT I: PRINT AT VB,HB+1: IN
K 0;"M":AT VB,HB+2: INK 1;"N":A
T VB,HB: INK 7;"": FOR I=1 TO 8:
NEXT I: PRINT AT VB,HB+2: INK 0.
"M":AT VB,HB+3: INK 1;"N":A T VB
,HB-1: INK 7;"": GO SUB 3000: L
ET HB=HB-3: FOR I=1 TO 20: NEXT
I: PRINT AT VB,HB: INK 0;"S":AT V
B-1,HB: INK 1;"S":AT VB,HB-1: INK
7;"": GO TO 2780
2804 LET NO=NO+1: IF NO=3 THEN L
ET HR=HR-1: PRINT AT VR,HR: INK
0;"S":AT VR-1,HR: INK 2;"S":AT VR-
1,HR-1: INK 7;"": RETURN
2806 LET HR=HR+1: GO TO 2802
3000 REM *** PRINT B SCORE ***
3010 PRINT AT 9,29: INK 7; PAPER
1:HPB;"": RETURN
3100 REM *** PRINT R SCORE ***
3110 PRINT AT 12,29: INK 7; PAPE
R 2:HR;"": RETURN
4000 REM ***** KEYBOARD *****
4005 LET XV=0: LET YV=0
4010 LET A=IN 63486: LET B=IN 61
438
4015 LET K=IN 65022
4020 LET C=IN 64510: LET D=IN 57
342
4030 LET E=IN 65278: LET F=IN 49
150
4038 IF B=k-1 THEN GO SUB 2250:
LET XV=1
4040 IF A=k-1 THEN GO SUB 2000:
LET YV=1: GO TO 4060
4042 IF C=k-2 THEN LET AS="H": L
ET BS="A": GO SUB 500
4044 IF C=k-4 THEN LET AS="P": L
ET BS="I": GO SUB 600
4046 IF E=k-1 THEN GO SUB 2500
4048 IF E=k-2 THEN GO SUB 1500

```

```

4060 IF XV=1 THEN GO TO 4140
4070 IF D=k-8 THEN LET CS="H": L
ET DS="A": GO SUB 700
4090 IF D=k-4 THEN LET CS="P": L
ET DS="I": GO SUB 800
4110 IF F=k-1 THEN GO SUB 2750
4130 IF F=k-2 THEN GO SUB 1750
4140 GO TO 90
9000 CLS: GO SUB 15: PRINT AT 1
,8;">>> CONTROL KEYS <<<":AT 3,8;"
BLUE player RED player":AT 5,1;"
LEFT U U":AT 7
,0;"RIGHT E E":
AT 9,1;"DUCK 1
0"
9010 PRINT AT 11,1;"KICK: C/5
HIFT ENTER":AT 13,0;"PUNCH
L"
9020 POKE 23659,0: PRINT AT 22,3
: INK 2; PAPER 7;"PRESS ANY KEY
TO CONTINUE": POKE 23659,2
9030 IF INKEY="" THEN GO TO 903
0
9040 CLS: GO SUB 15: GO TO 22
9900 REM ***** U.D.G.'S *****
9905 RESTORE 9920
9910 FOR F=USR "a" TO USR "p"+7:
READ A: POKE F,0: NEXT F
9915 GO TO 17
9920 DATA 12,30,12,30,26,26,26,2
2,0,0,128,255,3,9,15,0,6,15,6,25
4,190,196,252,0,12,30,12,156,250
,26,26,22
9930 DATA 0,0,1,15,246,193,207,2
48,0,96,240,96,127,125,35,63,56,
84,108,124,56,124,254,254,30,30,
54,98,67,65,195,0
9940 DATA 48,120,48,120,88,88,88
,104,0,0,1,255,192,144,240,0,96,
240,96,127,125,35,63,0,48,120,48
,121,95,88,88,104
9950 DATA 0,0,128,240,31,131,243
,31,0,6,15,6,254,190,196,252,132
,32,73,4,48,138,36,255,120,120,1
08,70,194,130,195,0

```

## Backpack Bozo

J Powell and J Burman,  
Cape Town,  
South Africa.

**BBC**

BACKPACK BOZO is a game for the BBC Micro Model B or Model A with 32K. It is mostly written in BBC Basic with a small section of

machine code. Due to the advanced nature of the BBC Basic it will be difficult to convert to any other computer.

The aim of the game is to fly Backpack Bozo around the screen squashing the mutated scorpions and landing on the bonus fuel tanks. Your fuel will decrease as you jet around the screen. When your score reaches 4,000, the gravity will double and you will get an extra

man. It is advisable not to land on the ground as it is highly acidic and will eat through your suit. As the game progresses the scorpions will move faster and faster.

Before you enter the program, type in the following line

\*KEYO !u

Whenever you see an italic "u" in lines 350, 370 and 1370, press the red function key f0.

```

50 MODE7
60 VDU23:0202:0:0:0:
70 IF AX=0 THEN PROC TITLE
80 FUEL=1279
90 X=0
100 DIR=0:DIR=0
110 SP=0
120 PROC ASS
130 FOD=0
140 LI=3
150 SPH=0
160 SPIS=5
170 GRAV=1
180 *FX10,2
190 *FX9,2
200 *FX255,1
210 MODE5
220 COLOUR1
230 PRINTAB(0,0):"LIVES 3 SCORE "
240 GC=0
250 *FX11,1
260 *FX12,1
270 VDU23,240,96,176,188,116,124,124,252,112
280 VDU23,241,112,112,128,124,188,182,182,238
290 VDU23,242,6,13,61,66,62,62,63,14
300 VDU23,243,14,14,30,62,54,102,102,119
310 VDU23,244,0,0,0,0,192,96,62,126,105
320 VDU23,245,255,255,255,255,255,255,255,255
330 VDU23:0202:0:0:0:
340 COLOUR3
350 PRINTAB(0,24):"*****
*****"
360 COLOUR2
370 PRINTAB(0,26):"*****
*****"
380 VDU19,2,2,0,0,0
390 HI=975
400 VEL=0
410 X=600
420 HI2=HI
430 K2=X
440 VDUS
450 GCOL3,2
460 MOVE X,HI:VDU240+DIR:MOVE X,HI-32:VDU241+DIR
470 PROC MD
480 PROC COMPUTE
490 IF FUEL=0:PROC KEYP ELSE *FX15,0
500 PROC FUEL
510 PROC SP10
520 PROC PD
530 IF SC=4000 AND GRAV=1 THEN PROC GRAV
540 GOTO 470
550 DEF PROC MD
560 GCOL3,2
570 *F810=X2 MOD 256:F815=X2 DIV 256:F81A=HI2 MOD 2
581:F81F=HI2 DIV 256:F833=X2 MOD 256:F839=X2 DIV 256:
F83D=HI2-32 MOD 256:F842=(HI2-32) DIV 256
590 *F824=240+DIR:F847=241+DIR:F84A=240+DIR:F84B
=241+DIR
590 *F856=X MOD 256:F85B=X DIV 256:F860=HI MOD 256:
F865=HI DIV 256:F879=X MOD 256:F87E=X DIV 256:F8D3=
(HI-32) MOD 256:F8D0=(HI-32) DIV 256
600 CALL A800
610 X2=X:HI2=HI
620 DIR=DIR
630 IF HI<320 THEN PROC DIE:GOTO 590

```

```

640 IF POINT(X,HI-64)=1 OR POINT(X+60,HI-64)=1 OR PO
INT(X+30,HI-64)=1 THEN PROC SQUA
650 ENDPROC
660 DEF PROC COMPUTE
670 VEL=VEL-GRV
680 IF VEL<-15 THEN VEL=-15
690 IF VEL=15 THEN VEL=15
700 HI=HI+VEL
710 IF HI>975 THEN HI=975:VEL=0
720 ENDPROC
730 DEF PROC KEYP
740 IF INKEY="9" THEN X=X-20:FUEL=FUEL-0:DIR=0:GOTO
740
750 IF INKEY="67" THEN X=X+20:FUEL=FUEL-0:DIR=2
760 IF INKEY="74" THEN VEL=VEL+4:SOUND0,-0.6,4:FUEL=
FUEL-0 ELSE *FX15,0
770 IF X<0 THEN X=0
780 IF X>1210 THEN X=1210
790 ENDPROC
800 DEF PROC ASS
810 PS=0
820 OPT0:LDAE1:JSR AFEE4
830
840 FORN=1 TO 20
850 READ A
860 OPT0:LDAE1:JSR AFEE4
870
880 NEXTN
890 OPT0:RTS
900
910 ENDPROC
920 DATA 25,4,88,2,255,3,240,25,4,88,2,223,3,241,25,
4,88,2,255,3,240,25,4,88,2,223,3,241
930 DEF PROC SP10
940 GCOL3,1
950 IF SP=1 THEN 1000
960 IF RND(15)<>5 THEN ENDPROC
970 SP=1
980 SX=1260
990 SOX=SX:MOVESX,285:VDU244
1000 SX=SX:SPIS
1010 SPIS=5:(SC-SPPI)/100
1020 IF SPIS=40 THEN SPIS=40
1030 MOVESOX,285:VDU244
1040 MOVESX,285:VDU244
1050 SOX=SX
1060 IF SX<-75 THEN SP=0
1070 ENDPROC
1080 DEF PROC SQUA
1090 IF INT(SX/10) 100 THEN SC=SC+100 ELSE SC=SC+INT(
SX/10)
1100 VDU4:COLOUR1:PRINTAB(16,0):SC:VDUS
1110 SOUND0,-15,5,25
1120 FORN=1 TO 10
1130 FORN=1 TO 25:NEXTN
1140 VDU19,1,4,0,0,0
1150 FORN=1 TO 25:NEXTN
1160 VDU19,1,1,0,0,0
1170 NEXT N
1180 VDU19,1,1,0,0,0
1190 GCOL3,1
1200 MOVESX,285:VDU244
1210 SP=0
1220 PROC BONE(1204)
1230 ENDPROC
1240 DEF PROC DIE

```

```

1250 SOUND0,-15,6,25
1260 VDU19,2,11,0,0,0
1270 VDU19,0,7,0,0,0
1280 FORN=1 TO 50:NEXT N
1290 VDU19,0,0,0,0,0
1300 FORN=1 TO 2000:NEXTN
1310 FORN=1 TO 150:NEXT N
1320 VDU19,2,0,0,0,0
1330 MOVE X2,HI2:VDU240+DIR:MOVE X2,HI2-32:VDU241+DIR
1340 LI=LI-1
1350 IF LI=1 THEN VDU4:COLOUR2:PRINTAB(5,10):"GAME
OVER":PRINT:PRINT:PRINT:"PRESS SPACE BAR FOR
ANOTHER GAME"
1360 GOTO 1390
1370 VDU4:COLOUR1:PRINTAB(0,0):"LIVES "LI
1370 FUEL=1279:COLOUR2:PRINTAB(0,26):"*****
*****":VDUS
1380 ENDPROC
1390 AGET
1400 IF A=32 THEN RUN ELSE 1390
1410 DEF PROC FUEL
1420 IF FUEL<125 THEN SOUND1,-15,255,2
1430 GCOL0,1
1440 MOVE FUEL,160:DRAW FUEL,190:MOVE FUEL+4,160:DRAW
FUEL+4,190
1450 ENDPROC
1460 DEF PROC BONE(A)
1470 GCOL0,2
1480 FORN=FUEL TO FUEL+4
1490 SOUND2,-10,248,1
1500 MOVE N,160:DRAWN,190
1510 *FX15,0
1520 NEXT
1530 FUEL=FUEL+A
1540 IF FUEL>1279 THEN FUEL=1279
1550 ENDPROC
1560 DEF PROC PD
1570 IF SC=100 THEN ENDPROC
1580 IF FOD=1 THEN 1670
1590 SCC=(INT(SC/100))*100
1600 IF SCC/500<>INT(SCC/500) THEN ENDPROC
1610 FOD=1
1620 TIME=0
1630 POX=POX+(1000)/20
1640 IF ABS(POX-X)>100 THEN 1630
1650 GCOL3,2:MOVEPOX,204:VDU245:GCOL0,0:MOVEPOX,204:P
RINT:"F"
1660 ENDPROC
1670 IF TIME>2000 THEN 1720
1680 IF HI<349 OR ABS(X-POX)>10 THEN ENDPROC
1690 IF VEL=0 THEN GCOL3,2:PROC DIE:GOTO 590
1700 N=1279:FUEL
1710 PROC BONE(N)
1720 GCOL3,2:MOVEPOX,204:PRINT:"F":MOVEPOX,204:VDU245
1730 FOD=0
1740 SC=SC+100
1750 VDU4:COLOUR1:PRINTAB(16,0):SC:VDUS
1760 ENDPROC
1770 DEF PROC TITLE
1780 AX=1
1790 PRINT:PRINT:PRINT:PRINT:PRINT
1800 PRINT:CHR(141):CHR(145):" BACKPACK BO
Z O"
1810 PRINT:CHR(141):CHR(146):" BACKPACK BO
Z O"
1820 PRINT:PRINT:PRINT:CHR(136):CHR(130):" (C)1985 J.

```



```
POWELL AND J. BURMAN
1000 PRINT:PRINT:PRINT:CHR(13);
1010 GOTO 1000
1020 AS=GET$:IF AS="N" THEN 1020
1030 CLS:PRINT:"Fly Backpack Bozo and squash the muta
nt scorpions as they crawl across the bottom of t
he screen. The further to the left you squash it, t
he fewer points you get. Avoid touching the ground a
s!"
1040 PRINT:"It is highly acidic and will eat through
our suit and kill you."
1070 PRINT:PRINT:"Your fuel supply will decrease as y
ou jet around the screen. You get extra fuel when
you squash the scorpions. In addition you get a fuel
tank every 500 points. If you land slowly on this"
1080 PRINT:"within 20 seconds your fuel supply will b
```

```
e completely replenished. When you reach a score o
f 4000 the gravity will double and you will get an ex
tra man."
1090 PRINT:PRINT:"CONTROLS: (Z X) RETURN"
1100 PRINT:PRINT:PRINT:"Press a key to start"
1110 A=GET
1120 ENDPROC
1130 DEFPROGNAV
1140 FOR N=1 TO 250 STEP 10:GOSUB 115,N,1:GOSUB 115,
N+1,1:GOSUB 115,N,N+1:NEXT
1150 GOSUB 2
1160 SPP=3995
1170 K=64
1180 LI=LI+1
1190 VDU4:COLOUR1:PRINTAB(0,0);"LIVES ";LI:VDU5
2000 ENDPROC
```

## Life on 64

Michael Morris Franks,  
Maida Vale,  
London.



LIFE IS ONE of the most famous computer games and certainly is more interesting than space invaders. The idea is to simulate the growth of a cell colony on a large two-dimensional surface which is arranged like a chessboard. Each square touches eight others. At the beginning each square is either full or empty — you can scatter cells all over the board as you wish.

The rules of Life then take over. If a cell has two or three cells touching it, it survives to the next generation. A full cell dies from loneliness if there are less than two cells touching.

It also dies from overcrowding if more than four cells touch it. The cells also reproduce — if there is an empty square which has exactly three cells touching it, a cell is born in it.

These simple rules can produce lively and complex patterns. Mathematical zoologists have identified a number of Life animals such as eaters, guns and gliders. Although Basic can be used to generate the patterns it is exceedingly slow and on a Commodore 64 using an array of 38 dots by 23 dots can take over five minutes to generate each generation. This program uses machine code to produce the new generation and can produce 100 generations in under 90 seconds. It also uses multi-colour graphics and sound.

The code looks at each space in turn and decides whether there will be a cell there in the next generation. If there is to be a cell

there it sets the colour of the space — by Poking the colour into the colour matrix — with the live cell colour. If not, it sets the colour matrix to the dead cell colour. Once it has looked at all the squares in turn it goes back and puts a dot — Poke code 81 — if there is a live cell colour for that space, and if not it puts a space there — Poke code 32.

The program allows you to choose the live and dead cell colours. It also allows you to either place the cells yourself with the keyboard or joystick, or if you are lazy the computer can do it for you.

The program checks to see if there has been any change from one generation to the next. If the cell pattern has become stable the program will tell you how many cell generations there have been and then allows you either to re-run the program or end it.

The listing for the program has been produced by a printer using a special program which replaces the cursor control characters with a code which should make the program easier to type in, i.e. instead of a reversed heart symbol the program produces CLR which means clear the screen. This is produced by pressing the shift key and the CLR/Home Key.

```
10 TO=1024:CO=5427:
20 KB=19:JV=5321:SI=5427:
100 GOSUB 1000
110 GOSUB 2000
120 G=0:N=1 :D=2:PRINT:(HOME,YELLOW,SPACE2)HIT "F1" TO STOP
125 POKE 54296,15
126 POKE 54278,255:POKE 54273,N:POKE 54276,17
130 SYS 828
140 N=0:IF N=1 OR N=244 THEN D=D
141 POKE 54276,0:POKE 54277,0:POKE 54278,0
150 REM (FPEEK(2))/8 THEN 200
160 IF PEEK(KB)=4 THEN 200
170 G=0+1:GOTO 125
200 PRINT:(HOME,DOWN24)STOPPED AFTER";G;"GOS";CHR(137)CHR(148)"E";
210 PRINT:(HOME,WHITE,SPACE3,RV3)R(RV3)FIE-RUN OR (RV3)E(RV3)FND ?
220 GOSUB 3000
230 IF R="R" THEN 251
240 IF R="E" THEN 220
248 POKE 53281,1:POKE 53280,3
250 PRINT:(CLR,DOWN8,RIGHT2,DOWN,BLUE)HOPE YOU ENJOYED IT" END
251 PRINT:(CLR,DOWN2,RIGHT,DOWN4,RIGHT4,DOWN,RV5,YELLOW)TAB(14)"N(RV3)F
EH COLOURS"
252 PRINT:(TAB(19))"DOWN2,WHITEJ"PRINT TAB(9)"(DOWN2,RIGHT3,YELLOW,RIGHT2,
RV5)J(RV3)FJLD COLOURS"
253 GOSUB 3000
254 IF R="N" THEN 110
255 IF R="O" THEN GOSUB 2100:GOTO 120
256 GOTO 251
1000 POKE 53281,2:POKE 53280,4:POKE 53282,4
1005 POKE 53278,PEEK(53278)OR 16
1010 PRINT:(CLR,DOWN)TAB(16)"[WHITE]L 1 F E"
PRINT TAB(15)"[YELLOW]I"
1030 PRINT TAB(10)"(DOWN3)MAGENTA,SPACE3)LOADING MACHINE CODE"
PRINT TAB(15)"(DOWN3)PLEASE WAIT"
1040 GOSUB 5000
1050 PRINT:(CLR,SPACE,RIGHT,SPACE12,RV5,YELLOW,SPACE3)E A D Y (RV3)F,
SPACE3)"
1060 PRINT:"(DOWN2,WHITE,SPACE5,RIGHT3)HIT ANY KEY TO START"
1070 GOSUB 3000:RETURN
1500 PRINT:(CLR,DOWN,YELLOW,SPACE2)USE THESE KEYS TO POSITION THE CELLS"
1510 PRINT TAB(19)"(DOWN,YELLOWJUP(DOWN,LEFT2)) (DOWN,LEFT,WHITE)S"
PRINT TAB(13)"(DOWN,YELLOWJLEFT(WHITE)X (YELLOWJRIGHT"
1515 PRINT TAB(19)"(WHITE,DOWNJ(DOWN,LEFT,YELLOWJ)DOWN,LEFT3)DOWN"
1520 PRINT:(DOWN,SPACE11,WHITE)SPACE-BHR (YELLOWJOK CELL"
1530 PRINT:(DOWN,SPACE10,DOWN)OR USE A JOY-STICK"
1540 PRINT:(DOWN,SPACE14,MAGENTA,RV5,SPACE3)HIT ANY KEY "
1550 GOSUB 3000:RETURN
2000 PRINT:(CLR)FOR I=0 TO 7:POKE 646,I:PRINT " ";NEXT:PRINT
2010 PRINT:(DOWN,YELLOWJLIVE CELL COLOUR"
2020 INPUT"(1-8):LC:IF LC1 OR LC8 THEN PRINT(CUP2):GOTO 2050
2030 LC=LC-1:POKE 646,I:PRINT " ";NEXT:PRINT
2040 FOR I=0 TO 15:POKE 646,I:PRINT " ";NEXT:PRINT
2050 PRINT:(DOWN,YELLOWJ"IVING" CELL COLOUR"
2060 INPUT"(1-16):DC:IF DC1 OR DC16 OR DC=14 THEN PRINT(CUP2):GOTO 2060
2065 DC=DC-1:POKE 646,DC:PRINT TAB(11)"*
2070 PRINT:(DOWN2,RIGHT2,WHITE)OK (V/N)?":GOSUB 3000
2080 IF R="Y" THEN 2000
2090 POKE 871,LC:POKE 883,LC:POKE 887,DC
2100 PRINT:(CLR,DOWN7,WHITE,RV5)TAB(13);"P(RV3)FJOSITION CELLS"
```

## Hex data pad

Tony Arrowsmith,  
Leigh,  
Lancashire.



THE AMSTRAD CPC-464 provides the useful facility of re-defining keys to the user's requirements and assigning a string of characters to a given expansion character. Unfortunately, the user manual is so concise that it is difficult to

quickly grasp how to go about this procedure.

For example in chapter 8, page 23 we are told how to make "n" print "?". Why on earth would anyone want to do that? Expansion characters 128 to 140 have default locations on the numeric keypad — but how do you find numbers 141 to 152? And what if I want to keep the keypad as it is?

The clue to the answer lies in the diagram on page 16 of Appendix III, where the physical key numbers are listed. This is used

as the first parameter in a Key Def statement. Different ASCII or expansion character numbers can be assigned to the normal, shifted or control depressions of each key. The syntax is Key Def key number, repeat (0 or 1), normal, shift, control.

The following short program sets up the numeric keypad as a hexadecimal data entry pad. Existing functions are retained but when shift 1-6 is typed the letters a-f are printed.

(continued on next page)



(continued from previous page)

Shift "." is ".", shift 7, 8 and 9 expand to the keywords Data, Edit and Auto.

The relevant line number should be inserted after Edit and Auto. Control 7, 8 or 9 are all assigned the same function — to escape from a possibly colour-scrambled screen and List in a readable format. Change the ink colours in line 28 to your own favourite combination.

## Riski

K Freeman,  
Mansfield,  
Nottinghamshire.



RISKI IS A machine-code game which is run from Basic. It was written on a 48K Oric 1 but should run on the 16K Oric and also the Atmos. The object of the game is to ski down the slope as quickly as possible — use up and down cursor keys to go faster or slower respectively. Then ski through 30 of the approaching gates to complete the course.

## Use the cursor keys

Use the right and left cursor keys to control your movement — but be careful, hitting a pole stops the game. The fastest time, elapsed time and gates entered are shown at the top of

Amstrad hex data pad.

```
10 repeat=0
11 DATA 7,46,44,46
12 DATA 13,49,97,49
13 DATA 14,50,98,50
14 DATA 5,51,99,51
15 DATA 20,52,100,52
16 DATA 12,53,101,53
17 DATA 4,54,102,54
18 DATA 10,55,141,144
19 DATA 11,56,142,144
20 DATA 3,57,143,144
21 FOR k=1 TO 10
22 READ keynumber,normal,shift,control
23 KEY DEF keynumber,repeat,normal,shift,control
24 NEXT k
25 KEY 141,"data "
26 KEY 142,"edit "
27 KEY 143,"auto "
28 KEY 144,"mode 2:border 0:ink 0,0:ink 1,15:list"+CHR$(13)
29 SPEED WRITE 1
30 END:REM **** change to NEW ****
31 SPEED WRITE 1:SAVE "hex pad":SPEED WRITE 0:SAVE "!hex pad"
```

the screen.

To load the game first type in program 1, which holds the machine code and Pokes it into memory. After entering program 1, run it and if any errors are found you will be informed at which line it lies in — so use the same line numbers, it will help.

If everything is correct then save it and type New but don't switch off the machine. Now enter program 2 and save it. Type

DOKE#9C,#265F

Locations #9C and #9D hold the end of address of a program for the Oric 1. Now save it with

CSAVE "RISKI",AUTO

It is now ready to run. If you can't be bothered to type it in and would like a copy then send £1.75 to K Freeman, 46 Station Road, Rainworth, Mansfield, Nottinghamshire.

### Program 1.

```
1 REM.....RISKI.....
2 REM.....program 1.....
3 REM.....Machine Code Loader.....
15 PAPER0:INK2:CLS
17 PRINT "Please Wait.....loading data."
18 FORS=1 TO 17:READA$,RS
195 FORH=1 TO 28STEP2
110 A=VAL ("E"+MID$(A$,H,2))
115 POKE2800+N,A:N=N+1:CK=CK+A
120 NEXTH
122 IFRS<>CKTHEN130
125 CK=0:NEXTSR
129 END
130 PRINT "PLEASE CHECK DATA IN LINE.....":GOTO130
132 END
1000 DATA AD1003C9BCF0034C1B20AD0F03C9....,1351
1002 DATA 7F00034C2020C9F0F0034C2F20A0....,1420
1004 DATA 004C25AD6E21C91FF0F4EC6E21....,1604
1006 DATA A0074C3B20AD6E21C907F0E5CE6E....,1638
1008 DATA 21A00E10A9A06D6E21B0D6C21A9BE....,1453
1010 DATA 690006D021A204B05121905221E0....,1353
1012 DATA 01F004C4C4D200C5221A20610B0....,1260
1014 DATA 4021A920B0A21B04921B90B0A0....,1146
1016 DATA 21E000F005C4C4C4B021B0A06C21....,1440
1018 DATA 697B0B4B21AD6D216900B04921AD....,1311
1020 DATA 6C21B0C120B0B20B0A0D21B0C220....,1540
1022 DATA 0B0320A904B0C320A20B0E7C21A0....,1515
1024 DATA 02B06F21C920B01B0B9F0BEC97C....,1739
1026 DATA F00464C0C20B04C0C32099F0BEC....,1765
1028 DATA 53F000E0B0C4D920B0A40A7C21E0....,1004
1030 DATA 03F0121B0B7D21A0B69040C420EC....,1515
1032 DATA 7C21B0A4C4F20B0A7C21B0C5221....,1445
1034 DATA AE7A21B0A421B02121B0A021B049....,1276
1036 DATA 21B02221B00B21A200B957214B0D....,1154
```

```
1038 DATA C7BFC920F00FC97C900B06C920F0....,1935
1040 DATA 0A10690A4C2021B09D07BFC006F0....,1411
1042 DATA 05C0C04C0521AE7021E004F00CE....,1599
1044 DATA 7B21EE7A21EE7A214CE0B0A200EE....,1586
1046 DATA 7B21EE7A216027BF4BF77BF9F0F....,1709
1048 DATA C7BF000000000000000000000000....,757
1050 DATA 20A06AE7F70202020B06A06A0C20....,1060
1052 DATA AF0E0F2061206263642065206620....,1137
1054 DATA 00000295155AC1D22C004901B0C....,1003
1056 DATA 0600034C03211B0A4C226920B04C....,1142
1058 DATA 22A04D226900B04D224C03213B0A....,1192
1060 DATA 4C22E928B04C22AD4D22E900B04D....,1369
1062 DATA 221B0A9E791E22B0D521A9226900....,1105
1064 DATA 000621AD4C22B0B021AD4022B0D9....,1703
1066 DATA 21B0322A0000F0B2299999B0C0C....,1724
1068 DATA 0A00F5CA0000B251B0A0D5216900....,1724
1070 DATA 0B0521AD06216900B0D5211B0A00....,1713
1072 DATA 216920B0D521AD07216900B0D921....,1407
1074 DATA 4C0221AC1D22C0160B0020A220A....,1340
1076 DATA 004C1922C0B0C1D22600100A00A0....,675
1078 DATA 0A000000000000000000000000....,10
1080 DATA 00000000000000000000000000....,39
1082 DATA 00A00000000000000000000000....,69
1084 DATA 95B02020202020202020202020....,014
1086 DATA 20202020202020202020202020....,632
1088 DATA 7020207C7C7C2020202020207C....,724
1090 DATA 7C202020202020202020207C7C....,724
1092 DATA 2020202020202020202020A226D....,1160
1094 DATA B0220B0622A0B0A0B06229B0722CA....,1725
1096 DATA 10F7291F18C91B00E169B20B04C22....,1522
1098 DATA A9B069000A40226A0A0B0135E20E....,1545
1100 DATA 50555555A00A40B0A0B0A0B0E22....,1462
1102 DATA 00B0C7F006FE224CE22A93090....,1969
1104 DATA E222E00F010CA0C72230B030E0....,1445
```

```
1106 DATA 507A353935397935200B216A00A0....,891
1108 DATA 0A0B4C03CE0A0B97A0DE27CE0B0....,1614
1110 DATA F004E04CFD22A200A00B0E22299....,1763
1112 DATA C2B0E001F00A0E00F006E00F00B....,1806
1114 DATA 0001C0B0E04C0C2360555555A200....,1477
1116 DATA 003623000007C00FF004C04C2C23....,1709
1118 DATA 600C1E3F3F1E0C1E3F0101B0B017....,435
1120 DATA 272A053F1E3F3F1E000020B018....,400
1122 DATA 2432390020056060C0C0101B03B....,376
1124 DATA 101B0C0C0606070202020202020....,371
1126 DATA 20050505050505050505050505....,157
1128 DATA 0101000000000020101020050201....,114
1130 DATA 00000000000000201020140A0A050....,133
1132 DATA 0102050A14142020102000000000....,166
1134 DATA 00000000000000202005050A142018....,101
1136 DATA 2020002C2C2C2C2C2C2C2C2C2C2C....,431
1138 DATA 05050505052140E050605050A0....,132
1140 DATA 0404042414142C0506050A040404....,164
1142 DATA 040424142C140C05060506050E....,195
1144 DATA 14142C2C14240404040404040404....,216
1146 DATA 0405060605050E142C1424240404....,205
1148 DATA 00000000000000040404040404....,20
1150 DATA 04000000000AD1022C90000024C....,741
1152 DATA 2B240B0A6E211B69B2A0B070BEC9....,1494
1154 DATA 7CF000CE4E21F004C04C224419B....,1594
1156 DATA 240A0A20B005E21B060A6E21A0B9....,1540
1158 DATA 2099A00E000F00B0D4C4924032A....,1472
1160 DATA 2B2C0A0A097C90A2B0F0C0A0A0....,1072
1162 DATA AE6E21B98C249DF2B0E90F249D1A....,1014
1164 DATA BF892249D42BFC00F200EC0B04C....,1920
1166 DATA 71242242526270292A20A9FF0B....,1005
1168 DATA 000460A06E211B69B0A0B070BEC9....,1426
1170 DATA 7CF000CE4E21F004C04C22440B0....,1750
1172 DATA 71BEC97C00F00E0F24E2F9240B0F....,2553
```

### Program 2.

```
1 REM.....RISKI.....
2 REM.....program 2.....
10 CLS:POKE118,10:PAPER0:INK2
12 GOSUB500:CLS:PAPER4
18 CALLE250D:CALLE25E9
20 POKE400,0:CALLE228A:POKEF221D,0
22 CALLE24DE:CALLE22F9:CALLE252B
24 IRQ=DEEK(EFFE)+1:STI=DEEK(IRQ)
26 DOKEE22F7,STI
40 CALLE2000
50 FORT=1T04:MUSIC1,2,2,0:PLAY1,0,1,350
52 WAIT50:NEXT
54 MUSIC1,2,6,0:PLAY1,0,1,350
56 WAIT50
98 PLAY0,1,7,30
99 DOKE IRQ,E22C0
100 REPEAT
110 CALLE2180:CALLE220A0:CALLE2420
120 CALLE2575
145 PK=PEEK(E400)
150 UNTILPK>0
155 DOKE IRQ,STI
160 IFPK=255THENPLAY0,7,1,350:GOTO250
```

```
170 CALLE2500
205 ZAP:PING
250 PLOT10,4,CHR$(6)+"ANOTHER GO Y/N"
255 REPEAT:Q$=KEY$
260 UNTILQ$="Y"ORQ$="N"
265 IFQ$="Y"THEN280
270 END
280 CLS:GOTO10
500 REM.....TITLE PAGE.....
505 PLOT14,3,CHR$(10)+CHR$(3)+"RISKI"
510 PLOT14,4,CHR$(10)+CHR$(6)+"RISKI"
515 PLOT12,6,CHR$(5)+"INSTRUCTIONS"
520 PLOT3,8,"Ski down the slope as fast as you"
525 PLOT3,9,"can passing through 30 gates to "
530 PLOT3,10,"complete the course."
540 PLOT14,12,CHR$(5)+"CONTROL"
545 PLOT3,14,"MOVE RIGHT"+CHR$(3)+".....CURSOR RIGHT"
550 PLOT3,16,"MOVE LEFT "+CHR$(3)+".....CURSOR LEFT"
555 PLOT3,18,"FASTER "+CHR$(3)+".....CURSOR UP"
560 PLOT3,20,"SLOWER "+CHR$(3)+".....CURSOR DOWN"
590 PLOT10,25,"Press"+CHR$(6)+"SPACE"+CHR$(2)+"to play"
595 Q$=KEY$
595 IFQ$<>" "THEN590
600 RETURN
```



```

1174 DATA 24C93A000EEFB24A9300DF924AD...1849
1176 DATA FA24C91E008A97F8000044CEB24...1518
1178 DATA A9008DF424A9300DF924AD...1857
1180 DATA F240DD1E0AD7F240DD20D603030...1945
1182 DATA 005355555555A00009F22204725...1355
1184 DATA 9013F0034C2025947250005F012...1275
1186 DATA C040C2259E2229947250005F004...1462
1188 DATA C04C1A25A2000000072599B780...1481
1190 DATA E001F00AE003F00AE005F0000001...1634
1192 DATA C0C0E04C2C256030313035343955...1277

```

```

1194 DATA C9F7D0034C6255C9F0017AD0C25...1847
1196 DATA C99A0E10E0BC25AC7025A00C25C...1798
1198 DATA 14F003CE0C25A0004C820A0C25...1340
1200 DATA AC0C25B0C00000F0E000F007CAAC...1981
1202 DATA 0C25AC7025A004A2000A1259010...1339
1204 DATA 85E047F004E04C8F2520A236007...1430
1206 DATA 8600C0C1C1E37312C161301000000...278
1208 DATA 2000000020303030363131090C0...414
1210 DATA 1414163737373737373737373737...520
1212 DATA 0510101014121110222020243F...364

```

```

1214 DATA 3F0C1A353F1E0C1432209011105...397
1216 DATA 21A000B9A2699000B0000269991...1437
1218 DATA B001126990C00A92099A400C00...1023
1220 DATA F00CB40E6254741544546415354...1394
1222 DATA 4945A90000C22A00D149170000F...1350
1224 DATA 202600322A0000A20149170000F...1343
1226 DATA A90190000F000F01010A02C2667...1058
1228 DATA 2000C22607126A02026A9000020...1350
1230 DATA 2600322A0C84C2926A91100A000A...1475
1232 DATA 850A9000055555555555555555...1361

```

```

1 REM (PLACE 80 CHARACTERS HE
RE)
10 PRINT "SIMON COLLINSON PRES
ENTS..."
20 LET SR=PEEK 16396+256*PEEK
16397+1
30 POKE SR,165,200
40 PRINT AT 5,5;"■■■■■"
50 PRINT AT 6,5;"■■■■■"
60 PRINT AT 7,5;"■■■■■"
70 PRINT AT 16,4;"A FIGHT OF 5
DRUMS"
72 FOR F=1 TO 50
73 NEXT F
80 FOR I=1 TO 32
90 LET A=USR 16537
100 NEXT I
110 FOR I=1 TO 5
120 LET A=USR 16562
130 NEXT I
140 PRINT AT 3,0;"A GAME FOR TH
E 16K ZX81 COMPUTER"
150 POKE 16524,0
160 POKE 16528,128
170 LET A=USR 16514
180 POKE 16524,128
190 POKE 16528,0
200 LET A=USR 16514
210 FOR F=1 TO 50
220 NEXT F
230 FOR I=1 TO 20
240 LET A=USR 16562
250 POKE 16524,0
260 POKE 16528,128
270 CLS
280 LET A=USR 16514
290 PRINT AT 11,0;"■■■■■"
300 LET A=INKEY$
310 IF A$="N" THEN GOTO 500
320 IF A$="Y" THEN GOTO 280
330 PRINT AT 0,10;"■■■■■"
340 FOR I=1 TO 22
350 LET A=USR 16562
360 NEXT I
370 PRINT AT 2,0;"USE THE ARROW
KEYS TO MOVE SID THE WORM ACRO
SS THE MINE FIELD."
380 PRINT "■■■■■"
390 PRINT "THE MINE FIELD IS AT
THE TOP OF THE SCREEN WILL TE
LL YOU IF ANY MINES ARE NEAR (I.
E. ONE MOVE AROUND, I SO USE THIS
WISELY."
400 PRINT "■■■■■"
410 PRINT "YOU ONLY HAVE
A LIMITED TIME TO REACH THE DOOR
IN THE MINE-FIELD SO GET A MOVE
ON."
420 PAUSE 40000
430 FOR I=1 TO 22
440 LET A=USR 16562
450 LET A=USR 16537
460 NEXT I
470 CLS
480 LET LE=1
490 LET LI=9
500 PRINT "■■■■■"
510 LET SC=0000
520 LET NM=50
530 LET SC=0
540 GOSUB 9000
550 LET AC=15
560 DIM P(50,2)
570 LET CO=0
580 LET UP=21
590 PRINT AT UP,AC;"S"
600 LET A$=INKEY$
610 IF A$="S" OR A$="B" THEN GO
TO 620
620 LET A1=AC
630 LET U1=UP
640 LET AC=AC+(A$="B")-(A$="S")
650 LET UP=UP+(A$="B")-(A$="S")
660 IF UP<1 AND (AC<14 AND AC>1
8) THEN GOTO 3000
670 IF UP<22 THEN GOTO 650
680 FOR I=1 TO 10
690 PRINT AT 0,0;"URONG WAY
■■■■■"
700 NEXT I
710 PRINT AT 0,0;"■■■■■"
720 LET AC=A1
730 LET UP=U1
740 GOTO 570
750 LET SR=PEEK 16396+256*PEEK
16397+1
760 IF AC<1 OR AC>30 OR (UP>20
AND AC<15) OR (UP=1 AND (AC<15
OR AC>17)) THEN GOTO 6500
770 IF PEEK (SR+(UP*33)+AC+1)=2
53 THEN GOTO 6000
780 LET MN=0

```

## Sid Worm

Simon Paul Collinson,  
Mirfield,  
West Yorkshire.

ZX-81

THIS PROGRAM is called Sid Worm and is for the 16K ZX-81. As well as it being interesting it is also informative as to the uses of machine-code to enhance games. The Poke on line 30 creates the high-resolution style graphics for the title page.

The idea of the game is to move Sid Worm past the hidden mines. The only way you can tell that there is a mine near, ready to turn you into worm pâté, is by observing the mine-sensor at the top of the screen which will tell

you if any mines are one slither away — that's one character. After seven sheets of these you eventually reach the far side of the mine field.

The program works by hiding the mines as character 253, which are Poked onto the screen. The machine code contains a routine which turns these into asterisks.

The machine code is arranged as follows. 16514 changes all the characters on the screen which have the same code as the number in address 16524 into the characters whose address is 16528.

16537 scrolls the screen left, taking the end characters, and putting them at the right. 16562 scrolls the screen down one line, leaving the top line intact, and 16595 makes the mines visible.

```

570 IF PEEK (SR+(UP+1)*33)+AC+
1)=253 THEN LET MN=1
580 IF PEEK (SR+(UP-1)*33)+AC+
1)=253 THEN LET MN=MN+1
590 IF PEEK (SR+(UP*33)+AC+2)=2
53 THEN LET MN=MN+1
600 IF PEEK (SR+(UP*33)+AC)=253
THEN LET MN=MN+1
610 IF MN<0 THEN PRINT AT 0,0;
CHR$(MN+156); "■■■■■"
620 IF MN=0 THEN PRINT AT 0,0;"
■■■■■"
630 LET SC=CO+1
640 LET P(CO,1)=UP
650 LET P(CO,2)=AC
660 IF CO=50 THEN GOTO 7000
670 PRINT AT U1,A1;"■■■■■"
680 GOTO 561
690 FOR I=1 TO 21
700 LET A=USR 16562
710 NEXT I
720 CLS
730 PRINT AT 8,11;"■■■■■";A
T 14,11;"■■■■■"
740 FOR I=9 TO 13
750 PRINT AT I,11;"■■■■■";AT I,19;"
■■■■■"
760 NEXT I
770 PRINT AT 9,14;"■■■■■";AT 10,15
;"■■■■■";AT 11,14;"■■■■■";AT 12,14;"
■■■■■";AT 13,14;"■■■■■"
780 PRINT AT 7,11;"SID WORM."
790 FOR I=1 TO 10
800 PRINT AT 12,17;"■■■■■"
810 FOR F=1 TO 5
820 NEXT F
830 PRINT AT 12,17;"■■■■■"
840 FOR F=1 TO 5
850 NEXT F
860 NEXT I
870 PRINT AT 21,0;"WELL DONE..U
ALL DONE..U..ELL DONE."
880 FOR I=1 TO 32
890 LET A=USR 16537
900 NEXT I
910 PRINT AT 0,0;"■■■■■"
920 FOR I=1 TO 22
930 LET A=USR 16562
940 NEXT I
950 LET SC=SC+100
960 LET NM=NM+200
970 GOTO 5180
980 CLS
990 POKE 16524,0
1000 POKE 16528,128
1010 LET A=USR 16514
1020 PRINT AT 0,12;"■■■■■"
1030
1040 PRINT AT 1,12;"SCORE=";SC
1050 FOR I=1 TO 50
1060 NEXT I
1070 LET A1=1 TO 21
1080 LET A=USR 16562
1090 NEXT I
1100 CLS
1110 RUN
1120 FOR I=1 TO 32
1130 LET A=USR 16537
1140 NEXT I
1150 PRINT AT UP,AC;"S";AT U1,A1
1160
1170 LET A=USR 16595
1180 FOR I=1 TO CO
1190 PRINT AT P(I,1),P(I,2);"■■■■■"
1200 IF INKEY$="S" THEN FAST
1210 LET P$=P(I,1)+(INT (RND*17)+3)
+33)+(INT (RND*29)+2)
1220 POKE P$,253
1230 NEXT I
1240 SLOW
1250 PRINT AT 2,14;"■■■■■";AT 20
14;"■■■■■"
1260 FOR I=0 TO 11
1270 PRINT AT 2,13-I;"■■■■■";AT 2,19
+I;"■■■■■";AT 20,13-I;"■■■■■";AT 20,19+I
;"■■■■■"
1280 NEXT I
1290 PRINT AT 2,1;"■■■■■";AT 20,1;"
■■■■■"
1300
1310 PRINT AT 0,0;"■■■■■"
1320 PRINT AT 0,21;"SCORE=";SC
1330 RETURN

```

```

6540 LET UP=U1
6545 PRINT AT 0,0;"■■■■■"
6550 GOTO 660
7000 PRINT AT 0,0;"OUT OF TIME"
7001 PRINT AT U1,A1;"■■■■■"
7010 FOR I=1 TO 20
7020 PRINT AT UP,AC;"■■■■■";AT UP,AC
;"■■■■■"
7030 NEXT I
7031 LET LI=LI-1
7032 IF LI=0 THEN GOTO 4000
7040 PRINT AT 0,0;"■■■■■"
7050 FOR F=1 TO 50
7060 NEXT F
7070 GOSUB 9000
7080 LET UP=21
7090 LET AC=15
7100 CLS
7110 PRINT AT U1,A1;"■■■■■"
7120 FOR I=1 TO 10
7130 PRINT AT UP,AC;"■■■■■";AT UP,AC
;"■■■■■"
7140 NEXT I
7150 LET A=USR 16595
7160 FOR I=1 TO CO
7170 PRINT AT P(I,1),P(I,2);"■■■■■"
7180 NEXT I
7190 FOR I=1 TO 10
7200 POKE 16524,0
7210 POKE 16528,128
7220 LET A=USR 16514
7230 POKE 16524,128
7240 POKE 16528,0
7250 LET A=USR 16514
7260 NEXT I
7270 FOR I=1 TO 21
7280 LET A=USR 16562
7290 NEXT I
7300 LET LI=LI-1
7310 IF LI=0 THEN GOTO 4000
7320 GOTO 7040
7330 REM "■■■■■"
7340 FOR I=1 TO 20
7350 PRINT AT I,31;"■■■■■"
7360 NEXT I
7370 PRINT AT 1,0;"■■■■■";AT 21,0;"
■■■■■"
7380
7390 LET SR=PEEK 16396+256*PEEK
16397+1
7401 PRINT AT 0,0;"LAYING MINES
■■■■■"
7410 FOR I=1 TO NM
7420 IF INKEY$="S" THEN FAST
7430 LET P$=P(I,1)+(INT (RND*17)+3)
+33)+(INT (RND*29)+2)
7440 POKE P$,253
7450 NEXT I
7460 SLOW
7470 PRINT AT 2,14;"■■■■■";AT 20
14;"■■■■■"
7480 FOR I=0 TO 11
7490 PRINT AT 2,13-I;"■■■■■";AT 2,19
+I;"■■■■■";AT 20,13-I;"■■■■■";AT 20,19+I
;"■■■■■"
7500 NEXT I
7510 PRINT AT 2,1;"■■■■■";AT 20,1;"
■■■■■"
7520
7530 PRINT AT 0,0;"■■■■■"
7540 PRINT AT 0,21;"SCORE=";SC
7550 RETURN

```

THE FOLLOWING HEX NUMBERS SHOULD BE POKED INTO THE REM ON LINE 1

2A	0C	40	23	0E	15	06	20
7E	FE	00	20	02	36	00	23
10	F6	23	00	20	F0	C9	2A
0C	40	23	0E	16	7E	23	06
1F	F6	23	0E	16	7E	23	06
2B	77	23	23	00	20	EE	C9
01	06	02	2A	0C	40	09	54
5D	01	05	02	3A	0C	40	09
0E	5B	2A	0C	40	01	22	00
99	36	08	23	10	F0	10	F0
C9	2A	0C	40	23	0E	10	06
20	7E	FE	F0	30	02	36	17
23	10	F6	23	00	20	F0	C9



## Monitor

D P Riley,  
Nuneaton,  
Warwickshire.



THE MONITOR is unusual in that it is written in Basic, but it provides some of the more fundamental facilities which are handy if you are new to machine code. The program provides the following facilities:

- Query Memory — displays a row of eight bytes of data in hex, starting with the specified address. Hitting Space displays the next eight bytes, and Enter will terminate the command.
- Edit memory — displays the specified

address in hex and the data held there, also in hex. Enter will step to the next address without changing any data, and ↑ — unshifted £ — will step backwards to the previous address, again without changing any data. Entering a byte of data, i.e. two hex digits, will cause that value to be entered at the current address. The two digits are entered without a preceding &. Entering a q will terminate the command.

- Breakpoint — sets or clears a breakpoint. If setting, then a four-digit hex address is requested, if clearing, the address is remembered and cleared automatically. On encountering the breakpoint, the contents of all the registers are displayed

— except for the alternate register set, which Amstrad discourages the use of.

- Goto — executes a machine-code program from a specified address.
- Load — loads a named binary file from cassette.
- Save — saves a named binary file to cassette.

Except for data entry during the edit command, all values must be entered in hex and preceded by the & character. As programmed, the monitor uses Window #1 on rows 20 to 25 of the screen. Window #0 is set to the remainder. Altering lines 25 and 30 will adjust this to your own requirements. The program occupies 2,700 Bytes.

```
10 REM basic machine code monitor
20 REM (c) D.P. Riley 1985
25 WINDOW #0,1,40,1,19
30 WINDOW #1,1,40,20,25
35 FOR pointer=&ABC0 TO &ABDF:READ a:POKE pointer,a:NE
XT
36 DATA &5,&f5,&e1,&22,&e0,&ab,&e1,&ed
37 DATA &43,&e2,&ab,&ed,&53,&e4,&ab,&22
38 DATA &e6,&ab,&dd,&22,&e8,&ab,&fd,&22
39 DATA &ea,&ab,&ed,&73,&ec,&ab,&e1,&c9
40 CLS #1:LOCATE #1,1,1:PRINT #1,"Command - (q)uery me
memory: (e)dit memory:PRINT #1," (b)reakpoint
set: (g)oto:PRINT #1,"
(1)oad code : (s)ave code
50 INPUT #1,"command ? ",command$
60 IF command$="q" THEN 100 ELSE IF command$="e" THEN
200 ELSE IF command$="b" THEN 300 ELSE IF command$="g"
THEN 400 ELSE IF comman
d$="l" THEN 500 ELSE IF command$="s" THEN 600
70 GOTO 40
100 REM query memory routine
110 CLS #1:GOSUB 1000:REM get start address
120 byte.count=0:PRINT #1,HEX$(address); " ";:WHILE by
te.count<8:IF PEEK(address+byte.count)<16 THEN PRINT #
1,"0";
125 PRINT #1,HEX$(PEEK(address+byte.count)); " ";:byte.
count=byte.count+1:WEND
130 IF INKEY(18)=-1 AND INKEY(47)=-1 THEN 130 ELSE IF
INKEY(47)=0 THEN PRINT #1:address=address+8:GOTO 120
140 INPUT #1,a$:IF a$="" THEN 40 ELSE 40
200 REM edit memory routine
210 CLS #1:GOSUB 1000
220 PRINT #1,HEX$(address); " ";:HEX$(PEEK(address)); "
";:INPUT #1,dat$:IF dat$="q" THEN 40 ELSE IF dat$="" T
HEN address=address+1:GO
TO 220 ELSE 230
230 IF dat$="^" THEN address=address-1:GOTO 220
240 i=0:WHILE UPPER$(LEFT$(dat$,1))<>HEX$(i) AND i<16:
i=i+1:WEND:IF i>15 THEN 220 ELSE dat=i*16
250 i=0:WHILE UPPER$(RIGHT$(dat$,1))<>HEX$(i) AND i<16
```

```
:i=i+1:WEND:IF i>15 THEN 220 ELSE dat=dat+i:POKE addre
ss,dat:address=address+1
:GOTO 220
300 REM breakpoint routine
310 CLS #1:INPUT #1,"(s)et OR (c)lear ",break$:IF brea
k$="s" THEN GOSUB 1000:GOTO 320 ELSE IF break$="c" THE
N 350 ELSE 310
320 break.address=address:saved.data=PEEK(break.addres
s):POKE break.address,&F7:REM set break
330 POKE &30,&C3:POKE &31,&C0:POKE &32,&AB:REM set res
tart & ready to jump to breakpoint handler at &ABC0
340 GOTO 40
350 POKE break.address,saved.data:GOTO 40
400 REM goto routine
410 CLS #1:GOSUB 1000
420 CALL address
430 reg.store=&ABE0:CLS #1:PRINT #1,"A F B C D E H
L IX IY SP PC"
440 FOR i=reg.store TO reg.store+13 STEP 2:a=PEEK(i+1)
:b=PEEK(i):IF a<16 THEN PRINT #1,"0";
450 PRINT #1,HEX$(a);:IF b<16 THEN PRINT #1,"0";
460 PRINT #1,HEX$(b); " ";:NEXT:PRINT #1,HEX$(break.add
ress);:PRINT #1:LOCATE #1,1,5:PRINT #1,"<Hit any key
when ready>";
470 a$=INKEY$:IF a$="" THEN 470 ELSE 40
500 REM load code routine
510 CLS #1:INPUT #1,"Title ? ",title$
520 WINDOW SWAP 0,1:LOAD title$:WINDOW SWAP 0,1:GOTO 4
0
600 REM save code routine
610 CLS #1:GOSUB 1000:INPUT #1,"length ? ",length:INPU
T #1,"entry point ? ",entry
620 INPUT #1,"title ? ",title$
630 WINDOW SWAP 0,1:SAVE title$,B,address,length,entry
:WINDOW SWAP 0,1
640 GOTO 40
1000 INPUT #1,"Start Address ? ",address
1010 RETURN
9999 LOCATE 1,18
```

## Hi-res dump

N Kimberley,  
Coal Aston,  
Sheffield.



THIS PROGRAM DUMPS the entire hi-res screen to a CGP-115 or MCP-40. It first asks what colour foreground and background you want it copied in. Then it copies it and asks if you want another copy. The copying routine is in machine code and is not relocatable.

I first tried to do a screen dump using Basic but it took some 20 minutes to do one copy. The machine code speeds this up about 10 times.

To enter the machine code first type in the hex loader. Run it and enter the machine code in listing 1. Then save the machine code. Then run it and type in listing 2 and save this after the machine code. To save the machine code type:

CSAVE "M/CODE", 32000,32134,32000

For anyone wanting to know how to output to any printer connected to a Dragon in machine code, load A with the number and JSR \$800F.

### Hex loader.

```
10 REM HEXLOADER - ENTER THE
20 REM STRING OF HEX DIGITS FIRST
30 REM AND THEN THE CHECKSUM
40 PRINT "ENTER START ADDRESS ":INPUT START
50 PRINT "ENTER FINISH ADDRESS":INPUT FINISH
60 FOR N = START TO FINISH STEP 8
65 PRINT N; " ";
70 TT=0:INPUT A$:Z=0
80 FOR G=1 TO LEN(A$) STEP 2
90 P=VAL("&H"+MID$(A$,G,2))
100 TT=TT+P:POKE (N+Z),P
110 Z=Z+1:NEXT
120 PRINT " = ";
130 INPUT T$
150 IF VAL(T$)<>TT THEN PRINT "ERROR - ENTER LINE AGAI
N":GOTO 70
160 NEXT
```

### Listing 1.

32000 : 8648BD800F860DBD = 874	32064 : 108E7D6F8D137F7D = 806
32008 : 800F8E0600C600A6 = 655	32072 : 6439108E7D658D09 = 691
32016 : 80B77D638D0D5CC1 = 974	32080 : 20DA108E7D6A8D01 = 781
32024 : 2026F48D238C1E00 = 660	32088 : 39A6A0BD800F810D = 857
32032 : 26EB39B67D63817F = 992	32096 : 26F73900004A312C = 509
32040 : 2A20BD26B67D6349 = 732	32104 : 300D52312C300D52 = 379
32048 : B77D63B67D648107 = 950	32112 : 2D3235362C2D310D = 353
32056 : 270C4CB77D6420E3 = 794	32120 : 8E0600A68443A780 = 808
	32128 : 8C1E0026F63900 = 511



```

10 PMODE4,1:PRINT#-2,CHR$(17):PRINT#-2,CHR$(18)
20 CLS:PRINT#9,"SCREEN DUMP"
30 PRINT#41,"===== "
40 PRINT:PRINT" FOR THE DRAGON 32 & CGP115"
50 PRINT" BY N.KIMBERLEY"
60 PRINT:INPUT"LOAD IN A SCREEN (Y/N)";YN$
70 IF YN$="N" THEN 90
80 SCREEN1,1:PCLS:CLOADM
90 CLS:PRINT:PRINT"ENTER FORGROUND COLOUR":GOSUB230:IN
PUTFC
100 PRINT:PRINT"ENTER BACKGROUND COLOUR":GOSUB230:INPU
TBC
110 IF FC=BC OR FC=4 AND BC=4 THEN PRINT"INVALID INPUT
":SOUND1,6:GOTO90
120 SCREEN1,1
130 IF FC=4 THEN GOTO160
140 PRINT#-2,"C";FC
150 EXEC32000
160 IF BC=4 THEN 190
170 PRINT#-2,"C";BC
180 EXEC32120:EXEC32000
190 EXEC32120:CLS:INPUT"ANOTHER COPY (Y/N)";YN$
200 IF YN$="N" THEN CLS:END
210 PRINT#-2,"A":PRINT#-2,STRING$(5,11):PRINT#-2,CHR$(
18)
220 GOTO130
230 PRINT#0"BLACK","1 BLUE","2 GREEN","3 RED","4 PRINT
ER PAPER COLOUR"
240 RETURN

```

## Image Edit

C Denning,  
Wilmslow,  
Cheshire.



HAVE YOU EVER wished you could combine the individual pictures you have created and stored on cassette? This is difficult in Basic as you cannot merge two screens or load one with Over on. This program, Image Edit for the 48K Spectrum lets you combine pictures.

First type in program 1. Save it using the command

SAVE "Image Edit" LINE 9000

Then Verify it. Next, to enter the machine code, type in and Run the hex loader. Type in the hex code and save with

SAVE "Image Edit" CODE 23296,188

Now Verify the code.

Once both parts of the program have been saved, enter

RANDOMIZE USR 0

to reset the computer. Then rewind the cassette and load the complete program.

You should be shown a menu. If you want to combine 2, 3 or 4 images, load them into different screens. To combine more than four images, load them in stages of four. Saving the composite on cassette each time. Later, combine the composite images.

When you have loaded all the images you want, press S to start the machine-code program. There are two different ways of combining images, using the machine code commands OR or XOR.

XOR puts the images together in the same way as the Basic command Over. Where there is an overlap, a space is made. OR adds the images completely, leaving the overlap black. When using the machine-code program, press

1, 2, 3 or 4 to put an image on the screen. It will be added to what is already on the screen according to the mode — XOR or OR.

■ 8 and 9 put the program in XOR and OR modes respectively.

■ 6 returns to the Basic program.

■ 0 clears the screen.

When returning to the Basic program, you will be given the opportunity of Saving the composite or Loading more images.

It is possible to create some other effects by combinations of the two modes. For example, you can subtract an image from what is already on the screen adding it first in OR mode, then in XOR mode.

When combining the pictures, colours are ignored as they would be jumbled when combined. The final image is Saved as black on white.

### Hex loader.

```

10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1))>"9")+CODE h$(2)
-48-(7 AND h$(2))>"9")
20 INPUT "Start" h$
30 INPUT "Finish" h$
40 FOR n=h$ TO f STEP 8
50 LET tot=0:PRINT n;" "
60 INPUT h$:PRINT h$
70 LET x=0
80 FOR b=1 TO LEN h$ STEP 2
90 LET z=FN h(h$):LET tot=tot
+2
100 POKE n+x,z
110 LET h=h$(3 TO ):LET x=x+1
120 NEXT b
130 PRINT " = ";:INPUT t:PRIN
T t
140 IF tot<t THEN PRINT "input
error - try again":GO TO 50
150 NEXT n
160 REM enter STOP to stop

```

### Program 1.

```

10 POKE 23658,8:CLS:PRINT A
T 5,14;Menu:"1/2/3/4 Load
Screen""S Start Edit o
r""0 Quit"
20 IF INKEY$="0" THEN STOP
30 IF INKEY$="S" THEN GO TO 10
0
40 LET C=CODE INKEY$:IF C>48
AND C<53 THEN LET sc=(CODE INKEY
5)-49:PRINT #0:"Start tape." :L
OAD "CODE sc+6144+40000:GO TO
10
50 GO TO 20
100 RANDOMIZE USR 23296:PRINT
#0:"Save Image Y/N ?"
110 IF INKEY$="Y" THEN INPUT "N
ame? " :ns:SAVE n$SCREEN$:GO T
O 10
120 IF INKEY$="N" THEN GO TO 10
130 GO TO 110
9000 BORDER 7: PAPER 7: INK 0: C
LEAR 99999:PRINT #0:"Leave tape
running." :LOAD "CODE 23296:G
O TO 10

```

### The machine code.

```

23296: 06F70EFE78ED78E5 = 1228
23304: 01283578ED78E502 = 803
23312: 284578ED78E50428 = 850
23320: 5578ED78E5082855 = 943
23328: 05EF78ED78E510C8 = 1168
23336: 78ED78E504287D78 = 998
23344: ED78E502287E78ED = 1112
23352: 78E5010C5B0D18C0 = 891
23360: 11004021409C0100 = 335
23368: 181AC09E5B121323 = 576
23376: 0B78B120F418A911 = 794
23384: 0040214054010018 = 366
23392: 1AC09E5B1213230B = 563
23400: 78B120F418921100 = 760
23408: 402140C00100181A = 416
23416: C09E5B1213230B78 = 657
23424: B120F4C3005B1100 = 756
23432: 402140540100181A = 440
23440: C09E5B1213230B78 = 657
23448: B120F4C3005B53A = 1042
23456: 8150CB472803F185 = 961
23464: C0F1AEC93E003281 = 1058
23472: 50C3005E3E013281 = 820
23480: 50C3005B5B = 469

```

## Turtles

Ian S Gibson,  
Maidstone,  
Kent.



THIS PROGRAM ENABLES the BBC B or Electron to perform several features associated with Turtle graphics. When you run the program, the micro's name appears with a prompt. Electron users should change Mode 7 statement to Mode 6 when typing in. The following commands are available in memory from the start. They can be used to build up other user defined words. These resident words are as follows:

Word	Abbreviation	Meaning
Circle	C	Draws a circle, centre graphics cursor, radius R. F is 0 for unfilled, 1 for filled.

Fill	—	Fill area of screen above and below graphics cursor.
Left X	L	Rotate cursor X° left — anti-clockwise.
Right X	R	Rotate X° right — clockwise.
Forward X	F	Draw line forward X units.
Pencil X	P	Change colour of graphics, 0-3.
Clean	—	Clear the screen.
Save X\$	—	Save all user-defined words under the name, X\$.
Load X\$	—	Load program marked X\$.
New	—	Erases all user-defined words.
Move X	—	Move cursor forward X units without drawing.

Plot	—	Plot cursor position.
Home	—	Return cursor to bottom left-hand corner
Colour XY	—	Change logical colour X to actual colour Y.
Wait X	—	Pause for X units.
Triangle X	T	Make a triangle; the third point is X units ahead, and the other two are the last two points plotted or moved to.
Scale X	—	Changes the scale of future drawing — 1 is default.
Dot	—	Makes future lines dotted.

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Line	—	Makes future lines undotted.
Forget X\$	—	Forgets the user defined word, X\$.
Text X\$	—	Writes text at graphics cursor.

The following commands may not be used in user-defined words.

List	—	Lists all user-defined words.
Goodbye	Bye	Returns to Basic.
Build X\$	B	Creates or edits a user-defined word with the name X\$.

## Save completed picture

To save a completed picture without the user defined words, type Bye and Return followed by

\*SAVE"Name"5800 7FFF

and reloading by

\*Load "Name".

To create a user-defined word, X\$, the following procedure should be used.

BUILD X\$ — where X\$ is a name  
Select a line number 1-20.

The contents of that line may be any user-defined, or resident word in Turtle's dictionary, for example F 100. In addition, after selecting a line number, Insert F0 or Delete F9 are available. Insert moves all lines after and including the selected line up one place. Line 20 is lost. Delete deletes the selected line thus moving all subsequent lines down one place. Return exits the editor when used instead of a line number.

Here is an example of a user-defined word:

```
BUILD STEP
1 (RETURN)
FORWARD 50 (RETURN)
2 (RETURN)
RIGHT 90 (RETURN)
3 (RETURN)
FORWARD 50 (RETURN)
4 (RETURN)
LEFT 90 (RETURN) (RETURN)
```

Type  
HOME (RETURN)  
STEP (RETURN)  
should produce a step.

## User-defined words repeated

User-defined words can be repeated by putting a number after them. For example Step 5 and Return produces five more steps. Once a word has been defined, it may be used in any other user-defined word. For example, BUILD STEPS (RETURN)  
1 (RETURN)  
HOME (RETURN)  
2 (RETURN)  
STEP 5 (RETURN) (RETURN)  
STEPS (RETURN)  
produces five steps.

Complex patterns can be built up in this way very easily. Programs may be merged simply by loading and running two sets of saved words to produce a final picture.

```
10REM TURTLE GRAPHICS
20REM For the BBC B or Electron
30REM By Ian S. Gibson
40KEY100LDRUN:M
50DN CTROR GOTO 1610
60MODE 7
70KZ=HMEM
80MODE 5
90VDU 20,0,31,19,27
100PRINT
110IF H$=31744 THEN PRINT"BBC Microcomputer" ELSE PR
INT"Acorn Electron"
120PRINT
130PRINT"I.S.G. TURTLE"
140PRINT
150REM Initialise variables
160KEY0=40:H
170KEY9=9:H
180IM D$=100,20,N$=100
190XZ=0:YZ=0:AZ=0:MX=0:Z=1
200VDU 20,0,31,19,27
210VDU 24,0,160,1279,1023
220VDU 29,0,160
230INPUT LINE" "
240IF L$="" THEN 230
250IF L$="GOODBYE" OR L$="BYE" THEN 1170
260PROCDO(16):IF TX=TRUE THEN 230
270IF H$="BUILD" OR L$="B" THEN MODE 7:PROCBU:MODE
5:GOTO 200
280IF H$="LIST" THEN MODE 7:PROCLI:MODE 5:GOTO 200
290PROCIR(16)
300GOTO 230
310DEF PROCIR(16)
320LOCAL IX,JX,KX,LX,DX,EX,E$
330LX=INSTR(16," ")
340IF LX<0 THEN CX=VAL(MID$(16,LX+1)):L$=LEFT$(16,L
X-1) ELSE EX=1
350DX=0
360DX=DX+1
370TX=0
380TX=TX+1
390IF N$(TX)=16 THEN 420
400IF IX<100 AND N$(IX)<>"" THEN 300
410PRINT"The word ";L$;" doesn't exist":PROCERR:ENDPR
OC
420JX=0
430JX=JX+1
440E$=D$(JX,JX)
450IF E$="" THEN 400
460PROCDO(E$)
470IF TX=FALSE THEN PROCIR(E$)
480IF JX<20 THEN 430
490IF DX<EX THEN 360
500ENDPROC
510DEF PROCDO(A$)
520TX=FALSE
530L$=LEFT$(A$,2)
540E$=INSTR(A$," ")
550R$=MID$(A$,3,1)
560R$=VAL(R$)
570RZ=VAL(R$)
580LX=LEFT$(A$,2):LX=1
590LX=INSTR(R$,2):LX=1
600R1=MID$(R$,2,LEN(STR$(R$)))
610R1=VAL(R1)
620IF H$="CIRCLE" OR L$="C" THEN PROCRCR(X,Y,R
XZ,R1X):TX=TRUE:ENDPROC
630IF H$="FILL" THEN PROCRI(1)(X,Y):TX=TRUE:ENDPROC
640IF L$="L" OR H$="LEFT" THEN PROCRL(RX):TX=TRUE:
ENDPROC
650IF L$="R" OR H$="RIGHT" THEN PROCRR(RX):TX=TRUE:
ENDPROC
660IF L$="F" OR H$="FORWARD" THEN PROCFR(RX):TX=TRUE
:ENDPROC
670IF L$="P" OR H$="PENCIL" THEN SCOL 0,RX:TX=TRUE:
ENDPROC
680IF H$="CLEAN" THEN CLG:CLS:TX=TRUE:ENDPROC
690IF H$="FORGET" THEN PROCFT(R$):TX=TRUE:ENDPROC
700IF H$="GAVE" THEN PROCGR(R$):TX=TRUE:ENDPROC
710IF H$="LOAD" THEN PROCLO(R$):TX=TRUE:ENDPROC
720IF H$="NEW" THEN PROCNE:TX=TRUE:ENDPROC
730IF H$="MOVE" OR L$="M" THEN PROCME(RX):TX=TRUE:
ENDPROC
740IF H$="PLOT" THEN PROCPL(RX):TX=TRUE:ENDPROC
750IF H$="HOME" THEN XZ=0:YZ=0:AZ=0:MOVE 0,0:TX=TRUE
:ENDPROC
760IF H$="COLOUR" THEN VDU 19,RX,R1X,0,0,0:TX=TRUE:
ENDPROC
770IF H$="TEXT" THEN PROCTE(R$):TX=TRUE:ENDPROC
780IF H$="WAIT" THEN FOR P=1 TO RX:NEXT P:TX=TRUE:
ENDPROC
790IF H$="TRIANGLE" OR L$="T" THEN PROCTRI(RX):TX=T
RUE:ENDPROC
800IF H$="SCALE" THEN Z=R:TX=TRUE:ENDPROC
810IF H$="DOT" THEN MX=1:TX=TRUE:ENDPROC
820IF H$="LINE" THEN RX=0:TX=TRUE:ENDPROC
```

```
830ENDPROC
840DEF PROC(FX)
850LET AZ=AZ+FX
860IF AZ<0 THEN REPEAT AZ=360-AZ:UNTIL AZ<360
870AZ=AZ MOD 360
880ENDPROC
890DEF PROCDO(FX)
900PROCDO
910IF XZ<0 OR XZ>1279 OR YZ<0 OR YZ>863 THEN PRI
NT"Can't - moves off""edge of screen":PROCERR
920XZ=XZ+FX
930YZ=YZ+FX
940MOVE XZ,YZ
950ENDPROC
960DEF PROC(FX)
970PROCDO
980IF XZ<0 OR XZ>1279 OR YZ<0 OR YZ>863 THEN PRI
NT"Can't - line off""edge of screen":PROCERR:ENDPROC
990XZ=XZ+FX
1000YZ=YZ+FX
1010IF MX=1 THEN PLOT 29,XZ,YZ ELSE DRAW XZ,YZ
1020ENDPROC
1030DEF PROCPL(FX)
1040PROCDO
1050IF XZ<0 OR XZ>1279 OR YZ<0 OR YZ>863 THEN PRI
NT"Can't - plot of""edge of screen":PROCERR:ENDPROC
1060XZ=XZ+FX
1070YZ=YZ+FX
1080PLOT 69,XZ,YZ
1090ENDPROC
1100DEF PROCIR(FX)
1110PROCDO
1120IF XZ<0 OR XZ>1279 OR YZ<0 OR YZ>863 THEN PRI
NT"Can't - triangle""off edge of screen":ENDPROC
1130XZ=XZ+FX
1140YZ=YZ+FX
1150PLOT 65,XZ,YZ
1160ENDPROC
1170PRINT
1180PRINT"BASIC"
1190PRINT
1200GOTO 2070
1210DEF PROCBU
1220IF R$="BUILD" THEN REPEAT:INPUT"Build what":R$:UN
TIL R$<>"" AND R$<>"BUILD":CLS
1230PRINT"BUILD ";R$
1240XZ=0
1250YZ=0:TX=1
1260IF N$(XZ)=R$ THEN 1290
1270IF OX<100 AND N$(OX)<>"" THEN 1250
1280IF OX<100 AND N$(OX)<>"" THEN PRINT"There is no n
ame room to store any words":ENDPROC
1290FOR FX=1 TO 20
1300PRINTTAB(0,FX+1):FX: " ";D$(OX,FX)
1310NEXT
1320PRINTTAB(0,23):SPC(39):INPUTAB(0,23):"Enter line
number or press RETURN ":"
1330IF TX="" THEN N$(OX)=R$:ENDPROC
1340TX=VAL(TX)
1350IF TX<1 OR TX>20 THEN 1320
1360PRINTTAB(0,24): " " - INSERT, "F9 - DELETE":TAB(0,
TX+1):SPC(39):TAB(0,FX+1):TX: " ";
1370INPUT LINE" "
1380PRINTTAB(0,24):SPC(39):
1390IF US="F9" THEN PROCNE:GOTO1320
1400IF US="F9" THEN PROCNE:GOTO1320
1410D$(OX,FX)=R$
1420GOTO 1320
1430DEF PROC(FX)
1440TX=0
1450TX=TX+1
1460IF N$(TX)=US THEN 1490
1470IF IX<100 AND N$(IX)<>"" THEN 1450
1480PRINT"The word ";US;" doesn't exist":PROCERR:ENDPR
OC
1490IF IX<100 THEN 1560
1500FOR RX=IX TO 99
1510N$(RX)=N$(IX+1)
1520FOR SX=1 TO 20
1530D$(RX,SX)=D$(IX+1,SX)
1540NEXT
1550NEXT
1560N$(100)= ""
1570FOR SX=1 TO 20
1580D$(100,SX)= ""
1590NEXT
1600ENDPROC
1610IF EROR<17 THEN 1650
1620IF HMEM<22520 THEN MODE 5:PRINTTAB(0,30):
1630PRINT"ESCAPE"
1640GOTO2000
1650MODE 7
1660PRINT
1670REPORT:PRINT" at line ";ERL
1680GOTO2070
1690DEF PROCNA(US)
```

```
1700IF US="SAVE" THEN REPEAT:INPUT"Save what":US:UNTIL
US<>"" AND US<>"SAVE"
1710YZ=OPENOUT(US)
1720PRINT"Saving ";US
1730PRINTYZ,US
1740FOR IX=1 TO 100
1750IF N$(IX)= "" THEN 1000
1760PRINTYZ,N$(IX)
1770FOR SX=1 TO 20
1780PRINTYZ,D$(IX,SX)
1790NEXT
1800NEXT
1810CLOSE#YZ
1820ENDPROC
1830DEF PROCLO(US)
1840PRINT"Searching"
1850IF US="LOAD" THEN US=""
1860YZ=OPENIN(US)
1870INPUTYZ,US
1880PRINT"Loading ";US
1890TX=0
1900IF EOF#YZ THEN 1970
1910TX=TX+1
1920INPUTYZ,N$(TX)
1930FOR TX=1 TO 20
1940INPUTYZ,D$(TX,IX)
1950NEXT
1960GOTO 1900
1970CLOSE#YZ
1980ENDPROC
1990DEF PROCNE
2000PRINT"NEW - Are you sure?";
2010REPEAT
2020GET=GET$
2030UNTIL GET="Y" OR GET="N"
2040PRINTGET
2050IF GET="N" THEN ENDPROC
2060RUN
2070DEF PROCIL
2080PRINT"LIST""Press SHIFT to scroll if necessary""
2090VDU14
2100FOR IX=1 TO 100
2110IF N$(IX)<>"" THEN PRINTN$(IX)
2120NEXT
2130VDU15
2140PRINT"<<< RETURN ";
2150REPEAT UNTIL GET=13
2160ENDPROC
2170DEF PROCIN
2180IF TX=20 THEN D$(OX,20)= "":PRINTTAB(0,21):SPC(39)
:TAB(0,21): "20 ":"":ENDPROC
2190FOR UX=20 TO TX+1 STEP-1
2200D$(OX,UX)=D$(OX,UX-1)
2210PRINTTAB(0,UX+1):SPC(39):TAB(0,UX+1):UX: " ";D$(
OX,UX)
2220NEXT
2230D$(OX,TX)= ""
2240PRINTTAB(0,TX+1):SPC(39):TAB(0,TX+1):TX: " ";D$(
OX,TX)
2250ENDPROC
2260DEF PROCDO
2270IF TX=20 THEN PRINTTAB(0,21):SPC(39):TAB(0,21): "2
0 ":"":D$(OX,20)= "":ENDPROC
2280FOR UX=TX TO 19
2290D$(OX,UX)=D$(OX,UX+1)
2300PRINTTAB(0,UX+1):SPC(39):TAB(0,UX+1):UX: " ";D$(
OX,UX)
2310NEXT
2320TX=20:GOTO 2270
2330DEF PROC(FX)
2340VDU5
2350MOVE XZ,YZ
2360ENDPROC
2370DEF PROCNA
2400IX=XZ+FX*(SIN(RAD(AZ)))
2410IY=YZ+FX*(COS(RAD(AZ)))
2420ENDPROC
2430DEF PROCERR
2440PRINT"RETURN to continue ";
2450REPEAT UNTIL GET=13
2460PRINT
2470ENDPROC
2480DEF PROCRCR(X,Y,RX)
2490LOCAL IX,JX,OX1X,OX2X
2500OX1X=XZ+OXXZ
2510MOVE XZ,YZ+OX
2520FOR IX=YZ+OX-4 TO YZ-OX STEP-4
2530JX=SOR(ABS(OX+OX*(IX-YZ)*(IX-YZ)))
2540IF WX=0 THEN PLOT 69,OX1X,IX+4
2550OX1X=XZ-JX
2560PLOT 5,OX1X,IX
2570IF WX=0 THEN PLOT 69,OX2X,IX+4
2580OX2X=XZ+JX
2590PLOT 5,OX2X,IX
2600NEXT
```







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```

638 PRINT "T"
640 PRINT INPUT "TRANSLATE CURSOR MOVES VIBB":Z$
650 IF ASC(Z$)+89 THEN T=1
660 OPEN "A:" FOR INPUT: IF FN=4 THEN PRINT CHR$(27); "C"; CHR$(0); CHR$(10+PL); CHR$(2
7); "N"; CHR$(4);
670 J=80: IF PC3 THEN GOTO 690
680 PRINT "T": J=PEEK(213)+1
690 PRINT "ENTER DATE (DD.MM.VV)";
700 INPUT DT$
710 IF LEN(DT$)+8 THEN GOTO 690
720 L$=J: PRINT "PROGRAM": "OS,DT$
730 PRINT "PLEASE WAIT...."
740 REM NEW LINE
750 GOSUB 2010: G=0: T=1: C1=-1: GET#1: R$=B$: IF STC=0 THEN 3000
760 IF R$="" THEN 3000
770 GET#1: R$=B$
780 L$=L$+R$: L$=L$+ASC(R$+CHR$(0))*256
790 IF L$=1 THEN 1000
800 IF L$=2 THEN 3000
810 F2=1: PRINT#4: R$=R$+R$: F2=STR$(L$)+""
820 REM START TEXT HERE
830 GET#1: R$=B$: IF R$="" THEN 710
840 T=0: R$=R$+R$: IF R$=0 AND R$="" THEN 840
850 IF G=0 OR G=1 AND 127>31 OR T=0 THEN 900
860 FOR J=0 TO 29: IF R$(J) THEN B$=R$(J): GOTO 960
870 NEXT J: GOTO 1000
880 IF B$=13 THEN B$=B+1: GOTO 910
890 IF B$=10 THEN R$=R$+CHR$(STR$(B+1)+2)+R$: B$=B+1: GOTO 890
900 R$=R$+B$
910 B$=B$+R$: F2=1: F1=1: GOTO 1010
920 IF G=0 THEN 905
930 IF R$=0 THEN 4100
940 IF R$=0 AND R$=128 THEN 4100
950 IF R$=0 AND R$=129 THEN 4100
960 IF R$=191 THEN 4200
970 R$=128: IF R$=0 OR R$=0 THEN 1000
980 IF R$=127 THEN R$="T": GOTO 1000
990 T=1: R$=R$+R$
990 IF R$=15 THEN G=2
1000 GOSUB 2010
1010 IF R$=CHR$(34) THEN G=1-0
1020 REM C=1 FOR ALPHANUMERIC
1030 CHR$(LEFT$(R$,1)): C1=LC48 OR C57 AND (C65 OR C90)
1040 IF C1=1 OR T=1 THEN T=T: IF NOT C AND NOT C1 THEN F2=F2+"" : GOSUB 2500
1050 CHR$(RIGHT$(R$,1)): C1=(C40 OR C57) AND (C65 OR C90) OR R$=37
1060 F2=F2+R$: GOSUB 2500
1070 GOTO 910
1080 REM SKIP TO NEXT LINE
1090 GET#1: R$=B$: IF R$="" THEN 710
1100 GOTO 1090
2000 REM CLOSE OFF CURSOR EXPRESSION
2010 IF F1=0 THEN 2040
2020 IF B$=0 THEN F2=F2+CHR$(STR$(B+1)+2): GOSUB 2500
2030 B$=F1+R$: F2=F2+R$: GOSUB 2500: F2=F2+R$
2040 RETURN
2500 IF LEN(R$)+8 THEN 2600
2510 FOR J=L$ TO L$+6 STEP -1
2520 IF MID$(R$,J,1)="" THEN 2580
2530 NEXT J: FOR J=L$+1 TO L$+6 STEP -1
2540 MID$(R$,J,1)=""
2550 IF J=91 THEN 2580
2560 IF J=90 OR J=44 OR J=93 THEN J=J+1: GOTO 2580
2570 NEXT J: J=L$+1
2580 PRINT#4: R$=LEFT$(R$,J-1)
2590 R$="" : MID$(R$,J)
2600 RETURN
3000 IF LEN(R$)+8 THEN F2=1: PRINT#4: R$=R$
3010 IF F2=0 THEN PRINT "NO LINES FOUND ***"
3020 CLOSE 1: GOSUB 2000: IF FN=4 THEN 3030
3030 PRINT#4: CHR$(12); CHR$(7); CHR$(7); CHR$(7); CLOSE 4
3040 PRINT "*****FINISHED*****"
4000 PRINT "PRINTER DEVICE # ";
4010 GET C$: IF C$="" THEN 4010
4020 IF C$="4" OR C$="5" THEN 4010
4030 P=VAL(C$): PRINT C$
4040 PRINT "PAPER LENGTH: 1311 OR 1307? ";
4050 GET C$: IF C$="" THEN 4050
4060 IF C$="1" OR C$="2" THEN 4050
4070 P=VAL(C$): PRINT "1", C$
4080 RETURN
4100 FOR J=40 TO 104: IF R$(J) THEN B$=R$(J): GOTO 860
4110 NEXT J: GOTO 930
4200 IF R$=191 AND R$=224 THEN R$=96: GOTO 4100
4210 IF R$=224 AND R$=255 THEN R$=64: GOTO 4100
4220 IF R$=255 THEN R$=126: GOTO 4100
4230 GOTO 905

```

## Autodata 2

A S Burbidge,  
Reigate,  
Surrey.

**VIC-20**

AUTODATA 2 IS a short machine-code utility program designed to overcome the extremely tiresome task of converting data stored in Ram into Basic Data statements with the minimum fuss and effort.

I have found this program invaluable. It converts large lumps of memory, such as characters, into printed Data statements, leaving the user with complete control over the very good line editing facilities already available on the basic Vic-20. The program is very compact, and occupies an area of 512 bytes still leaving the user with 3K to use for storage.

In fact the program produced the Data statements in the program used to load the

program itself. Using the utility, this operation took just over a minute — that would normally take over an hour, even for the fastest typist.

The program is designed for use with the unexpanded Vic-20, but can easily be relocated to any other part of Ram. It resides from 1C00 or 7168 to 1E00 or 7680, and all that needs to be changed are a few JSRs and the relocation of the interrupt vector.

Be careful when typing in the program, as it is machine code and a single mistake could crash the system. It is best to save the program before running it, or at least to check your typing thoroughly.

Once you have typed in the program and successfully run it, type Sys 7408 and Return. Nothing will appear to happen, but if you look carefully you will notice slight disturbances in your TV picture. This is because the 60Hz interrupt vector has been altered.

Now all that you have to do to get your first line of data printed is to press F1.

When you hit F1, the line is printed, and you are free to edit the line as if you had just typed it, and you can hit Return to enter it as a Basic program line. Once you have done this, you can hit F1 again to get the next line printed. For example, to get data from 7680 to 8192 starting at line 100 with 14 items per line at a 10-line interval run the Autodata program and then:

```

START LINE ? 100
START ADDRESS ? 7680
END ADDRESS ? 8192
ITEMS/LINE ? 14
LINE # INTERVAL ? 10
SYS 7408, then hit F1
100 data etc.

```

You may experience inverse spaces at the ends of lines. This is due to the cursor doing weird things.

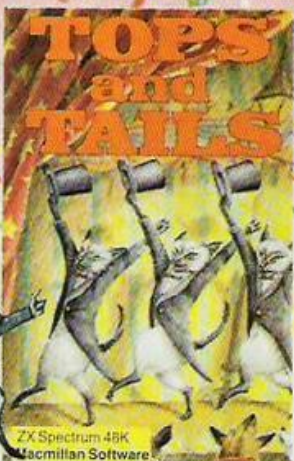
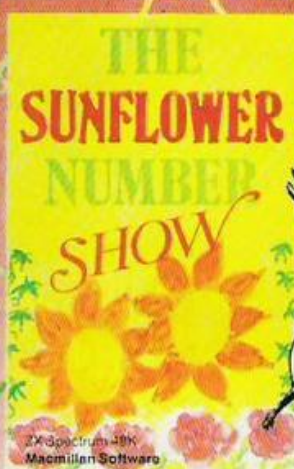
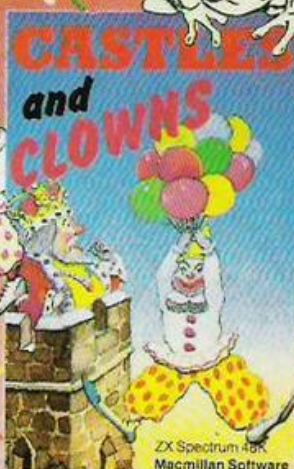
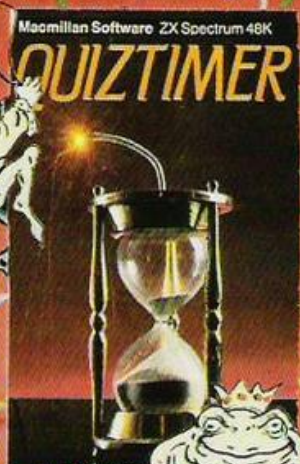
```

1 REM DATA FOR
2 REM AUTODATA (1000)
3 REM SYS7408 TO
4 REM START
5 REM MC (C) A.S.
6 REM BURBIDGE 1984
100 DATA 172, 60, 3, 173, 61, 3,
    32, 145, 211, 160
110 DATA 3, 162, 68, 133, 74, 13
    2, 73, 32, 215, 219
120 DATA 169, 0, 172, 67, 3, 32,
    145, 211, 160, 3
130 DATA 162, 75, 132, 74, 134,
    73, 32, 215, 219, 96
140 DATA 6, 255, 0, 2, 0, 255, 0
    , 255, 160, 3
150 DATA 169, 68, 32, 162, 219,
    32, 12, 220, 32, 221
160 DATA 221, 162, 0, 169, 0, 1,
    240, 6, 32, 210
170 DATA 255, 232, 208, 245, 160
    , 3, 169, 68, 32, 140
180 DATA 218, 160, 3, 169, 75, 3
    2, 162, 219, 32, 106
190 DATA 216, 160, 3, 162, 68, 1
    32, 74, 134, 73, 32
200 DATA 215, 219, 169, 68, 32,
    210, 255, 169, 97, 32
210 DATA 210, 255, 96, 0, 255, 0
    , 255, 0, 255, 11
220 DATA 255, 130, 255, 0, 255,
    0, 255, 0, 173, 63
230 DATA 3, 172, 62, 3, 32, 145,
    211, 32, 13, 216
240 DATA 32, 221, 221, 162, 0, 1
    89, 0, 1, 240, 6
250 DATA 32, 210, 255, 232, 208,
    245, 24, 173, 62, 3
260 DATA 105, 1, 141, 62, 3, 169
    , 0, 109, 63, 3
270 DATA 141, 63, 3, 32, 106, 21
    6, 32, 12, 220, 96
280 DATA 2, 0, 255, 0, 223, 16,
    255, 0, 255, 0
290 DATA 255, 82, 174, 66, 3, 13
    8, 72, 32, 48, 28
300 DATA 169, 0, 160, 0, 32, 145
    , 211, 32, 12, 220
310 DATA 32, 128, 28, 104, 170,
    202, 138, 72, 240, 7
320 DATA 169, 44, 32, 210, 255,
    208, 239, 104, 96, 162
330 DATA 0, 189, 0, 1, 240, 8, 3
    2, 210, 255, 232
340 DATA 32, 0, 28, 120, 169, 29
    , 160, 0, 141, 21
350 DATA 3, 140, 20, 3, 88, 96,
    165, 197, 205, 96
360 DATA 3, 208, 3, 76, 191, 234
    , 141, 96, 3, 201
370 DATA 39, 208, 246, 32, 192,
    28, 173, 63, 3, 205
380 DATA 65, 3, 240, 2, 16, 11,
    173, 64, 3, 205
390 DATA 62, 3, 48, 3, 76, 191,
    234, 169, 15, 141
400 DATA 14, 144, 169, 176, 141,
    11, 144, 76, 191, 234
410 DATA 165, 197, 205, 96, 3, 2
    40, 26, 141, 96, 3
420 DATA 201, 15, 208, 255, 2, 2
    55, 2, 255, 167, 144
430 DATA 0, 255, 0, 244, 128, 3,
    205, 62, 3, 48
440 DATA 8, 254, 0, 255, 0, 255,
    0, 255, 2, 251
450 DATA 0, 255, 0, 255, 0, 255,
    0, 247, 0, 255
500 FOR N=7168 TO 7680: READ A:
    POKE N,A: NEXT N

```



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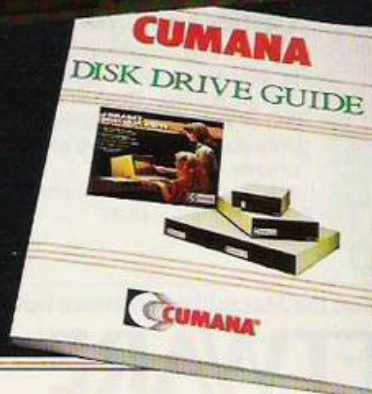
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But that's not all.

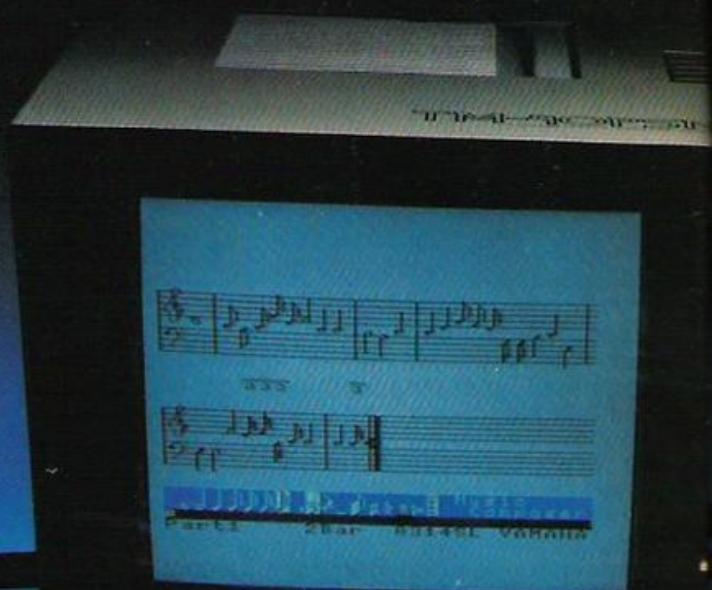
Inside the CX5 is a polyphonic, programmable FM Digital synthesiser that can be played with its own music keyboard or, via its industry-standard MIDI port, control a network of compatible musical equipment.

In 1984 Yamaha's DX Series FM Synthesizers revolutionised the voice of music synthesis with their stunning reproduction of natural and electronic sounds. Now the CX5 gives you that same musical fidelity simply by hooking-up through your TV monitor or Hi-Fi system. For the first time a computer is a real musical instrument.

Yamaha also offer a number of music-based software ROMs. Music Macro for instance is designed specifically for the computer hobbyist. It enables you to access the CX5's superb FM sounds from MSX BASIC and from this, program games and AV sequences using music and sound effects.

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# its musical dues

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- Music keyboard split & swap - voice and mono/poly)
- 8-voice multi-timbral
- Built-in real-time performance recorder
- Auto-accompaniment with rhythm
- Yamaha Software ROMs:
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  - FM Music Composer
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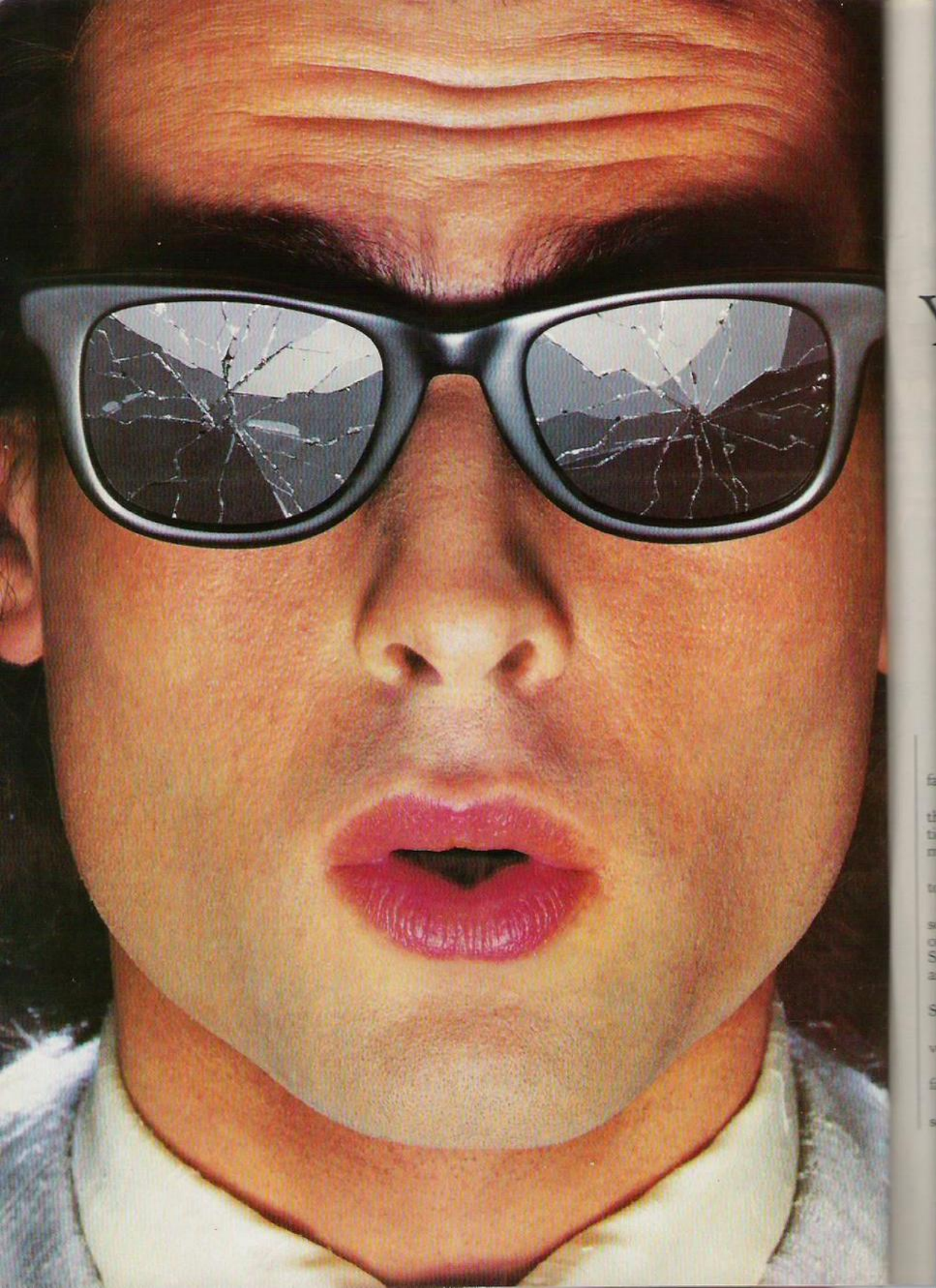
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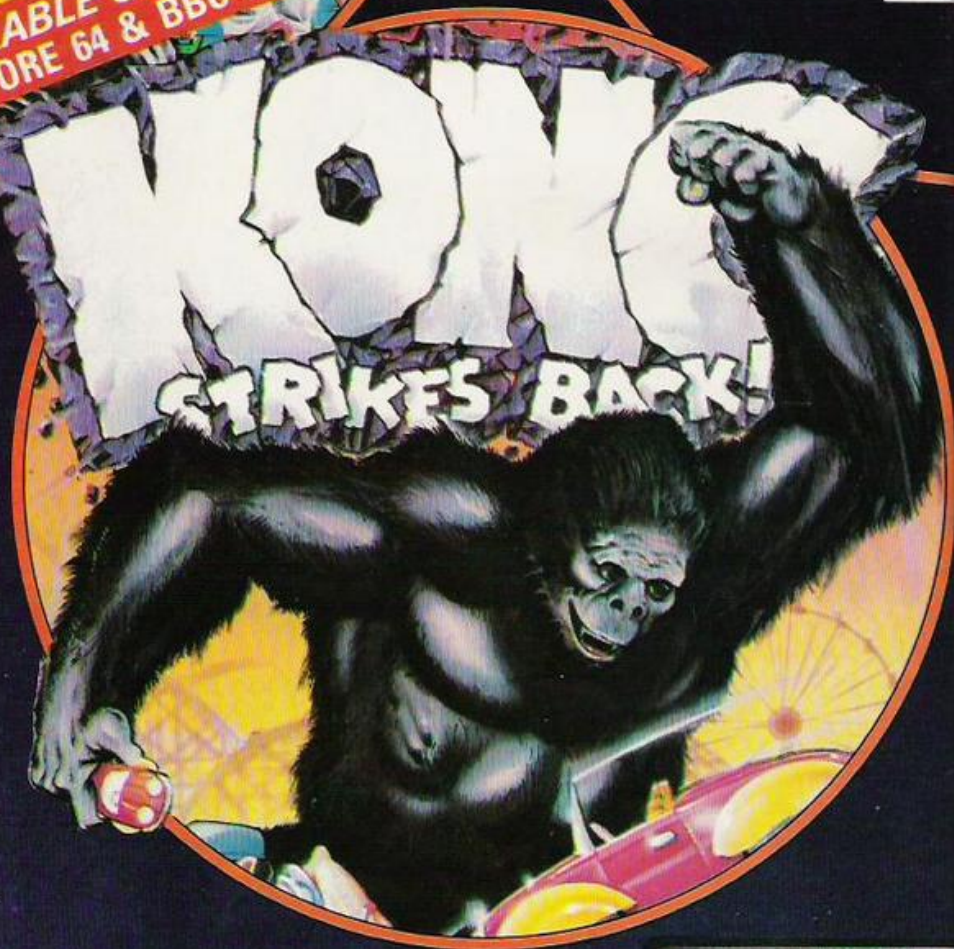
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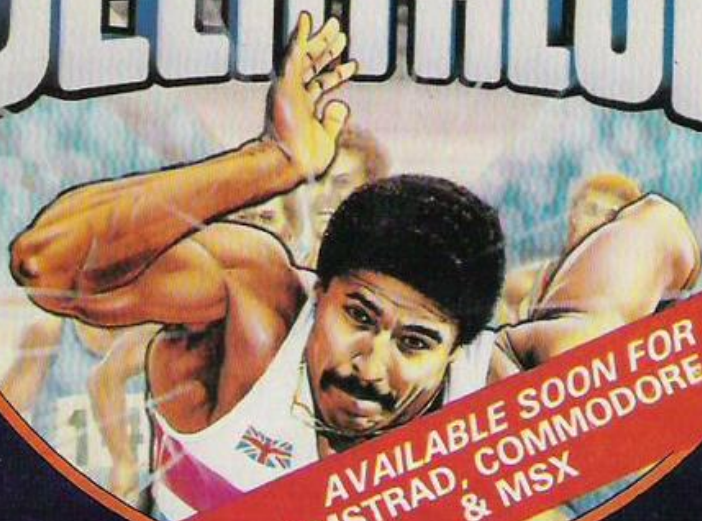


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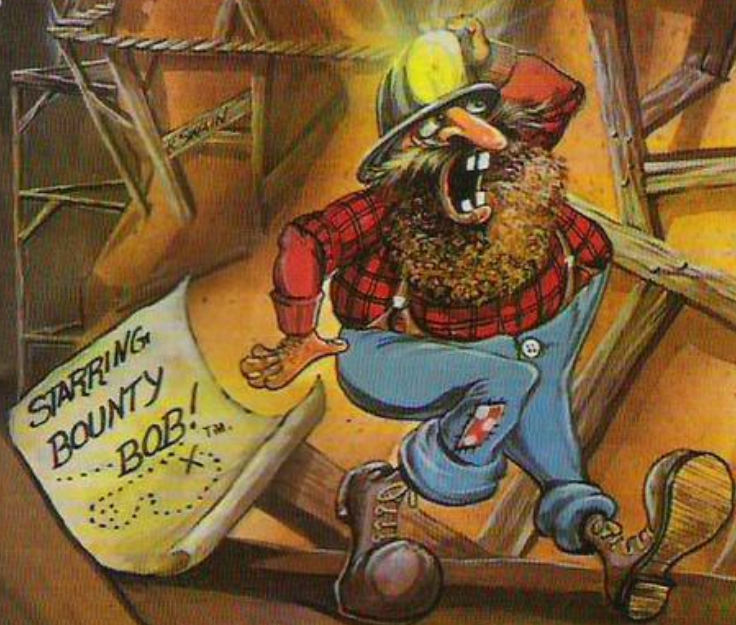
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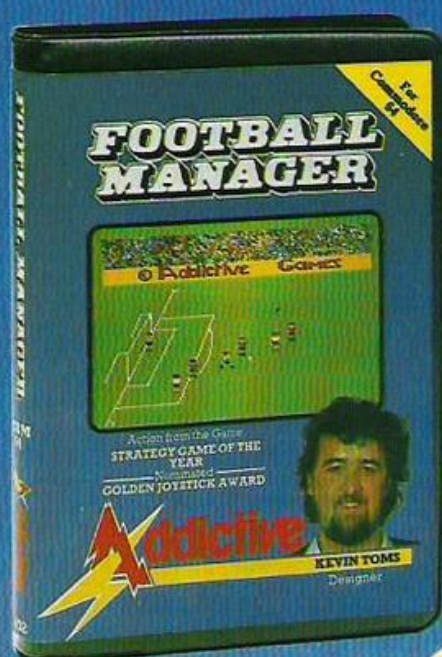
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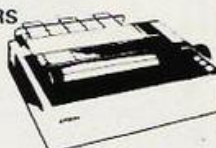
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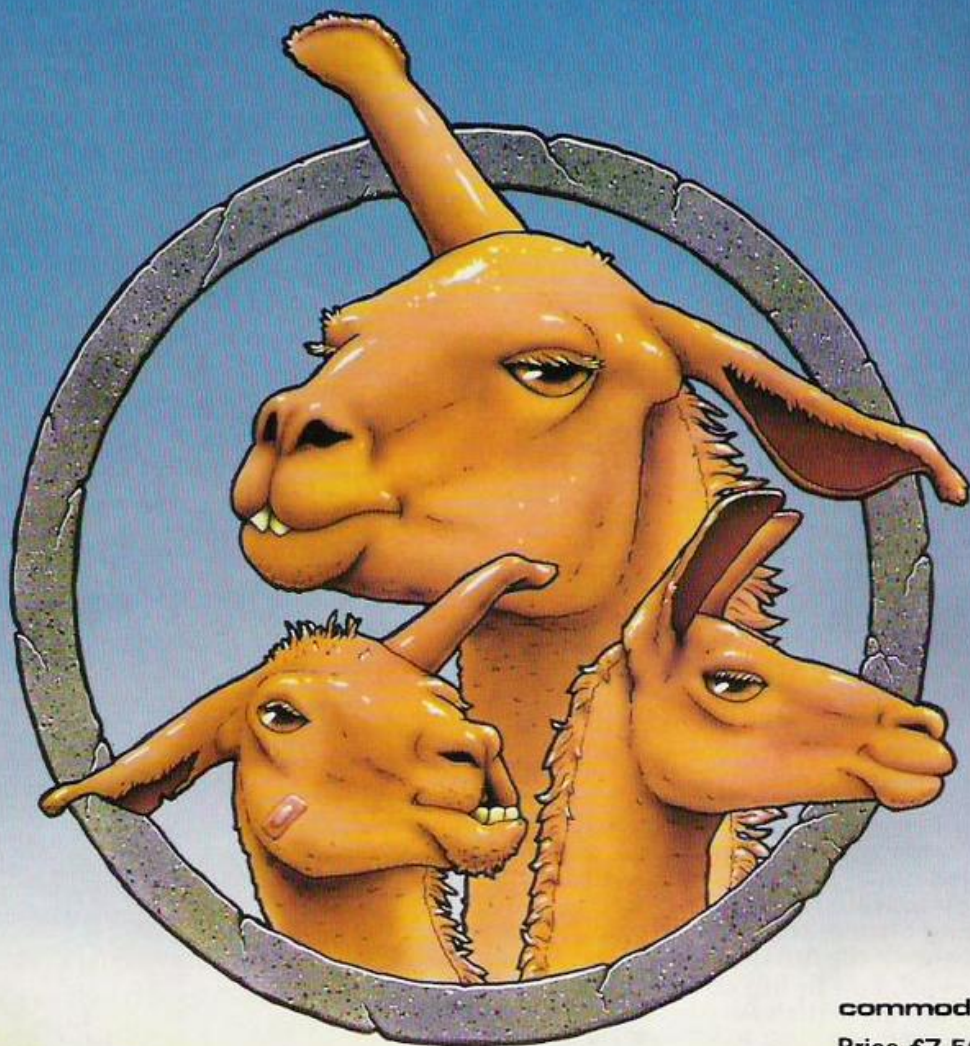
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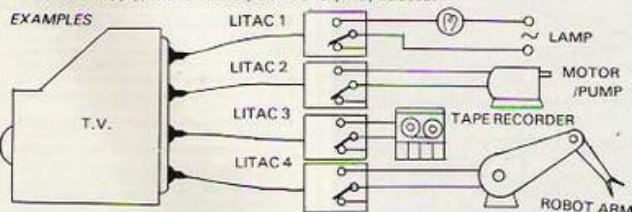
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Paul and David Cunningham were the two brothers to solve Melbourne House's Sherlock computer adventure game. They are pictured here with the runner up, who shot himself after receiving the complete range of Melbourne House books and software for the CBM-64.

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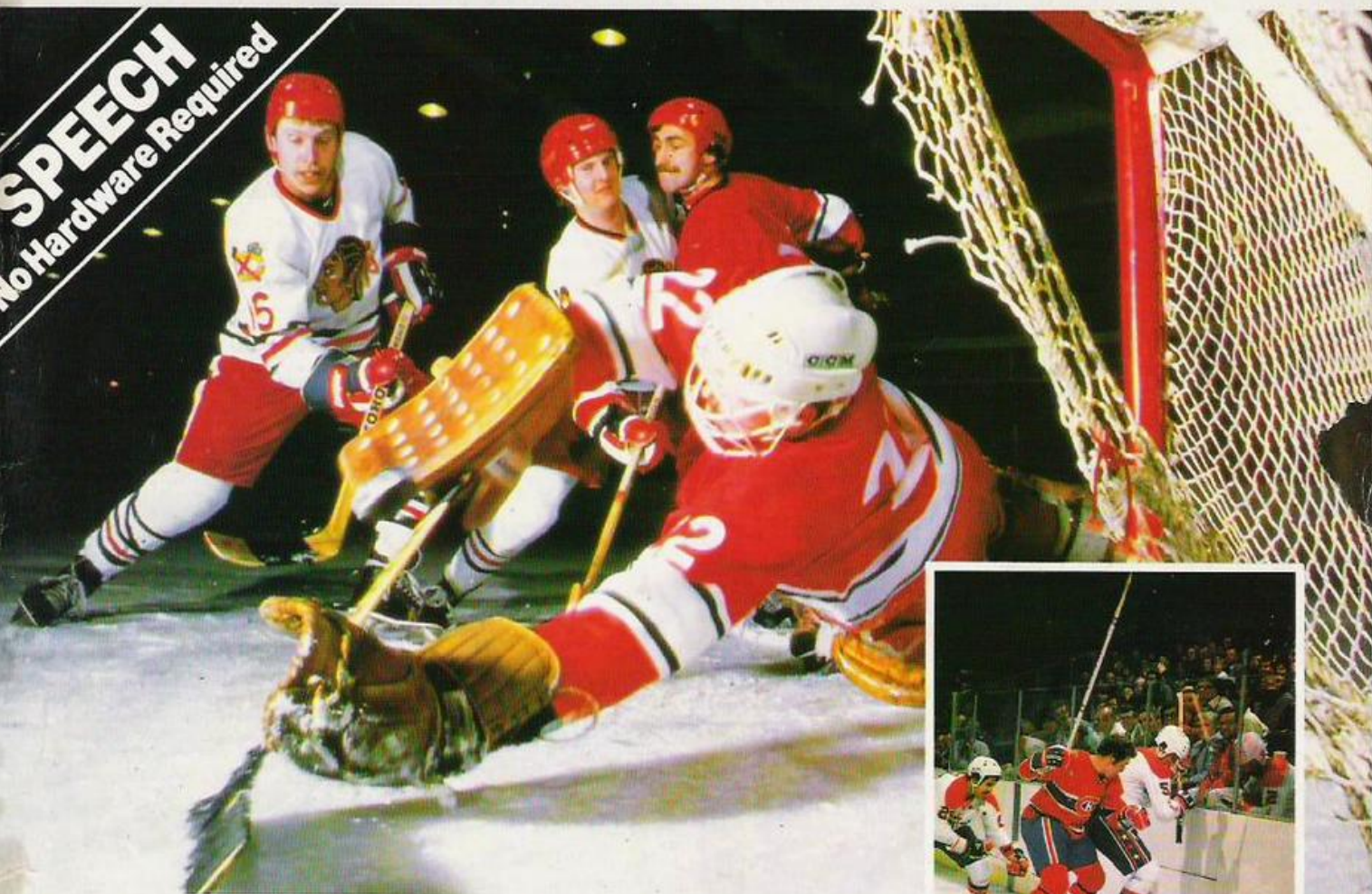
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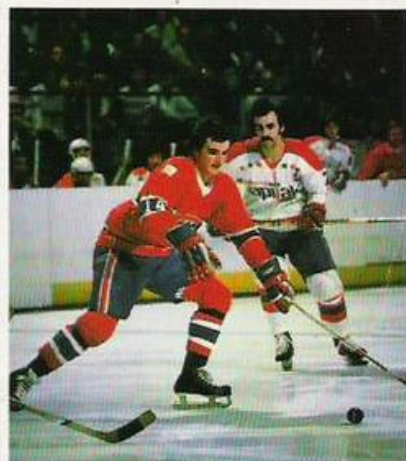
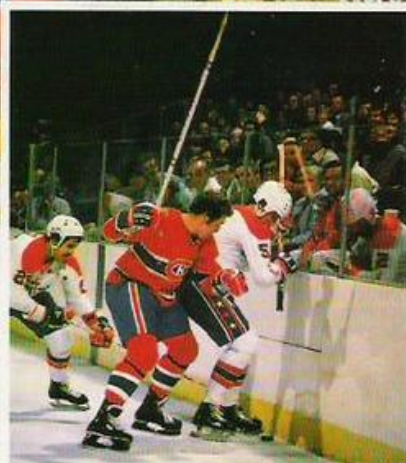


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SLAPSHOT from Anirog is a two player, fast action, ice hockey program. Also in this thrilling game there is included a smoothly running speech synthesis system of the very highest quality. Before the actual game starts each player must select an international hockey team to represent. After doing this you must quickly and skilfully manoeuvre your man across the glistening ice whilst your other team-mates move automatically around the rink waiting for you to pass the puck to them. If you do manage to race past the opposing defence then you have a chance to shoot for goal and score. However, you still have the goalie to beat who is able to dive in all directions. Also included in this amazingly quick and totally original game is the ability to actually physically bodycheck your opponents. Never the less, do not be too aggressive otherwise you could incur a "roughing penalty", resulting in a faceoff in your own end, giving the opposing side an easy chance of scoring. Also other extra features available include: Pause mode, and three levels of play ranging from fast to slow as well as a re-start option. Slapshot from Anirog is a totally original two player game with lightning fast action never seen before on the Commodore 64.

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