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Vol. 4 No. 11

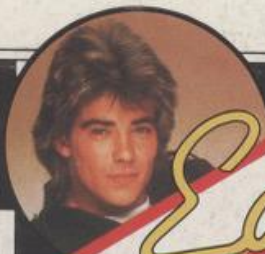
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Details inside

MSX — Goldstar v. Canon, Sony and Mitsubishi
BBC Music, ZX-81 Red Ants and Oric Brood
CBM-64 Quick Load and Canyon
Spectrum Zoom and Multitask
Amstrad Word Processor

**GAMES TESTS VIC-20,
AMSTRAD, BBC**



THE
OFFICIAL

Eddie Kidd

JUMP CHALLENGE



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CBM 64

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

YOUR COMPUTER *Contents*

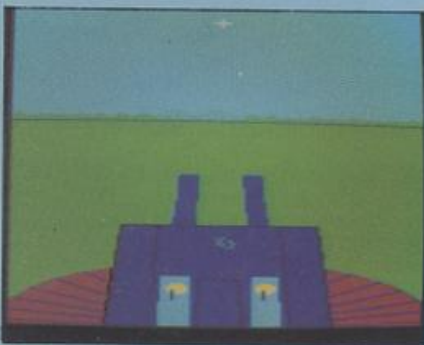
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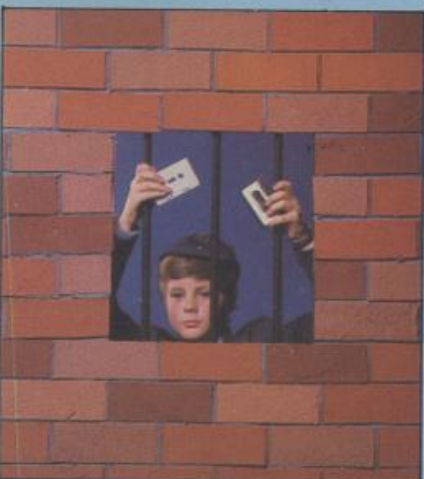
New Sinclair — page 42.



MSX machines: page 62.



BBC Gunner: page 91.



- 40 LETTERS AND EDITORIAL:** Basic is better; that was the bodge that was.
- 42 NEWS:** New Sinclair Spectrum Plus, Best music program yet and more.
- 45 FIRST BYTES:** Speech synthesis and recognition; also robots.
- 49 COMPUTER CLUB:** Lee Paddon gets a little tan in the Southend rain.
- 51 SOFTWARE SHORTLIST:** Try for a third down; go on down with Deus Ex Machina; try landing your interdictor at base without getting shot down. Latest games.
- 55 QUEST CORNER:** Hugo North leads adventurers through new mazes.
- 57 VIC-20 SOFTWARE REVIEW:** Paul Bond pats the old workhorse.
- 59 AMSTRAD SOFTWARE:** Paul Bond sees what's on the CPC-464.
- 60 BBC SOFTWARE:** Simon Beesley finds the Beeb far from on the wane.
- 62 FACE TO FACE WITH MSX MICROCOMPUTERS:** Glyn Moody gets to grips with the rigid uniformity of Japanese MSX machines, plus a Korean interloper.
- 67 THE YOUR COMPUTER GUIDE TO MICRO BUYS:** What microcomputers are around, what will be around shortly — allegedly. A guide for computer consumers.
- 73 PIRACY — THE BLACK FLAG:** Meirion Jones sets the scene for a tale of skulduggery, greed and treachery. What the big companies are really afraid of.
- 74 PIRACY — CONFESSIONS OF A HACKER:** A darkened studio, heavily backlit. Our man in the hood reveals some of the tools and tricks of the black art.
- 76 PIRACY — DEATH OF A SOFTWARE GIANT:** Was it piracy, or just bad business practice? Bruce Everiss on the last days in Imagine's bunker.
- 78 PIRACY — COMMODORE CBM-64 QUICKLOAD:** Defend yourself, landlubber. Quickloads make it hard to pirate your programs, thanks to Andrew Caple.
- 85 ALIQUID SIMPLEX:** Help Dr Hilfe with David Aspinall's Spectrum game.
- 91 BBC GUNNER:** Tim Humphries draws a bead on the foe.
- 93 VIC ELEVATORS:** They may have stopped making them, but your Vic-20 will soon be going up in the world with H Kaljouw's elevating game.
- 97 ORIC BROOD:** P H Phoeng un-yolks eggs-treme horror.
- 100 CBM-64 CAVERN:** Into the chasm with Patrick Edmond.
- 106 SPECTRUM ZOOM:** Mark Jones enables you to zoom in and get a close-up on any section of your screen display.
- 109 BBC MUSIC:** Allows you to enter the notes on the staves and then play them. Get in harmony with Nick Lea.
- 115 THE DRAGON CURSE OF ABU SIMBEL:** A voyage into the city of the damned. Mick Stevens is your bus conductor.
- 122 AMSTRAD WORD PROCESSOR.** Move paragraphs around.
- 129 ATARI ANIMATION:** Bring those spritely sprites to life.
- 133 QL 68000 DISASSEMBLER:** The first in a series on machine code for the QL. Phill Holliday initiates you in the rites of the machine.
- 141 ZX-81 ASSEMBLER:** Anthony Nwokoye allows you to enter machine code using Z-80 mnemonics.
- 147 SPECTRUM MULTI:** Multitasking for your Spectrum. Now you can have an Every and After command like on the Amstrad, thanks to Richard Taylor.
- 153 BBC RETROFITS:** John Dawson looks at add-ons for the Micro.
- 161 COMPETITION:** Win a Sony MSX.
- 163 ZX-81 RED ANTS:** Carlo Delhez helps you climb to the top of the heap. An absolutely vast maze, eleven times screen-size.
- 173 RESPONSE FRAME:** Tim Hartnell helps you with bugs.
- 175 SOFTWARE FILE:** Ten pages of software for most home micros.
- 203 COMPETITION RESULTS:** Who won the Psion Organisers.
- 248 DATABASE:** Paul Bond rounds up micro events.



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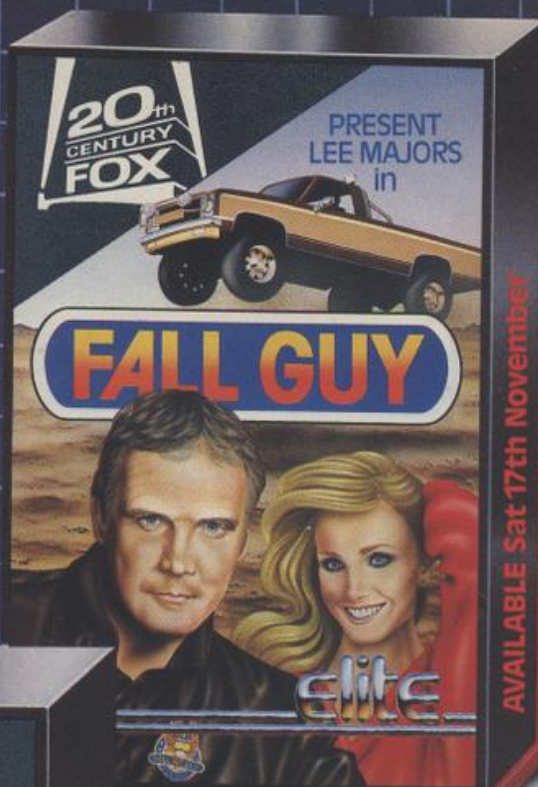
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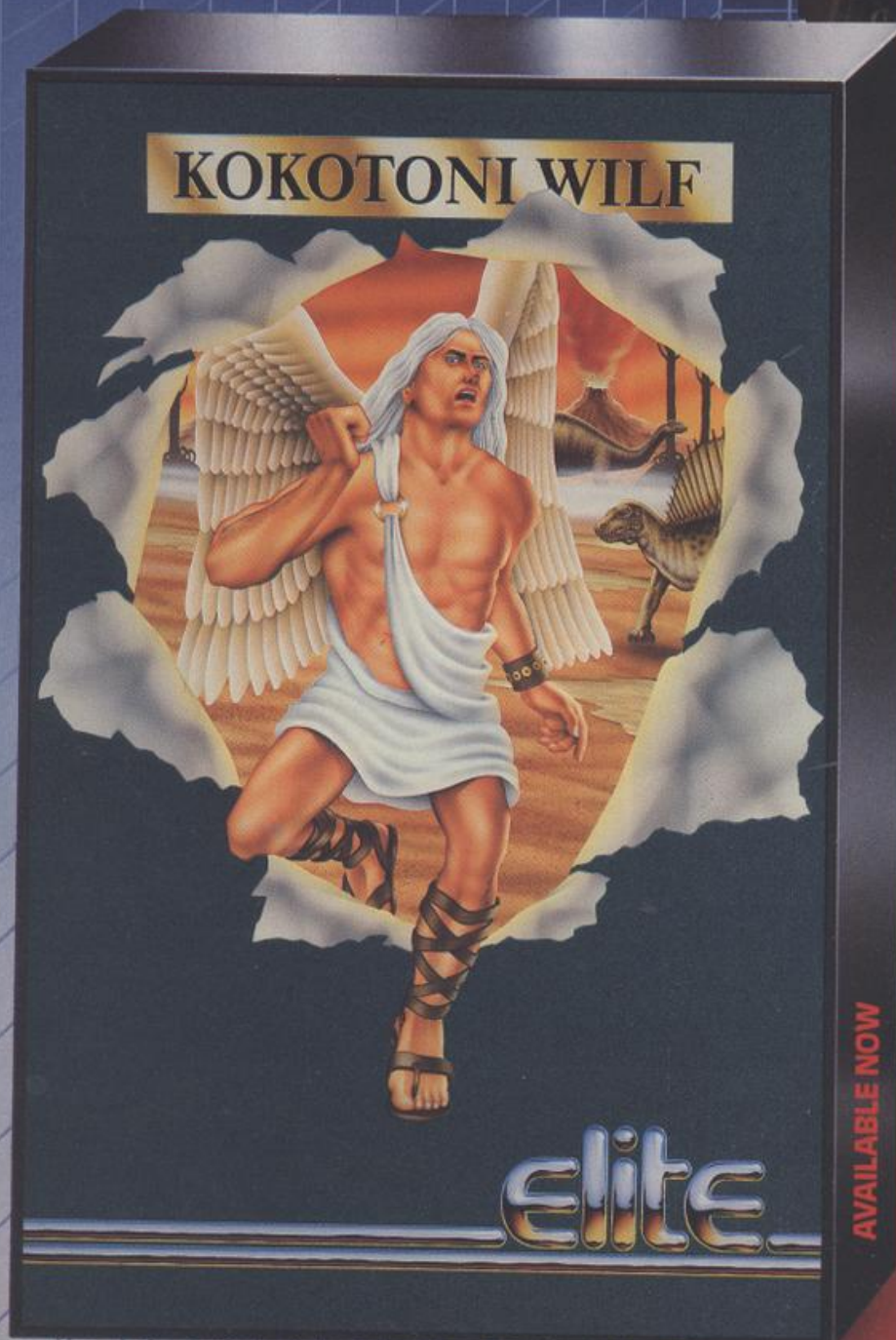
The cast of characters is:

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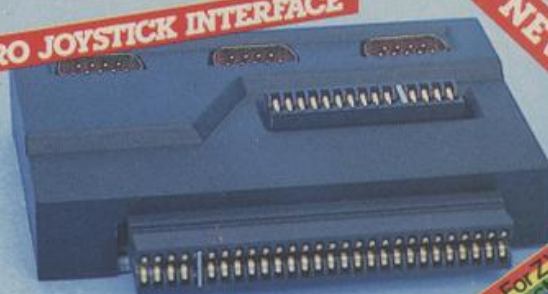


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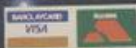
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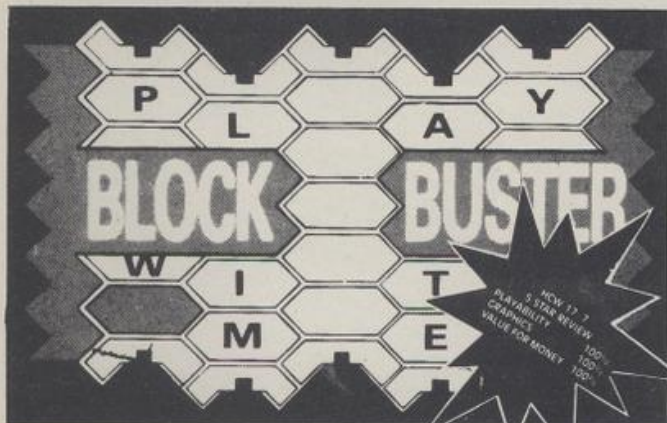
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Swords and Sorcery represents the first example of the ultimate in graphic adventures using the unique MIDAS system.

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You begin as a novice with limited abilities in the use of magic, sword play and stealth (lock picking, thieving etc).

As you wander the corridors, you will encounter beings meek and mighty, discover untold wealth and worthless trash. Some objects will increase your powers, whilst some will be dangerous and still others will be protected from pilferers (you!) by friendishly ingenious traps, all designed to help or hinder you on your pilgrimage to power and glory.

There are quests within quests within Swords and Sorcery, for those who want to follow them. Some are given others

must be found, and some are lost causes. There are many ways of opening the gate between the levels of the dungeons. Some are obscure and easy, others obvious and dangerous. The most profitable paths are both. The Ultimate goal of many will be to find the lost armour of Zob, which was un-made by its maker, and its parts scattered across the levels. What, where, how, who and why are answers to be found. All that is known is the prayer of the seekers:

WHEN DARK CABALLUS HIS COUNCILS LEND US
LET NOT THE RED CLUPEA HARANGUE US
TURN US FROM WHAT SEEMS TREMENDOUS AND
THUS TO ZOBS GREAT TREASURE SEND US.

You need never tire of Swords and Sorcery — when this dungeon can no longer hold you, the next awaits. . . there are a series of expansion modules planned to extend your enjoyment indefinitely.

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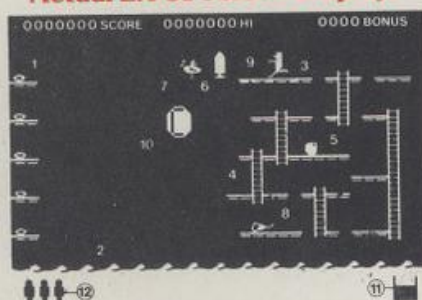
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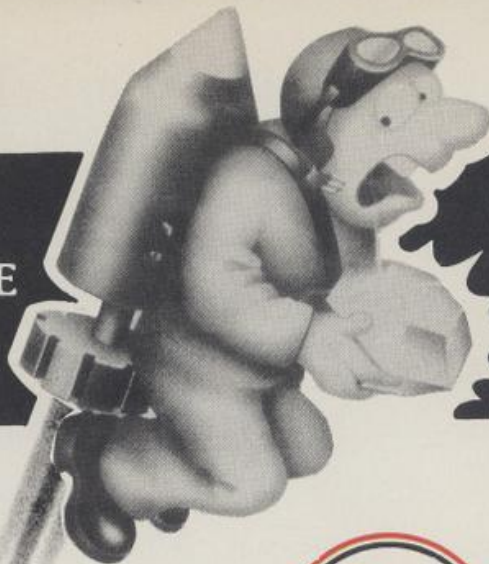
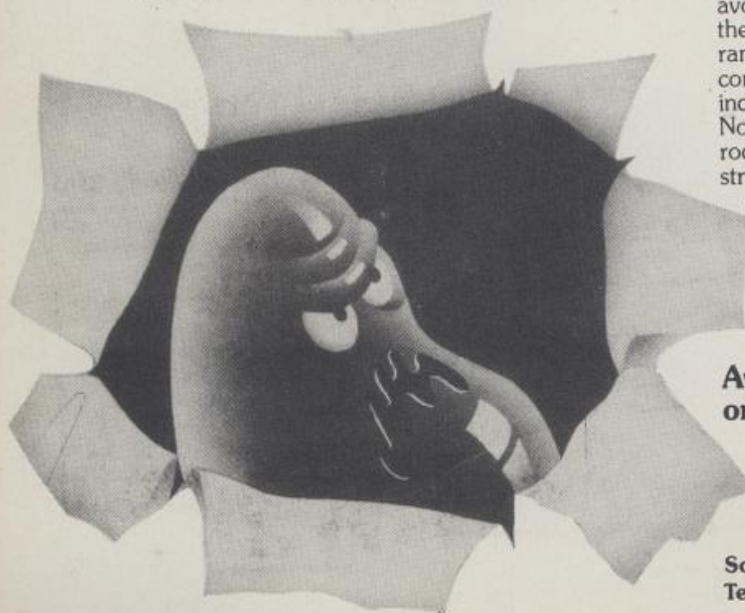
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|--------------|----------------|-------------------|
| 1. Diamonds | 5. Fuel Cans | 9. Player |
| 2. Sea | 6. Rocket | 10. Bubloid |
| 3. Platforms | 7. Vulture | 11. Fuel Gauge |
| 4. Ladders | 8. Leg of Lamb | 12. Men Remaining |



Get rich quick by collecting Diamonds that are simply lying there waiting for you!

Oh... I forgot to mention that there are one or two problems! There is an expanse of Shark infested water between you and the Diamonds and a strange breed of Bubble that seems hell bent on getting you in it! Somehow you must cross it...

You have a Rocket Pac to help you (a Vulture on higher levels) but you must rush around the platforms and ladders collecting cans of fuel (legs of lamb with the Vulture) and cursing that weird Bubble. Once you have enough fuel then it's Chocks Away!

Oh... but don't run out of fuel on the way - otherwise it's... **SPLASH!**

The aim is to collect all the diamonds from the far left hand side of the screen, whilst avoiding the rampant Bubloid. These emerge from the sea and are hell-bent on returning to their watery habitat with you in tow. Sooner or later you are going to end up in the drink - The idea is to make it later!

By belting round the system of platforms and ladders, cleverly avoiding the Bubloid, you collect the fuel cans which appear in random positions, until you consider that your fuel gauge indicates sufficient in the tank. Now you can go and collect your rocket. With the rocket-pack strapped to your back you can fly across the expanse of sea to collect the diamonds... but don't run out of fuel or your rocket-pack will simply disappear and you will wind up in the drink!

There are six stages with six different platform layouts. On stages 1-3 the Bubloid, which floats in front of the platforms with uncanny ease, gets an ever increasing ability to home in on your position, making the task of staying alive more demanding with each stage. On stages 4-6 you once again start with the easiest Bubloid (which is a blessed relief!) but the fuel cans are replaced by legs of lamb which you must collect to feed your vulture, and once it has enough energy (or you think it has!) you must flap across the water on its back to collect the diamonds.

Extra men are awarded for every 10,000 points - but **ONLY** once you have collected all the diamonds and so completed each particular stage.

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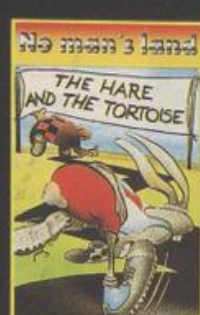
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The report
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ALL you need to know about computers can be summed up in one word: Commodore. (Well, we did tell you this would be biased).

We make everything you'll ever need to get the most out of home computing: all the *hardware* and all the software. (And if you don't understand what that means, simply look under "H").

That's what these three pages are all about: explaining what computers are (without the scientific jargon), how they work (without any technical mumbo-jumbo), and how you can get more enjoyment out of them (without much difficulty).

BASIC. Most home computers speak the same language. It's called BASIC. This is a more friendly way of saying "Beginners All-Purpose Symbolic Instruction Code."

There are different kinds of BASIC and, like languages, some are a little easier to understand than others. Like, BASIC 3.5 in the *Commodore Plus/4* and *Commodore 16*.

BOOKS you can read: "Teach Yourself Computer Programming With The Commodore 64" and "Programmers Reference Guide."

CASSETTE. Just as you keep your favourite music on cassette, so you can also keep your favourite computer programs on cassette.

You can either buy pre-recorded programs in a shop, or you can write them yourself. Cassettes are just one form of program storage and playback - see also *Cartridges* and *Disk Drive*.

To play cassette software you need a cassette unit. The Commodore 1530 and 1531 cassette units have been specifically designed to get the very best out of our computers, and provide consistently reliable results.



CARTRIDGES. These are programs that plug directly into the back of the computer itself.

CPU stands for Central Processing Unit. This is the computer's "brain," and as such it's what does all the hard work.

CHIP: silicon. A very complex electrical circuit miniaturised in silicon. It carries out the functions in the computer. Unlike other home computer companies, we make our own chips, so maintaining quality.

DISK drive. A program and data storage system, just like cassettes, but much faster. You can find and load the program you're looking for in seconds instead of minutes.

Diskettes, which can be used repeatedly for recording or re-recording programs, transfer information or instructions to and from the computer.

EDUCTION software from Commodore. We work non-stop with educationalists improving our range of programs for the pre-school to "O" level age groups and beyond.

Computers are an invaluable educational tool - versatile, patient and able to present information in an exciting way.

Our "Get Ready to Read" series, with lovable B.J. Bear, is recognised as an excellent



example of how it is possible to develop reading and writing skills in pre-school children.

ELEPHANT: well-known symbol of the Commodore 64's enormous 64K memory. And don't you forget it!

FOUR is for Commodore Plus/4, our very latest home computer with four, very popular built-in programs: wordprocessing, spread-sheet (financial planning), database (filing), and graphics.



It has an extensive 64K memory, with an exceptionally large 60K available for use. The Plus/4 comes equipped with the Commodore BASIC 3.5 with over 75 programming commands.

Other features include sound facilities, comprehensive graphics and 121 colours.

GORTEK and the Microchips is a unique programming course, for children of all ages, that links learning exercises with a space adventure story. **GRAPHICS.**

The pictures and diagrams on a monitor or TV screen, either high or low resolution.

All Commodore home computers have 62 graphic symbols to create low resolution pictures and diagrams, or high resolution modes that allow you to specify each pixel (or dot) on the screen.

(There can be up to 64,000 of these).

GAMES: Commodore produce them all, and more! From shoot 'em up games, to games of adventure and complex strategy.

HELP! On both the Commodore 16 and Plus/4 computers there is a very special feature: a HELP key. It does exactly what it says: it helps you to debug (which is the smart way of saying, "identify and correct errors") when you're programming.

It highlights errors right down to individual instructions.

HARDWARE. The computer itself - you can touch it. Whereas software's a program you can only see or hear (on the monitor) when it's running in the computer.



INTEGRAL software is software that is actually built into the computer, as on the Commodore Plus/4, the very latest in home computing.

INTRODUCTION to BASIC. Just as you don't need to understand how a car works to be able to drive it, you don't have to understand how a computer works to be able to use one.

But you will definitely get more enjoyment out of it if you do have a basic knowledge of programming.

Which is why "Introduction to BASIC" has become the most popular software tutorial.

It comprises 2 cassettes and an easy-to-follow, step-by-step manual.

INPUT/output: Input is information put into the computer from either the keyboard or a storage device. Output is information from the computer to either a screen, printer or storage device.

JOYSTICK and paddles. As well as improving speed and accuracy, these make games more real by putting the control of whatever it is on the screen directly into your hands.

KILOBYTE is 1,024 bytes. So "K" stands for a unit of 1,024 or 2^{10} . A 64K byte memory unit contains 64×2^{10} , or 65,536 bytes of memory. And if you don't understand all that, don't worry.

All that's important is knowing you can run more complex programs through a computer with a large memory, than one with a small memory.

LANGUAGE. This is a system of coding that can be understood by a computer. It allows you to "speak" to the computer, and for the computer to "speak" to you. Most home computers speak BASIC, but there are also other languages available for Commodore computers that have been designed for specific uses.

For example, LOGO and PILOT in education.

MONITOR: this is the screen on which you can see what you've typed into the computer, and also what the computer is saying back to you. You can use an ordinary TV screen, but more preferable is a colour video monitor, like the Commodore 1701.

This is a special device that produces much higher resolution than a TV, and so offers superb reproduction and clarity.

On top of which it allows the rest of the family to stay tuned-in to their favourite TV programme while you're tuned-in to your favourite computer program.

MODEMS allow computers to connect via a telephone line to other computer systems. Commodore 64 modem owners can communicate with other owners, join systems like Prestel/Micronet and an exciting new system called Compunet, where quality software is available cheaply or even free.



MEMORY. There are two basic types of memory: ROM and RAM.

Read Only Memory (ROM) is the computer's permanent built-in memory which tells the computer what to do. It doesn't disappear when the computer's switched off.

Random Access Memory (RAM), however, is for temporary storage.

It is the part of the computer's memory that's free for you to use. It can be erased and used over and



over again. It stores both data and instructions during the execution of a computer program. These are lost when you switch the machine off - unless, of course you store them on cassette or diskette.

NUMBER ONE. In the whole wide world, Commodore is No. 1 in microcomputers, and the Commodore 64 is the No. 1 best seller.



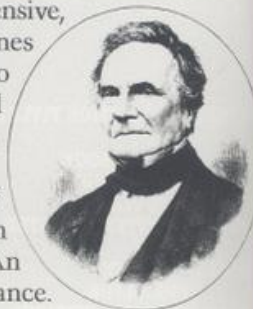
ORIGIN of the computer. In the 19th Century an Englishman, Charles Babbage, invented the first true computer. But his "Analytical Engine" was so ahead of its time, it turned out to be impossible to build!

The modern computer first appeared around the time of World War II. Britain's "Colossus" was vast, consumed vast amounts of electricity, required its own air-conditioned room, was unreliable and difficult to operate.

It had its limitations. Then came the amazing transistor... integrated circuits... and microcomputer.

The first desk top microcomputer in the world was the Commodore PET (this was a friendly name for Personal Electronic Transactor), in 1977.

In effect Commodore had taken hitherto huge, expensive, mysterious machines accessible only to eggheads, reduced the size and price, and put them into the hands of ordinary mortals in ordinary offices. An extraordinary advance.



PERIPHERALS. These are separate add-ons that will extend your computer's capabilities. Like our printers, storage devices and monitor.

PRINTER: One of the ways a computer can "speak" to us.

It means you can produce charts, letters, documents, pictures on paper

The Commodore range includes four printers and one printer plotter.

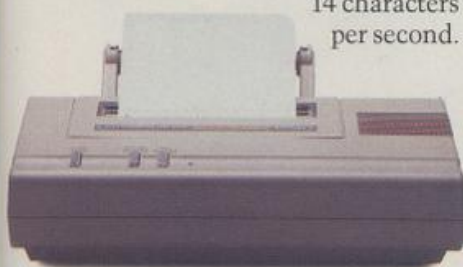
The MPS 801 dot matrix printer (so called because its characters are made up of dots) has a print speed of 50 characters per second, about five times as fast as the fastest secretary.

The MPS 802 dot matrix friction feed printer has a print speed of 60 characters per second and uses either single sheets or continuous stationery.



The DPS1101 daisy wheel printer (called that because, surprise, surprise, the print wheel looks a bit like a daisy), produces superb quality print on all letters, reports and documents (the kind of quality one desperately requires on a letter to the bank manager). There's a range of alternative type faces available on additional print wheels. Speed: 18 characters per second.

And the 1520 printer plotter (illustrated). This has 4 colours, and opens up a whole new world of graphic print-out ability. You can draw pictures, create graphic designs, plot graphs or construct bar and pie charts. Speed: 14 characters per second.



QWERTY – the 6 keys at the top left hand side of a standard typewriter. Unlike lesser machines, all Commodore computers have full-size, professional typewriter keyboards.

They have a solid, responsive feel to them. (The problem with rubber or membrane keyboards is they have a soft, spongy feel to them: you press a key, then wonder if the message got through).

RANGE. The range of Commodore software is enormous. There is something, as they say, for everyone: educational, business, home and games.



STARTER PACK. The Commodore 16 Starter Pack has been specially designed to introduce you to computing.

It contains everything you need to start home computing, complete in one box: a 16K computer, cassette unit, four superb software programs, and Introduction to BASIC Part 1.

It has a *Help* key in case you get into difficulties, and incorporates advanced BASIC, which has been specifically designed to simplify the programming process.

Other features include: 4 cursor keys, 2 joystick ports, an astonishing 121 colours, plus excellent sound and graphics capabilities.

TUNES. Commodore make software to help you compose your very own music.

All our home computers have great sound and music capabilities.

USER friendly. This is a program that explains itself as it goes along, or a computer that people can easily operate.

Every computer manufacturer now claims its products are "user friendly," but only Commodore really demonstrates it. For example, our *Help* key and use of Advanced BASIC.

VERTICAL integration is not as complicated as it sounds. All it means is that Commodore make everything to do with computers, from the silicon *chip* to the computer casing.

So we have complete control over everything, from design to manufacture.

It also means, of course, that we can design everything so you're able to get the very best out of your Commodore computer system.

WOMEN also are discovering computers – and not just in offices, but at home. Computers aren't sexist.



They were invented for everyone, and the fact that they're fun, exciting, educational, practical and time-saving are benefits that apply to women just as much as to men.

XMAS. There is no better time to give or receive a Commodore present.



YIPPEE! Yes, now you know (or should do) that computers are really interesting. They're not just about space games with horrendous monsters. Nor are they horrendously complicated machines that you need a maths degree to understand.

Computers are the future, and it's important that you and, even more so, your children don't get left behind in the past.

With a Commodore computer and a *peripheral* or two (and we now know what those are, don't we?) whole new leisure and business opportunities will immediately be opened to you.

Make the choice now and (just so long as it's Commodore) we promise you will never regret it.

ZIP us a line if you'd like more even more biased information on any Commodore products.

Write or telephone: Commodore Information Centre, 1 Hunters Road, Weldon, Corby, Northampton NN17 1QX. Tel: Corby (0536) 205252.



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TWO GREAT NEW CHART CLIMBERS from

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Software

COMMODORE 64

WARLOK



Some time in the far future, the Colonial Union is crumbling and the planets Warlok and Aldarr are on the brink of war.

Returning from a mediation conference, an Aldarrian starship is attacked and boarded by the Imperial troops of WARLOK. Four robot drones containing top security information on the Aldarrian planetary defences, are discovered on board the starship and transported to WARLOK where, for interrogation and security purposes, they are each placed at the heart of a heavily fortified underground defence network.

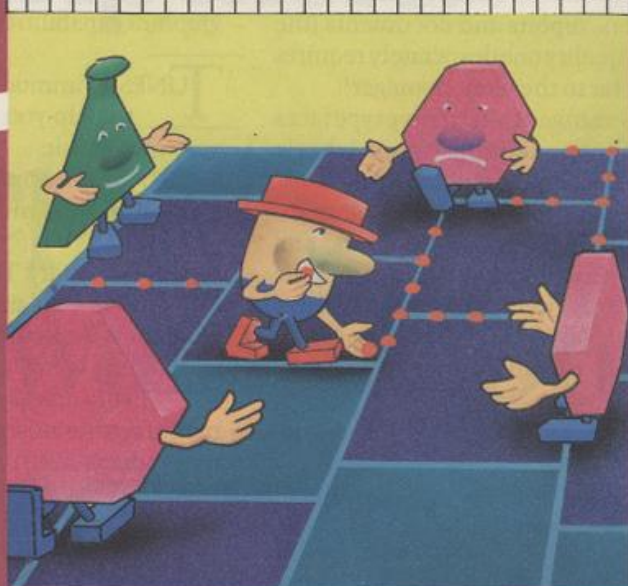
Your mission, as elite space fighter commander of the Aldarrian defence forces, is to enter the network and recover the robot drones before Warlok can discover the drones' access codes.

Before you get to the drones you must survive a lethal defensive network of attack robots, laser barriers oscillating droids and much more... Good luck, the fate of Aldarr lies in your hands.

WARLOK is a stunning, high resolution tour-de-force of arcade style fast action. From the first screen as you descend into the defence networks to the final release of the last drone (if you ever make it!) WARLOK is compulsive gaming for all arcade addicts from the hardened old-timers to rank beginners.

COMMODORE 64

HOOVER



From the darkest, mysterious depths of Croatia came Hooper, Prince amongst his own people but ridiculed by humans due to his exaggerated facial features and large floppy hat - a symbol of greatness in his own land. Angered by the taunts of men, Hooper sets off in this cruel world to prove himself any man's equal.

In this, the first of his adventures, Hooper has to enter the infamous death grid where he must steal precious jelly beans from the dreaded Sneakers and Bleepers. (The stuff that nightmares are made of). Once the beans are collected he must replace them with fakes then advance to another part of the grid, even more dangerous than before.

To complete his task Hooper must raid each of the eight sections of the death grid six times while nasties get faster and faster. May the strength of your ancestors guide you.

HOOVER is a 100% machine code game written by MAK JUKIC.

Access and Barclaycard welcome.



Both programs

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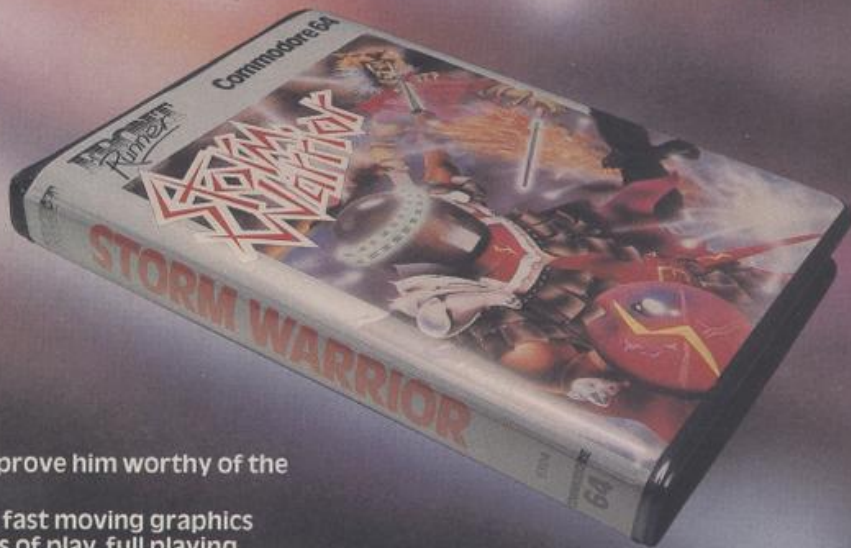
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Storm Warrior is a 12 screen, all machine code, fast moving graphics adventure using 58K of RAM. It features 5 levels of play, full playing demo mode on the first four screens, game freeze facility and a fast loading system.

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A great graphics adventure in the land of Demons. Coming Soon.

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Dead City Rescue.

The mind blowing, fast loading, 100 screen graphics adventure featuring 5 different speeds of scrolling to give an incredible depth of perspective. Mentally stimulating, strategy packed, visually stunning!

Commodore 64 Tape £7.95 Disk £9.95 (including VAT.)

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Castle of the Skull Lord

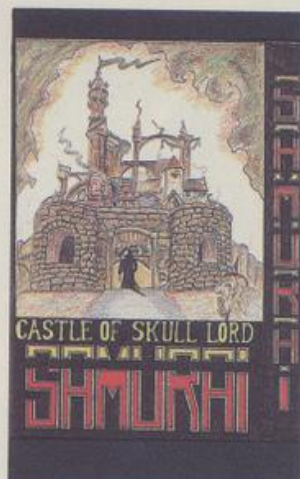
Packaged in a Special Presentation Box which includes a "Free Dust Cover" for your computer.

In a battle lost in the mists of time, the necromantic Skull Lord attacked and defeated a race of noble Dwarves. The Dwarves lost many treasures, the most valuable of these being the "Crown of Dwarves Kings". For many ages did they attempt to regain this artifact, and for many ages did they fail.

Now in desperation they call upon you, noble warrior, to attempt that which is beyond their power.

Your quest:— To regain the fabled crown and defeat the all powerful skull lord.

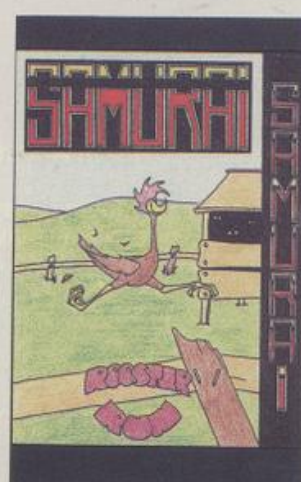
The adventure is of the classic format. Simple verb-noun combinations are expected, and will usually be understood.



Samurai Invaders



Ms. Mazey



Rooster Run

You control a fearsome Samurai warrior whose aim is to prevent the Alien invaders from gaining control of the earth. To help you in this task, you are armed with shuriken, fearsome oriental throwing stars.

Can you guide the intrepid Ms. Mazey around her garden maze and collect the daisies? Or will you fall victim to the evil skull riders? (In a garden?) Can you make it to the magical "flower pills". Will you get the "flower power" to zap the skulls? Will Ms. Mazey ever get to see the flower of her heart, Percy Chukka?

Why DID the chicken cross the road? You don't know? Neither do we, but with the help of this game you may just find out! Your aim is to guide the hapless rooster across the road, then, get in the boat and avoid the aquamarine hazards. What could be simpler?!

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ATARI

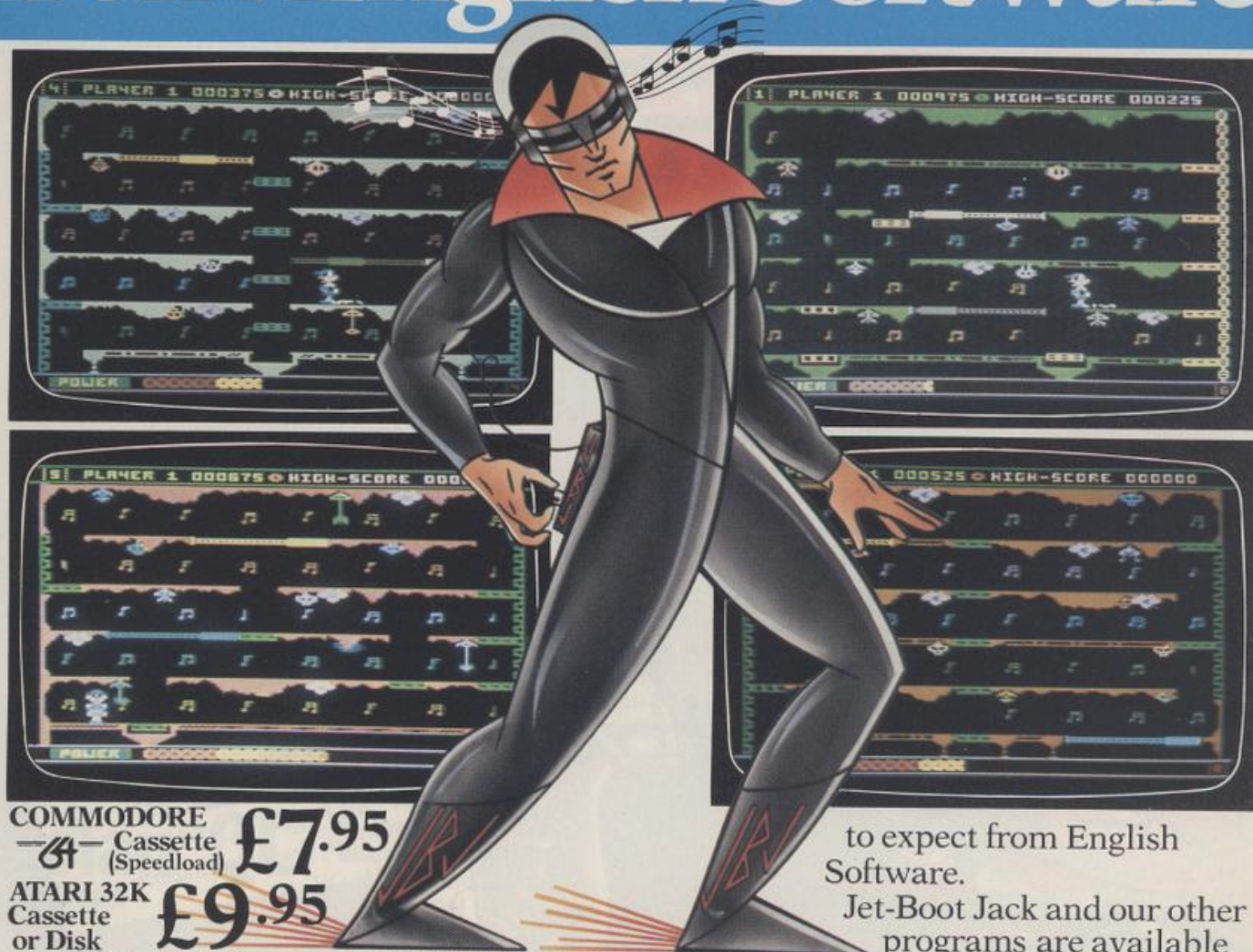
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AVAILABLE
FOR
COMMODORE
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COMMODORE
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Sliders and elevators provide access to new levels – but sometimes they turn nasty!

With 10 different screens and 6 skill levels Jet-Boot Jack will stretch your abilities to the limit.

Which, after all, is what you've come

to expect from English Software.

Jet-Boot Jack and our other programs are available from branches of Laskys, Greens and all good software dealers.

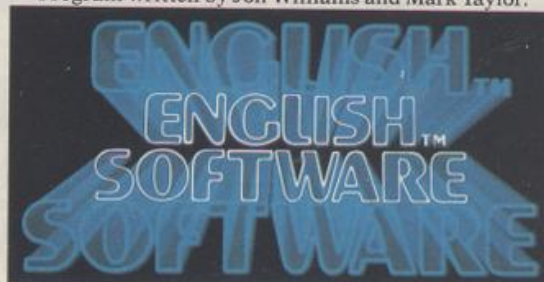
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JET-BOOT JACK

© Copyright 1983 English Software

Program written by Jon Williams and Mark Taylor.



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In his latest action
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- ★ 200 PLUS LOCATIONS in ye High Resolution Graphics
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ZX Spectrum 48K

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Containing: • Computer Scrabble
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Sinclair QL 32-bit power . 128K RAM . ARRIVING SOON! ... business software ... it's the amazing QL!



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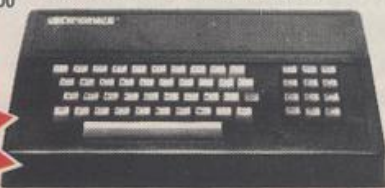
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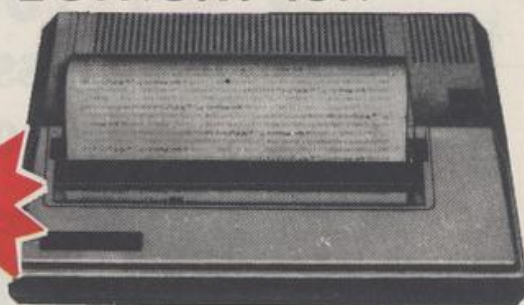
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Scoop Purchase! Timex 2040

Thermal Printer for the
SPECTRUM 48K

SPECTRUM
PRICE

£77⁵⁰



This top-value thermal dot matrix printer is designed especially for use with the Spectrum 48K computer. With a print rate of 80cps on no-ribbon thermal paper and a maintenance-free life, plus 80 dpi graphics capability, the 2040 really is a terrific buy at our low price!

The Rat Cheetah Remote Action Transmitter



SPECTRUM
PRICE

£29⁹⁵

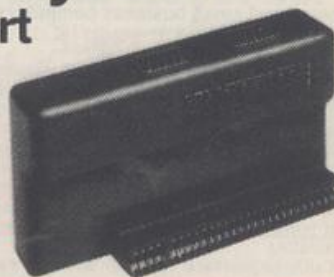
Cheetah's Remote Action Transmitter (R.A.T.) is the most sophisticated computer controller around. Cordless Infra Red transmission lets you sit back (up to 30 feet away) in your chair and enjoy the action! Electronic Touch Control system means no moving parts, superfast action, long life.

DK Tronics Joystick Interface — Dual Port

The 2 joystick facilities are:
1st port simulates 6789 & 0 keys; the 2nd port
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software. 1-Using keys 6789 and 0; 2-Having
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★★★★★PLUS★★★★★

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The 10 Runners-Up each get a

£100 Voucher

to spend in any Spectrum store -
anywhere in the country.

Just look at the fabulous 1st prize in this new competition - a super holiday for you and 3 friends among the sun, sea and palm trees of Florida. PLUS, an incredible £2,500 to spend when you get there.

There's exciting day trips too to the Kennedy Centre, the famous DISNEY WORLD and more!

The competition closes on December 31st 1984 - call into your Spectrum dealer NOW and collect an entry form - you could win the holiday of a lifetime!

MICRO UPDATE

- Spectrum's own magazine for
home and small business computers
AUTUMN ISSUE

Have you seen our MICRO UPDATE magazine yet? It's Spectrum's own computer guide, published by the experts for YOU - and the Autumn issue will be out soon.

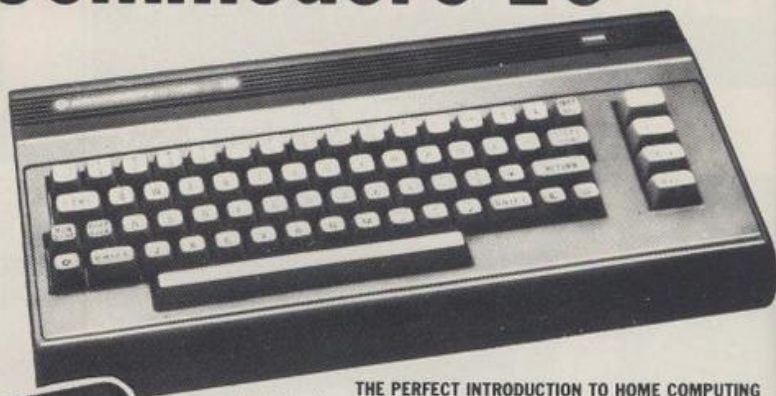
It's packed with illustrations and descriptions of just about everything you're likely to meet in home micro hardware, add-ons and accessories. Plus there's information on current software, and hints and tips from experts about home computing.

Call in to your local Spectrum dealer and get YOUR copy - it's great!

Just Arriving

New! Commodore 16

Including
Commodore
1531
Cassette
Recorder



THE PERFECT INTRODUCTION TO HOME COMPUTING

Introducing the new Commodore 16 - the advanced micro that's designed with the beginner in mind.

This brand new micro features a powerful 16K RAM, a full professional keyboard, superb graphics with 121 colours, plus terrific built-in sounds.

In its 32K ROM is a new BASIC 3.5 with over 75 commands including graphics plotting and program editing. There's a unique HELP key that highlights errors when you're learning to program.

It's a tremendous new micro and the Spectrum package includes a Commodore Model 1531 Cassette Data Recorder too. See it at your local Spectrum dealer now!



SPECTRUM
PRICE
ONLY

£139⁹⁹

Add-ons

Simon's Basic.....	£50.00
Intro to Basic Pt 1.....	£14.95
Intro to Basic Pt 2.....	£14.95
MPS801 Printer Ribbon.....	£9.95
MPS802 Printer Ribbon.....	£12.95
64 Magic Voice	
Speech Synthesiser.....	£50.00

**Sensational
Value!**
**Commodore 64
Compatible Data
Recorder
ONLY**

£34⁹⁹

Commodore 64 Package Offer



Including:

- Commodore 64
- A Joystick
- C2N Cassette Recorder
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AND ALL FOR ONLY

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See the super new Commodore Range at your local Spectrum Dealer - Now!



Just Arriving New!

Commodore Plus/4

Commodore's new, advanced Plus/4 bridges the gap between home and business micros in a way that's unique - and at a price that's unbelievable! The Plus/4 features, besides its powerful 64K of RAM memory, has a host of features to make computing easier.

For starters, there are four popular software packages built-in - Word Processing, Spreadsheet, Database and a Business Graphics program. That's all a small businesses needs - in a budget-priced micro!

Besides that, there's a HELP key that highlights errors in program lines, plus built-in graphics, advanced BASIC 3.5 with over 75 commands, separate cursor controls, a full 32K ROM and 4 programmable function keys.

SPECTRUM PRICE

£299⁹⁹

New! DPS1101 Printer



SPECTRUM
PRICE

£399⁹⁹

Commodore 1701 Monitor



£230

Commodore MPS802 Printer

SPECTRUM PRICE

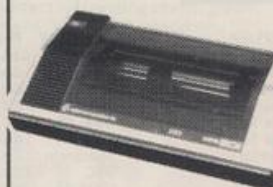
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MPS801 Printer

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1542 Disk Drive

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1530 Data Recorder

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1531 Data Recorder

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For further information on these products - see Spectrum's own magazine MICRO UPDATE. Ask your local dealer for a copy!

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Micro Dealer UK's **TOP 50** Britains No.1 Weekly Software Chart



PROGRAM
New! Sherlock
Daley Thompson
Decathlon
Daley Thompson
Astro Chase
Flip & Flop
Monty Mole
New! Elite
Death Star Interceptor
New! Zim Sala Bim
Full Throttle
Olympicon
New! High noon
Hero
Forest at World's end
Bear George
Monty Mole 64
Lords of Midnight
Beamrider
New! Stuntbike
Battle for Midway
Frank N Stein
Pitfall
Tiler
Strip Poker
Star Striker
Jet Set Willy
New! Pitfall II
Gisburnes Castle
Sabre Wolf
New! River Raid
New! Black Hawk
New! Havoc
New! Enduro
Beachhead
New! Kokotoni Wilf
Wunda Walter
New! Delta Wing
New! Kokotoni Wilf
New! Zenji
T.L.L.
New! River Raid
New! Toy Bizarre
New! Jetpac
New! H.E.R.O.
New! Stagecoach
Giants Revenge
New! Poster Paster
Stop the Press
Matchpoint

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Melbourne Hse
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Interceptor
Cheetahsoft
Gremlin
Beyond
Activision
Ocean
PSS
PSS
Activision
Interceptor
Datasoft
Superior
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Martech
Ultimate
Activision
Creative Sparks
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Spectrum £6.95
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CBM 64 £6.90
CBM 64 £14.95
Spectrum £6.95
CBM 64 £9.99
CBM 64 £5.50
CBM 64 £9.95
BBC £7.95
Spectrum £9.99
CBM 64 £7.99
Spectrum £6.95
CBM 64 £9.95
Spectrum £7.99
CBM 64 £9.95
Spectrum £5.95
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Spectrum £6.95
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CBM 64 £9.99
Spectrum £6.95
CBM 64 £9.99
CBM 64 £9.99
BBC £7.95
Spectrum £7.99
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Spectrum £6.95
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BBC Model B Package Offer



HURRY!
Offer extended
**WHILE
STOCKS
LAST**

Including FREE!

• Cassette recorder • 5 pieces of software
when you purchase a BBC 'B' from Spectrum.

The BBC MODEL B, probably the most flexible personal microcomputer available today. Using powerful BBC BASIC, the BBC B is widely accepted as providing the educational standard for computer learning.

The model B features a variety of interface ports allowing easy connection not just of ordinary peripherals but also second processors or devices to give access to teletext or prestel services.

£399



Cumana Disc Drives

CSX 100 CS 100
£129.95 £159.99

Super Value- For-Money Shado Data Recorder

Compatible with ACORN
BBC and ELECTRON micros



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Acorn Electron

The Electron gives high quality graphics output to either colour TV or monitor. Sound can be generated through the internal loudspeaker. The Electron comes complete with a free introductory cassette, containing 19 free programmes & two manuals - the User Guide and Start programming with the Electron."



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Amstrad Software all at £8.95

EDUCATIONAL SOFTWARE
Wordhang
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ARCADE
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Codename Matt
Xanagrams
Hunter Killer

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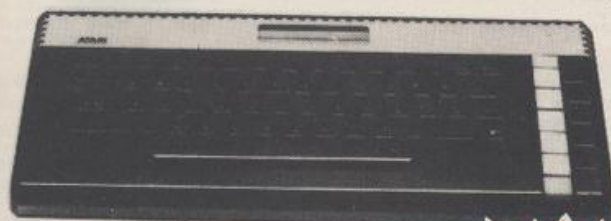
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Atari

A great line up from one of the first names in home computing...
...Now at Super New Low prices from Spectrum

Atari 800XL



• Powerful 64K RAM • Full-stroke keyboard • Full sound with 3½ octave range • 11 Graphic Display modes • Full colour (256 Colours - 128 colours can be displayed at one time) Ask to see this super new micro at your local SPECTRUM dealer NOW!

SPECTRUM
PRICE

£199⁹⁹

Atari 850 Interface



SPECTRUM
PRICE

£99⁹⁹

Essential for more advanced work with their Atari computers. It provides 1 parallel output for a huge range of printers, and no less than 4 serial outputs which can be individually programmed for different purposes. It comes with a comprehensive manual, power pack & interconnecting cable to the computer.

Atari 1027 Letter Quality Printer

This superb Letter Quality Printer prints fully-formed letters just like a quality electric typewriter, making it the ideal word-processing companion for business correspondence. The Atari 1027 accepts single sheets of paper so you can even use your own letterhead paper.



SPECTRUM
PRICE

£249⁹⁹

Atari 600XL



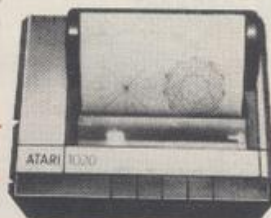
The 600XL features a 16K RAM, expandable to 64K with the memory expansion module. There's a 24K ROM operating system including ATARI BASIC. Plus 16 colours, 11 graphic modes and 4 independent 3½-octave sound synthesisers. It really is a top-value micro - come in and see for yourself!

SPECTRUM
PRICE

£99⁹⁹

Atari 1020 Printer/Plotter

Using 4 colour graphics and text, the 1020 colour printer/plotter is perfect for creating charts, graphs & even artistic designs. Very quiet operation.



SPECTRUM
PRICE

£99⁹⁹

Atari 1010 Program Recorder



Add storage and retrieval capability to your Computer system without spending a lot of money. Uses cassettes to store text, programs & other information.

SPECTRUM
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£34⁹⁹

Atari 1050 Disk Drive



Add the Atari 1050 Disk Drive for fast, convenient data access by storing on compact, easy-to-handle 5¼" disks. Storage capacity with DOS 11 up to 127K bytes, (around 100 pages) of information per disk.

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Atari Software

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Missile Command	Video Easel £22.99	Manuals £49.99
Pengo	Music Composer £22.99	Home Business
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Space Invaders	Invitation to Prog 1 £19.99	Visicalc (Disk) .. £49.99
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Sensational Printer Offers from Spectrum

Juki 6100

Super
Value!

Daisy Wheel
Printer



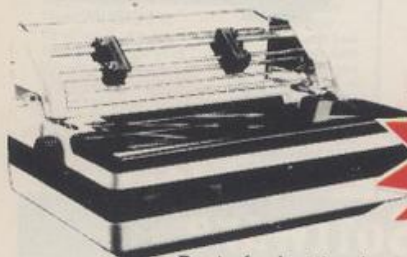
This fabulous new printer is a real breakthrough in the performance/value stakes! For a remarkably low price you get all these great features:

- Daisywheel printing • 20cps (av. 18cps Shannon Text) • 10/12/15 or Proportional character spacing • Bi-directional friction-feed • Tractor feed or cut paper • Centronics as standard; RS232C optional • 2K byte print buffer

£399

Quendata

Just look at this for value - a true daisy-wheel printer offering top quality printing at a remarkably low price. Print speed is 18/20cps, uni- or bi-directional printing (depends on software), variable pitch.



SPECTRUM PRICE

£289⁹⁵

Tractorfeed optional extra

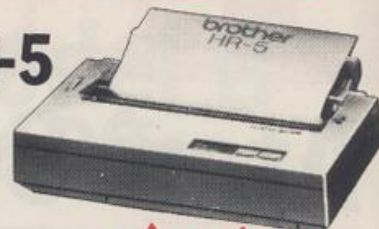
Other Printer Bargains

SEIKOSHA		GP100VC VIC 20/64	£199.95
GP50A	£99.95	Friction Feed GP100/250X	£28.75
GP50S Spectrum	£99.95	EPSON	
GP500A	£179.95	FX80	£503.70
GP550A	£229.00	RX80T	£286.35
GP100A MkII	£199.95	RX80FT	£327.75

Brother HR-5

Super value printer that prints on plain paper, yet still fits in your briefcase.

- Operates on 4 standard batteries
- Incorporates Centronics or RS232C
- Bidirectional or unidirectional
- High quality Thermal head
- Prints at 30cps on plain paper (with ribbon) or directly onto thermal paper
- Weighs under 2kg



SPECTRUM
PRICE

£159⁹⁵



Brother HR-15

A great printer at a top-value price from Spectrum. Here's what you get:

- Letter-quality daisy-wheel printing
- Between 13 and 18cps
- Bi-directional printing
- Tractor-fed paper or single sheets
- Super low price!

£458⁸⁵

SPECTRUM
PRICE

Brother EP-44

"Transforming Office Machines", runs Brother's slogan - with these super-compact battery powered typewriters, it's easy to see why!

- Top quality thermal printing head
- 4K of text memory (3 A4 pages)
- Text centring if required
- 15-digit LCD display for pre-printing corrections
- Line-by-line edit facility



SPECTRUM
PRICE

£249⁹⁵

Smith-Corona D100

This superb dot matrix printer from Smith-Corona is a sleek, well-made machine that'll work with either tractor- or friction-fed paper. It offers a fast 120cps print speed, with 80 characters per line and a choice of well-defined typestyles. The D-100 incorporates a Centronics parallel interface.



Also available

Fastax 80

£225¹⁷

SPECTRUM
PRICE

£286³⁵

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There's a Spectrum near you...

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Tel: (0225) 61676
WESTON-S-MARE K & K Computers,
32 Alfred St Tel: (0934) 419324

BEDFORDSHIRE

DUNSTABLE Dormans 7-11 Broad Walk
Tel: (0582) 65515
LEIGHTON BUZZARD The Computer Ctr
at Milton Keynes Music, 17 Bridge St.
Tel: (0525) 376622
LUTON Terry-More, 49 George St.
Tel: (0582) 23391/2

BERKSHIRE

BRACKNELL Computer Centre, 44 The
Broadway Tel: (0344) 427317
SLOUGH MU Games and Computers 245
High St. Tel: (0753) 21594

BUCKINGHAMSHIRE

BLETCHLEY Rams Computer Centre,
117 Queensway Tel: (0908) 647744
CHESHAM Reed Photography & Com-
puters, 113 High St. Tel: (0494) 783373

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Saints Passage, High St. Tel: (0480)
411579
PETERBOROUGH Pirbright Communications,
91 Midland Rd. Tel: (0733) 41007

CHANNEL ISLANDS

GUERNSEY Gruts, 3-5 The Poillett,
St Peter Port Tel: (0481) 24682
Jersey Audio & Computer Centre,
7 Peter St, St Helier. Tel: (0534) 74000

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ALTRINCHAM Mr Micro 28 High St
Tel: (061) 941 6213
CREWE Microman Unit 2,
128 Nantwich Rd. Tel: (0270) 216014
ELLSMERE PORT RFR Computers, 1
Pooltown Rd. Whitby. Tel: 051 356 4150
MACCLESFIELD Camera & Computer Cen-
tre 118 Mill St. Tel: (0625) 27468
STOCKPORT Wilding Ltd,
1 Little Underbank Tel: (061) 480 3435
WARRINGTON Wildings, 111 Bridge St.
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WIDNES Computer City, 78 Victoria Road.
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Annes Parade. Tel: (0625) 526213

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TRURO Truro Micro Ltd, Unit 1, Bridge Ho,
New Bridge St. Tel: (0872) 40043

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CARLISLE The Computer Shop, 56-58
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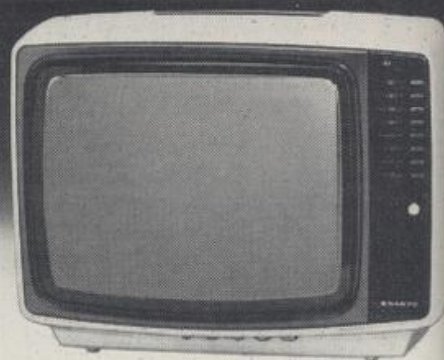
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This sophisticated piece of equipment offers all the advantages of 64K MSX computing. (complete with 4 programme starter pack)

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Plus a unique optional feature – **MLT001 LIGHT PEN**. This provides you with unlimited flair and flexibility in colour graphics design. This feature comes complete with a software package containing some intriguing graphic facilities.



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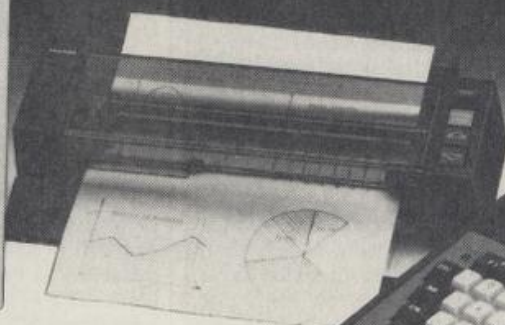
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The perfect partner for the HX10, providing excellent picture and sound quality.

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AXIS
AT HOME WITH TECHNOLOGY

YOUR LETTERS

OU — BASIC IS BEST OK!



BASIC IS BEST

To counter your correspondents in the October issue who run down the ever popular Basic, there is another side to the debate. To take a small sample there are 23,000 Open University students with home micros, a third of them teachers and most of the rest in business and industry, with the following proportions 34 per cent BBCB, 15 per cent Spectrum, 11 per cent ZX-81, 6 per cent Commodore 64, 5 per cent Dragon, 4 per cent Apple, 4 per cent TI99, 3 per cent Tandy, 2 per cent each Vic20, Electron, 380Z, Atom, Pet, MZ80 and 1 per cent or less each of Genie, QL, Oric and others. They all have Basic as their *lingua franca* native language, which is easily converted from one dialect to another as Prestel, Ceefax and Basicode have shown; impracticable for other languages.

Indeed universal Basic common to all has Goto (stuff the pundits), Gosub, For..To..Step..Next, If..Then, so omit Procedure, Repeat, Until, While, Wend and Else which are not common to all. As they never teach you in 20 years, when you get down to it all, computers large and small only do three principal things:—they Loop, Branch and Gosub — equivalent to brackets in algebra; the rest is arranging input and output. As simple as that.

A recent survey among those OU students shows that 99.6 per cent do not want full time careers in computing but do "want to use their micros quickly and simply". So that means Basic, which after all was designed for that very purpose, so that the scientist, mechanic, executive or teacher could start programming within a day to help their job without a lot of elitist fuss.

It is also clear among those OU students that they have discovered for themselves, away ahead of academic staff, that programming their micros in Basic improves their studies and greatly increases their understanding of concepts in Maths, Science, Technology, Engineering, Social Science, Education, Business and Industry; and their time is at a premium.

The currently fashionable and transient structured programming and top down design — sacred cows if ever there was one; and what ever happened to yesteryear's fashionable algorithm — taught with Pascal in the OU's main computing course is a dismal failure with 51.6 per cent drop-out or failed — compare with 75 per cent normal pass rate — that is, 1163 students gave up costing £1 million of wasted resources of the taxpayers money. If the students were aircraft we would all be grounded; and if the staff who wrote the course were football coaches...!

It's comparable to the Army who ordered new boots and provided a sample, and then found they had 900,000 left boots only; with severe condemnation from the Parliamentary Audit Committee.

With "programs that generate programs" already on the wing there will soon be no need for these tedious, elitist and idiot fashions in structure and 30 languages; they will be as dead as yesterday's punched cards, in your lifetime. We are still in the Tiger Moth stage.

Sharpey,
OU Student,
Sussex.

AMSTRAD PEEK

In answer to Matthew Leach's letter in *Your Computer* September 1984, it is possible to peek the Amstrad CPC-464 ROM, but this must be done from machine code. The best way is to disassemble the ROM with a machine-code disassembler. Switching the ROM in with the following machine code routine.

ORG 4000H
CALL B900H
CALL B906H

JP start of machine-code disassembler

The ROM can now be disassembled but if you return to Basic, the ROM is switched out.

M.J. Dyos,
Little Sutton,
Cheshire.

ZX-81 SPRITES

With reference to my Sprite program for the ZX-81 in the September issue of *Your Computer*, it is bug-free. However, owners of ZX-81s with the unimproved ROM

will find that on running the demo program the Report Code C/100 appears. To rectify this problem the following Pokes should be carried out to the machine-code.

POKE 17403,82
POKE 17421,82
POKE 17435,82
POKE 17464,82
POKE 17468,82
POKE 17481,82
POKE 17485,82
POKE 17498,82

POKE 17575,82
POKE 17629,32
POKE 17695,41

Malachy Devlin,
Co. Tyrone.

HEX AND BUGS

I am the author of the Dragon Disco Lights program *Your Computer*, vol 4, No. 9. I would like to point out that my name is Ross not Ron as printed. Also I believe there

QL: THE BBC STRIKES BACK

I must protest at the gross inaccuracies and untrue sections of Kathleen Peel's second look at Sinclair's QL in the July issue. I quote "... In hardware terms, the QL currently represents the ultimate in technical achievement in the (under) £400 range ..."

The BBC instantly springs to mind as a £400 computer; here is a comparison in hardware terms.

QL

Monitor and TV ports.
Up to 80K ROM.
Up to 640K RAM.
Up to 64 on network.
2xRS — 232 — 19200/9600 max.
2 x joystick port.

BBC

Monitor and TV ports.
Up to 256K Paged ROM.
Up to 16 megabyte RAM through Tube and 16032 second processor.
Up to 256 on network.
1 x LRS — 232 — 19200/19200.
Improved RS — 232
4 channel, 8 bit A/D converter.
1 Mhz Bus.
User port.
Tube interface.

The BBC is 1.5 times as fast as the QL. Now, which computer is the ultimate in technical achievement?

The QL may not have been on the market long, but the situation between the BBC and the QL currently is:

	QL	BBC
IEEE	Under development	two available
Modem	Under development	many available
Teletext	?	yes
Mhz bus	?	built in
User port	?	built in
Monitors	Special one needed	Any
Serial int.	2 x RS232	1 x RS432
Fastest TX	19200	19200
Fastest RX	9600	19200
Network	Does not work	Econet, E-net etc.
Max net users	64	256
IBM upgrade	no	yes
Teletext display	no	yes
Sound	?	4 channel, 8 octave
Max cols	8	8/16
Max res	512x256	640x256
Function keys	5	10 (40 with shifts)
Text	85x25	80x32
Fastest data transfer k/sec.	0.08	up to 62.5
Speech	no	yes
Languages	Super Basic	Basic, Forth, Lisp, Pascal BCPL.

The QL at this stage is totally outclassed, in every field. Given time, the QL will improve but for my money I'll take the BBC every time...

Stephen Corcoran,
Aylesbury,
Buckinghamshire.

is an error in the hex code; the line headed 24656 should read:
810B1027008620B6.

As I no longer own a Dragon I am unable to list this, but it should now be correct.

Ross Gardler,
Havel Grove,
Stockport.

NO COMPLAINTS

With reference to Mr Doug Bullen's letter in the September issue, I feel honour-bound to take exception to the statement that a computer's bugs are in direct proportion to the complexity and versatility of the machine.

I have owned a Memotech MTX-512 since November last year, and, to date, I have found no bugs. Perhaps the use of a Z-80A CPU, in Mr Bullen's opinion, places it outside the scope of a "versatile machine", or perhaps the inclusion of three languages resident in ROM, plus a front panel display and Logo-style graphics commands make it a little limited in his opinion?

D.J.W. England,
Wroughton,
Wiltshire.

Lines 10-170 of September's ZX-81 program were left out. They are supplied below:

```
5 REM BARREL-BARRAGE
6 REM MISSING LINES
10-170
10 CLEAR
15 DIM D$ (793)
25 PRINT AT 6,24;
30 POKE 16418,0
35 FOR A=1 TO 14
40 PRINT " ";
45 NEXT A
50 PRINT "
"; AT 5, 18; " "; AT 6, 12; "
55 PRINT AT 22,31; " "; AT
21, 31; " "
60 PRINT AT 0, 0; "SCORE:
000000"; "HI: 000000"; "
LIVES: 5
65 PRINT AT 18,22; "...."; AT
0, 0;
70 PRINT TAB 13; " "
80 PRINT TAB 13; " "
90 PRINT TAB 13; " "
100 PRINT TAB 13; " "
110 PRINT TAB 13; " "
120 PRINT TAB 13; " "
130 PRINT AT 1,19; " "
140 FOR A=2 TO 4
150 PRINT AT A,19; "H H H"
160 NEXT A
165 RAND USR 17130
170 STOP
```

Many people may have a problem when typing in the game, "Track Chase" which was published in the October issue of *Your Computer*.

In listing 1, lines 120 and 130 contain some funny characters which are difficult to obtain. The lines should be entered as follows:

■ Type the line in as shown with spaces instead of the inverted " " characters.

■ Cursor back over the spaces, press CTRL and RVS On and replace the spaces with shifted "M" characters.

■ Press Return.
The Rem statements in listing 1 must be typed in.

TILTING TRAINS THAT only work on straight tracks, Bristol Brabazons and failed perpetual-motion machines don't get much of a look in when it comes to histories of great inventions of our time.

Accounts of technological advancements are always about people getting it right first time or stumbling across something important like the theory of displacement in the bath.

It would be a shame if chroniclers of home computing paint a picture of soaring achievement when we all know the real landscape is covered with low points littered with dodos.

For example, whatever happened to the Haven colour board for the ZX-81 which offered Spectrum colour at a price you could afford? Our review in the July 1982 issue found that this product didn't quite live up to expectations: "The screen went fuzzy orange and no cursor could be seen... Waves of a darker colour advanced down the screen and rippled the whole display."

Haven pluckily pronounced this problem "unusual", and suggested that the colour board performed differently with different TVs: "This was confirmed by testing the board supplied with a Bush, a Sony and a Ferguson. The poor-quality picture mentioned was obtained with the Bush, but no colour picture could be obtained at all with either the Ferguson or the Sony."

However, an alternative was being advertised in the same issue: "Now you can add a coloured background to your displays!" What silicon trickery lay behind this breakthrough? Yes, you've guessed it: "High quality PVC in either blue or green. Only £2.95+pp per pack of two."

If these hardware pioneers stand head and shoulders below the rest, then Warp Factor Eight's popular add-on reached new heights: "Lift off into

'83 with Hi-Stak. It makes your computing easier, faster, more reliable, less exhausting and simply more enjoyable." In its day the Hi-Stak was the latest in lumps of plastic. For £3.95 a pair the Hi-Stak stick-on legs fulfilled the claims made for them in the adverts by propping up the Spectrum to a more ergonomic angle.

But software disasters have also played a major role in the alternative history of computing. Leaving aside Space Invader — where you endlessly destroy a solitary alien struggling down the screen — let us turn to another chapter.

Bridge Software's Vic Invaders, renamed "The massacre of the saucepans" in our June 1982 edition, was too easy: "The invaders do not advance, there are no mystery ships, the base at the bottom zips along at rocket speed, and the invaders do not speed up when only a few remain."

Alternatively, there was Petals Around The Rose: "a number guessing game with a difference — it does not tell you the rules" or Neme's pontoon program which did not recognise pontoon.

Computer manufacturers should also take their share of the credit. Remember Sanyo's enigmatic PHC range which appeared in October 1982 and disappeared again in November? Or the Grandstand Tutor, the Textet TX-8000 and the Comx 35, built around the RCA 1802 chip that was more at home in early guided missiles?

If you would like to nominate a product which you feel deserves a place in the home computing house of horrors, write in to "Off-white Heat", Your Computer, at the address below. We'll publish the worst of your entries, libel-lawyers permitting, and find suitably awful prizes for the winners.

How to write for Your Computer

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

Why not give it a try? You have nothing to lose but your postage.

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Icon worshippers thrill to Island music

NEW PROGRAMS rarely cause excitement in the *Your Computer* office but The Music System from Island Logic had BBC enthusiasts shrieking with delight as they danced around the filing cabinets. Not only is The Music System the most advanced music program on the market it also uses Macintosh-style icon graphics to control the various elements.

Part 1 of System comprises a Printer and an Editor which allows you to word process with music — writing notes on staves and modifying existing tunes. The Editor had four voices including on disc percussion, 15 sound envelopes, choice of notation and automatic barline creation.

The Printer generates four-part music manuscript from your files so long as you have a Centronics printer. Part 2 has a Synthesiser which creates 30 tones which can be simultaneously edited on screen and a Keyboard which in addition to allowing you to use your QWERTY as a piano keyboard also allows you to record four tracks. There is also a sound and song library.

Each part can be bought separately on cassette for £13 or together on disc with a separate library disc for £25. The disc system also has a Linker module which allows you to combine single files into one piece.

This is Island's first computer program despite the fact that the company has had a dozen programmers slaving away over hot micros for the last year. A Commodore 64 version of The Music System is on its way amongst other products.

Putting a real plastic piano keyboard on the 64 gives Commodore's Music Maker an immediate appeal. For £30 you get the synthetic ivories together with a music book and a tape or disc of software which allows you to simulate eight voices with instruments such as guitar, piano and synthesiser. Set rhythms for bass or percussion backing are also available.



Yashica YC 64 MSX clone

CALLING ITS first home computer the YC-64 is a certain way for Kyocera to get its new MSX micro into the pages of *Your Computer*. Kyocera which makes the Tandy lap held

computer amongst others is selling the YC-64 under the Yashica name which is better known in this country for cameras. The computer has the standard MSX bag of chips together with 16K video Ram and 64K system Ram.



YOUR COMPUTER TOP 20

Game	Company	Machine
<input type="checkbox"/> Arabian Nights	Interceptor	BBC
<input type="checkbox"/> Beach Head	US Gold	CBM 64
<input type="checkbox"/> Decathlon	Activision	CBM 64
<input type="checkbox"/> Decathlon Ocean		CBM 64
<input type="checkbox"/> Encounter	Novagen	Atari
<input type="checkbox"/> Football Manager	Addictive Games	BBC
<input type="checkbox"/> Frak	Aardvark	BBC
<input type="checkbox"/> Full Throttle	Micromega	Spectrum
<input type="checkbox"/> Jack and the Beanstalk	Thor	Spectrum
<input type="checkbox"/> Jet Set Willy	Software Projects	Spectrum
<input type="checkbox"/> Lords of Midnight	Beyond	Spectrum
<input type="checkbox"/> Match Point	Sinclair	Spectrum
<input type="checkbox"/> Micro Olympic	Micro User	BBC
<input type="checkbox"/> Monty Mole	Gremlin	CBM 64
<input type="checkbox"/> Psycho Shopper	Mastertronic	Vic-20
<input type="checkbox"/> Sabre Wulf	Ultimate	Spectrum
<input type="checkbox"/> Scrabble	Little Genius	CBM 64
<input type="checkbox"/> Tornado Low Level	Vortex	Spectrum
<input type="checkbox"/> Valhalla 64	Legend	CBM 64
<input type="checkbox"/> Zaxxon	Adventure International	Spectrum

At the touch of a button

WHILE SPECULATION continued on whether Sinclair would upgrade the Spectrum or go for a cut down QL — "there are as many opinions on what should follow the Spectrum as there are people at Sinclair" says Nigel Searle — there seemed little chance that he would remember to include an on/off switch. There is not even one on the QL. So in the short term TEC of 24 Victoria Road, Bromsgrove, Worcestershire, are selling £5 plug-in on/off switches which clip on the top of your Spectrum. TEC claims that this positioning does not interfere with interfaces — but the Alphacom 32 printer, for instance, will not fit with the switch, and the really bad news is that not only does the new Spectrum Plus have no on/off switch but TEC switch will not fit either.

Electronic books from Tandy will run on BBC

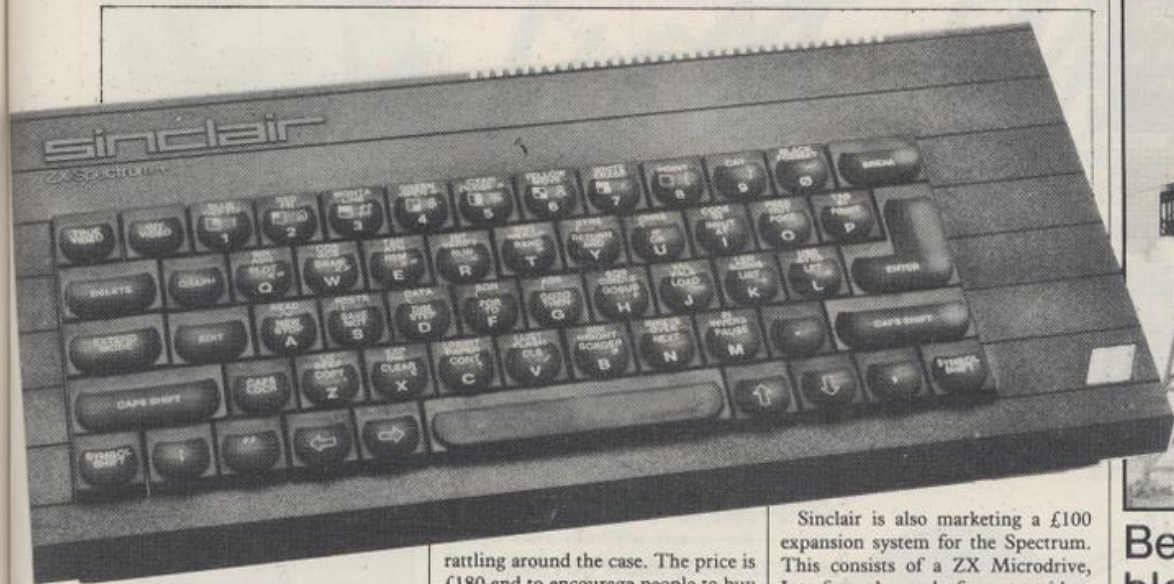
ONE OF THE strangest stalls at the Motor Show in Birmingham's National Exhibition Centre is Tandy and West Midlands County Council's joint effort. In case you need documentary evidence you can win an "I'm no Wally" certificate in a road safety competition.

Somehow this is supposed to

publicise Tandy's new electronic books which plug into the Tandy Colour Computer, or with an adaptor to a BBC Micro. The books have touch sensitive pages. A £20 music book called Professor Pressnote and a guide to the planets, Solar Explorer, which costs £17 are the first two releases.



New Sinclair looks like a sawn-off QL, performs like a Spectrum



SINCLAIR'S NEW Spectrum Plus or + as he prefers to call it is nothing more than a Spectrum in a new QL style box with realish keyboard and a reset button, plus six pieces of software Scrabble, Make a Chip, Chequered Flag, Chess, Vu-3D and the Tasword 2 word processor.

The keyboard is described as "professional" but despite company claims that Sinclair was "very keen to have a robust keyboard" ours had been amateurishly put together — several keys had fallen off and were

rattling around the case. The price is £180 and to encourage people to buy the Plus rather than the standard 48K Spectrum the free software deal with the standard Spectrum will be discontinued in the next few weeks. The good news is that thousands of Pluses have already been built so this time there should be no "coming soon — 28 days and counting" saga.

16K Spectrum production is increasingly aimed at overseas markets but Sinclair claims that there are no plans to stop production of the standard machine. Sinclair will be making 200,000 computers a month this winter.

Million pound bait one that got away

"EVERYONE'S JUMPING on the one million pound bandwagon" is Commodore's excuse for launching Spirit of the Stone — a treasure hunt

for the Commodore 64 with a potential seven figure prize for the winner.

The £15 program and book set contains a series of arcade games which gives clues to the whereabouts of 40 talismen hidden on the Isle of Wight, each containing a single diamond. Commodore is putting 50p into the royalty fund for every cassette sold — the fund will be closed when all the talismen have been discovered or when the fund reaches £1,000,000 or failing that in 1993. Program crackers may well have an advantage over those who stick by the rules. Short of the Isle of Wight slipping silently below the waves of the Solent during an earthquake the talismen will be found well before 1993.

The million pound target is equally unlikely to be met — Commodore would have to sell more copies of Spirit of the Stones than all the 10 best selling computer games so far put together.

Not the right Habitat

IMAGINE BUYING a computer sprayed a tasteful primary colour or perhaps covered in raffia. Habitat carried out a feasibility study but decided that computer fanatics were boring people who were not prepared to pay more for trendy looking micros.

Expansion is kids' stuff

REMEMBER My Talking Computer — now there is a new £18 120K expansion module for it which contains music, sentence making, digital time, alphabet colour, shape and size amongst its programs.

Sinclair is also marketing a £100 expansion system for the Spectrum. This consists of a ZX Microdrive, Interface 1, and four cartridges including an Introduction to Microdrive use, two "business" programs, Masterfile and Tasword Two, a blank cartridge and two of the best fun programs Ant Attack and Games Designer.

One final advantage of the Plus is that is that it is the first Sinclair that can stand on its own feet. The retractable legs give you a proper keyboard angle. The original Spectrum had none and the QL's continually fall out.

Christmas is cancelled

CHRISTMAS IS CANCELLED this year and that's official. Well the *Your Computer Christmas Fair* is anyhow. The Fair which was scheduled for November 30 through December 2

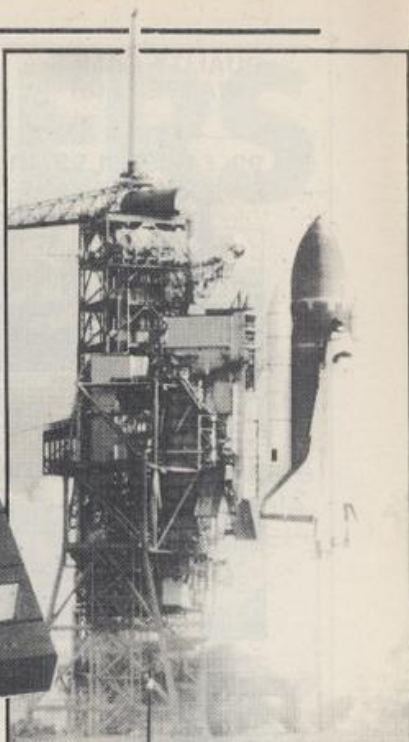
Be there at blast off

SPACE SHUTTLE computer malfunctions permitting three kids will win a chance to watch a space shot from Cape Canaveral next year.

Monitor maker Microvitec is sponsoring a Cub British Schools National Computer Challenge open to teams of three contestants who must be 16 years old or less. The winners will have an all expenses paid five day trip to Florida including the shuttle launch.

at Olympia has been cancelled because most of the games and computers which used to be mail order are now available through high street shops.

From the outside it looks like a perfectly normal £40,000 Aston Martin Tickford Trekker van but another way of looking at it would show you that it is the most expensive Apple Macintosh on four wheels. At the centre of the van sits a Mac with printer surrounded by the sort of accessories every computer user has come to expect — radio phones, drinks cabinet, raised roof viewing platform, sink, stereo, drinks cabinet and swivelling leather chairs.



**SPECTRUM, ATARI
CBM 64, VIC 20,
DRAGON 32
SEND NOW!**

ANNOUNCE THEIR OWN POCKET MONEY RANGE. MORE FUN AT LESS PRICE



CASEY JONES — Here is your chance to fly a piston engine, not only does this mean fly but also it has an unlimited supply of navigation needles.

Your mission: To go further than any mail has gone before, 10 weeks.

CS 5



MISSION ATTACK — Try your hand at flying a Hawker jet from an Air-Craft carrier at sea, taking on crack pilots and missiles. Then on to your mission over land. **C13**

BLABY COMPUTER GAMES, CROSSWAYS HOUSE, DEPT YC, LUTTERWORTH ROAD,
BLABY LEICESTER. TELEPHONE 0533 773641 TELEX 342629 JRHHG



I could do that...

For this month's competition we would like you to write a Basic Fill routine. It should accept two inputs — giving the x and y co-ordinates of a point within an enclosed shape — and then proceed to fill in all the pixels within that shape. To make your task easier the routine only needs to handle convex figures — that is, figures whose outlines do not "turn in".

Perhaps the simplest approach to the problem is to move from top to bottom filling in horizontally up to the left and right outline. Another possibility is the "grass-fire" method where you spread out in all directions from the centre, keeping a record of filled pixels in an array.

Whatever approach you adopt you will need some way of detecting what is on screen. Spectrum and BBC owners can use the Point command while Commodore owners will have to Peek the screen memory. On the ZX-81 you can use PEEK 16396 + PEEK 256*16397 to find the start of the display file.

In awarding the £15 prize we will be looking for programs that do the job quickly and in as few lines as possible. Obviously if your machine already has a Fill command we expect you to ignore it.

September's competition asked you to write a program which would conduct a conversation between you and your machine. Some highly amusing conversation pieces were sent in. Typically the dialogue took an abusive turn with the computer heaping scorn on human intelligence. Most of these were, unfortunately, too long to print. Although the programs kept within the 20-line limit their Data statements were massively long.

Instead we plumped for a mini-version of Animals by Andrew Babbington, 31 Glen Iris Avenue, Canterbury.

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.

Robots

EVERYBODY KNOWS what a robot is. It is a machine with arms and legs and a tinny voice. If it is really good, it might make it into the android class. That, anyway, is the picture most people have from films and books. The reality is slightly different, though there are signs that it will become just as exciting over the next few years.

Surprisingly, the idea of a robot has been around for more than 60 years. The word was first used by the Czech playwright Capek in his play *Rossum's Universal Robots*. Robot comes from a Czech word meaning "work". The next landmark was in the 1940s, when the American writer Isaac Asimov formulated his three Laws of Robotics:

- A robot may not injure a human being, or through inaction allow a human being to come to harm.
- A robot must obey the orders given to it by human beings, except where such orders conflict with the First Law.
- A robot must protect its own existence as long as such protection does not conflict with the First and Second Laws.

Robots became a reality in the 1950s. They usually consisted of hydraulically controlled arms that performed a fairly simple task again and again, without variation.

In many ways, these first robots were simply glorified pieces of machinery that you might find on any

I'M NICKING YOU FOR BREAKING THE FIRST LAW OF ROBOTICS.



Andrew Babbington's winning mini-version of Animals.

```

100 DIM A$(512)
110 LET A$(1)="fox"
120 LET N=1
130 PRINT "Think of an animal..."
140 IF A$(2*N)<>" " THEN GOTO 250
150 PRINT "Is it a ";A$(N)
160 INPUT X$
170 IF X$="yes" THEN PRINT "One up to me!!"
180 IF X$="yes" THEN GOTO 120
190 LET A$(2*N)=A$(N)
200 INPUT " Then what is it";A$(2*N+1)
210 INPUT " Give me a question that would be true f
or a "
220 PRINT " ";A$(2*N+1);" but is false for a ";A$(2
*N);" ..."
230 INPUT A$(N)
240 GOTO 120
250 PRINT " ";A$(N);
260 INPUT X$
270 LET N=2*N + ABS(X$="yes")
280 IF N<256 THEN GOTO 140
290 PRINT " Too much, I quit!"
    
```

assembly line. The big breakthrough came when the newly-developed computers were hooked up to robots. This gave them a certain life of their own and brought them one step closer to the all-singing, all-dancing metalman.

A true robot has three basic properties. Apart from the mechanical

(continued on page 47)

More exciting games for your ZX

Athlete

So you didn't make the Olympics? No wonder, there's a selection of track and field events where you can show the selectors how you compare against some tough opposition. Sports (100m & 400m), Hammer Throw, Hurdles (110m & 400m).

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Make Music

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Pools Predictions

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Racing Predictions

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Card Games

CRIBRAGE is the most fascinating of this series, produced in response to Crisbridge's address requests. Also in the same category are PAIRS, RINOC and PATIENCE.

Loony Bin

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☐ Card Games ☐ Loony Bin

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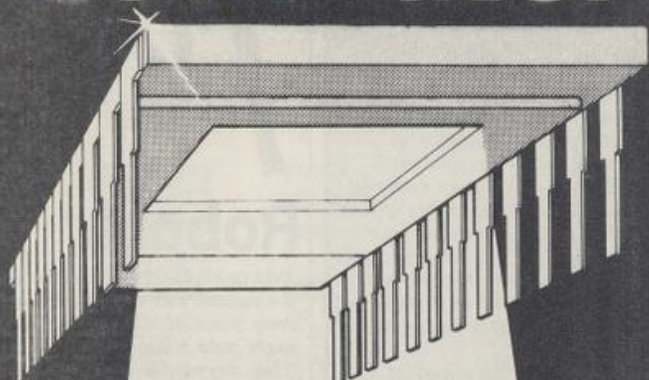
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Popular Computing Weekly

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Which Micro & Software Review

“The best machine code tutor and no serious Spectrum programmer should learn machine code without it.”

Crash

“By far the best attempt comes from New Generation Software who has recently issued its Complete Machine Code Tutor for the BBC and the Spectrum.”

Popular Computing Weekly

“New Generation have got a very nice product here. It's well thought out, easy to use, aesthetically pleasing, and (as far as I could tell) bug-free and crash-proof.”

“Overall then, an excellent idea, well executed.”

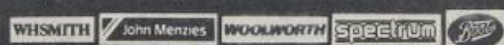
Computing Today

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First Edition of New Generation Software is available from other computer shops and is larger in volume.



(continued from page 45)

side of things you need some sort of sensory device to tell you what that mechanism is doing, for example how far it has moved its arm. Then you need a computer to analyse that information, decide what to do on the basis of it, and instruct the mechanical parts accordingly.

The same basic principles apply to home robots. To qualify for membership of the robot club, they need some kind of mechanical action controlled by a computer that can react to the outside world. Mechanical action includes simply moving.

Perhaps the simplest examples are some toys from Prism. These micro-robots respond to sound or infra-red light by hopping or wheeling along. In this case the mechanical element is slight, as well as being pretty useless, so the computer power is also small. But they do fulfil all the requirements.

More sophisticated home robots include models like Hero, Topo and RB-5X. They are also rather more expensive, costing up to £3,000 – so robotics has a long way to go before you can buy the equivalent of Sinclair's £100 Spectrum micro.

Topo is actually more of a robot peripheral than a true robot. It has no independent computational power on board, but is controlled via infra-red signals from a standard Apple II

computer. Topo has a younger brother called Fred who is even dumber – aren't they all? He can just about manage to hold a pen and draw with it, which is hardly in the R2-D2 class.

Hero and RB-5X are very similar to each other in design. They both have an on-board processor, a robot arm, and various sensors. Hero has a sound sensor and a light sensor. RB-5X also has bumper devices around its base to detect collisions. Both machines can be programmed to respond to feedback from the outside world.

For example, you could get the robot to move around a room, manoeuvring its way as it bumps into objects. It could then store the layout of the room and the objects, and so avoid them in the future. Or you could program it to move towards the brightest light in the vicinity, or even to the nearest human being, using its infra-red sensors to detect heat given off. Eventually robots could be used in the home as untrusting watch dogs, responding to the slightest noise, light, or heat from human bodies.

The big breakthrough in home robots will come when they can respond to spoken commands. After all, it's not much fun having a robot do everything for you if you first have to program it in machine code. The first few steps have been taken in this

BEGINNERS

first bytes

direction. For example Hero has a voice output facility which allows you to create words and sentences.

The home robot has some way to go before it is an everyday sight, but some people think that the situation now is rather like that of micros about 10 years ago. The models that are around are crude and not very powerful, but with great promise. So far it has been hobbyists who have bought them, quite content to get down to the nuts, bolts and chips level. But the next generation of machines could be as cheap and as useful as micros are today.

If you want to get a taste of this world, but can't quite afford the £1,600 for Hero in kit form, there is an alternative. For some years now, the micromouse competition has been

flourishing in this country and abroad. A micromouse is a small powered device with sensors and an on-board computer, that tries to find its way to the centre of a maze. It is, in fact, a fully fledged robot.

To build your own, you could do worse than follow the example of Alan Dibley, the U.K.'s leading micromouser. He uses plywood, balsa and card for the chassis, infra-red detectors and old Sinclair computers – literally sawn-off to fit on the wheeled assembly.

A micromouse competition is held each year at the Earl's Court Computer Fair in June. Alan usually wins. If you feel like challenging him, you can obtain more details of the micromouse competition by writing to John Billingsley, Department of Electrical and Electronic Engineering, Portsmouth Polytechnic, Anglesea Road, Portsmouth PO1 3DJ. Entry is free.

Speech synthesis/recognition

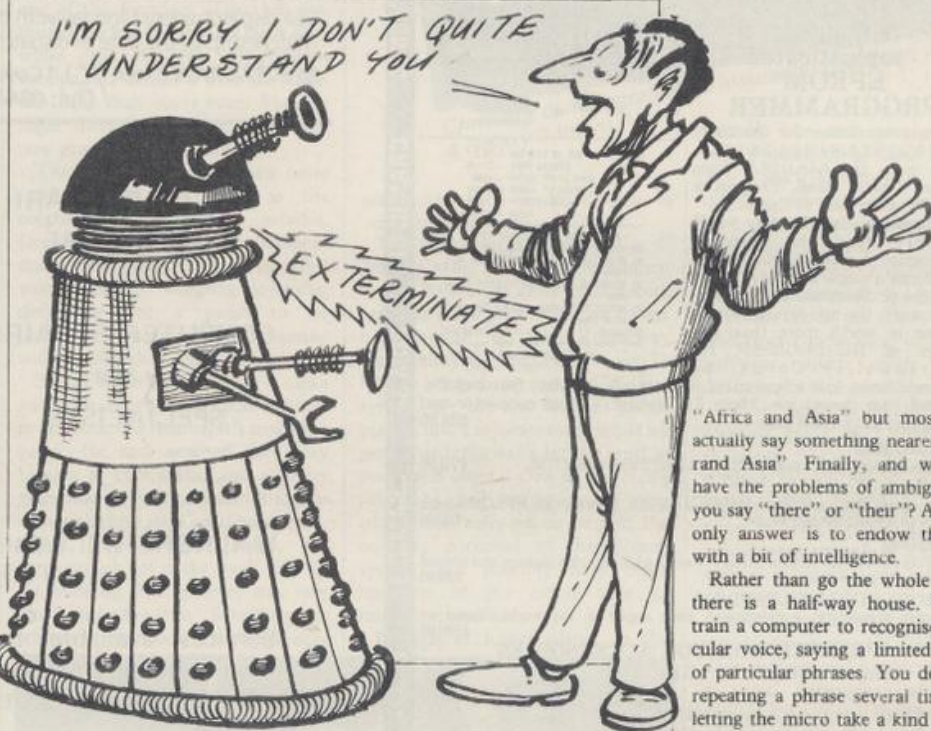
MOST HOME COMPUTERS will make a noise at you if you try hard enough. Some, like the BBC Micro, have a full three channels of music to serenade you with. Making your micro talk is a little harder, but by no means impossible.

As with most things to do with computers, the secret is to spoonfeed it. Words are broken down into their basic components. The micro then produces each of these, one after another. The fundamental elements of spoken words are called phonemes – hence the saying "don't phoneme us, we'll phoneme you".

For example the word "speech" has five: one each for "s", "p", "ee", "t" and "ch". It is relatively straightforward to program a micro to accept words broken up into these elements, and then to produce something like the right sound. The effect is the "I am a Dalek" sort of voice. Speech synthesis units are available for many micros including the Spectrum and BBC.

To get a micro to produce spoken output directly from the word itself is much harder. At the moment only relatively large systems can even begin to try to cope with the problems.

These are easy to describe and difficult to solve. Basically the spelling system of the English language is a mess. Just consider the group of letters "ough". How is a computer to cope with pronunciations as different



as "though", "rough", "bough", "thorough" and "through" – not to mention "hiccough", pronounced "hiccup".

The answer is that the computer has to do it the way we do it, by the context of the surrounding words. This leads us into the realms of Artificial Intelligence, and an area where research is only just beginning to produce results. Clearly, though, the benefits could be enormous. For example it would be easy to adapt any program to work with the blind,

giving verbal messages or warnings. It would be possible to scan a printed document or book and have the micro "read" it out, doing away with the need for costly Braille books.

If a computer could give spoken messages, it would obviously be convenient if it could also obey spoken commands. The difficulties here are even greater than with speech synthesis. First there are technical problems of picking out the speech from the background noises. Slurring is a problem too. You may think you say

"Africa and Asia" but most people actually say something nearer "Africa rand Asia". Finally, and worst, we have the problems of ambiguity: did you say "there" or "their"? Again, the only answer is to endow the micro with a bit of intelligence.

Rather than go the whole AI hog, there is a half-way house. You can train a computer to recognise a particular voice, saying a limited number of particular phrases. You do this by repeating a phrase several times, and letting the micro take a kind of audio average of the sound. This is stored together with the appropriate command it represents. When a spoken phrase matches this average closely enough, the micro will respond by carrying out that command.

Apart from the difficulties of distinguishing similar sounds, there is also the slight problem that this system only responds to the basic words it knows. So "delete" and "don't delete" will have the same effect on your precious files. Which is why you really need to give your micro that bit of intelligence.

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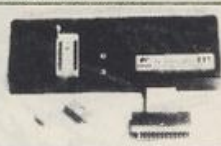
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STATUS NO. OF SYSTEM — HEX
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RAM START ADDR — 4000
EPROM ST. ADDR — 8000
JOB LENGTH — 4000
TASK — CHECK

WHICH TASK DO YOU WISH TO DO
W) CHECK THAT EPROM IS CLEAN
X) READ THE CONTENTS OF EPROM INTO RAM
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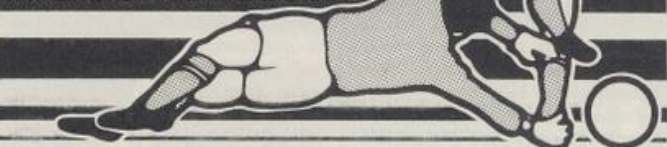
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If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

Local news

Leytonstone

The East London Amateur computer club has catholic tastes; it caters for all micros, from Nascoms to Apples. It meets on the second and fourth Tuesday of each month. The venue is the main hall of the Harrow Green Library, Leytonstone. Interested parties should ring Fred Linger on 01-554 3288.

Orpington

State-of-the-art Orpington Computer Club can be contacted on Mailbox No. 068931263, or further details can be accessed on Clubspot 800 on frame 800841142. However, if your technology is still firmly rooted in the past you could always try phoning Tony Self on 0689 31263. They meet at Christchurch Hall in Charterhouse Road, Orpington every Friday. The club caters for a wide range of machines and interests.

Congleton

Congleton and District Computer Club meets on alternate Mondays at "Heather Brae", Sandbach Road, Congleton. Hardware and software discounts are available to members and a wide range of projects are under way using BBCs, Spectrums and Commodores. Contact Tony Harratt on Cheshire 6758.

Chinor

A new user group has been set up in the Chinor and Thame area of Oxfordshire. Users of all ages and machines are welcome. The group organises lectures, competitions and games evenings. It also hopes to start a library. It meets every other Thursday at Mill Lane School Hall, Chinor. Further details from Bryan McAlley on 0844 52426.

COMPUTER

club

Lee Paddon finds himself depressed in an out-of-season Southend-on-Sea until he discovers the secret of BBC's Elite at the local computer club. Perhaps he could give Simon Beesley some tips — see page 60.

SOUTHEND-ON-SEA can be a depressing place out of season. The still-lit illuminations glare mournfully down on any remaining tourists who might have got the month wrong and still be found wandering along the seafront.

Just a few yards along the seafront from the pier stands the Esplanade Hotel, looking suspiciously like a large pub. It is also the home of Southend Computer Club which can be found by entering "Go North" after you reach the bar.

Robin Knight is the chairman and one of the founders. The club was formed back in the low-res black-and-white days of 1979 when Acorn Atom's and TRS80's were the staple diet. The club meets every Monday night from 7.30 to 10.30 and has now grown to 86 members.

There was nearly as much noise coming from the club as the neighbouring amusement arcades. Decathlon is popular at the moment and several young Olympic hopefuls were furiously waggling joysticks; definitely not a game to be undertaken without rigorous training and a thorough medical beforehand.

Simon Rush was showing a clean pair of heels or a deadly pair of lasers to all comers in Acornsoft's new Elite game. He had attained the dizzy heights of competent, and a pretty gruesome array of accessories for his ship with three days continuous play. "Well, two-and-a-half really, my Saturday job got in the way". His tip for budding Elite players was very much down to earth: "Save the game whenever you dock"; even the aces



Chris Pitt demonstrates his insurance quotation system based on a Galaxy 3 micro.

sometimes need a quick spot of reincarnation.

Robin Knight explained "a lot of games playing goes on at the moment but we hope some more serious work can take place once we move to our new venue at the Rocheway Community Centre. They've got 13 BBCs hooked up to an Econet system. We can also lock the games players into a separate room while we get on with the more serious stuff in peace and quiet." One of the club's first jobs will be to write some educational software to exploit the teaching potential of the Econet system and possibly help other members of the centre take an interest in micros.

Enough of future plans. At the

moment the club struggles along with a collection of black and white T.V.'s and a large toolbox. However, this lack of equipment was made up for by the members who seemed to favour disc drives.

This apparent affluence might have something to do with Steve Sullivan, one of the club's founders, who runs a local shop called Estree Software which offers generous discounts to club members.

There was a notable lack of copying going on. Robin Knight explained "At the last meeting we decided to outlaw it. We simply switch off the computer of anyone seen doing it. This seems punishment enough as it takes a fair amount of patience and hard work to copy a program."

Away from the games players, Stig was demonstrating his dexterity with a screwdriver and a soldering iron as a tape recorder underwent emergency surgery. By the end of the evening the patient was alive and well again and demonstrating a program analysing Stig's taste in contemporary music in terms of a line wandering around a telly screen driven through his Spectrum's ear socket. "I started mending really old tape recorders but my Mum decided I should get up to date and so she bought me a copy of *Your Computer* — the first time." Needless to say Stig has never looked back.

For more information about the club, contact Robin Knight on Southend-on-Sea 335747.



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Star★ chart

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★ ★
A flawed attempt to recreate the famous Battle of Midway. All you have to do is sink the four Jap carriers and they all troop off the map, victory to you! Well, that's the idea. So how come after sinking four carriers you then get hit by their aircraft and lose the game? Some nice touches of presentation, easy to order units Eastern Front fashion, but fatally flawed as a simulation.

H.E.R.O.

Activision
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Spectrum
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★ ★ ★ ★
Assuming anyone ever goes down a coal mine again, you may be called upon to rescue them if they get trapped. Our hero has to drop down mine shafts, blowing up a wall here, zapping a nasty spider there, and so on till he saves his man. Sounds simple enough, and it is to start off with. However, each successive shaft is harder. In some the walls are deadly, in others you can't even see the walls!

Ancipital

Llamasoft
Arcade Adventure
CBM-64
£7.50

★ ★
A silly scenario. A crack squad of Ancipitals have to go around breaking down walls whilst various other things try to stop them. There are 81 rooms in all. Fast, with good graphics and sound. Not terribly original, but enlivened by the usual Jeff Minter humour. The way you knock down walls changes with every room, movement and firing is a bit tricky.

SOFTWARE

Shortcut

Interdictor Pilot

Supersoft
Commodore 64
Simulator
£17.95

★ ★ ★ ★
SIMULATOR AFFICIONADOES need no longer feel earthbound. Interdictor Pilot claims to give you all the thrills and spills of zapping aliens plus have all the usual features you'd expect from a simulator.

Be warned, however. This is not the sort of game you get to grips with in an afternoon; the 50-page pilot's manual gives that away.

In order to keep down the body count, you are thoughtfully provided with a simulator with which to practice zipping around the cosmos. The simulator even allows you to slow things down and freeze the enemy while you walk up to him and shoot him. This thoroughly unsporting option didn't seem to work on the review copy.

Still, being unsporting and underhand is something you learn all about in this game. You have a device called a transponder which identifies you, and you to your enemy. However, interdictors have the ability to change their call sign. So the idea is to slowly move up to the unsuspecting enemy, then give

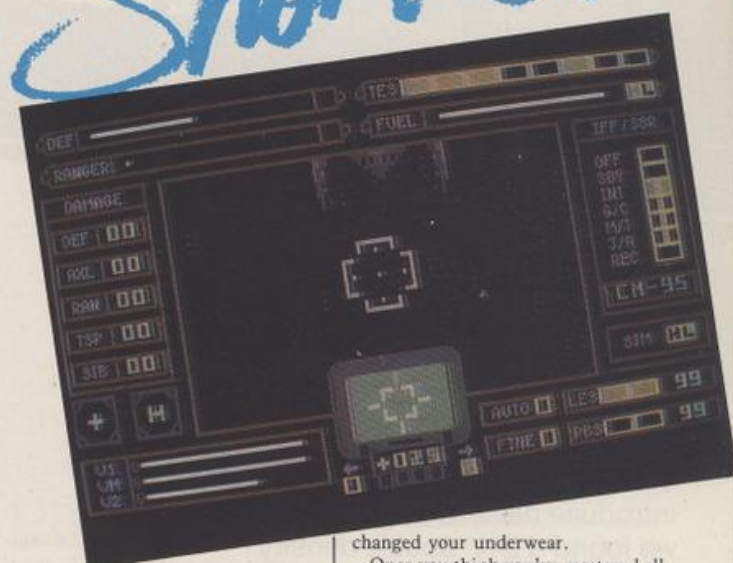
him a quick blast up the rear shield. Works every time, unless that is he does it to you!

Like any simulator worth its salt, there are plenty of controls to play with and instruments to watch. You have 20 controls to play with and a dazzling array of instruments which tell you everything from the I.D. of the nearest ship to the day you last

changed your underwear.

Once you think you've mastered all this in the simulator, you get on with the real thing, life and death stuff.

Having zapped all the bad guys, now you get the hard part. Between you and getting some shuteye at the local spacepost are the automatic space station defences — and boy, are these lads jumpy. Your course, speed and transponder must all be correct or it's curtains.



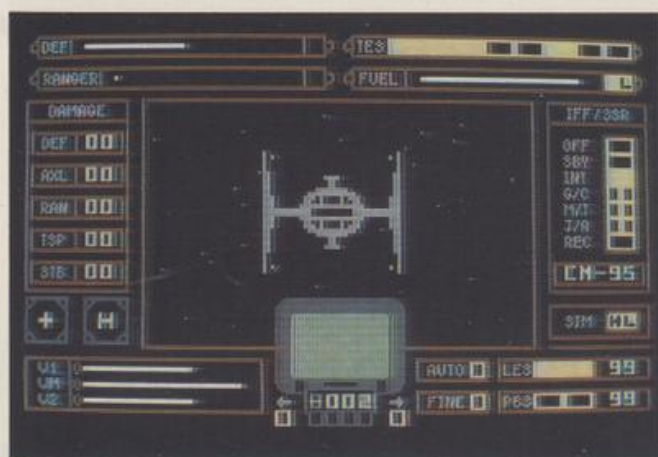
Deus ex Machina

Automata
Spectrum 48K
Unique
£15.00

★ ★ ★ ★
HOW DO YOU start to review this game? With most, you say its similar to A, or an enhancement of B; but this game is just unlike anything you've seen before, there is no reference point.

The plot goes along these lines. Just before the last mouse on earth died, it climbed into this machine, and had, well, a slight accident. You must, as some kind of life force within the machine, guide this accident through to becoming some sort of life form. Weird, huh? All this is done in synchronisation with a sound track which features such luminaries as John Pertwee, Ian Dury and historian and nuclear disarmament campaigner E.P. Thompson. John Pertwee is the main narrator, and guides you through the game with a sort of space-age version of The Bard's Seven Ages of Man.

During each of these seven ages, some ill will assail your little accident as you guide it through life. How well you cope with your task is reflected in your rating which you



take on with you to the next section of the game. Eventually it is hoped, you will make it to the end in some kind of shape, expressed as a percentage.

The graphics in this game are quite outstanding, considering the limitations of the machine and really add to the overall flavour of the game.

Automata have without doubt produced something which is totally original here which might just give the software industry the creative jolt it so badly needs. Non-sexist, non-racist and non-violent: it should have come with a 'G.L.C.-approved' label. No longer

is it the mind-numbing business of going about slaughtering anything in our path, before it kills us, the mentality induced by many games. This game is trying to show how the computer game can be a stimulus to the imagination. I just hope they don't start interviewing computer programmers like pop stars: "Could you explain the meaning of your latest game to our viewers?" stuff.

It certainly is a very enjoyable game, however, it may not be the sort of addictive game you play hour after hour.

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Star★ chart

Star Commando

Terminal Software
Amstrad CPC-464
Shoot 'em-up
£8.95

★ ★

If MAT is an example of the evolution of a game, I'm afraid I have to say that Terminal Software's Star Commando is an example of relative degeneration. The highlights of this program for me was entering a sector on which no data was available and being attacked by a bunch of giant strawberries. This is yoghurt making on the grand scale. As a conventional shoot-'em-up, it's fine.

The screen shows a head-on view of attacking aliens, together with power, score and danger level displayed in a square at the base of the screen. The long-range scan option is just a disguised way of opting for different screens and strategy does not come into it. Frankly it's hard to see how a galaxy run by giant strawberries could be any worse off than it is already.

Roland in Time

Indescomp
Amstrad CPC-464
Platform game
£8.95

★ ★

Roland In Time from sunny Spanish software house Indescomp is an Amstrad original. Sadly it's not all that original and the graphics are not as interesting as the company's implementation of Roland on the Ropes — or Fred, as he is known on the Spectrum.

A timewarp facility catapults you into different frames of a ladders-and-levels game. The frames have titles like "Roman Fort", "Njorl's Dragonboat", "Seen my Ballista?" and "West of Dome 9". You move around picking up power pills and trying not to bump into nasties.

American Football

Argus Press Software
Spectrum 48K
Sport simulation
£9.99

★ ★ ★

AMERICAN FOOTBALL simulations have been around almost as long as Lunar Landers and Hammurabis. Essentially, this offering from Argus Press is simply a refinement of this hoary old classic with some nice touches and pretty graphics thrown in.

The instruction book contains the basic rules for American football, along with a phrase book to explain the essential slang of the game to the ignorant Limies. Then on to the game proper with an explanation of what to do. The game can be played against the computer or by two humans. The attacker selects a play in secret and then the defender enters his play. By comparing the two, and introducing a random element, the computer works out the results of the play, whilst you watch your best quarterback getting flattened on screen.

The tactics seem to be to try and run for the first few 'downs' to see if you can make the ten yards required, and only resort to a risky pass if things look desperate. Of course, this is exactly the tactic your opponent will be expecting, so you have to spice it up with the odd unexpected pass now and then.

The screen display is very helpful, showing the pitch itself, the score,

Countdown to Meltdown

Creative Sparks
Spectrum 48K
Arcade Adventure
£7.95

★ ★ ★ ★

SOMETHING DISTURBING has happened at the local nuclear power station, there's been a bit of an explosion and most of the human staff have been killed. However, there are still a bunch of aggressive androids hanging about trying to stop your bunch of androids from closing down the plant before you all get blasted to kingdom come.

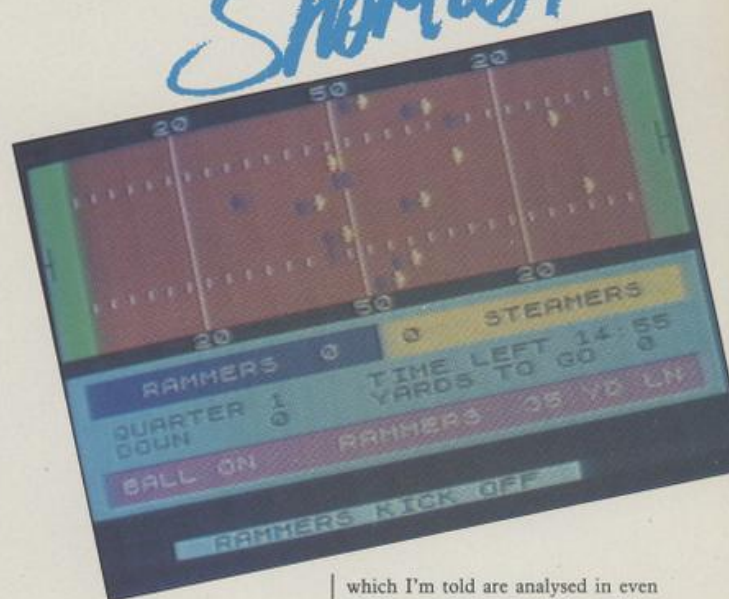
Your job is made no easier by the fact that someone has inadvertently lost the plans so you don't know where the core room is; also the radiation level is rising all the time, which is no fun, even for an android.

A description of the scenario hardly does justice to the game. There are two thousand rooms spread over eight levels. You have eight androids, only one of which you can control at a time. Each of these androids has different abilities: strength, intelligence and so on.

These abilities govern the ease with which he can use the various bits of equipment scattered all over the place. Each android can only carry eight pieces of equipment.

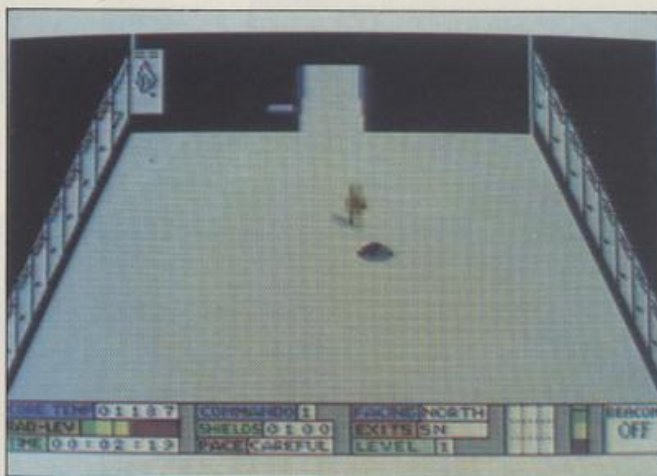
SOFTWARE

Shortlist



time left, yards required and 'downs' to go. There is also a help screen in case you forget the two letter code for the particular play you want, of which there are 15. After the match, you get a whole bunch of statistics,

which I'm told are analysed in even more excruciating detail than cricket averages. This game may well go down well Stateside, and it is probably going to remain the best version of this old classic, but for the true English man, it may soon lose its appeal.



The game avoids the tedious adventure game "suck it and see" approach by telling you how to use each piece of equipment; none of this "try every verb I can think of, something's gotta work" stuff that we normally have to resort to.

The graphics are excellent. Although the huge number of rooms I achieved by having a limited number of room types, this is enhanced by the "Star Trek" type doors and lifts. Some of the doors are broken and have to be fixed. This can be awkward if you've got a dumb android on your hands; the unfriendly attentions of the reactor guardians do not help either.

This is a well-designed game which will hold its appeal even after you've found the reactor. Getting all the stuff you need together is fun.

Sultan's Maze

Gem Software
Amstrad CPC-464
Maze game
£8.95

★ ★

GEM SOFTWARE'S Sultan's Maze gives you the same down the corridor view that you get in Romik's 3D Monster Maze, but has more of a myth attached to it. Apparently the Sultan of Baghdad was robbed on a visit to England. His personal champion pursued the robbers into Hampton Court maze. You have to retrieve all the jewels, steering yourself around by the numeric keypad.

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NEWS

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The crystal ball

Coming soon from Adventure International is Spiderman, written by Scott Adams as a follow up to the successful Incredible Hulk. Like Hulk, the adventure will be text and graphics and be available for a wide range of home computers.

Scott Adams also has two others on the way — Sorcerer of Claymore Castle and Return to Pirate Island. The latter is a sequel to the earlier, and immensely popular, Pirate Adventurer.

Beyond The Infinite is the title of Digital Fantasia's latest. Expect it in your shops soon.

The Final Mission is the third part of Incentive Software's Ket trilogy for the 48K Spectrum. The earlier two were Mountains of Ket and Temple of Vran. While all three are self-contained adventures, solving all of them could win you a video recorder from Incentive in a competition to celebrate the release of the complete saga.

A helping hand

For BBC adventurers wrestling with Acornsoft's superb PHILOSOPHER'S QUEST: Being grabbed by a sad octopus?

KNI FO ELTTOB A TI EVIG
Have you ceased to exist?
"KNIHT" TON YHW OS MA I
EROFEREHT KNIHT I

For stymied players of Adventure International's THE COUNT:

Stake keeps getting stolen when you fall asleep in the brass bed?
TESOLC YTSUD EHT NI TI
KCOL
Coffin locked from the inside?
TES SAH NUS EHT RETFA TI
GNINEPO YRT
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.

The Count

BBC B
£7.95

Adventure International

ALTHOUGH THIS extremely popular adventure has been around for some time, it has only recently been converted for the BBC B micro-computer. Now owners of this micro can share in the pleasures and mind-stretching of one of the classics in the adventure genre.

Written by Scott Adams, who is something of a legend among adventure buffs, The Count sets you down in Dracula's castle, your mission being to seek out the Count and destroy him. You start the adventure in a brass bed where you have just awoken, in the afternoon, from a deep sleep. There's no point in trying to escape from the castle before you've completed the job — the local peasants will lynch you if you attempt to sneak out!

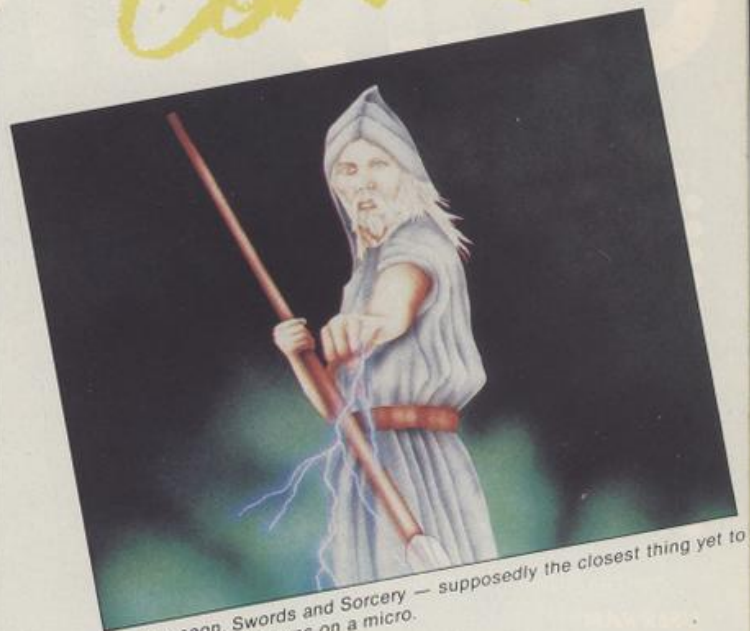
The adventure accepts the traditional verb/noun command input and the location descriptions are fairly short. But what sets the Scott Adams' adventures high above others are the tantalising puzzles and dry wit of the author. Among many bizarre objects and incidents you'll come across in The Count are a laughing bat, a bottle of blood which is delivered to the castle front door, and an unreliable flag pole.

You only have a certain time limit to accomplish the deed; watch out when the sun sets! You'll find a couple of useful hints on this testing adventure over in the Helping Hand column.

Robyn Hode

48K Spectrum
£9.95
Runesoft

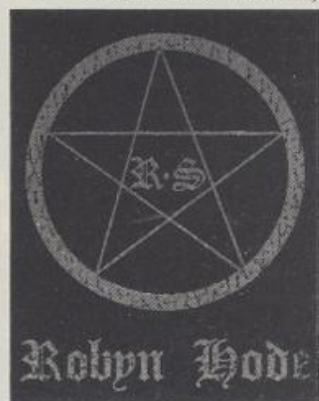
NOTE THE Olde Englishe spelling — the adventure is set in the 13th century, all the place names and spelling are based on original ballads of Robyn and his Merrie Men. In



Coming soon. Swords and Sorcery — supposedly the closest thing yet to Dungeons and Dragons on a micro.

fact, in order to make this adventure as authentic as possible, a great deal of research has been conducted, including reference to such historical documents as the Domesday Book and early maps.

The adventure is massive,



providing over 400 locations for you to heigh-nonney-no around. Because it is so large, the adventure comes in two parts on the single cassette, each part using all 48K of the Spectrum's memory. To get to play part two, you'll need to finish part one first — this will give you a two-part code as your password to the second half.

The vocabulary is similarly impressive — over 120 words in all — yet response is immediate. The entire program being in machine code, generated with the aid of The Quill.

The plot: Maid Marion has been captured by the Sheryffe and held in

Nottingham Castle on a charge of treason. Although it may well be a trap, Robyn decides to rescue her without the aid of his men. Can you, as the outlaw of Scherwoode Forest, outwit the Sheryffe and so save fair Marion?

If you fall, mortally wounded, Lyttle Johnne carries you to Kirklees Priory where, on your deathbed and bow in hand, you fire off a perfect final arrow through the open window before expiring. Beat that for a poetic demise! Odds Bodkins and by my troth, this is indeed a smashing adventure, highly original and beautifully put together.

Mysterious Fairground

48K Spectrum
£6.95
Buffer Micros

A QUILL-GENERATED adventure, this one has an intriguing setting. As you can gather from the title, the adventure takes place inside a strange fun fair where your objective is to recover five hidden items of treasure.

You start inside the fairground, a locked gate dashing any thought of a quick exit. A cursory trip around the nearest locations reveals a garden — I wonder if those bean plants can be watered? — a hall of mirrors, a rifle range and a ghost train.

The ghost train gives you your first major problem. Inside this ride, you experience a sense of the unnatural so shouldn't be surprised to find something unpleasant lurking there.

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THE NEWS THAT Commodore is to cease manufacturing the Vic-20 must have brought a nostalgic tear to the eye of many a home computer owner. It is rather like the roll-out of the last DC-3 aircraft, or the final German-built Volkswagen Beetle. It seems incredible that Commodore has already manufactured a million computers in their recently-opened Corby facility — but the company will be rolling machines off the production line at the rate of one every 2.5 seconds when up to strength. Sadly, the Vic will not be part of this great future — tomorrow belongs to the C-16.

This has not deterred the company's software arm from releasing more new software for what must be one of the world's most ubiquitous computers.

Bomber Mission, for the Vic-20 plus 16K expansion is a compact flight simulator, supposedly putting you in the pilot seat of a World War Two fighter-bomber. First, select your target — it could be anything from an armoured column to a submarine pen or a power station — then pick your weapon system: tall boys, fragmentation bombs, blockbusters.

The computer then puts up the cockpit display. It's a fly-by-instrument job, even with the extra 16K the Vic is not up to giving you much of a view out of the window, until enemy fighters turn up.

These judder about the screen in best Vic-20 rough-scrolling graphic fashion giving you an opportunity to use up your ammunition.

Over the target the bombs are automatically armed. You press the fire button and a message appears telling you the result.

You then have to turn to bearing 0 to fly home, and be sure to lower wheels and flaps above 1,000 feet and get speed in the area of 120-150 knots. I was destroyed quite a few times by pre-emptive strikes on the runway — the trickiest thing in this simulation is getting your plane off the ground before you're blown up. Each mission has a time limit and you must land before it ends. As a last gasp for the Vic-20, this program is quite an achievement — but it will bring a wry smile to the faces of Spectrum fighter jocks.

At the other end of the scale from quality software produced on behalf of the manufacturing company to ensure old hardware stocks keep moving we find the licensing trend. This is where a software house decides to let someone else have the bother of selling a line which has been around for a while.

This is good news for Vic-20 owners in the case of Omega Software — "the last word in software" — because they're doing a Mastertronic and selling everything for 1.99. Omega was the last word in Vic-20 software for Anirog, it would appear, since all the Omega

Paul Bond wallows in nostalgia as the last Vic is rolled out of the hangar

VIC GAMES

games looked at for this review hail originally from that house.

Omega's Gunslinger is, in fact, Anirog's High Noon — a four-cactus scenario where you steer your cowboy around the screen, using a joystick and 16K expansion. You are better off playing the game with another human since the micro takes a sadistic delight in shooting you dead immediately the game starts, just so it can play the funeral march. The theme music is Mungo Jerry's "In the Summertime", which should appeal to devotees of '60s novelty hits.

Battle Ground is like Space Invaders tipped

Game	Company	Price
Bomber Mission	Commodore	£4.99
Gunslinger	Omega	£1.99
Battle Ground	Omega	£1.99
Space Pirate	Omega	£1.99
Bricks	Palace	£5.99
Squish	Palace	£5.99
Dodo Lair	Software Projects	£5.95
Perils of Willy	Software Projects	£5.95

on its side. Imperial walkers move toward the right-hand side of the screen which you defend by moving behind your bases and shooting or zipping out and laying barriers in their path to delay them.

Space Pirate, which needs 16K expansion, is set in a space shooting gallery presented in perspective. The targets emerge from a box in the upper centre of the screen and weave about frustrating your attempts to put the cross-hairs square-on and blast them to smithereens. The explosions are very good, I must say. The second level includes indestructible ships which collect the target

ships, reducing your score. A neat little shoot-'em-up, good value at this bargain price.

Palace Software presents us with two "exciting and frustrating" arcade-style games for unexpanded Vic-20s, excitingly and frustratingly titled Bricks and Squish.

Squish is a shove-things-around-and-squash-icky-things game. The graphics are pure Vic-20 primitive, which is all you can expect given unadorned onboard memory. Little purple scorpion-like creatures menace the protagonist who runs about waving his arms and making the sort of footstep noises you hear between tracks on avant-garde rock albums. Twenty levels and watch out for the bug bullets.

Bricks I found more frustrating than exciting. You are at the bottom of the screen. Bricks rain down. You dodge them. The idea is to climb up using the fire button until you reach the top of the screen. You can jump up only one brick at a time, but jump down any number of bricks.

Perils of Willy, also from Software Projects, but with 16K more of elbow room is more impressive graphically. The cassette inlay tells us you are a little the worse for alcohol and you must stagger home, catching the notes of music that hang in the air. The loading screen puts up the tell-tale "Miner". It is in fact a ladders-and-levels game, with lots of jumping on to platforms, sliding along conveyor belts, and being eaten by dogs. The game is a dire warning to people who insist on seeking out the Pub of the Year in Richmond, rather than just going to their local.

Punchy from Mr Micro runs on a Vic-20 with 16K. You must guide Bobby the policeman through various obstacles to rescue Judy from where Punch has imprisoned her.

This includes jumping over spiders on the flat, catching a magic carpet across the sea, and hopping along a castellated rampart. Have you ever castellated a rampart, missus? Enough of this alternative humour. I was a little spoilt by having seen this on the CPC-464, flicker-free graphics, smooth-scrolling etc., and frankly I had a hard time figuring out what some of the things were supposed to be on a Vic. Punch could have been the Honourable John Selwyn Gummer for all I knew.

A brave try, but you know what they say about the limitations of the machine. Well, here I am, saying it again.



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Protek

IT'S EARLY DAYS yet, but it's clear that not only do you get a monitor for your money when you buy an Amstrad CPC-464. You also get a rapidly-expanding software base.

"Software houses tend to take promises of hardware availability with a pinch of salt," said Amsoft boss William Pole when I asked him how the CPC-464 managed to attract all this interest. "We've had Amstrad machines out at software houses since last December."

A lot of the Amstrad software consists of old Spectrum favourites re-implemented for the 464. That doesn't worry Amsoft — "We just wanted plenty of software to be around when the machine came out."

Re-implementation of Spectrum software makes sense — both machines share the Z-80 CPU; software houses' fancies may also have been tickled by similarities in specification which the Amstrad shares with MSX. Another factor which Amstrad has in common with MSX is that both will appeal to that lost generation that wouldn't have been seen dead fooling around with rubber-mat keyboards, tape recorder level controls, dodgy cables and awkward power-packs.

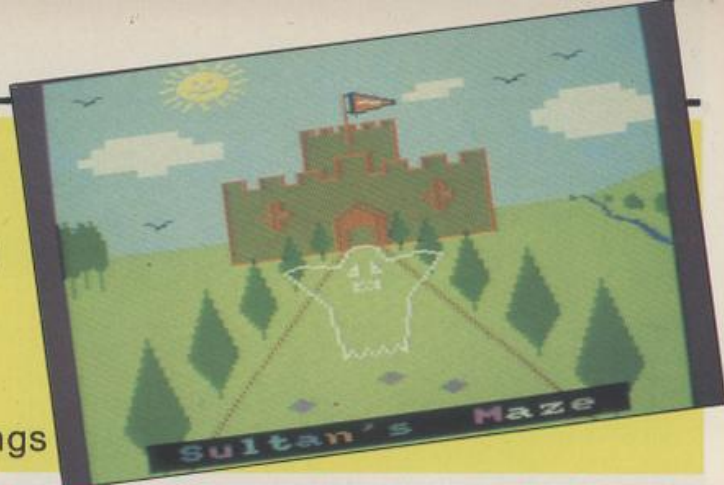
Yes, it's true. The built-in cassette recorder loads first time, every time — at least it did while I was looking at software for this review. One of the best games to find its way onto the 464 from its Spectrum spawning ground is Derek Brewster's Codename MAT — acronym for Mission Alien Termination as many devoted vidkids will know.

Tracing its heritage from the old granddaddy of computer games, Star Trek, via Atari Star Raiders, the game finds you in command of the *USS Centurion*. You can call up a long range scan, a solar chart and a sector scan showing a 10 by 7 grid. This galactic A-Z shows you where our boys are and what planet or satellite the evil Myons are encroaching on.

The game has two main options: you can play as pilot with deployment of Earth defence fleets under computer control: or you can play as commander — you control deployment of fleets. Moving from one part of the sector grid to another is achieved by placing the cursor over the destination point, and pressing W to engage warp drive. Tricky, this. You have to keep the cursor central on the screen or else you will end up in some galactic cul-de-sac with everybody on the bridge arguing like it's the family outing to Bracklesham Bay.

Myon fighters are easy meat for the average space cadet, but cruisers are really nippy and the motherships are mean mothers. At the higher level they attack you immediately until you zap their shields — then they retreat, recharge and return to the attack. And that is the secret of this game's appeal: the aliens are no pushover.

Paul Bond meets some old friends in new surroundings



AMSTRAD GAMES

Strategy definitely comes into Master Chess, implemented for Amsoft by Mikro-Gen. While I doubt that this game could play those Russian boys out of town like Bobby Fischer does in the Prefab Sprout song, it is nevertheless an excellent tutor.

The screen displays the chessboard and pieces together with the current level of play on the right-hand side and a history of the 13 most recent pairs of moves for reference on

Game	Company	Price
Codename MAT	Micromega	£8.95
Master Chess	Mikro-Gen	£8.95
Monster Maze	Romik	£8.95
Atom Smasher	Romik	£8.95
Alien Break-In	Romik	£8.95
Galactic Plague	Indescomp	£8.95
Electro Freddie	Sosoft	£8.95
Gems of Stradus	Kuma	£7.95

(All except Kuma programs available from Amsoft)

the left-hand side. This scrolls upward as you play. There are 10 levels of play, numbered 0-9.

An opening book of 6,000 moves is included in the program; apparently the program can look ahead as far as 27 moves on certain opening gambits. Looking ahead is a good thing to do in a maze filled with monsters — like in Romik's 3D Monster Maze. The game which won such rapturous acclaim when introduced on the good old ZX-81 is beginning to look a little tired now on the Amstrad, as are most of the Romik retreads like Atom Smasher and Alien Break-In. Nevertheless, the latter is probably one of the best straight shoot-'em-ups around; I have

even heard aficionados speak of the BBC implementation in the same breath as Zalaga — praise indeed.

Paco Suarez, one half of Indescomp's indefatigable Paco and Paco who produced the graphically excellent Bugaboo for the Spectrum, has however created a stunning Space Invaders variant for the CPC-464. In Galactic Plague, everything happens so quickly that one is tempted to start doing Neil impressions — "What's happening, man?"

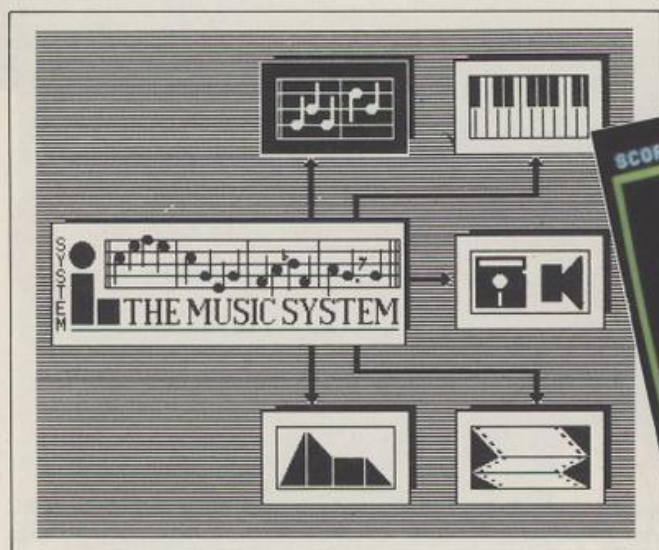
Brightly coloured space fighters zoom across the screen dropping bombs in a diagonal criss-cross wave pattern. The game seems almost unplayable, but as various strategies are developed by the player it looks possible to survive long enough to score at least 300. Wow-ee.

Your Computer has already reviewed Sosoft's Electro Freddie (Software Shortlist, October) and Kuma's Gems of Stradus (Software Shortlist, September). Protek's Hunter Killer submarine game written by Rod Hopkins in fact made its debut in Spectrum format in the August 1983 edition of Your Computer. Some 50 titles are scheduled for release in the next three or four months, 20 of which will appear on the Amsoft label. Level 9 are implementing most of their adventure titles for the 464 and Ultimate Play The Game were one of the first companies to get an Amstrad. The next wave of releases will include some very brainy stuff, like a sound designer and also a screen designer. The latter is from DJL, famous for Ms Pac-Man, and is described as "the Rolls-Royce of screen designers." Tasword and languages like Abersoft Forth will also arrive in time, making the Amstrad a very respectable machine indeed.

The clincher is the release of the Hitachi three-inch add-on disc drive. For less than £200 you get access to 180K of memory on each side of a disc. This and the capacity to run CP/M 2.2 will appeal to the "serious user", whoever he is. For the games player — well, average cassette loading time is about eight minutes. Discs promise eight seconds.



BBC SOFTWARE



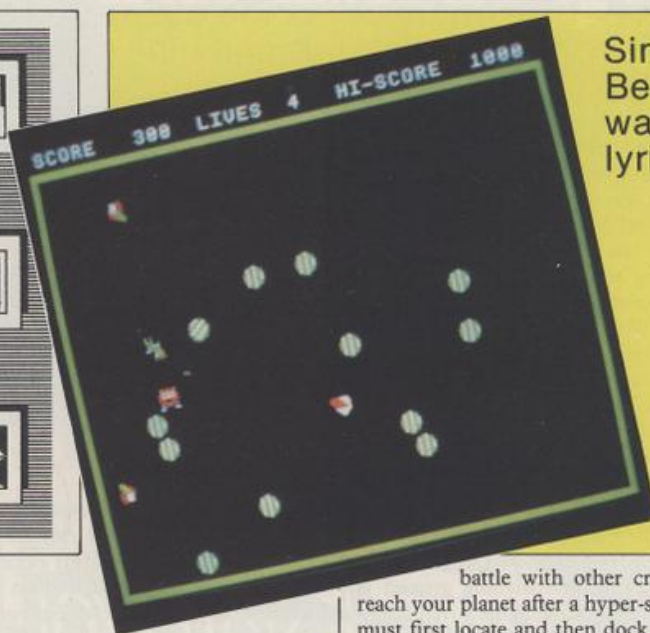
SOME PEOPLE ARGUE that BBC games over the last year have not generally improved on the standard set by Acornsoft's first releases — Snapper and Planetoids. It has also been suggested that the supply of new software is about to dry up. But in fact, far from being on the wane, BBC software is definitely thriving.

In particular the space epic, *Elite*, marks Acornsoft's return to form. This is a blockbuster of a program which combines elements of *Star Trek* games, flight simulators, and trader games. It also has points in common with Atari's *Star Raiders* — the game deemed by Jeff Minter and the editor of *Practical Computing* to be the greatest ever written.

The aim in *Elite* is to roam the galaxy as commander of a spaceship and by a mixture of trading and combat improve your status from "harmless" to "elite". In the trading stage you need first to choose a suitable planet.

Long and short range charts show the options while entering Status mode gives such detailed information as the nature of a planet's inhabitants, its form of government, and technological level.

Getting to a new planet, however, plunges the player into arcade action. On the way you



Simon Beesley waxes lyrical.

battle with other craft. When you reach your planet after a hyper-space jump, you must first locate and then dock with a rotating Coriolis space station — a difficult feat of manoeuvring.

In the action sequences the screen manages to combine a view of space in Mode 4 high resolution with a console display below in Mode 5 colour. Planets, space stations, and other ships are shown in motion in 3D complete with hidden line removal.

This description barely conveys the scope and complexity of the game. Acornsoft is organising a monthly competition around it. Players who want to join the Order of *Elite* will have to study the 61-page training manual thoroughly and then notch up hours of flight experience.

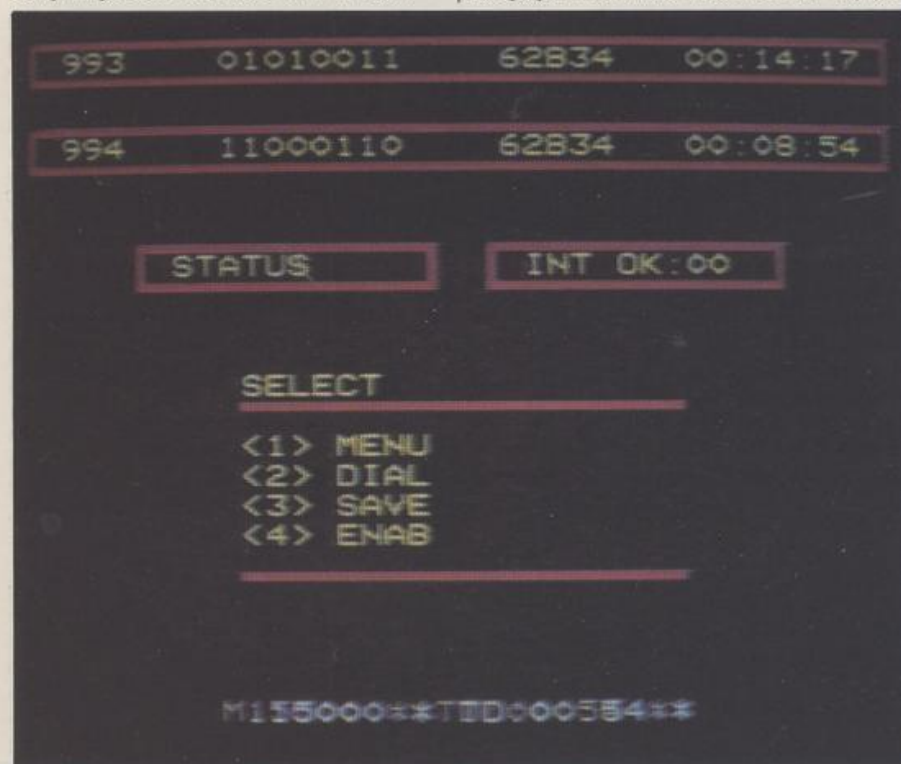
Good though *Elite* is it has to yield first place to Island Logic's *The Music System* — not a game but easily the most impressive piece of software in this month's batch. Island Logic is a new software house formed by the record company Island Records.

For almost a year a team of 12 has been working on the program. The end result is a package which makes other music programs on this, or indeed any other home micro, look crude by comparison.

The Music System consists of five programs, or modules, managed by a control program. Perhaps the most striking of these is the Editor module. Displaying some superb graphics it allows you to write notes on staves using the full range of musical notation.

Island Logic rightly describes it as the musician's equivalent of a word processor. Up to 860 notes can be entered in any one of four voices. Each note can be assigned volume and one of 15 envelopes. You can also set the tempo, transpose the key, and mark the bars automatically. Changing a note is simply a matter of pressing a cursor key to shove it up or down the staff.

When you have composed your piece you



can play it back and watch the notes scroll across the screen. Alternatively you could use the Linker module to combine it with another composition or load in a backing track.

There is a Library disc which contains a large number of predefined envelopes, rhythm tracks, and sample compositions. For a vivid demonstration of the Editor's power load in Bumble Boogie, a jazzed up version of the Flight of the Bumble Bee. Up the tempo and you can enjoy the spectacle of notes bouncing up and down the stave at a rate of 200 beats per minute.

To create new sounds there is a Synthesiser module which displays graphs of the volume and tone envelopes. In the Keyboard module you have a superior version of Quicksilver's Muproc: it lets you lay down four tracks using the Qwerty keys which it displays as a piano keyboard.

Both these features are common enough, although not usually so well implemented. Quite a new feature is the Printer module. With this you can create a four-part musical manuscript by dumping it to the printer in either high or low resolution.

Apart from its range of facilities what lifts TMS out of the ordinary is the ease with which it can be used. The entire system is driven by menus together with Macintosh-like icons. And it even includes message windows which paste over the display.

Perhaps the best tribute one can pay to TMS is that it is probably the first program that would not draw scorn from practising musicians — providing, of course, that they were not put off by the rather tinny quality of the BBC's sound.

Back on the games front, there is Acornsoft's Tetrapods, a much simpler game than Elite but in its own way just as addictive. You control an Asteroids-style triangular ship. Scattered around are numerous pods, which resemble peppermint lozenges, and a couple of Killer Bees. In later screens the bees are assisted by the more vicious Red Devils and Poison Orbs.

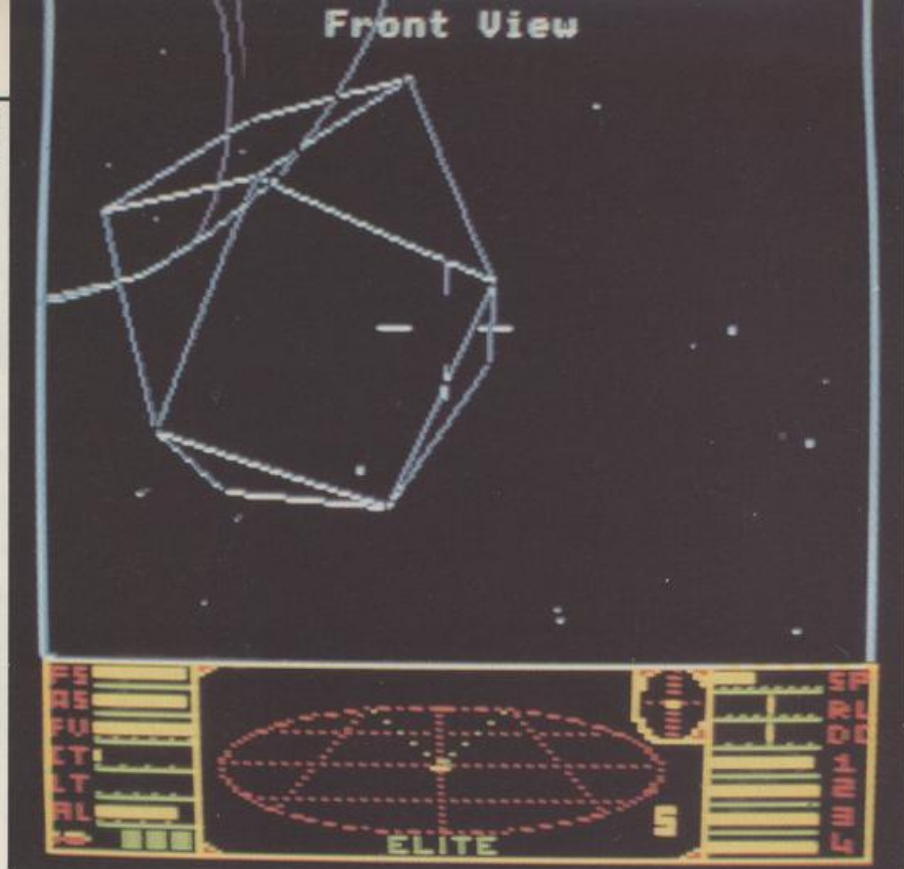
It is possible to shoot some of these creatures but more satisfying is to enlist the aid of lizards. These are what hatch out when you hit a pod. Like heat-seeking missiles they are relentless in pursuit of the nearest life-form.

To complicate matters the scene is one of constant motion with bullets bouncing off the sides, pods behaving like billiard balls, and wriggling lizards tracking their prey. It is like looking at a cell colony under a microscope.

By contrast Acornsoft's other two releases are disappointing. Drogna is a two player board game which first appeared on the TV series *Adventure Game*. Although a fun game which calls for a high level of skill, it is only marginally enhanced by being translated to the computer screen. What is needed is a one player option against the computer.

Volcano requires you to pilot a helicopter across Mount Crona, avoiding an eruption of blue rocks. On the other side are some humans who need to be carried back to safety. The graphics here are lacklustre and, while the game is challenging, it lacks variety. Acornsoft would have done better to have attempted a version of the definitive helicopter game, *Chop-lifter*.

If there is already a great game on another machine, converting it to the BBC often



succeeds better than striving for originality. AtariSoft has made a good job of translating its classic game, Pole Position.

Most of the original features are here. You are competing in the Atari Grand Prix against a dozen or so other racing cars. Crash into them and you burst into flames. Take to the verge if you like but it slows you down and you risk hitting a hoarding.

These and other effects such as gear changes and the mountain backdrop, which scrolls when you corner, are convincingly rendered. The all-important engine sounds are not quite as satisfying as they are on the original. The BBC can't reproduce the deep throaty roar of the Atari cars. And the scrolling is not as smooth. Nonetheless this is the best race-track game available for the BBC.

Converting a platform game to the BBC is not quite so easy. An essential feature of the genre is that there should be numerous different screens. But on the BBC there is not enough memory to store a great variety of screen layouts.

Durell's Manic Miner-type game, Mineshaft, gets round the problem by stripping away such extraneous details as zany flying objects, and concentrating on sheer tortuousness. The cast of hostile objects is small and many of the screens use the same conveyor belts or crumbling floors. But to make a successful jump your timing has to be of split-second

accuracy, while finding the correct route is even more critical than usual.

To prove the point, one of the 20 screens — entitled The Resting Place — does without any moving obstacles. You have simply got to travel from A to B — a bit like trying to find a foothold on the North Face of the Eiger. It is a relief to discover you can move on to the next level by pressing Escape.

Needless to say this level of difficulty is just what the platform enthusiast looks for. Together with a restful soundtrack — a rendition of *Greensleeves* — and smooth animation it makes Mineshaft superior to such rival games as Bigger and Ghoul.

Would-be hackers can serve their apprenticeship on System 15000. A hacker, of course, is someone like the teenage hero of the film, *War Games*, who uses a modem and the telephone system to break into computer databases.

System 15000 is the name of the simulated communications system which this game puts at your disposal. Apparently your friend Richard's company Comdata has been ripped off to the tune of \$1,500,000. He wants you to save the company by breaking into a chain of computer databases.

Throughout, the game provides a convincing simulation of the hacker's task. On screen it gives a typical viewdata display. It maintains the realism by producing a telephone sound.

At the start you are supplied with the telephone number and code of a single database. By viewing this you gain leads which allow you access to others. Each may contain information about names and associated codes or vital financial and company data.

In all there are 16 databases to crack and as many red herrings along the way. Expert hackers might possibly solve the problem in one day-long sitting but it is more likely to take weeks or months. In this respect the program is like an adventure game. But otherwise System 15000 is that rare phenomenon — a genuinely novel game.

The Music System Elite	Island Logic	£24.95 (disc)
	Acornsoft	£14.95
		£17.95 (disc)
Drogna	Acornsoft	£9.95
		£11.95 (disc)
Tetrapods	Acornsoft	£9.95
		£11.95 (disc)
Volcano	Acornsoft	£9.95
		£11.95 (disc)
Mineshaft	Durell	£5.95
System 15000	AVS	£12.95
Pole Position	AtariSoft	£9.99

MSX REVIEW

MSX MUST HAVE seemed like a good idea at the time. Good for the user, who could be sure of buying a stable machine, with what was likely to prove a huge range of games and other software. Good for the manufacturer, who could avoid going out on any draughty and lonely limbs, and save on costs by sticking to components that were in plentiful and cheap supply.

But there is one tiny problem. For the whole idea of MSX to work, you have to impose fairly strict rules of what an MSX computer must and must not have. This means that all MSX machines are much of a muchness. They all run the same Basic from Microsoft, have a Z-80A processor, and use similar sound and graphics chips. So when it comes to buying a particular model, you have to choose between very similar machines.

The four micros reviewed here — three "official" Japanese MSXers, and one interloper from Korea — show the different ways manufacturers have tried to make their machine stand out from the crowd. The most obvious way is the packaging. Although every machine has the same keyboard, including special keys like Graph, Select and Code, and a cartridge slot, joystick ports and various

video outputs, where you put them on your plastic box is up to you. And you certainly have plenty of room. MSX machines seem so far to have pretty greedy footprints.

One of the tell-tale signs of an MSXer is its cluster of cursor keys, set to the right of the keyboard. Sony's Hit Bit Uses four trapeziums — or is that trapezia? — arranged in a square. These are nice and large but very shallow, so you feel curiously unsatisfied when you hit them.

The Mitsubishi ML-F80 uses a similar plan, but squashes the left and right cursor. They do, however, have deeper travels. For my money, the Canon V-20 wins the day in this department. Rather daringly, it uses bold large rectangles, two large ones for up and down, and two smaller for left and right. Again, they are rather shallow, but their shape somehow compensates for this.

In fact Canon has played it big and bold throughout its machine. The five function keys doubling up to 10 with the Shift key that the MSX scheme of things demands, extend right the way across the top of the keyboard. In programming this is really useful. For

example in MSX Basic, F4 is programmed as List and F5 Run. With such big targets it is easy to flick a nonchalant finger in their general direction and obtain the desired result.

The other machines all tuck the function keys away to the left-hand side of the keyboard, and use skinny little strips for keys. In-depth discussions of the width of function keys may seem completely over the top, but differences between MSX machines do really come down to this level. Most people pay far too little attention to the keyboard. After all, this is where you actually get that hands-on experience. Normally you don't have any choice. If you want the Spectrum you just have to put up with those funny rubber keys. But with the MSX range, the feel and layout of the keyboard could well be the deciding factor between machines.

MSX keyboards have much more than just the standard QWERTY keys. Most keys can generate three or four different characters when used with the Shift key, Graph key, Graph and Shift key, Code key and Code and Shift key. There is a special foreign accents key just for sticking on umlauts and circumflexes.

Other unusual keys on all machines include

AUTUMN COLLECT

Blacks and greys are the MSX colours for this autumn. But can our man on the catwalk, Glyn Moody, tell the difference between the Canon, Mitsubishi or Sony styles and the £230 Goldstar's coarser cut?



CTION

such things as square and curly brackets, pound signs and Spanish tilde signs. One effect of this generosity is that Return and Back Space keys are slightly too far away if you are trying to touch-type with your hands stationary on the keyboard.

The Canon scores again in choosing to put the accents key mentioned above to the right of the right-hand Shift key. It is therefore much harder to press Return by mistake — only too easy on the other machines.

All of the MSX machines have TV, video and audio outputs, cassette port, MSX printer port, two joystick ports and a second cartridge slot which can function as an expansion bus. Ports and on/off switches are all over the place on different machines, but there are no startling innovations.

The cartridge sockets are generally in the top right-hand corner of the machine — except for that individualist Canon, who puts it in the top left-hand corner. This may well be more convenient for right-handed games players who wish to flip in mid-stream from one zapping cartridge to another without ever loosening their fevered grip on the joystick.

Moving on to the software, one way of adding something to a machine's appeal is to stick in a few ROMs' worth of software. This will leave the basic structure of the machine intact, and preserve the MSX format. Sony has followed this path with its Personal Data Bank.

On powering up the Hit Bit, you are given a short menu of choices. One of these takes you straight to Basic. The others let you use an address book and memo pad program which are held in ROM. These are not very sophisticated, but you can store about 50

(continued on page 65)



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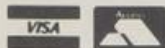


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(continued from page 63)

names with up to 80 characters' worth of information in the address and telephone book. You can then search through them either by name or number or address. Lists of addresses can be saved to tape or cartridge.

If these first programs are a little unimpressive, they at least hint at possible directions in which MSX micros may develop. In an effort to woo buyers to particular machines, manufacturers will probably be forced to offer more and more glamorous ROM extras.

The MSX Basic itself, of course, is sacrosanct. So there can be no tampering here to tweak its performance or facilities. But to be fair, that is not really necessary anyway. Microsoft has done a good job in providing a powerful and clean Basic. Some of the commands were discussed in detail in the Toshiba review in the September issue of *Your Computer*. Everything you would expect from a reasonably structured Basic is there, along with powerful sound, graphics and sprite commands. Out of a nominal 64K RAM, you are left with only 28,815 bytes program area. Editing is carried out simply and efficiently using the cursor, insert and delete keys.

Text and graphics modes are entered using the Screen command. The default value is Screen 0, which allows 40 columns and 20 rows. Three rows at the bottom are given over to the function key labels. These automatically switch when you press the Shift key to flip from F1-F5 to F6-F10. Screen 1 gives you 32 columns. Screen 2, the high-resolution graphics mode allows 256 by 192 pixels. Screen 3 is the low resolution mode, with 64 by 48 coarse pixel elements. The image is stable and the colours reasonable.

16 colours are available, but in the high-res mode there are restrictions as to how foreground colours may be assigned to individual bits. Another problem is that text may not be mixed directly with graphics. Graphics commands include plotting, line, circle and box drawing, area filling, and sprite commands. Up to 32 sprites can be handled at once.

Two types of sound commands are included, both of which use the TV speaker. The Sound command itself allows you to specify 13 parameters defining channels, loudness, pitch and envelope. A more civilised command is Play, which lets you input letters such as A, C, E, which are interpreted as the appropriate musical notes of that name. Altogether there are three musical channels,



and also a simple Beep command.

Other features of the Basic include a Def Fn which allows you to define additional functions, and useful programming aids like Tron which turns the program trace on, and error-trapping routines like and Erl and Err, giving the error code and the line which generated it respectively. There is also a real-time clock accessed via the variable Time.

Running a series of standard Basic benchmarks is instructive. In ordinary loops and Gotos, the MSX machines emerged as about half as fast as the BBC, and twice as fast as the Spectrum. But in one speed checks designed to test the maths routines — such as calculating sines, logs and so on — the MSX micros were markedly slower. This is mostly due to the fact that they work to 14-digit precision. This is hot stuff for a home micro, but the penalty you pay is loss of speed in intensive number-crunching activities. For games this should be no problem.

After manufacturers have done their utmost in hardware and software to make their MSX micro into an MSXtra micro, they have only one weapon left: the price. And this is where it gets interesting for you.

Since, in functional terms, there is very little to choose between the various machines, it would be perfectly reasonable to buy purely on the basis of price. Therefore, you would expect manufacturers to be locked in a life-or-death price war. Which rather goes against the spirit of gentlemanly co-operation that lies at the heart of MSX.

Alternatively, the manufacturers could come to an equally gentlemanly agreement to keep their prices roughly comparable, so that there were no gross differentials, and also to keep them profitably high. At the moment, this appears to be what is happening. Both the

almost bound to come down dramatically from their present high levels. So wait if you can. Secondly, if you really must be the first on your street with one of these dark gleaming machines, make sure you try out as many as possible, especially the keyboards.

As time goes on, it is also likely that manufacturers will offer an increasing number of "added-value" features. Again, check these out thoroughly before deciding.

Sony Hit Bit and Mitsubishi ML-F80 weigh in at a hefty £299.95. The Canon breaks ranks slightly with a price tag of £279.95. These are all 64K machines. Although MSX allows for smaller RAM sizes down to 16K, manufacturers seem sensibly to be pushing the top of the range versions in this country.

This kind of tacit agreement works fine while everyone sticks to it. The danger is that some outsider will come in and use the very strength of MSX against itself. That is, it will produce a totally MSX compatible machine, but for half the price, say. Since there will be functionally little difference between the top and bottom of the market, the intruder stands to clean up.

There are signs of this already in the Korean MSX machine reviewed here, the Goldstar FC-200. In all important respects this is identical to the honest-to-God Japanese models — except that it is £70 cheaper. True, the whole machine does look a bit like a Mickey Mouse toy version, with garish red, green and blue keys. But on powering up, the differences prove only skin deep.

Unfortunately for the Japanese manufacturers, their bright peripherals will be no help either. Sony has produced a stylish but rather unwieldy plotter costing £250, a 320K disc drive for a steep £350, and various joysticks, including an infrared one for £65. Apart from being hideously expensive, the disc drive is also rather badly designed. For reasons of cooling, presumably, the entire case is perforated with large holes — just asking for coffee or other sticky liquids to be poured in. The other manufacturers will no doubt follow suit in announcing add-ons when the machines are released over the next few months.

Peripheral MSX appeal

But again the complete compatibility of MSX means that you can use any manufacturer's equipment with another's. So once you have bought your cheap but workable MSX micro, you can then pick and choose similarly amongst the peripherals. For once, it looks as if things could be going the user's way.

Whether the whole MSX philosophy is going to result in an MSXplosion is another matter. Personally, I think that the U.K. market will prove hard to breach, largely because of local aberrations like Sinclair, and the strong Commodore following here. The new Commodore Plus 4 in particular seems to offer practically everything that an MSX micro does, but with a neater design and useful bundled software. The Amstrad, too, will be a strong rival.

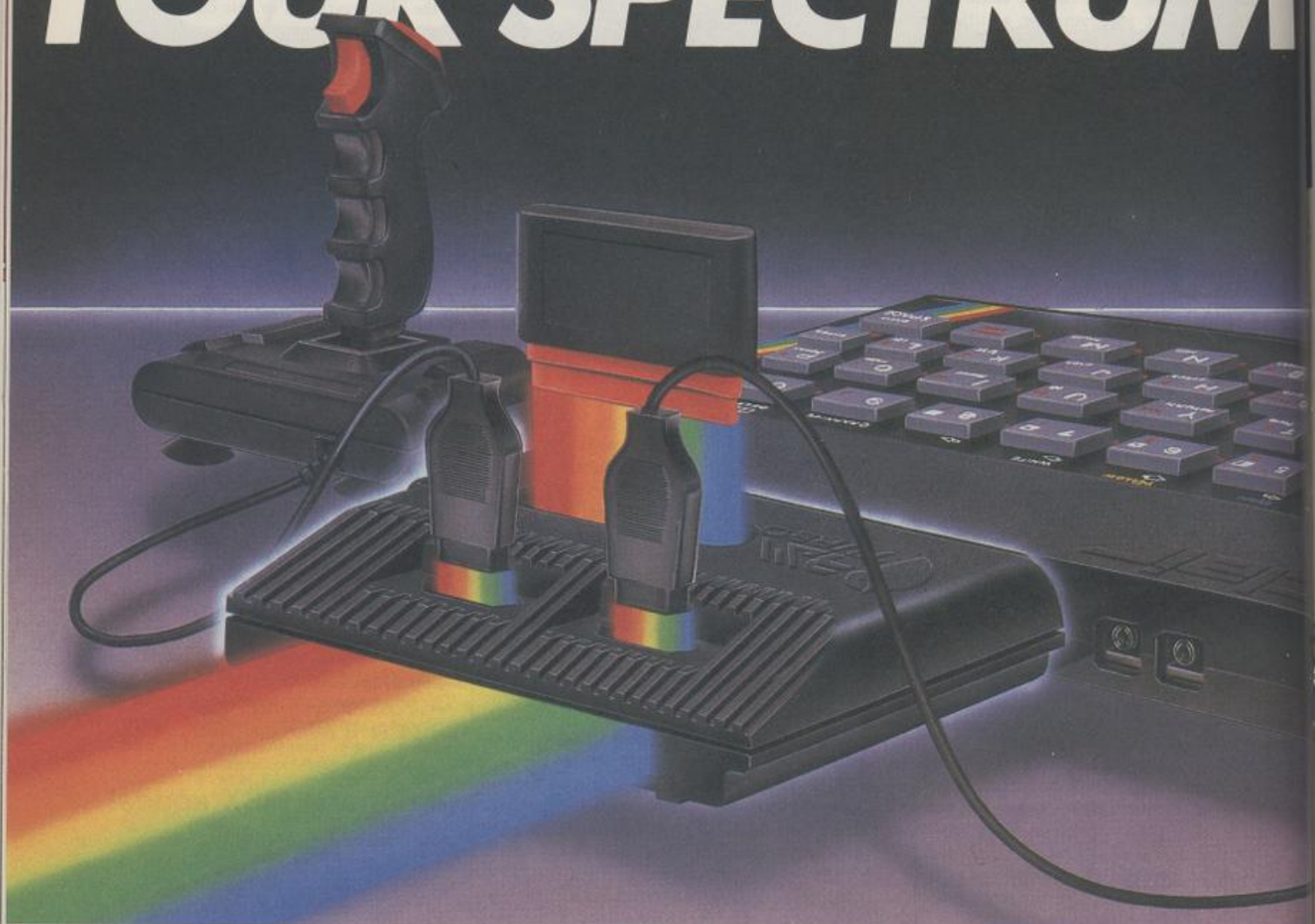
But there can be little doubt that the machines will sell, and that huge numbers of games will be written for them. It could be though, that a plateau will eventually be reached where every last drop has been squeezed out of the Z-80 that lies at the heart of the MSX philosophy. It is not clear where MSX will go after this first wave of machines.

Certainly, we can expect — one day — much more exciting games on something like the QL. As ever, it really is a question of paying your money and taking your choice.

CONCLUSIONS

- MSX is here, and here to stay. The concept will prove more relevant to the first-time buyer than to the hardened games addict or machine-code programmer.
- The machines are sensibly designed, and have an especially good Basic. The standard of construction seems high.
- When it comes to buying an MSX machine, there are two things to remember. First, that prices are

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BARGAIN BUYS — UP TO £50

These machines have been around for some time now, are competitive prices. They are worth considering as basic entry about to disappear from the market and are available at very machines to see what computing is all about.

COMPUTER	Hardware	Operating System/Basic	Software	Accessories
ZX-81 Sinclair £30	Black and white only. Touch sensitive membrane keyboard is barely adequate but this is the cheapest computer. 1K RAM. An ageing design.	Good editor with syntax checked keyboard data entry. Basic is very slow. Chunky graphics and no sound.	Lots and lots of very good cheap software considering the machines limitations.	Keyboards, joysticks, printers, lots of choice, relatively cheap. Good books. Add on memory.
MC-10 Tandy £50	Colour with chunky graphics — no user defined graphics. Sound through TV speaker. 3/4 size keyboard — moving hard plastic keys with space bar.	Keyword or typed in full entry. Microsoft Basic.	There are games, not many and adequate is about the right description.	TP10 printer, also very cheap. Add on memory 16K.
SORD M5 Computer Games Ltd £50	Colour and Sprites. The MSX chip set coupled to the worst keyboard of the three colour computers. 4K 3 channel sound.	The best operating system software for a m/c Z80 programmer, access to everything. Pity about original price and keyboard. Basic is a bit weak.	Very little software available, but what there is, is good quality.	Available but only from manufacturer, no other sources.
AQUARIUS 1 Radofin £50	Chunky graphics — no user defined graphics. No sound, keyboard only a little better than the Sord.	Microsoft Basic but no editor, keyword or typed entry.	More than Sord or MC10 but again, only adequate.	Printer, memory, joysticks and discs available relatively cheaply.

COLOUR COMPUTERS — UP TO £100

The machines in this range offer more than the bare minimum performance and each has its own particular strong points. The Vic-20's software base is extensive and cheap. The Atari's software is the best, but expensive.

COMPUTER	Hardware	Operating System/Basic	Software	Accessories
ATARI 600XL £89	Very good real keyboard. Newish design. Sprites and good sound — 4 channel. 16K needs special tape recorder.	Very much better Basic than original Atari. Nice screen editor with syntax checked data entry.	Some of the very best, but cartridges are expensive and soon cost a great deal more than the computer.	Printers, joysticks, discs, memory. Average prices — look for special offers.
VIC-20 £89	Good real keyboard. Limited characters per line 3 channel sound. 3K mem needs special tape recorder.	Limited Basic with a good line editor.	Very large number of quality cheap cassette games available. Some require additional memory.	Printer, joysticks, disc, memory, average prices.
TANDY CoCo £99	Moving key keyboard. Lowish colour resolution. 16K memory. Sound through TV speaker. RS232 port.	Line editor, abbreviated error messages show computers age.	Can run OS-9 on expanded system to provide user with mini computer feel. New learning book may be the shape of things to come.	All things available but do tend to be expensive. Can be extended to become a limited business machine.

LARGER MEMORY COMPUTERS — UP TO £150

The larger memory generally permits more extensive and better quality cassette-based games.

COMPUTER	Hardware	Operating System/Basic	Software	Accessories
DRAGON 32 £99.95	Real keyboard but feels a little tacky. Sound through TV. 32K.	Very similar to Tandy CoCo on which it was based.	Some good cheap software.	Printers, discs, joysticks etc, reasonably priced.
ATMOS ORIC £99.95	Good real keyboard. 3 channel sound.	A vast improvement over the original Oric 1 which had cassette loading difficulties.	The lower UK profile of the Oric/Atmos will not help in the availability of software.	Printers, discs reasonably priced.
SPECTRUM Sinclair (6 Pack) £129.95	Moving key rubber keyboard worst of this group, weak sound. The Spectrum is becoming overpriced in the current market.	Single keyword entry with full syntax check on line entry. Design becoming dated now.	By far the largest cheap quality software base of any UK machine. The standard by which other games are judged.	Printers, joysticks RS232 interface Microdrives etc. Generally cheap though some items could be cheaper.
AQUARIUS 2 36K £129	Good real keyboard. Limited chunky colour graphics. Sound through TV speaker.	Microsoft extended Basic with reasonable editor. Some of the feel of MSX in this Basic.	Limited software availability likely to be a problem.	Aquarius 1 accessories fit and just about everything available from printer, joysticks, memory to cheap discs.

THE BEGINNINGS OF BUSINESS USAGE — ABOUT £200

The Memotech has the ability to become a limited business machine but there is unlikely to be a tremendous amount of software for it. The Commodore has the software but not the ability. The Electron needs a fair amount of expansion which effectively changes the price bracket it occupies.

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COMPUTER	Hardware	Operating System/Basic	Software	Accessories
COMMODORE 64 £199	Average keyboard. Very good sound facilities, needs a special cassette recorder.	Minimal Basic, does have sprites but not easy to use, or sound, from Basic.	Do like cartridge football. Games tend to be more expensive than, say, Spectrum.	Everything — big selection.
ELECTRON ACORN £199	A cut down version of the BBC computer. Good keyboard. Single channel sound. Overpriced.	Runs slower than the BBC but quality Basic. Can run mixed Basic and machine code programs.	Quantity increasing all the time.	Needs expansion box before accessories can be hung on to computer.
MEMOTECH MTX £239	Very solid machine with average keyboard — includes separate numeric keypad.	Built in assembler/disassembler plus Noddy language besides Basic. Line syntax checker. Can expand to a CP/M system.	Limited in quantity but of reasonable quality.	Everything, but little choice.
AMSTRAD £240	Includes black and white monitor and built-in cassette drive. Quality keyboard and limited cassette control.	Nice operating system. Basic is quick but could be more user friendly in graphics and sound department.	Needs the colour monitor to really be used as a games machine. TV adaptor available. Some nice games.	New machine, items just beginning to appear.

TOP OF THE RANGE — ABOUT £400

These machines cover the top end of the games machine range and the bottom end of the business machines.

COMPUTER	Hardware	Operating System/Basic	Software	Accessories
BBC ACORN £399	Very old design. Not long before the new ABC's take over. Well overpriced because of captive market.	Very fast, against which all others are compared. Can run mixed Basic and machine code programs.	Not as good as specification is capable of producing. The best for educational uses.	Big choice in all price ranges. Can become expensive with a big footprint on the desk.
QL SINCLAIR £399	Uses the IBM alternative microprocessor (MC68008). The hardware is the best in the price range, still a few bugs to be knocked out.	Look out for 3rd party vendors to provide multi-user/multi-tasking o.s. that works. 4 software packages in price that are improving in quality — slowly.	Very few at present, but all the best software is being programmed for it at present. Worries about cartridges, pricing and piracy.	Needs care when choosing monitor and printer, they don't all work with the QL.
AMSTRAD £349	Includes colour monitor and cassette drive. Not always easy to read 80 column text but display rock steady. Stereo sound.	Quick Basic with nice editor easily learnt.	The B/W monitor is more suitable for business use. Some very good software.	Few at present but coming soon.
EINSTEIN £499	Includes a 500K 3" disc drive. Nice keyboard and reasonable sound.	Clean machine with Basic loaded from disc. CP/M capability.	Predominantly a business machine between the QL and the ABC's and the new Apricot.	Not much at present but it should be all available in time.
ADVANCE 86A £400	Upgradable to IBM PC compatible. Looks different from other computers with keyboard storage in main console. Good keyboard. Takes up a lot of desk.	Very nice full screen editor, the IBM standard Basic. Faster than IBM machine.	Surprisingly little for the basic machine, but masses for the full blown expanded version. Software is comparatively expensive.	Most IBM accessories are suitable, the cost is higher than other accessories listed.
ALPHATRONIC £347	Very good keyboard with excellent feel. Very limited graphics.	Full screen editor, with Microsoft Basic.	Very little, requires expansion to CP/M level before much software available.	Discs, printers etc to full CP/M compatibility.

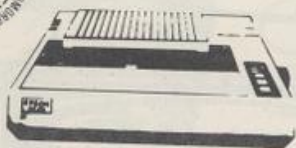
COMING SOON

Some new computers will be launched prior to Christmas and they will have varying degrees of success in achieving a place in the market. The following group is my assessment of the machines based on a brief encounter.

COMPUTER	Hardware	Operating System/Basic	Software	Accessories
COMMODORE 16 £140	The replacement for the Vic-20. Nice keyboard, good sound.	Better Basic but a very conservative specification.	Can't help but be good. Initially certain to be cartridge and expensive. There may not be a UK driven cassette base this time.	All Commodore accessories should fit.
ENTERPRISE £250	One year on from initial showing, the impact is considerable less. Whether a better buy than Amstrad is doubtful. Keyboards on the machine I've seen poor.	Good Basic but the competition is no longer overawed by the specification.	Bound to be good, but whether there will be sufficient to sustain the machine is questionable.	Coming soon.
COMMODORE +4 £250	Very nice feel to the machine with a good keyboard. Sound facilities not up to those of the CBM-64.	4 very simply built in packages, but they are quick and usable. Better Basic than 64. Packages are word processor, spreadsheet, database and business graphics — no sprites.	Certain to follow 64 standard, only question is the availability of cheap cassette-based software.	Some differences in the connectors may mean some new accessories. Joystick ports are different etc.
MSX £250	Can be bought in any shape, colour to suit taste. Real keyboards, moving key. From 16K upwards memory.	Bound to become THE home micro standard with the ability to run CP/M software when expanded.	Already substantial and before long all new games will be here first.	Everything including the new quick discs.

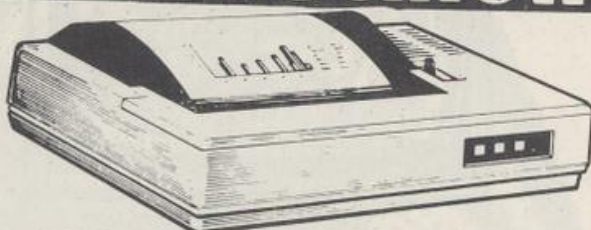
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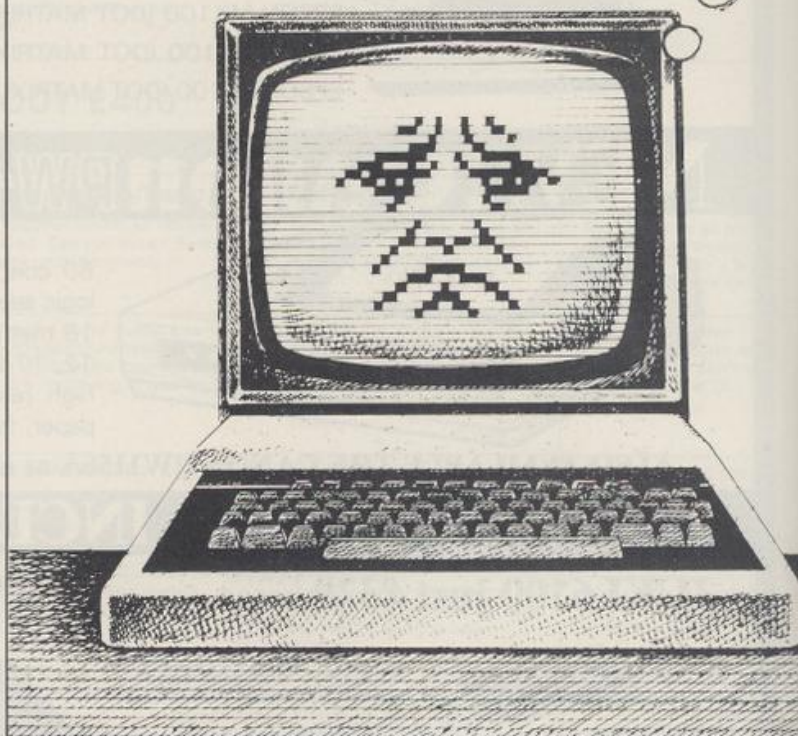
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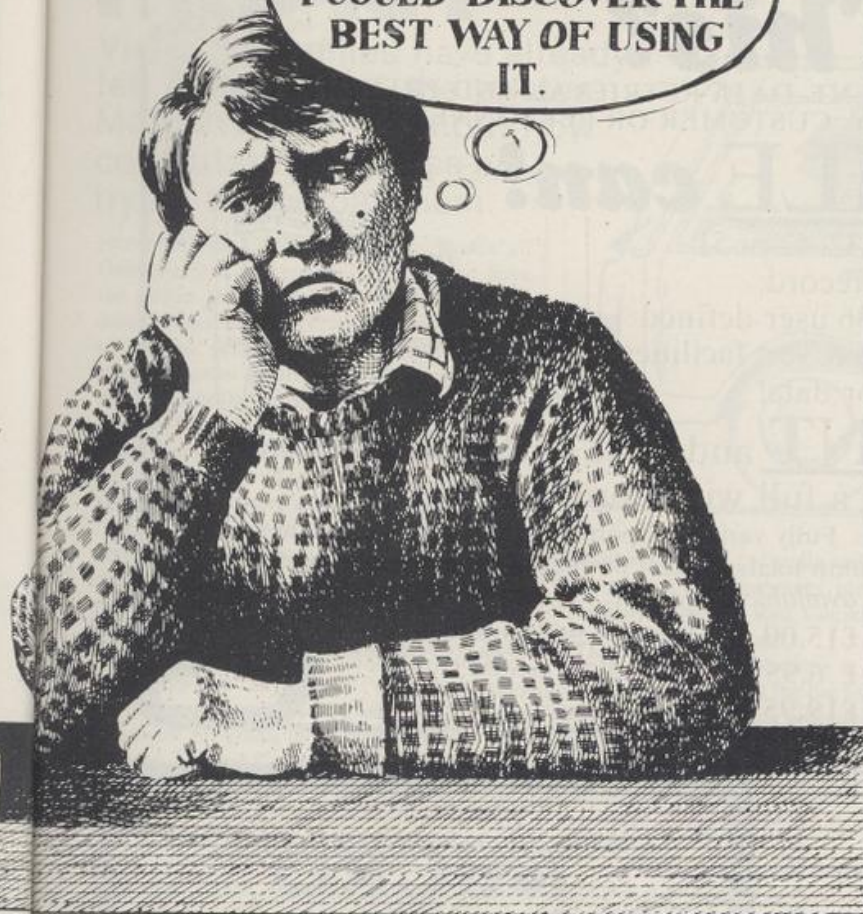
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PIRACY

Video companies have already felt the power of the pirates. Meirion Jones finds out how computer companies are trying to combat them.

NOT SINCE Johnny Kidd had them *Shakin' all Over* nearly a quarter of a century ago have the pirates been such hot news. Everybody's doing it from the market traders selling bottles of dubious yellow coloured water under the misspelt names of famous French perfumes to the upmarket jewellers selling bogus Cartier watches faked in Mexico.

As Terri Anderson of the British Phonographic Industry which has led the campaign against audio cassette counterfeiters explains "the whole business of intellectual theft is getting out of hand — there can hardly be a consumer product that you can't buy a pirated version of — shoes, jeans, records, software..." Even some software house heads admit to the temptation. "If you could photocopy cars" says David Potter of Psion — the company that has sold over 500,000 Flight Simulator programs to Sinclair owners "we'd all have Ferraris."

All the problems that the computer industry now has with piracy — an unauthorised copy of a program is made every three seconds — were experienced first in the audio and video industries. "Two years ago" as Peter Duffy, Director of Investigation of the film business's Federation against Copyright Theft says "every feature film that was released was pirated that week or before it came out".

The worst case was ET which was seen in millions of British homes, months before it was even premiered in this country. Unlike British software houses which originally concentrated their wrath on schoolkids making occasional copies to swap with friends, FACT went for the big boys. In alliance with BPI which was cracking down on audio copying they helped force through the 1983 amendment to the Copyright Act which Duffy says "totally transformed the position".

Raids on counterfeiters put many of them out of business with £2,000 fines and two year prison sentences as a deterrent. Projectionists hurrying out of the cinemas late at night as the last strains of God Save the Queen died away were ambushed by police before they could make an undetected overnight copy for the video pirates.

Audio tape counterfeiters were also hit hard by BPI raids although it is still waging a "Home-taping is killing music" campaign against casual copiers and demanding a levy on blank tape to reduce the margin between buying an album on cassette and taping it from a friend. But as the 1983 law has made it more difficult for the counterfeiters to make a



dishonest living out of audio and video so they have moved into computer piracy where as Quicksilver director Rod Cousens points out "the law is a grey area".

Now that organised crime is moving in to computer game piracy the big software houses are taking a less hostile attitude to schoolkids who make a one-off swop for a friend. "Help us smash the counterfeiters and we won't send the police in on search and destroy missions to the home of every Spectrum owner" is the message.

The Federation against Software Theft — FAST — has been set up by the likes of IBM, Acornsoft, Sinclair, Microsoft, WHSmith, Thorn EMI and Virgin to get the same legal protection for software that already exists for records and videos. Nicholas Lyell the Member of Parliament for Mid Bedfordshire signalled the new initiative with a Ten Minute Bill in July which increases the chances that one day it will be made law.

He told Parliament "The video pirates who used to make pirated copies of video tapes and

films, and whose activities are now being substantially curbed by the Copyright Amendment Act 1983 are now turning their attention to the piracy of software." He pointed out that "At least one operator has his own factory with sophisticated duplicating equipment and a substantial distribution network." He also explained the new realistic mood of the software houses "We are not after the schoolboy, but we are after the commercial pirates."

Industry figures like Quicksilver's Rod Cousens now see making copies for swaps as "an occupational hazard" which needs to be stopped by "technological advances" such as the speed loaders which make audio copying more difficult, and increased use of discs and cartridges. Anyone copying "for commercial gain" will feel the full force. Quicksilver was one of a dozen companies which backed August's Arctic co-ordinated raids in Hull on small-time operations advertising their products in local papers.

Zap clubs too are on the target list of the companies. "They should be hit" says Mike Dixon of Frontrunner software — part of the K-tel group. Schools are blamed by many companies for not setting a good example. "Teachers are the worst offenders" according to Randal Robertson of FAST. He blames this piracy "in the education field as one of the main reasons for the lack of good educational software". Companies are unwilling to invest in development if they are going to sell insufficient units to cover the cost. That's why Randal says "in the short term the user may gain but in the long term he will lose out."

The new conciliatory mood of software houses to their customers — instead of regarding them as the enemy seems to be paying off. Quicksilver has been surprised how many of the members of its Gamelords club have volunteered information to their Super Pirates Squad — which has helped to squeeze out some of the counterfeiters.

PIRATE HOTLINE

We want to know if anyone near you is selling counterfeited computer games. We are not interested in Johnny next door who has made one copy of an outdated game but in people who are making money by stealing other people's work. You can often tell pirated tapes by their lack of identifying marks on the cassettes — for instance the butterfly mark on Quicksilver products. Phone Your Computer Pirate Hotline on (01) 661 3465 and we will treat any information you give us in confidence.

BREAKING AND ENTERING

Confessions of a pirate. Our old friend Henry Morgan reveals the tricks of the zapper's trade, smashing the protection that hides program secrets.

HACKERS OFTEN derive as much pleasure from defeating a company's protection mechanisms then breaking into the program, altering it to taste and making a back-up copy as they do from actually playing the thing, more so in some cases. This article specifically looks at some of the protection mechanisms applicable to the Sinclair Spectrum, but the principles and the moral of the story apply equally to all home computers.

Way back in 1982, when the first commercial games were marketed for the Spectrum, very few authors bothered to protect their programs. It seems that software piracy had not been heard of. These early programs offered no challenge to those who wished to copy them, all that was necessary was to have sufficient knowledge to read a program "header". This is the very short burst of 17 bytes which follow the first "tone" when a program block is loaded into a Spectrum, and comprises the information which the computer needs to know about that block; that is whether it is in basic or machine code, which part of memory it is to be loaded into, how much there is of it, does it auto-run and so on.

It is very easy to isolate and read headers, and so no Spectrum program can ever be made absolutely secure. Most software loads in two or more sections, all that was needed to copy a program back in those days was to Break into the Basic block, save it with the appropriate line to make it auto-run then load the code block and save it defining the start and length, all this information is available in the headers.

Of course it wasn't long before software houses realised that their work was all too easy to rip-off, and so a number of ingenious mechanisms began to appear to stop the home

user from being able to break into the software.

Two simple mechanisms which soon appeared were the DF-SZ and the ERR-SP. I will explain what these are. If you read the Spectrum manual, you will find a section on the "system variables".

System variables, also known as run-time variables, are numbers held in a special part of the computer's memory whose only purpose is to allow it to know what it is doing and what is going on inside it. DF-SZ is a good example of a system variable, it lets the Spectrum know how many lines are to be reserved in the lower portion of the screen for reports. Normally there are two lines, and so DF-SZ holds the value 2. DF-SZ can be altered by POKEing a different value into 23659, which is its address in the system variables area. If its value is changed to 0, then there will be no spare lines available for the reports such as Break to be written, and the computer crashes if one is encountered. So you cannot just break into the program.

ERR-SP is a little more complicated in that it occupies two locations, 23613 and 23614. It points to an address in memory where an instruction is waiting to be performed if a report such as Break or Stop needs to be produced. It is very easy to point this variable to a part of memory which causes spectacular crashes if the program is broken into, simply by fiddling with the values using the Poke command. These two mechanisms will stop anyone from successfully breaking into a Basic program, but the Spectrum has a simple device to defeat them.

A Basic program can be Merged instead of Loaded, and instead of auto-running just sits there waiting for a hacker to list it! Clearly DF-SZ and ERR-SP were inadequate on their own as real protection.

As you know, blocks of machine code are normally loaded in and then run by short Basic programs which precede them, using a Usr command. Since it is so easy to disable any protection present in the Basic block, software houses had to look for methods of protecting the code itself.

Load in short bursts

Some programs can be found which load in very short bursts of bytes after the main block of machine code has been loaded, these serve to protect the main block which will crash if they are not present. Often they are mini programs themselves which modify the code in some way, either by providing data or by



Henry took just half an hour to make a copy of Imagine's Zoom.

altering its position in memory. A determined copier will use his knowledge of header reading to simply load each section in and then save them sequentially, but wait... the copy crashes when run.

This is usually because of another system variable, Frames. This is actually a clock, it is incremented 50 times per second and the value is therefore constantly changing. Frames occupies three locations, although only one is usually checked by the protection mechanism. How does it work? A short block of three bytes is loaded into Frames, which will immediately begin updating the values. A short time later, one of the first set of instructions in the code block will compare this value with a pre-determined value held somewhere, it doesn't matter where, in memory.

If the result is not what it should be, that is if it was a copy then the program will direct the computer to do a system reset. This is not a difficult mechanism to disable, indeed there are several methods which hackers can and undoubtedly do use. Those with no knowledge of machine code will normally alter the Basic loader so that the block is loaded into Frames irrespective of where it was saved from. A more elegant approach is to disassemble the offending section of code and nullify it.

So, we see that the headers preceding blocks of code give the game away every time. It wasn't long before programs came on the market featuring sections of code which



Ant Attack: hard to crack.





loaded in without headers. To demonstrate how this works, it is necessary that you understand a little machine code, but do not worry, I shall explain all. The Spectrum Rom is actually a machine-code program that carries out all the Basic commands, including those involved in loading and saving software. Indeed, a large chunk of Rom is devoted to these procedures.

Save a block

It is quite possible to save a block of memory and it doesn't matter whether its Basic or code or whatever without a header, as long as the microprocessor, the computer's brain, is first told some basic facts about what you are doing. This has to be done in machine code, since there are no Basic commands that will do the job. The microprocessor — in the Spectrum its a Z80A — can be thought of as a chest of drawers, with the drawers in two rows, and given letters, A B C D E etc. These drawers are actually called registers, and registers next to each other can be paired if necessary, eg BC, DE. On its own a register can hold a number from 0-255, but a pair can hold 0-65535.

For a block to be saved without a header, the A register is loaded with the value 255, the IX register is given a number corresponding to the start of the block, the DE register pair is told the length of the block and the Rom save routine is called at location hex04C2, which by-passes the header mechanism.

Such headerless sections are themselves loaded in not by a Basic loader, but by a block of code.

The instructions which do so are extremely simple, again the A register is given the value 255, the IX register to a position of memory where the program is to go to and the DE register pair the length. Also, the Carry flag must be set, the F or Flag register is a sort of microprocessor system variables, Carry being one of the variables, that is, given a value of "1", and the Rom routine called at hex 0556.

The headerless system is ingenious, but it still relies upon a section of code which must be loaded in the normal way, and this is vulnerable to anyone with a disassembler. An increasingly popular trick is to load in a block of code, often without a Basic loader, which

apparently auto-runs itself. This is a very simple technique, but it can be very effective if combined with headerless sections. How does a block of code autorun? As you might expect, it is due to our friends the system variables. You now know that these are continually updated by the computer and in effect at any one moment in time hold a complete record of the state of the computers memory.

If a block of code is saved so as to include the system variables the Basic program area and also the machine stack, a few bytes found just below Ramtop, it will run when loaded back in from where it left off — code blocks which autorun include a USR command just after the save. For instance:

```
10 SAVE "NAME" CODE 23552, 4000
20 RAND USR 27000
```

where 23552 is the start of the system variable.

Copying a program saved in such a fashion is actually quite simple, and so it is really no deterrent to the hackers. If the program is not too long, a budding pirate could simply clear Ramtop to a suitably low address load the code above it and save from there.

When you want to play the thing, you merely load it back to the original address.

If the program length is too long to allow Ramtop to be covered to a sensible level, the pirate merely needs to generate an error report — but how? Quite simply, he or she loads the block in using either a machine coded loader, as previously described, with a length speci-



PIRACY

fication set too high. On encountering insufficient bytes on the tape the computer would be put back into Basic, allowing the hacker to continue from there. Easy isn't it?

But you say, what if DF52 or ERR-SP had been previously set? If you remember, the save routine produces a report in the lower screen when actuated, and so no auto-run code block can have these mechanisms. Unless it is a headerless block!

What does one do if the program block occupies the full length of Ram from 16384 the start off screen Ram to 65535 P-Ramtop. Again machine code is resorted to, but this time a short program is written from within system variables to load the program as a headerless block from 16384 to 65535 but excluding those bytes occupied by the loader. Such programs, complete with headerless files are no longer rare.

All the mechanisms that I have described, and one or two I still have up my sleeve, cannot stop a potential pirate from connecting up two cassette recorders and simply dubbing the programs. What they do however is make life awkward for the hacker. It does nothing to stop the large scale criminal pirates who are the ones that actually defraud the companies of their money by copying tape to tape. I do not believe that schoolkids or hackers defraud the companies of much revenue, simply because I am sure they probably spend all their available pocket money on games anyway, and even if they do pirate a few copies, in most cases simply because they've already spent their money.

The cake is only so big. Is there a system then that is fair to the hacker that actually buys the tapes, but makes life awkward for the large-scale pirates? There is. Owners of Jet Set Willy by Software Projects, or Night Gunner by Digital Integration will have noticed a protection mechanism requiring the input of a code before the game could be played — once again it is easy to nullify such a mechanism but the long scale copiers who actually need to mimic both the game and cassette inserts need to go to extra trouble — perhaps they won't bother. Mathew Smith with his Jet Set Willy could have made life difficult for the hackers with headerless files and so on, but chose not too — and witness the result.

Immense interest was generated in his game leading to all manner of Pokes being published in many computer magazines, which I am sure generated more sales revenue in turn — free advertising. In conclusion then, what is the hackers view?

The hacker probably likes a bit of a challenge, but no unfriendly 48K headerless autorun code blocks. He likes to dabble around in the code, and may perhaps make a back up copy or two. How much does this defraud the software company? Not much. The only mechanisms so far which actually inhibits the large scale tape pirates is the colour code as seen in Jet Set Willy — and this is no obstacle for the hacker. So, 10 out of 10 for Mathew Smith and his fertile mind, I will certainly be looking out for his next offerings.

IMAGINE: WHAT WAS THE NAME OF THE GAME?

In 18 months Imagine shot from nowhere to the top and back again. Many blamed piracy for the collapse. Imagine's operations director Bruce Everiss disagrees...

THE POPULAR MISCONCEPTION of Merseyside is of a riotous Toxteth backing onto strike-bound docks. People see it as a fluke that the area has been the centre for pop music for the last 20 years. Now Liverpool's emergence as a leading force in the micro industry seems somewhat surreal.

The reality is that Merseyside has a fair share of the electronics industry with major companies such as Plessey and Marconi. The area also has an unfair share of traditional data processing with lots of big installations such as the National Giro, Royal Insurance, Littlewoods, the Ministry of Defence, BICC and Unilever. A further factor is the excellent reputation of the computer departments at Liverpool University and Liverpool Polytechnic and also the private sector training of computer staff at KBS.

Against this background it is not surprising that one of the first computer stores in Britain was set up in Liverpool and traded successfully in 1978. Microdigital's customers set up some of the earliest and most enthusiastic computer clubs in the country. Microdigital's staff often left to set up or work for new microcomputer firms, spawning an industry. Two well-known ex-Microdigital staff are Eugene Evans and Mark Butler. Microdigital was absorbed by Laskys in 1980 which resulted in yet more staff leaving to work elsewhere.

Among the Liverpool companies was one of the first games software houses, Bug-Byte, owned by Tony Baden and Tony Milner. Then, as now, the two Tonys ran their business cautiously, preferring safe gradual growth. Two staff at Bug-Byte, Mark Butler the sales manager and David Lawson a programmer, did not agree with this policy and sought a more aggressive approach.

Both were offered, and turned down, a share in the ownership of Bug-Byte. Due to the clash of personalities David Lawson was given notice in late 1982 followed by Mark Butler who left of his own volition. They formed Imagine Software.

Knocked on doors

David wrote a superb Galaxians/Invaders-type shoot-'em-up game, Arcadia, for the Vic-20 and Spectrum. Mark Butler knocked on doors and sold it. There was a shortage of software in the shops at Christmas 1982 which Imagine met by doing deals with duplicators and by trucking software all over the country. Arcadia went to number one and stayed there. Imagine invested the proceeds of its success in advertising and started a high-profile image that was to remain.

The economics of games software is like high-stakes gambling. To launch a game properly costs anything from £10,000 upwards

and if it fails all is lost. If it succeeds it is a licence to print money as the manufacturing cost is so low compared to the retail price. Through 1983 all Imagine releases succeeded and thus Imagine became the undisputed number one games software house.

David and Mark found themselves in a situation that they were not equipped to cope with, catapulted from obscurity to fame and fortune in a few short months. Realising this they sought advisors, both professional and management. This advice, by and large, made Imagine more successful still. Eventually, however, by taking wrong advice and ignoring sound council, decisions were made that led to the downfall of Imagine.

Mistake number one was that Mark and David believed that Imagine's success proved them to be good businessmen and that they could thus apply their talents to other businesses. Against advice they tried to run an advertising agency, Studio Sting, along with Steven Blower. They gave Steven 10 per cent of Imagine and in return each owned a third of Studio Sting. Studio Sting failed. The reasons behind the failure are many but include the following: First, the relationship between the two companies was never defined and areas of responsibility were never laid down; second, there was insufficient management resources to have any control over events or to institute systems; third, when things started going wrong the relationship between Steven and his co-owners broke down.

Mistake number two was not employing a professional accountant until just before the end, again against advice. This meant that there was insufficient financial control. It was not possible to discover whether anything was profitable or not. Money was spent without knowing whether it could be afforded. Funds were not available when they were most needed. Incoming invoices were paid without being checked.

In the beginning none of this mattered because there was no much profit to finance them — hence the downfall. The wages bill was over £50,000 a month, not because of high wages but because of the large number of employees.

The rents and rates bills were enormous because of the insistence on prestige and because of moving twice to bigger premises while still paying for the premises vacated. Comparatively little was spent on advertising.

Mistake number three was the refusal to manage technical staff. David Lawson insisted that programmers, artists and musicians were special and that any attempts of management would reduce productivity, obviously the reverse is true. While the administrative, sales marketing, accounts and warehouse staff were well managed and earned their salaries the technical staff could do as they pleased. This was excused on the basis that they worked at home or because discipline would reduce creativity. The reality was that it took over 50 technical staff to produce Imagine's products, usually late and usually with bugs still in them.

Mistake number four was to be taken in by their own publicity instead of reality. This is an obvious human failing but one which they were warned to guard against, especially as the publicity seemed to create a largely false picture. An example is to take a



Bruce Everiss and another, David Lawson, were "catapulted from obscurity to fame and fortune in a few short months."



Operations director
Bruce Everiss:
"The economics
of games
software is
like high-stakes
gambling."

programmer and make him famous; after that no matter how good he is at his job he is held in esteem because of his publicity.

Mistake number five was the Marshall Cavendish project to produce 26 games across five machines — this was worth as much as £11 million to Imagine over two years. The first problem was not to give these games sufficient priority, thus losing the contract. The second problem was keeping on the staff and therefore the overheads after losing the contract.

Mistake number six was the Megagames. After six months work and at a cost of several hundred thousand pounds the games were nowhere near completion. It was obvious that Imagine could not afford the cost of writing them never mind the cost of mass-producing the special hardware necessary. Despite this Imagine's best resources were committed at the expense of producing any good "ordinary" games to pay to keep the company going.

Internal politics

Mistake number seven was allowing internal politics to flourish. The tougher things became the worse were the politics with certain people looking after their own naked ambition at the expense of the company. Certain wives were allowed to interfere at will with the running of the company. It became difficult for staff to identify the motives behind actions.

Despite the meteoric rise and fall of Imagine, some good things have come out of it. Imagine created the market as we now know it. By deliberately having a high profile and with the use of hype, especially in the national daily press, the games software industry was born. Prior to Imagine the industry was small and fragmented with its products appealing to a small specialist audience. Imagine popularised the industry and created a switch in consumer spend. The industry has gone from mail order

to high street multiples.

Imagine led with product quality. Look at a few pre-Imagine games and be amazed at their crudity. Imagine set standards in playability, originality and use of graphics and sound that were quickly imitated by the whole industry. When Ultimate got ahead in graphics quality Imagine responded by employing professional artists to produce the bit patterns.

Imagine was departmentalised with clearly defined areas of responsibility and a well-developed management reporting system. The rest of the industry has largely followed suit.

Imagine showed the way with marketing software as a mass consumer product: Good PR is essential these days — Imagine was the first. Every new advertising idea was subsequently copied as were the insert cards.

Imagine had the first professional sales team with a sales manager, telesales and export telesales, sales and market research and an export manager. For the first six months turnover at least doubled each month. Eventually, well over half all sales were from export.

Imagine was developing a new type of product that was enjoyable as a game but which educated the player. The first such product, Sidney Meets His Match, was completed but never marketed.

Imagine was starting with the use of professional psychologists to look at game playing *per se*. By looking at the motivation the hope was to produce more playable, more addictive games.

Imagine's contribution

Imagine was looking at alternative input devices including electrodes to monitor brain waves and thus allow thought control of games.

The best thing to come out of Imagine is not yet obvious. Time will surely show that those people who worked at Imagine have a lot more to contribute to the microcomputer industry. Already, there are former staff working for Ocean, Bug-Byte and Software Projects using knowledge and skills gained while at Imagine. Many former staff have now formed their own companies doing what they did at Imagine but reaping the rewards for themselves.

Already, there are at least five new companies on Merseyside composed of these people. It is too early for any of them to have made their mark but there is little doubt that they will. A small flock of Phoenix rising from the ashes of Imagine.

NEWS

Issue 1 March 1984

IMAGINE -

A SOFTWARE SUCCESS STORY

A year after its formation in the front room of a Merseyside house, Imagine Software Limited has mushroomed into the world's largest independent company in the fast-moving world of home computer games.

...a £35,000 a year earning potential after Imagine's launch of his 'Wacky Waiters' for the VIC.

Other 'top ten' games have followed in quick succession. There have been 'cuties' like 'Ah Diddums' and 'Molar Maul' for the Spectrum, arcade-style blasters such as 'Zzoom' and 'Zip Zap' for the Spectrum, and the occasional outstanding game bought-in from other programmers, such as 'Jump' for the Spectrum (now re-released on Atari) and...

...were among the first to use the processing power of the Apple II to rapid program development. This has now been superceded by use of Sage 'super-micros' with disk storage and the ability to line and simplify highly complex machine code routines.

Imagine also employ their time professional artists and to work with programmers in the visual and aural new games.

For the future, Imagine...

Program 1.

```

100 REM PROGRAM ONE : (C) AM CAPLE 1984
170 POKE53280,6:POKE53281,6:PRINT"GENERATING CODE"
180 PRINT"PLEASE WAIT"
185 PRINT"DONE" :TAB(17):"LINES":TAB(31):"TO DO" :178
190 LN=10000:ER=0:AD=49152
200 F=0:READA$:IFA$="END"THENPRINT"CODE OK":END
210 IFLEN(A$)<24THENPRINT"WRONG NUMBER OF DIGITS":GOTO300
220 T=0:L=4:GOSUB900:IFERTHEN900
230 IFAD<0THENPRINT"BAD ADDRESS":GOTO300
240 L=L+1:N=0
250 GOSUB900:IFERTHEN900
260 POKEAD+N,D:N=N+1:IFN<8THEN250
270 TL=T:L=4:GOSUB900:IFERTHEN900
280 IFTL<0THENPRINT"CHECK SUM":GOTO300
290 LN=LN+10:AD=AD+8:K=LN/10-1000
300 PRINT"IT":TAB(4):K:"":TAB(36):178:K:"":GOTO200
800 PRINT"ERROR":PRINT"DATA":A$
810 PRINTTAB(F+10):"1":PRINT"1"
820 POKE53280,2:POKE53280,4:GOTO820
900 C=L:D=0:FORG=1TOL:F=F+1:D=MID$(A$,F,1)
910 IFD<"0"ORD$>"9"OR(D$>"9")AND(D$<"A")THENPRINT"ILLEGAL DIGIT":ER=-1:RETURN
920 Q=ASC(D$)-48+7*(D$>"9"):T=T+Q:D=16*D+Q:NEXT:RETURN

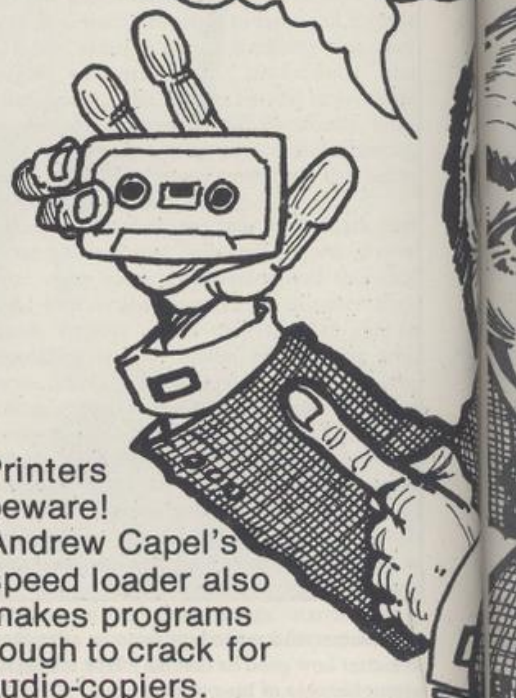
```

```

10000 DATAC00078D0D0DCA900D0F000F
10010 DATAC000DCAE06DCA07DCA900AD
10020 DATAC01059D0FDCAD20D049008B
10030 DATAC01001D0D0D0C3D008E00071
10040 DATAC020EE9011E0C20D0DA50078
10050 DATAC0208E1059C602A900850077
10060 DATAC0308F4C84C080CF90530088
10070 DATAC030A5E3016A527C5200079
10080 DATAC040B009A900852685270062
10090 DATAC0484C84C0C6E8A90E8D009E
10100 DATAC05020D0E0C3668B068F0087
10110 DATAC050D02A8A8F9A08858F0096
10120 DATAC060A5E349FA629F007090
10130 DATAC060D1FBD08F4C71C0910097
10140 DATAC070FBA6FBE4FD006A500A7
10150 DATAC078FCC5FEF0B0E86F00BC
10160 DATAC080D002E6FC68A869A0094
10170 DATAC080E85840A58309CE0008C
10180 DATAC09026D0F1E6274C84C0007F
10190 DATAC090A01B20A7C49005A90077
10200 DATAC0A00F85026A0D20D085007C
10210 DATAC0A82A9038D20D0A900077
10220 DATAC0B085E8526852785020074
10230 DATAC0B8A908858FA97F8D0D0A9
10240 DATAC0C0D0C0D0D0DCA900D0E00A3
10250 DATAC0C0D0C0D0FDC9A008D0500A3
10260 DATAC0D0DCA910D0D04CA9FF00A9
10270 DATAC0D8D07DC8D06DCAD1400A6
10280 DATAC0E0038D9F02AD15038D0081
10290 DATAC0E8A002A9008D1403A90071
10300 DATAC0F0C08D1503A80129DF007C
10310 DATAC0F88501A9018D0EDCA90094
10320 DATAC100598D0FDC9A008D0D0096
10330 DATAC108DC50A58F3008AD010087
10340 DATAC110DC30F7A91E859EC60098
10350 DATAC110278A9008D0EDC8D0088
10360 DATAC1200FDC9A97F8D0DCA900A6
10370 DATAC128818D0D0C20CE558008C
10380 DATAC130A52A8C901D008593006E
10390 DATAC138A588D901F005A930081
10400 DATAC1404CEDF586C184C2AD009C
10410 DATAC14801DC10FBA53349010077
10420 DATAC150290118691C859E8D0071
10430 DATAC158FFC9C487F024B1800A5
10440 DATAC160C93AD0F52077C4800081
10450 DATAC16805204FC4B006A900074
10460 DATAC170384C39C2A5885C10085
10470 DATAC178A58C85C2A5B929FE00A5
10480 DATAC18085B9A93C85FA9500097
10490 DATAC18885FAD90385FC85FE00A6
10500 DATAC190A90F8528A9008529007A
10510 DATAC1982099C0A50210034C0062
10520 DATAC1A030C2A063202FF1A00068
10530 DATAC1A800B9410320D2FFC8007E
10540 DATAC1B0C01D0F5A202A93A0074
10550 DATAC1B8204CC2A204A92D00074
10560 DATAC1C04CC2A0FFC80487F000A4
10570 DATAC1C812B1B8C93AF00C0008F
10580 DATAC1D01080F1D94103F8EC007D
10590 DATAC1D84C82C1A000B93D03007A
10600 DATAC1E099FB00C8004D0F5008C
10610 DATAC1E8AD3C034A05892901007F
10620 DATAC1F0D026A5C185FBA5C20091
10630 DATAC1F885FCAD0F3F0338D3D00A6
10640 DATAC2000385FAD400B3D3E0084
10650 DATAC2088385FAD400B1865FD009C
10660 DATAC21085FAD5FC65FE65FE00B4
10670 DATAC218A5938529A5F85C1008F
10680 DATAC220A5FE85C2A90485280085
10690 DATAC2282098C0A05020D0C0071
10700 DATAC2302019C456029007A50059
10710 DATAC2383EAE2DA4E6020EA008D
10720 DATAC240C4A5B92902D0F2A60080
10730 DATAC248C1A4C26048A92020006C
10740 DATAC250D2FF6820D2FFA9200092
10750 DATAC25820D2FF8A92420D2FF0092
10760 DATAC260D3C03206DC2CBED008F
10770 DATAC2683C034C6DC248A4A0087
10780 DATAC2704A4A2078C268290F0078

```

TENSE, NERVOUS
WAITING FOR YOU
NOTHING LOADS
QUICK LO



Printers
beware!
Andrew Capel's
speed loader also
makes programs
tough to crack for
audio-copiers.

VFL is an alternative Datassette communications program for the CBM-64. Not only does VFL improve on speed and reliability but on versatility as well. It runs in approximately 1.5K bytes, and fluctuates between 1,500 and 3,000 baud giving an average of roughly 2,200 baud for an evenly distributed file.

Here is a list of VFL's features:

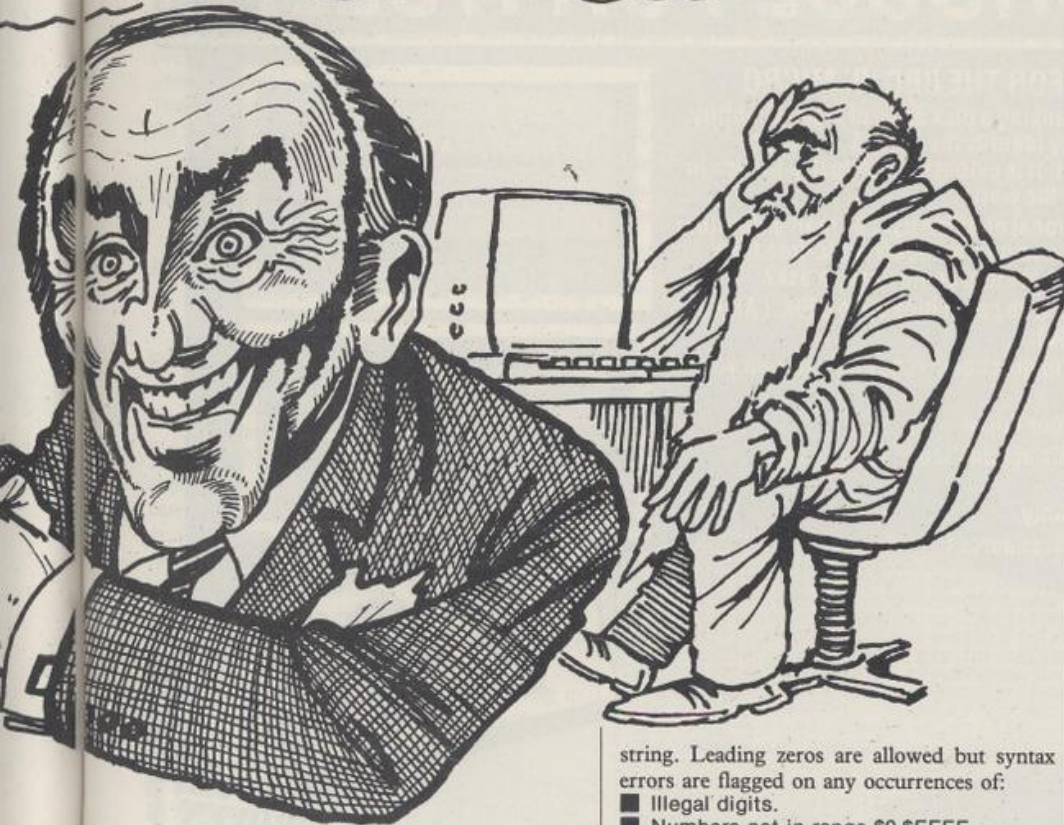
- Communicates up to 9.5 times faster than the normal kernel routines.
- Runs directly from Basic replacing the original CBM V2 Load, Save and Verify commands.
- Code may be saved within the routine to machine code.
- Code may be force-loaded to any specified location.
- Invisible loading facility, preserving the variable pointers.
- Full error reports.
- Occupies no Basic program area.
- May be called in machine code using the standard kernel routine addresses and formats.
- Visual and audio task completion signals.

```

11580 DATAC4F0C38D0D04A9408D010081
11590 DATAC4F8D4A900A9FF8D02D400A4
11600 DATAC500A9078D03D48D05D4007F
11610 DATAC500A9F9D06D4A9418D009D
11620 DATAC51004D4A9408D04D4100071
11630 DATAC5180A90685C0A50109006E
11640 DATAC520209501A90D20D2FF0072
11650 DATAC52860A9C68D3003A9C10078
11660 DATAC5308D3103A978B8D32030072
11670 DATAC538A9C32D330360AD9F0091
11680 DATAC540028D1403AD0028D006C
11690 DATAC5481503A9258D04DC90085
11700 DATAC550400D05DC9018D0E0024
11710 DATAC558DC60A90085B885B0091
11720 DATAC560A90185BA998385B008E
11730 DATAC568A9C558CA90C85B700A5
11740 DATAC570A90085FBA9C085FC0089
11750 DATAC578A28FA0C8A9F20D000A2
11760 DATAC580FF186056464C20420074
11770 DATAC5884F440520312E3000005E
11780 DATAEND

```


US FED-UP WITH GROWING OLD
YOUR COMMODORE? REMEMBER,
ADS FASTER THAN 'YC'
LOAD.



- Full motor control.
- Retains video output.

To link the new routines to the operating system the system vectors ILoad and ISave must be altered. A small program within VFL changes these vectors and may be called by:
SYS 50473

Once ILoad and ISave have been changed Basic will call on VFL until:

- Obviously power down.
- A system restore is called.
- A 6510 BRK instruction is executed.

In cases two and three the system call above will rechain VFL. Case one poses much more of a problem.

SAVE
SYNTAX:

SAVE [<FILE-NAME STRING>],
[<DEVICE NUMBER>],
[<SECONDARY ADDRESS
NUMBER>]

DEFAULT : NULL STRING,1,0

Only the first 16 characters of the file-name are saved on the header. Names shorter than the limit are padded with trailing spaces. When a colon is included anywhere in the file-name string it will signal the end of the file-name and the presence of two numeric parameters. These two numbers represent the addresses of the first and last bytes sent to the Datasette.

They should be written in hexadecimal, prefixed by a dollar sign and separated by a dash. Spaces are permitted between the colon and the first dollar sign, the last digit of the first number and the dash, the dash and the second dollar sign and between the last digit of the second number and the end of the file-name

string. Leading zeros are allowed but syntax errors are flagged on any occurrences of:

- Illegal digits.
- Numbers not in range \$0-\$FFFF.
- Second number is less than the first.
- Any character other than a space

between the colon and first number, first number and dash etc.

The secondary address number:

Bit 0 = 0 code relocatable on load

Bit 0 = 1 code may not be relocated and is always loaded back at the address from which it was saved.

Once your command has been accepted the usual motor tests are performed, which may result in a prompt. When the appropriate keys are closed VFL pauses for a second to allow the Datasette to reach operating speed. While the header tone is being sent the border displays static, red and cyan bars. When data is being transmitted the bars are more active, are narrower, and change to light grey and light blue. When all the data has been despatched a tone will sound and the motor is stopped. An example is:

SAVE"FRED:\$8000-\$8000",1,1

This saves one byte from address 32768 with a file-name of Fred (+ 12 spaces) and protects it from force-loading.

LOAD/VERIFY

SYNTAX:

LOAD [<FILE-NAME STRING>],
[<DEVICE NUMBER>],
[<SECONDARY ADDRESS
NUMBER>]

DEFAULT : NULL STRING,1,0

The file-names on the cassette are only compared as far as the length of the file-name in memory up to a maximum of 16 characters. Any characters over this limit will be ignored but no error will be generated. If a program is saved by typing:

SAVE"HERBIDATIOUS"

it may be loaded by typing:

LOAD"HERBI"

Again a colon is significant, but in this case only one number is expected by the syntax.

(continued on page 81)

CBM-64 QUICK LOADER

The preloader.

```
10 REM* PRELOADER : (C) AM. CAPLE 1984
20 P=PEEK(2054):IFP=43THEN80
30 POKE2054,P+1:POKE53280,6:POKE53281,6
40 PRINT"*****VFL IS LOADING"
50 FORF=1TO2000:NEXT:PRINT"X"
60 POKE56,207:POKE52,207
70 LOAD"":1,1
80 PRINT"*****VFL HAS LOADED:38":SYS50473
90 POKE56,160:POKE52,160:NEW
```

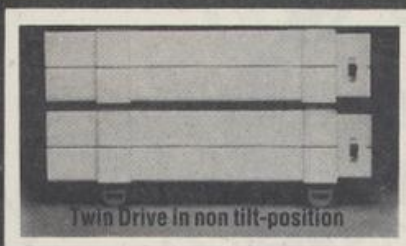

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FD-55F* DS 80TK 400K	£309.35		
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FD-55B DS 40TK 200K	£342.70		
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A black and white cartoon illustration. In the foreground, a man with a large, expressive face, wearing a dark suit and tie, is smiling broadly while holding a video camera up to his eye. In the background, another man is sitting at a desk, looking down at a computer monitor. The style is a simple line drawing with some cross-hatching for shading.

```

10 REM PROGRAM TWO (C) AM CAPLE 1984
20 POKE53280,6:POKE53281,6:PRINT"***";
100 DIMI$(56):FORF=0TO56:READI$(F):NEXT:DIMC$(15)
101 C$(0)="-4E514[414E2X2[404E0X3[44E1X1[4"
102 C$(1)="-":E614[414E7X7[404E9[444E8X8[4"
103 C$(2)="-715514[4142X2J2[41440J3[4141J1[4"
104 C$(3)="-*:$614[4144X7J7[40459[41445X8J8[4"
105 C$(4)="-L4:514[414142C2[4F4:0C3[441:1C1[4"
106 C$(5)="-":614[414147C7[424:91[414[4148C8[4"
107 C$(6)="-M4#514[4144#2K2[4H#0K3[44;#1K1[4"
108 C$(7)="-/:#614[4144#7K7[404#9[41444#8K8[4"
109 C$(8)="-[4R514[414T2R2S2[494[4X4[41T1R1S1[4"
110 C$(9)="-&:R614[414T7R7S[424R9Y4[4144R814[4"
111 C$(10)="-B055A014B202R2[4V400U4[4B101R1[4"
112 C$(11)="-^:0614[414B707A[414309W4[4B008A9[4"
113 C$(12)="-6045[414624272[444084[4614171[4"
114 C$(13)="-+:46[41444777[41449[414444978[4"
115 C$(14)="-50N5[41445N2;2[44N0D4[451N1;1[4"
116 C$(15)="-<:N6[41414N7;7[44N9[414414N8;8[4":DIMM(12):FORF=0TO12:READM(F):NEXT
200 PRINT"*** DIS-ASSEMBLER (C) AMC 1984 ***"
205 INPUT"START ADDRESS ..... 49152#####":AD
210 INPUT"END ADDRESS ..... 50576#####":EN
220 INPUT"OUTPUT DEVICE NUMBER ..... 3####":DE
230 INPUT"SECONDARY ADDRESS ..... 0####":SA:OPEN4,DE,SA
335 PRINT#4:PRINT#4," DISASSEMBLY OF":AD;"TO":EN:PRINT#4
250 D=AD:L=4:GOSUB8000:L=2:0$="" $+=D$+" "
260 D=PEEK(AD):F$=MID$(C$(INT(D/16)),(DAND15)*2+1,2):MD=ASC(RIGHT$(F$,1))-48
270 GOSUB8000:D$=D$+D$:V$="" N=M(MD)
280 FORG=1TO2:IFN=0THEN0$=0$+" " :GOTO291
290 AD=AD+1:D=PEEK(AD):GOSUB8000:0$=0$+" "+D$:V$=D$+V$:N=N-1
291 NEXT:0$ND+1GOTO350,350,350,355,370,310,320,330,330,340,300,300,305,340
300 D=PEEK(AD):D=AD+1+G*(0/127)*256:L=4:GOSUB8000:L=2:V$="$"+D$:GOTO370
305 V$="$"+V$+" "
310 V$="$"+V$+"X":GOTO370
320 V$="$"+V$+"Y":GOTO370
330 V$="$"+V$+"X":GOTO370
340 V$="$"+V$+"Y":GOTO370
350 V$="$"+V$:GOTO370
355 V$="R":GOTO370
360 V$="B":GOTO370
370 PRINT#4,0$:"":I$(ASC(F$)-35):":V$:IFADCENTHENAD=AD+1:GOTO250
380 PRINT#4:PRINT#4," OK FINISHED":PRINT#4:CLOSE4:END
9000 D$="" :FORF=1TO1:D$=D/16:R=D-16*DX+48:D=D\X:IFR>57THENR=R+7
9010 D=CHR$(R)+D$:NEXT:RETURN
9000 DATARC,AND,ASL,BCC,BCS,BEQ,BIT,BMI,BNE,BPL,BRK,BVC,BVS,CLC,CLD,CLI,CLV
9010 DATACM,CFX,CPY,DEC,DEY,DEI,EOR,INC,INX,INY,JMP,JSR,LDA,LDX,LDR,LSS,NOP
9020 DATARA,PHA,PHF,PLA,PLP,ROL,ROP,RTI,RTS,SBC,SED,SEI,STA,STX,TAX
9030 DATATY,TSX,TXA,TXS,TYA,???
9040 DATA1,2,1,0,0,1,1,1,2,2,1,2,1

```

Program 2 may be used to disassemble the object code. If you use this routine to debug the code file, note that there should be no invalid op-codes before the address 50568 decimal (\$C588 hex).



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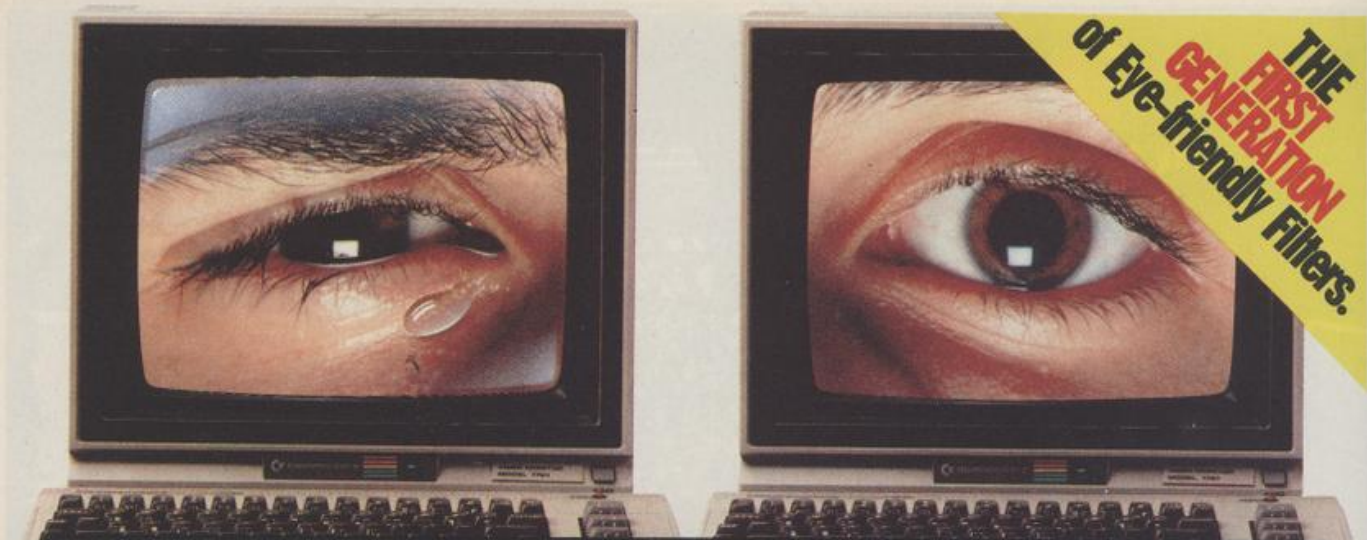
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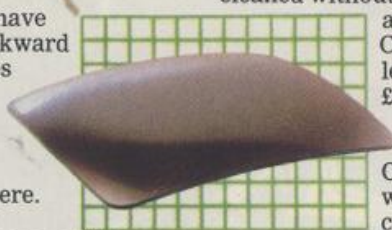
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ROAD FROG by courtesy of Ocean Software.

MTA 4628

EVERYTHING is going wrong for Professor Hilfe today. First, he leaves his laboratory after a bad day's work to get a bite to eat. When he returns, it is only to find that he left the power on, connected to his experiment. The circuitry has overheated, and caused his generators to fail, sending massive power surges throughout the laboratory. This has caused a fire to break out, and if that wasn't enough, it has somehow caused all his chemical apparatus to come alive!

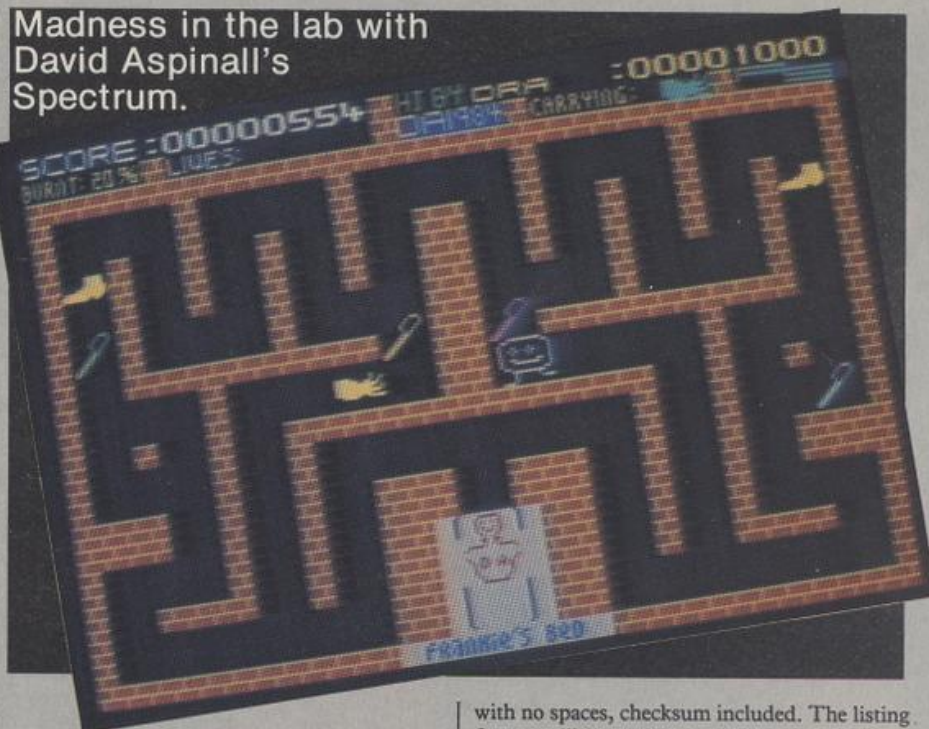
But, all is not lost for Hilfe. For the main pieces of his pride and joy, Frankie his robot, are still intact, although scattered around. If he could just manage to carry each piece, one at a time to Frankie's bed then his life's work might be saved. But will it all end there? You have to guide Professor Hilfe around his laboratory, avoiding Barmy Bunsens, Crazy Conicals, Terrible Test-tubes and the like, taking one part of Frankie at a time to his bed.

I have written a special loader for typing in the hex codes, which are extensively checksummed. Another problem created in the writing of this program, is that the code isn't all in one place. In fact roughly two-thirds of it is above RAMtop, and the rest below: 3K in a Rem line and a further 118 bytes crammed into the printer buffer. For this reason, we will have to modify the hex loader twice to put the code in place.

So, first things first. It is best to have at least one totally blank short tape on which to put the finished product, and another on which to store the hexloaders and half-finished efforts. I shall now detail the procedure step by step:

ALIQUID

Madness in the lab with David Aspinall's Spectrum.



SIMPLEX

1. Type in the loader program for the finished game, but don't run it. Save this at the beginning of your blank tape, using
SAVE "ALIQUID" LINE 1

2. New the computer, type
CLEAR 26969

and enter the first version of the hexloader. Save this on another tape.

3. Now start typing in the main bulk of the machine code, from Dump 1. If at any time you wish to stop and start again later, type 5 and then save the program on the other, non-finalised tape. Enter the hex digits one row at a time



Loader program for finished games.

```
10 BORDER 0: PAPER 0: INK 0: C
LEAR 26970: PRINT INK 7: AT 10,1:
"ALIQUID SIMPLEX IS LOADING..."
AT 8,10: INK 5: "PLEASE WAIT": AT
0,0: LOAD ""CODE": LOAD ""CODE
LOAD ""
```

The hexloader.

```
5 DEF FN H(H$)=16*(CODE H$(1)
-48-(7 AND H$(1)>"9"))+CODE H$(2)
-48-(7 AND H$(2)>"9")
10 FOR N=26970 TO 32767 STEP 8
12 PRINT N: LET C=0: POKE 236
58,8: INPUT LINE H$
14 IF H$="5" THEN GO TO 100
16 IF H$="E" THEN STOP
20 IF LEN H$>18 THEN PRINT "
ERROR": BEEP .1,-10: GO TO 12
22 FOR M=0 TO 7
24 POKE N+M, FN H$(M+2+1 TO M
+2+2): LET C=C+PEEK (N+M)
26 PRINT " ": H$(M+2+1 TO M+2+2
);
```

```
28 NEXT M
30 IF FN H$(17 TO 18)=C-255
+INT (C/255) THEN PRINT "=";H$(1
7 TO 18): NEXT N: PRINT "O.K."
1" STOP
32 PRINT "ERROR": BEEP .1,0:
GO TO 12
100 SAVE "SO FAR" LINE 120: SAV
E "AS CODE SO FAR"CODE 26970,N-2
6969
110 PRINT "SAVED...": STOP
120 RANDOMISE N: CLEAR 26969: L
OAD ""CODE": LET N=PEEK 23670+25
5*PEEK 23671: CLS: GO TO 12
```

The Rem creator.

```
10 FOR N=32600 TO 32644: READ
A: POKE N,A: NEXT N: RANDOMISE U
SR 32600: PRINT "NOW DELETE L&N
ES 10 AND 100"
100 DATA 33,202,92,1,145,11,205
85,22,33,203,92,34,93,95,11,205
85,14,11,30,80,3,94,11,205,90,10
234,1,1,1,30,80,3,94,11,205,90,10
177,30,203,92,34,10,201
```

with no spaces, checksum included. The listing format will be the same as it is here. If at any time a checksum doesn't correspond to the total modulus 256 of the eight other bytes entered, a Beep will sound, and you will get the same prompt address to enter that row again.

4. Once you have finished this, the loader will end, and you can save the resultant code after the loader program on the finalised tape:
SAVE "MC"CODE 26970,5798

5. Now edit the following lines of the hex-loader and change them to:

```
10 FOR N=23363 TO 23481 STEP 8
100 SAVE "SO FAR" LINE 120:
SAVE"XDAT"CODE 23363,118
120 RANDOMISE N: LOAD""CODE:
GOTO 12
```

6. Run the hexloader again, and enter the data from Dump 2, the printer buffer data. When this is all correct, type:

```
SAVE "XDAT"CODE 23363, 118
and record on to the finalised tape.

```

7. Next, edit the hexloader again:

```
10 FOR N=29800 TO 32755
100 SAVE "AS SO FAR"CODE 29800,
N-29799
120 RANDOMISE N: CLEAR 29799: LOAD
""CODE: LETN=PEEK
23670+256*PEEK
23671: CLS: GOTO 12
```

8. Now type as a direct command
CLEAR 29799: RUN

and enter the codes from Dump 3, once again use S to save a partly finished version.

9. After you have finished this, do not save it on the finalised tape but the other one, and with:

```
SAVE"REMLINE"CODE 29800,2955
```

10. Now pull out the plug or otherwise clear the computer, and type in the Rem creator program; take care with the machine code in

(continued on page 87)

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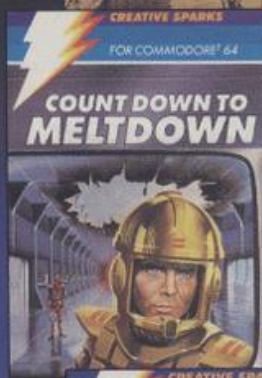
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3. The Rem will now not list properly, and

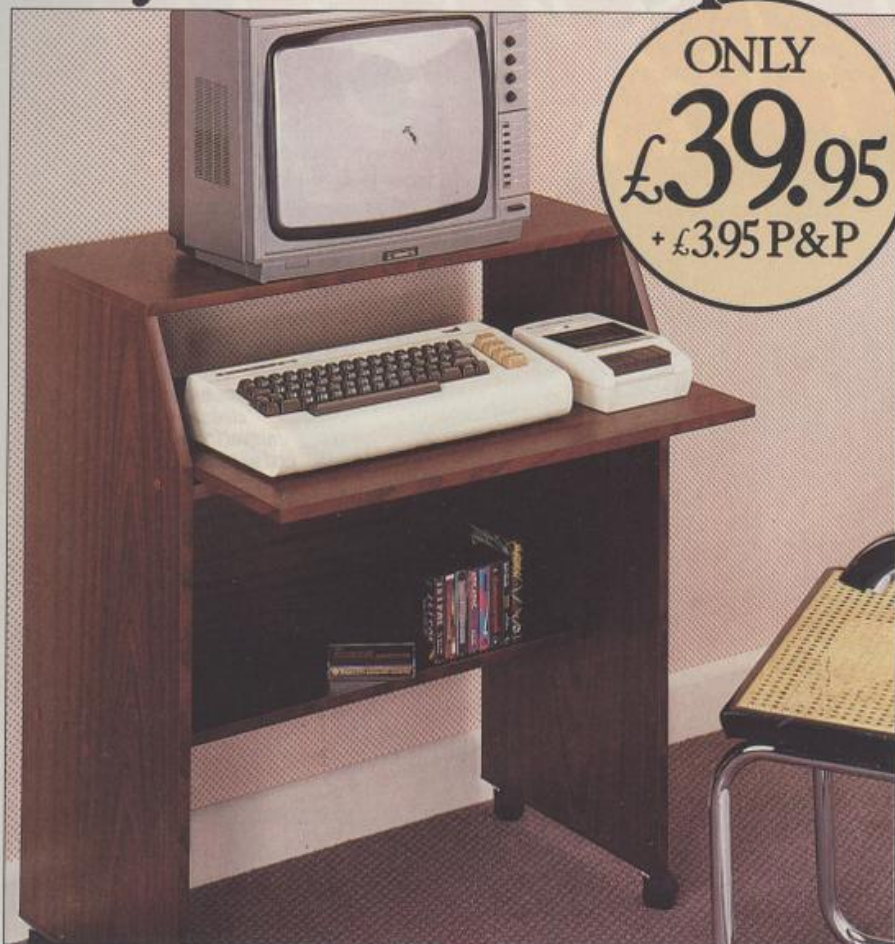
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GUNNER

THE OBJECT of Gunner is to stop the planes from passing over, towards their destination which is your local city.

You may rotate the gun 360 degrees to scan for the enemy planes which come screaming towards you in a 3D perspective form. When they are visible you must shoot them down with your gun sights which could be difficult,

as they swerve and sweep and have a few pot shots at you as they go.

Unfortunately your guns can only withstand three hits resulting in destruction or, if you let 10 planes pass, you are retired from your position due to total destruction of your city.

Hit those planes before their air-to-ground missiles hit you in Tim Humphries BBC game.

1058R **** By Tim Humphries 1984 ****

```

20TX=RD(1-31)*H2X=500
30ENVELOPE1,3,0,0,0,0,0,0,121,-10,-5,-2,120,120
40ENVELOPE2,133,0,1,1,-10,0,0,121,-10,-10,-8,126,0
50VDU23,240,128,192,160,144,156,167,196,255,23,241,7,12,20,39,228,148,140,255
23,248,16,16,16,256,16,16,16,0,23,254,60,126,255,255,255,255,126,60
60VDU23,250,0,0,0,48,48,48,0,23,255,255,255,255,255,255,255,23,248
0,0,0,16,56,254,255,255,23,246,0,0,0,56,60,127,255,255,23,247,0,0,0,0,255,255
255
70VDU23,233,0,0,0,0,0,0,24,24,23,234,0,0,0,0,24,60,60,60,23,235,0,0,0,24,60,6
0,126,60,23,236,0,0,56,124,56,124,254,124,23,237,0,60,126,126,60,126,255,126,23
238,60,126,126,60,126,255,255,126
80FORJX=230T0232:VDU23,JX,RND(255),RND(255),RND(255),RND(255),RND(255),RND(255)
5),RND(255),RND(255):NEXT
90DIR CX(30),CY(30),AX(4),FORKX=0T030:CY(X)=1+30*CDOS(X/158P1):CY(X)=1+
30*IN(X/158P1):NEXT
100MODE7:VDU23:8202:0:0:0:FORIX=0T01:PRINTAB(0,IX):CHR#141:CHR#132:CHR#157:B
PC13:CHR#131:"GUNNER":NEXT
110PRINTAB(0,23):CHR#129:CHR#157:CHR#135:" By Tim Humphries":TAB(24):"Copyri
ght 1984"
120PRINTAB(15,4):CHR#130:"Keys :":TAB(6,7):CHR#129:"LEFT":CHR#131:" - " :TAB(6,9):CHR#129:"RIGHT":CHR#131:" " :TAB(6,11):CHR#129:"LP":CHR#131:" " :TAB(6,13):CHR#129:"DOWN":CHR#131:" " :TAB(6,15):CHR#129:"FIRE"
130PRINTCHR#131:"
RETURN":TAB(5,18):CHR#130:"OR Joystick":TAB(0,22):CHR#
132:CHR#157:SPC2:CHR#136:CHR#135:"PRESS SPACE OR FIRE TO START":PROCKJ
140MODE2:VDU23:8202:0:0:0:
150VDU19,0,6:0:19,15,0:0:19,13,0:0:19,14,4:0:19,5,7:0:
160GCOL0,2:MOVE0,0:MOVE1279,0:PLOT85,0,600:PLOT85,1279,600:GCOL0,4:MOVE0,605:D
RAW1279,605
170BS=STRINGS(20,CHR#247)
180FORX=0T020:BS=BS+CHR#(244+RND(3)):NEXT
190BS=BS+CHR#241+CHR#240+CHR#241+CHR#240:BSX=10:FORKX=0T020:BS=BS+CHR#(244+RND
(3)):NEXT:BS=BS+STRINGS(20,CHR#247)
200TX=700:BX=0:HTX=2:PLX=0:PROCCrs
210PROCLsc
220GCOL0,1:FORJX=0T020:MOVE639,0:MOVE639+680*CDOS(JX/208P1),0+200*SIN(JX/208P1)
PLOT85,639+680*CDOS(JX/11/208P1),0+200*SIN(JX/11/208P1):NEXT
230FORIX=0T012:VDU19,1,1:0:0:0:VDU19,9,4:0:0:
240CX=9:FORJX=0T070:GCOL0,CX:MOVE639,0:DRAW639+680*CDOS(JX/708P1),0+200*SIN(JX/
708P1):CX=CX+1:IFCX=13:CX=9
250NEXT
260CX=9
270GCOL0,4:MOVE300,0:MOVE350,300:PLOT85,979,0:PLOT85,979,300:MOVE500,300:MOVE5
20,450:PLOT85,560,300:PLOT85,570,450:MOVE780,300:MOVE756,450:PLOT85,720,300:PLOT
85,710,450:GCOL0,13:MOVE300,0:DRAW350,300:DRAW929,300:DRAW979,0
280MOVE570,0:DRAW580,140:DRAW700,140:DRAW710,0
290MOVE430,0:DRAW460,300:MOVE490,0:DRAW519,300:GCOL0,6:MOVE460,0:MOVE470,150:P
LOT85,550,0:PLOT85,550,150:MOVE520,0:MOVE510,150:PLOT85,740,0:PLOT85,740,150
300GCOL0,3:MOVE480,150:VDU5,254,4:MOVE750,150:VDU5,254,4:GCOL0,13:MOVE500,110:
DRAW500,80:MOVE770,110:DRAW770,80:COLOUR3:PRINTAB(15,0):H2X
310AX(0):MOI:AX(1)=15:AX(2)=8:AX(3)=21:AX(4)=24:CPX=250:TX=RD(4096):X=X-(1408)
YX=620+RND(200):Y=0:0:0:RX=0:EX=0:MX=3
320SOUND1,-15,150,1:FORIX=0T0500:NEXT:SOUND1,-15,150,1
330COLOUR14:PRINTAB(8,18):VDU255,9,9,255
340PROCLane
350COLOUR13
360REPEAT
370IFHTX(0PROCCend:PROCHsc:60T0270
380PROCLane
390IFEX=1:PROCCpini:60T0450
400JX=JX+G:G=0.005
410IFRND(10)=5:RND(3)-2:FORX=0T04:AX(0)=AX(0)+RX:NEXT
420YX=X-(R3X(320)):YX=Y+(44J)
430SOUND14,-(384),98,10
440IFJ:2:IFRND(10)=2:PROCCp

```

```

450FORX=0T04:IFAX(0X)=29AX(0X)=0
460IFAX(0X)=0AX(0X)=29
470NEXT
480IFJX=1:PROCCpini:60T0530
490IFINKEY=98:XX=XX+64:BGX=BGX-1:PROCLsc:CX=CX-1
500IFINKEY=67XX=XX-64:BGX=BGX+1:PROCLsc:CX=CX+1
510IFINKEY=73ANDTX<1040:PROCCr:TX=TX+16:PROCCr
520IFINKEY=105ANDTX<670:PROCCr:TX=TX+16:PROCCr
530IFCX=12:CX=9:VDU19,12,1:0:0:0:IFCX=9CX=12:VDU19,9,1:0:
540VDU19,CX,4:0:19,CX-1,1:0:0:IFCX=13:VDU19,CX+1,1:0:0:ELSEVDU19,15,0:0:
550IFXX=1408X=256:SEIFXX=256X=1408
560IFXX<0ANDXX<1279ANDMX<0COLOUR3:PRINTAB(0,0):"IN RANGE":MX=0
570IFXX<0ANDMX<1COLOUR3:PRINTAB(0,0):"TO LEFT":MX=-1
580IFXX<1279ANDMX<1COLOUR3:PRINTAB(0,0):"TO RIGHT":MX=1
590PROCCpini
600IFJX=1AND(ADVAL(0)AND1)=1:PROCCr:ELSEIFINKEY=74:PROCCr
610IFEX=2:PROCCpini:SOUND0,-15,100,50:GCOL3,1:FORKX=0T0200:MOVEX,YX:VDUS,(229+
RND(33)),4:NEXT:GCOL0,2:MOVEX,YX:VDUS,255,4:YX=2000:XX=4000
620UNTILYX>1100
630FX15,0
640IFXX<2000:PLX=PLX+1:FORKX=-12T00:SOUND0,KX,98,2:NEXT:COLOUR1:PRINTAB(0,0):P
LX:" PLANES":AX=INKEY(200):IFPLX=10:PROCCend:PROCHsc:60T0270
650PROCCpini
660GOT0310
670DEFFPROCCr
680JX=ADVAL(1)/65520+10:JRX=ADVAL(2)/65520+10
690IFJX>7XX=XX+64:BGX=BGX-1:PROCLsc:CX=CX-1
700IFJX<3XX=XX-64:BGX=BGX+1:PROCLsc:CX=CX+1
710IFJRX<3ANDTX<670:PROCCr:TX=TX+16:PROCCr
720IFJRX>7ANDTX<1023:PROCCr:TX=TX+16:PROCCr
730ENDPROC
740DEFFPROCCpini
750GCOL3,15:MOVEX+CX(AX(0)):JX,YX+CY(AX(0)):JX:DRAWX+CX(AX(1)):JX,YX+CY(AX(
1)):JX:MOVEX,YX:DRAWX+CX(AX(2)):JX(3/2),YX+CY(AX(2)):JX(3/2):ENDPROC
760DEFFPROCLsc
770COLOUR2
780IFBGX=1BGX=65:ELSEIFBGX=65BGX=1
790PRINTAB(0,12):MID$(BS,BGX,20)
800ENDPROC
810DEFFPROCCr
820GCOL3,7:MOVE620,TX:VDUS,248,4:ENDPROC
830DEFFPROCCr
840FX21,4
850VDU19,14,2:0:0:GCOL3,7:SOUND0,2,102,2:FORIX=0T01:MOVE540,450:DRAW640,TX-20:D
RAW740,450:NEXT:VDU19,14,4:0:0:PNX=POINT(639,TX-20):IFPNX=130R:PNX=15:PROCCexp
860DEFFPROCCpini
870DEFFPROCCpini
880FX15,0
890GX=GX+(150-(JX30)):COLOUR1:PRINTAB(9,0):GX:SOUND0,-15,100,5:EX=1:SPX=RND(4
):1:FX<639XX=20:ELSEXX=20
900SNDL=100
910ENDPROC
920DEFFPROCCpini
930FORX=0T02:AX(0X)=AX(0X)+SPX:NEXT:YX=YX-20
940IFXX<(590-(JX20)):EX=2:FX15,0
950SOUND13,-10,SNX,10:SNX=SNX-1
960XX=XX+XX:ENDPROC
970DEFFPROCCpini
980FX=X+CX(AX(3)):JX(3):GX=YX+CY(AX(3)):JX(3):HX=X+CX(AX(4)):JX(3):IX=YX+
CY(AX(4)):JX(3)
990FX21,4
1000GCOL3,1:SOUND0,1,100,1:FORIX=0T01:MOVE FX,GX:DRAW XX,YX:DRAWHX,IX:NEXT
1010IFPOINT(FX,GX)=4:MOVEFX,GX:PROCHit(0)
1020IFPOINT(HX,IX)=4:MOVEHX,IX:PROCHit(1)
1030ENDPROC
1040DEFFPROCCend
1050FX15,0
1060SOUND0,-15,100,20:COLOUR1
1070PROCCpini:PRINTAB(0,0):SPC19
1080ENDPROC
1090DEFFPROCHit(HX)
1100GCOL0,2
1110IFHX=0:IFHX<200GCOL0,1:ELSEIFHX=1:IFIX<200GCOL0,1
1120VDUS,232,4:FORGX=0T010:VDU19,4,1:0:19,4,4:0:0:0:NEXT:HTX=HTX+1:ENDPROC
1130DEFFPROCHsc
1140GCOL0,0:MOVE0,640:MOVE1279,640:PLOT85,0,1023:PLOT85,1279,1023
1150IFX<HS:PRINTAB(6,10):"THE END":PROCKJ:PRINTAB(6,10):SPCB:TX=700:BX=0:HTX
=2:PLX=0:PROCCr:ENDPROC
1160HX=65
1170FORX=0T010:PROCCr:NEXT
1180VDUS:GCOL0,1:MOVE140,900:PRINT"CONGRATULATIONS":MOVE240,850:PRINT"YOU NOW
HOLD":MOVE190,800:PRINT"THE HIGH SCORE"
1190TX=700:GX=0:HTX=2
1200FX15,0
1210PROCL:GCOL0,0:MOVE0,640:MOVE1279,640:PLOT85,0,1023:PLOT85,1279,1023:PROCCr
S:ENDPROC
1220DEFFPROCCr
1230REPEAT:JX=ADVAL(0)AND1:UNTILJX=1:OR INKEY=99:ENDPROC

```


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STATUS: READY

MEN

SCORE: 00000



VELOCITY X 00TK/H COORDINATES X 000
 Y 00 K/H Y 000
 TIME TO IMPACT: 05:39:6 ALTITUDE 00
 BOMBERS * * * * * SCORE: 00000



CONFIRMATION ENEMY LAUNCH DETECTED
 LAUNCH SITE: 0000
 TARGET: MONTREAL
 TIME TO IMPACT: 05:44:1
 BOMBERS * * * * * SCORE: 00000

The Soviets launch a nuclear strike against major cities in the United States and Canada. With our own nuclear arsenal dismantled, in accordance with the Salt IV Arms Agreement, the Soviets believe their treachery will lead to total world domination. Our only hope is our space station equipped with stealth bombers, which can fly undetected in Soviet airspace.

As squadron leader, you must lead your commandos on a virtual suicide mission, knock out the Soviet launch sites, and then proceed into the city of Moscow. Armed with only the weapons you can carry, you must seek and destroy the Soviet defence centre to stop the attack! Top multi-screen action!

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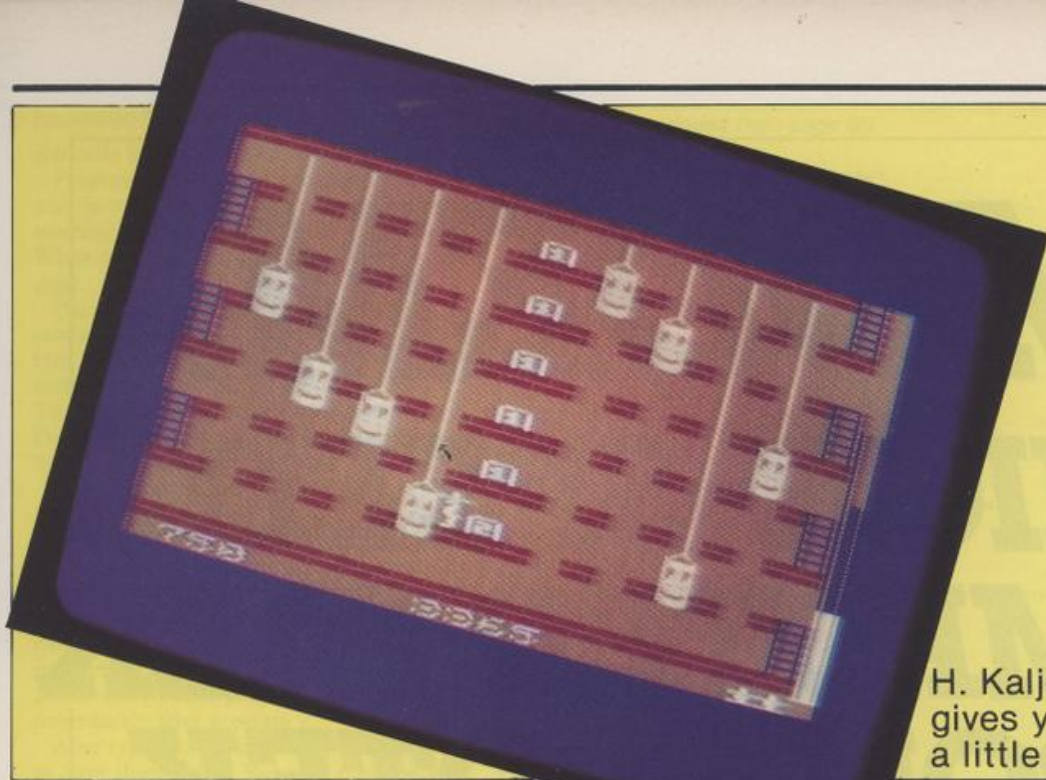


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H. Kaljouw
gives your Vic
a little lift

ELEVATORS IS A GAME of skill written for the unexpanded Vic-20. The elevators have run amok in a huge building. They have to be switched off but there is one problem, the main switch is on the top floor of the building. The elevators are useless so you will have to use the stairs.

So far it looks easy but there are a few problems. First of all you have to dodge the eight elevators, which is pretty tough in itself, and secondly you have a time limit to cross each floor. If you get hit by an elevator or if you pass the time limit you are dead, and you have to start at the ground level again. At the start of the game the time limit is 15 seconds. If you manage to reach the top of the building the time limit decreases by 2.5 seconds. You have three lives.

There is a bonus to be found in the middle of each floor, except for the ground level. Each bonus is numbered from one to four. When you walk through a bonus, it is automatically replaced by another one which is worth a further 100 points. The highest bonus is worth 400 points.

Each time you cross a floor safely, you automatically go to the next floor. You get 500 points plus extra points depending on the time you have left. When you have crossed the top floor safely you get 4,000 points. Then you have to start at the ground level again. The time limit goes down by 2.5 seconds.

Elevators uses machine code and 25 user-defined characters. To make the game fit in the unexpanded Vic I had to write it in three parts, and even then there was no space left to add Rem statements.

Program 1 contains the data for the machine code and the user-defined characters. There are checksums for both. If you have typed in a wrong number the program will end with an error message. After program 1 is run it automatically loads and runs the second program.

Program 2 gives you the title screen, instructions and the scoretable. It also tells you which key to use — “,” = left and “.” = right. After program 2 is run, it also auto-

(continued on page 95)

VIC

Program 3.

```

1 REM * ELEVATORS 3 *
2 REM
3 POKE36879,142:PRINT"JW":POKE36869,255:POKE36878,10:POKE7160,104:POKE7161,11
4 HI=PEEK(7160)+256*PEEK(7161)
5 GOSUB900
10 P=8120:X=0:SC=0:R=0:V1=32:V2=32:W=0:N=3:F=60
15 F=60:T1$="000000"
20 GOTO100
30 SYS7137
40 GOTO575
100 O1=PEEK(203):IF O1<37AND O1<29 THEN110
105 R=-1:IF O1=37 THEN R=1
110 IFX=0ANDR=-1 THEN R=0:GOTO160
115 IFX=20ANDR=1 THEN R=0:GOTO160
117 IFR=0 THEN FORA=1 TO7: NEXT:GOTO160
118 O1=PEEK(P):O2=PEEK(P+22):IF O1<30OR O1>59 THEN V1=O1:V2=O2:GOTO600
119 IF O2<30OR O2>59 THEN V1=O1:V2=O2:GOTO600
120 O1=PEEK(P+4):O2=PEEK(P+R+22)
121 POKE36875,200:POKE36875,0
125 IF O1<37AND O1<42 THEN R=0
130 IF O1=32AND O2=32 THEN150
135 IF O1=33AND O2=33 THEN150
140 IF O1=30AND O2=30 THEN150
145 GOTO600
150 POKEP,V1:POKEP+22,V2:P=P+R:X=X+R
155 V1=O1:V2=O2
160 POKEP,45+2*R:POKEP+22,44+2*R:POKEP+30720,1:POKEP+30636,1
165 GOTO30
500 FORA=1 TO130:POKE36879,132:POKE36876,255-A:FORB=1 TO13: NEXT:POKE36879,140: NEXT
510 POKE36877,0:W=4000:GOSUB850:POKEP,30:POKEP+30720,6:POKEP+22,30:POKEP+30636,6
P=8120
515 FORA=7734 TO9064 STEP66:POKEA,30:POKEA+30720,1: NEXT
520 X=0:R=0:V1=32:V2=32:T1$="000000":F=10:GOTO160
575 K=INT(T1/F):IFK=0 THEN586
582 POKE7833+K*22,37:IFK=1 THEN POKE7811+K*22,37
585 IFK=14 THEN600
586 GOTO20
600 N=N+1:POKE36877,220:FORL=15 TO1STEP-1:POKE36879,L:FORM=1 TO7: NEXT: NEXT:POKE36
877,0
610 POKE36878,10:IFN=0 THEN650
620 POKEP,V1:POKEP+22,V2:FORA=1 TON-1:POKE8195-A,44: NEXT:POKE8195-A,32:T1$="000000"
625 IFN=1 THEN POKE8194,32
630 FORA=7855 TO8163 STEP22:POKEA,36: NEXT:P=8120:X=0:V1=32:V2=32:R=0:GOTO160
650 PRINT"*****RESTARTING OVER*****":PRINT"*****RESTARTING OVER*****":PRINT"*****RESTARTING OVER*****"
(HI/256)
655 POKE7160,(HI-PEEK(7161)*256):GETA#
657 IF A#="Y" THEN CLR:GOTO4
660 IF A#="H" THEN PRINT"J":POKE36869,240:END
665 GOTO655
700 POKEP,32:POKEP+22,32:P=P+R:X=X+R:POKEP,45:POKEP+22,44:POKEP+30720,1:POKEP+30
690,1
727 IFP=7744 THEN500
730 FORA=PTOP+44STEP-22:POKEA,30:POKEA+30720,6:POKEA+22,45:POKEA+30636,1:POKEA-4
4,44
740 POKEA+30676,1: NEXTA:FORB=60 TO1STEP-9:FORV=192-8 TO192+8STEP4:POKE36876,V
750 NEXTV:W=500:INT(15-K)*15:GOSUB850:P=P+66:R=0:V1=32:V2=32:T1$="000000"
770 FORA=7855 TO8163 STEP22:POKEA,36: NEXT:GOTO160
800 POKEP,V1:POKEP+22,V2:P=P+R:X=X+R:W=(O1-37)*100:V1=O1+1:V2=32:IF O1=41 THEN V1=3
2
830 GOSUB850:GOTO160
850 SC=SC+W*20*INT(W/20)
855 FORI=1 TO W/20
860 SC=SC+20:IF SC<0 THEN SC=0
865 PRINT"*****SCORE*****":PRINT"*****SCORE*****":PRINT"*****SCORE*****":PRINT"*****SCORE*****":PRINT"*****SCORE*****"
870 POKE36876,230:POKE36876,250:POKE36876,0
875 FORO1=1 TO5: NEXT
880 NEXTT

```

(program 3
continued on
page 95)

MODEM.

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(continued from page 93)

matically loads and runs the next program.

Program 3 is the main program. The little man is controlled by Basic, the elevators by machine code. At first the man is stationary. When you press "." he starts walking to the right.

Once the man has started walking, he cannot be stopped. The only way to protect him from being hit by an elevator is by making him walk back by pressing the “.”. This makes dodging elevators very hard. Program 3 also keeps a high score which is 3,000 at the start.

The automatic Load Run in programs 1 and 2 is done by following

POKE 631, 131: POKE 198, 1: NEW

This line is equivalent to holding down the Shift-key and then hitting the Run/Stop key. By putting this line at the end of a program it automatically Loads and Runs the next program on tape. So you should Save program 2 immediately after program 1 and program 3 immediately after program 2.

After typing in programs 1 and 2 you have to Save them before Running them because they both end with a New statement and will destroy themselves.

(program 3 continued from page 95)

```

885 RETURN
900 PRINT "*****"
904 FORT=1T06
906 PRINT "*****"
908 NEXT
910 PRINT "*****"
911 PRINTSC;TAB(8);HI"獎"
912 FORX=2T018STEP2
913 IFX=10THENNEXT
914 Y=INT(15*NRND(X)+2)
916 FORT=1TOY-1
918 POKE7680+T*22+X,33:POKE38400+T*22+X,7
920 POKE36876,135+T*7
922 FORP=1T060:NEXT
923 POKE36876,0
924 NEXTT
926 P=7680+X+22*Y
927 T=30720+P:POKET,7:POKET+22,7:POKET+44,7
928 T=NRND(X)*2:IFT>1THEN932
930 POKEP,27:POKEP+22,28:POKEP+44,29:GOTO934
932 POKEP,60:POKEP+22,61:POKEP+44,62
934 NEXTX
936 POKE8098,44:POKE8120,45
937 POKE8185,31:POKE38985,7
938 FORP=7855T08163STEP22:POKEP,36:T=6:IFP>8053THEN7
939 POKEP+30720,T:NEXT
940 FORY=3T015STEP6
942 FORT=YTOY+2
943 POKE38400+22*T,6
944 POKE7680+22*Y,30:NEXT:NEXT
946 FORY=0T018STEP6
948 FORT=YTOY+2
949 POKE38420+22*T,6
950 POKE7700+22*T,30:NEXT:NEXT
951 POKE8183,44:POKE8184,44
955 FORA=7734T08064STEP66:POKEA,38:POKEA+30720,1:NEXT
960 RETURN

```

Program 1.

```

1 REM * ELEVATORS 1 *
2 REM
5 POKE36879,110:PRINT"*****PLEASE WAIT..."
10 POKE56,27:POKE55,0:POKE52,27:POKE51,0:S=0
20 FORP=0TO240
30 READD$:D1$=LEFT$(D$,1):D2$=RIGHT$(D$,1)
40 D1=ASC(D1$):D2=ASC(D2$)
50 G1=D1-48:IFD1>57THENG1=D1-55
60 G2=D2-48:IFD2>57THENG2=D2-55
70 G=16*G1+G2:S=S+G
80 POKE6912+P,G
90 NEXT
95 IFS<>25925THENPRINT"DATA ERROR IN 500-740":END
97 FORP=0TO511:POKE7168+P,PEEK(32768+P):NEXT
100 GOSUB1000
480 PRINT"■"
490 POKE631,131:POKE198,1:CLR:NEW
499 END
500 DATA A2,AF,BD,DC,1E,C9,1B,D0,12,9D
510 DATA F2,1E,A9,1C,9D,08,1F,A9,1D,9D
520 DATA 1E,1F,A9,21,9D,DC,1E,CA,D0,E4
530 DATA A2,C6,BD,16,1E,C9,1B,D0,12,9D
540 DATA 2C,1E,A9,1C,9D,42,1E,A9,1D,9D
550 DATA 58,1E,A9,21,9D,16,1E,CA,D0,E4,60
560 DATA A2,00,BD,58,1E,C9,3E,D0,12,9D
570 DATA 42,1E,A9,3D,9D,2C,1E,A9,3C,9D
580 DATA 16,1E,A9,20,9D,58,1E,E8,E0,F2
590 DATA D0,E2,A9,00,BD,4A,1F,C9,3E,D0
600 DATA 12,9D,34,1F,A9,3D,9D,1E,1F,A9
610 DATA 3C,9D,08,1F,A9,20,9D,4A,1F,E8
620 DATA E0,84,D0,E2,60
630 DATA A2,15,BD,8C,1F,C9,1B,D0,0F,A9
640 DATA 3C,9D,8C,1F,A9,3D,9D,42,1F,A9
650 DATA 3E,9D,B8,1F,CA,10,E7,60
660 DATA A2,15,BD,16,1E,C9,3C,D0,0F,A9
670 DATA 1B,9D,16,1E,A9,1C,9D,2C,1E,A9
680 DATA 1D,9D,42,1E,CA,10,E7,60
690 DATA A2,FF,BD,00,1E,C9,1E,30,04,C9
700 DATA 3C,30,05,A9,07,9D,00,96,CA,D0
710 DATA ED,A2,00,BD,00,1F,C9,1E,30,04
720 DATA C9,3C,30,05,A9,07,9D,00,97,CA,D0,ED,60
730 DATA 20,00,1B,20,3D,1B,20,7E,1B,20
740 DATA 9A,1B,20,B6,1B,60
1000 S=0:FORA=1TO26
1002 READX:S=S+X:FORI=XTOX+7:READY:S=S+Y:POKEI,Y:NEXTI
1004 NEXTA
1005 IFS<>216859THENPRINT"*****DATA ERROR"
:PRINT"*****IN 1000 - 1260":END
1006 RETURN
1010 DATA 7384,24,36,66,129,255,255,255,153
1020 DATA 7392,153,153,187,187,255,255,219,255
1030 DATA 7400,255,189,129,195,255,255,126,0
1040 DATA 7408,255,129,129,129,255,129,129,129
1050 DATA 7416,255,0,0,0,0,0,0,0
1060 DATA 7432,8,8,8,8,8,8,8,8

```

```

1070 DATA 7448,223,223,223,0,253,253,253,0
1080 DATA 7456,93,93,93,93,93,93,93,93
1090 DATA 7464,65,65,65,65,65,65,65,65
1100 DATA 7472,126,129,153,185,153,153,189,129
1110 DATA 7480,126,129,189,141,189,177,189,129
1120 DATA 7488,126,129,189,141,189,141,189,129
1130 DATA 7496,126,129,173,173,189,141,141,129
1140 DATA 7504,0,24,24,255,24,56,8,24
1150 DATA 7512,56,56,60,28,8,24,8,56
1160 DATA 7520,0,24,24,255,60,60,24,255
1170 DATA 7528,255,126,60,126,66,66,66,231
1180 DATA 7536,0,24,24,255,24,28,16,24
1190 DATA 7544,28,28,60,56,16,24,16,28
1200 DATA 7648,24,36,66,129,255,255,255,221
1210 DATA 7656,221,153,153,153,255,255,219,255
1220 DATA 7664,255,189,129,195,255,255,126,0
1230 DATA 7632,8,16,32,32,32,32,16,8
1240 DATA 7640,16,8,4,4,4,4,8,16
1250 DATA 7672,0,2,4,8,16,32,64,0
1260 DATA 7168,0,126,126,192,192,126,126,0

```

Program 2.

[illegible]

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The Prince

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ORIC

Go to work on an egg in P.H. Phoeng's cracking game for the Oric or Atmos computer. Go on and poke that yolk!

BROOD IS WRITTEN on an Oric-1 48K computer. But as I have not used any bugged Basic commands nor any ROM calls, only a few changes need to be made for Atmos conversion.

Just add one to the X-coordinate of the Plot commands in the following lines: 115, 270, 275, 315, 380, 400, 640, 645, 650, 680, 685, 695, 700, 705, 775, 2005, 2140. Also change FOR A=3 TO 34

in line 690 into

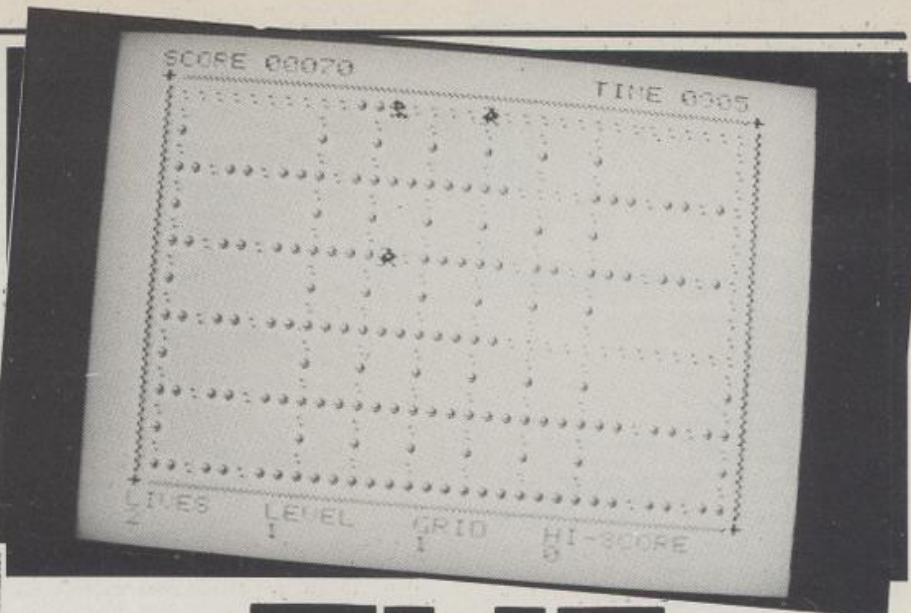
FOR A=4 TO 35

The main loop of the game is written in machine code — #9800-#9A50, entered with Basic — while the rest is written in Basic. The program uses approximately 7K of RAM memory.

The game can be played with the keyboard or with a joystick attached to the right port of a Pase joystick interface. The player is also offered a choice in sound volume.

The player finds himself on a grid in an incubator and the object is to destroy the Munzter's eggs before they hatch. The brood-gridders, who protect the eggs, will make the job a bit harder. But while the player is able to leave the grid, these brood-gridders have to stay on the grid.

The player is equipped with the z-ray, a weapon that will freeze the brood-gridders but



THE BROOD

at the same time speeds up — by 10 times — the hatching of the eggs.

When all eggs are destroyed the player moves on to the next grid. There are nine different grids. There is a life bonus after every third finished grid while the speed level will be increased after every sixth grid.

If you want to practice on a particular grid, change the grid variable (GR) in line 655.

Variables.

GR : grid number
HI : high score
LE : speed level
LI : lives
R : finished grids counter
SC : score
T & T\$: time
V : sound volume

Oric Brood.

```

5 TEXT:CLS:PAPER3:INK4
10 HIMEM#97FF:POKE618,10
15 FORA=8880TO88A7
20 POKEA,19:NEXT
25 PRINT"LOADING M.C."
30 GOTO1000
95 REM MAIN LOOP
100 SOUND1,RND(1)*99,V
105 CALL#9800
110 SOUND1,0,0:A=PEEK(17)
115 PLOT16,0,3+A*2:SOUND2,100,V*A
120 IFPEEK(15)<36THEN200
125 T=T-A*9-1:IFT<1THEN150
130 WAIT5-LE:GOTO100
150 REM EGGS HATCHED
155 POKE#BBB8,48:SOUND1,250,V
160 WAIT100:POKE4,165:POKE5,37
165 FORA=1TO30:SOUND1,150,V
170 CALL#99FA:SOUND1,0,0:NEXT
175 POKES,167:CALL#99FA
180 SOUND2,900,V:WAIT100
185 POKE(DEEK(0)),162:POKES,39
190 FORA=1TO51:SOUND2,A*5,V
195 CALL#99FA:NEXT
200 IFPEEK(15)=0THEN300
205 REM LOSE LIFE
210 A=DEEK(0):FORB=127TO32STEP-1
215 POKEA,B:SOUND2,B,V:NEXT
220 SOUND2,0,0
225 LI=LI-1:DOKE18,#B91:PRINTLI
230 WAIT200:CLS
235 IFLI>0THEN660
240 SC=""
245 FORA=88B1TO88B5
250 SC$=SC$+CHR$(PEEK(A))
255 NEXT:SC=VAL(SC$)
260 A$="GAME OVER"
265 IFSC>HITHENA$="HIGHEST SCORE":HI=SC

```

```

270 PLOT9,10,A$
275 PLOT9,12,"TRY AGAIN ? (Y/N)"
280 GETA$:IFA$="Y"THEN640
285 IFA$<>"N"THEN280
290 DOKE621,48000:POKE623,27:END
300 REM FINISHED
305 CLS:GR=GR+1
310 IFGR=10THENG=1
315 PLOT14,9,"BONUS 0"
320 FORA=0TO3:B=88BC8+A
325 POKE#BD26+A,PEEK(B):NEXT
330 FORA=1TO200:SOUND2,RND(1)*100,V
335 NEXT:SOUND2,0,0
340 C=0:FORA=0TO4:SOUND1,200+50*A,V
345 B=PEEK(88B5-A)+PEEK(88D29-A)
350 B=B-48+C:C=0
355 IFB>57THENC=1:B=B-10
360 POKE(88B5-A),B+128
365 WAIT80:POKE(88B5-A),B
370 SOUND1,0,0:NEXT
375 R=R+1:IFR/3>INT(R/3)THEN430
380 PLOT14,11,"LIVE BONUS":LI=LI+1
385 FORA=0TO200:SOUND1,ABS(100-A),3
390 NEXT:SOUND1,0,0
395 IFR/6>INT(R/6)THEN430
400 PLOT14,13,"LEVEL INCREMENT"
405 IFLE<4THENLE=LE+1
410 FORA=1TO10:FORB=1TO6
415 MUSIC1,B,A,V:MUSIC2,1,A,V
420 WAIT1:NEXTB,A
425 SOUND1,0,0:SOUND2,0,0
430 WAIT200:GOTO660
600 REM INITIALIZE, SET UP SCREEN
605 PLAYS,2,0,0
610 CLS:PAPER3:INK0
625 FORA=1TO24:PRINT:NEXT
630 DOKE621,48080:POKE623,21
635 PRINT" LIVES","LEVEL","GRID","HI-SCORE"

```

(continued on next page)



(continued from
previous page)

```
640 PLOT2,0,"SCORE 00000"
645 PLOT26,0,"TIME"
650 PLOT15,0,CHR$(12)+CHR$(3)+"Z-RAY"+CHR$(8)+CHR$(4)
655 SC=0:LI=3:LE=1:GR=1:R=0
660 CLS:DOKE18,8BF91
665 PRINTL1,"LE,"GR,"HI
670 A=INT(RND(1)*3)+20:IFA=20THENA=18
675 FORB=3TOD3:POKE#BB80+40*B,A:NEXT
680 PLOT0,0,4:PLOT0,24,1:PLOT0,25,1
685 FORA=2TOD22:PLOT1,A,9:NEXT
690 FORA=3TOD34:PLOTA,1,38:PLOTA,23,38:NEXT
695 FORA=2TOD22:PLOT2,A,38:PLOT35,A,38:NEXT
700 PLOT2,1,43:PLOT35,1,43
705 PLOT2,23,43:PLOT35,23,43
710 GOSUB900+GR*10
715 POKE0,251:POKE1,187:CALL#99A9
720 POKE0,252:POKE1,187
725 POKE2,A:POKE3,B:CALL#99D1
730 POKE0,C:POKE1,D
735 POKE2,E:POKE3,F:CALL#99D1
740 RESTORE
745 FORA=OTD18:READB:POKEA,B:NEXT
750 REM ZERO PAGE DATA
755 DATA252,187,1,1,36
760 DATA27,188,32,1,165
765 DATA59,191,32,21,165
770 DATA191,0,0,35
775 POKE14,8:PLOT31,0,T#
780 T=VAL(T#)
785 GOTO100
800 REM JOYSTICK DATA
805 POKE#9804,0:POKE#9805,4
810 POKE#9809,173:POKE#980A,176
815 POKE#980C,138:POKE#980D,24
820 POKE#980E,105:POKE#980F,32
825 POKE#9810,170:POKE#9814,191
830 POKE#9815,176
835 POKE#9820,183:POKE#983A,175
840 POKE#9854,190:POKE#986E,189
845 GOTO200
900 REM GRID DATA
910 A=31:B=62:C=4:D=188:E=3:F=18
915 G=207:T#="1000":RETURN
920 A=31:B=62:C=255:D=187:E=5:F=30
925 B=183:T#="1000":RETURN
930 A=1:B=8:C=20:D=188:E=1:F=8
935 G=235:T#="1500":RETURN
940 A=3:B=15:C=15:D=188:E=3:F=15
945 B=181:T#="1500":RETURN
950 A=12:B=36:C=255:D=187:E=4:F=32
955 G=198:T#="1500":RETURN
960 A=8:B=32:C=31:D=188:E=8:F=32
965 B=183:T#="1000":RETURN
970 A=71:B=35:C=255:D=187:E=7:F=35
975 B=193:T#="1000":RETURN
980 A=21:B=12:C=17:D=188:E=2:F=12
985 G=215:T#="1500":RETURN
990 A=8:B=32:C=253:D=187:E=5:F=35
995 B=199:T#="1000":RETURN
1000 REM REDEFINE CHARACTERS
1005 FORA=OTD18:READB:NEXT
1010 FORA=4736TOD47423
1015 READB:POKEA,B:NEXT
1020 REM BROOD-GRIDDER
1025 DATA28,4,14,27,62,28,10,49
1030 REM PLAYER
1035 DATA8,28,42,62,8,4,31,21
1040 DATA4,14,21,31,4,8,62,42
1045 REM GRID
1050 DATA0,0,8,0,0,4,0,0
1055 REM EGG
1060 DATA63,51,41,33,33,51,63,63
1065 REM EDGE
1070 DATA4,4,8,8,4,4,8,8
1075 REM MUNZTER
1080 DATA9,18,10,31,21,14,10,19
1085 FORA=46384TOD46391
1090 READB:POKEA,B:NEXT
1095 DATA0,0,0,21,42,0,0,0
1100 REM MC
1105 FORA=402TOD422
1110 READB:B=VAL("B"+B#)
1115 POKEA,B:NEXT
1120 DATAAD,1,3,48,AD,3,3,48
1125 DATAA9,CO,8D,3,3,A9,80
1130 DATA8D,F,3,AD,F,3,8D,0,4
1135 DATA68,8D,3,3,68,8D,F,3,60
1140 FORA=89800TOD9A50
1145 READB:B=VAL("B"+B#)
1150 POKEA,B:NEXT
1155 DATA20,2,4,AE,8,2,A0,0,E0,84,DO
1160 DATA7,E6,11,4C,19,98,E6,11,E0
1165 DATA38,F0,2,86,F,A6,F,A5,4,91,0
1170 DATAE0,B4,DO,16,A2,0,20,D6,98
```

```
1175 DATA B1,0,C9,26,DO,6,20,E2,98,4C
1180 DATAAD,98,E6,3,4C,84,98,E0,9C
1185 DATA DO,16,A2,0,20,E2,98,B1,0,C9
1190 DATA26,DO,6,20,D6,98,4C,AD,98
1195 DATA C6,3,4C,84,98,E0,AC,DO,16
1200 DATAA2,0,20,F5,98,B1,0,C9,26
1205 DATA DO,6,20,EE,98,4C,AD,98,C6,2
1210 DATA4C,84,98,E0,BC,DO,E,A2,0,20
1215 DATAEE,98,B1,0,C9,26,DO,6,20,F5
1220 DATA98,4C,AD,98,E6,2,C9,21,DO,3
1225 DATA85,F,60,85,4,C9,A5,DO,1C,C6
1230 DATA10,38,E9,81,85,4,A2,4,FE,B1
1235 DATA8B,8D,B1,8B,C9,3A,DO,9,A9
1240 DATA30,9D,B1,8B,CA,4C,9A,98,A5
1245 DATA12,49,1,85,12,91,0,A5,10,DO
1250 DATA3,85,F,60,A5,11,C9,1,DO,3C
1255 DATAA2,3,8D,C7,8B,C9,30,DO,6,CA
1260 DATA DO,F6,60,EA,EA,A2,2,4C,95
1265 DATA99,18,85,0,69,28,95,0,90,2
1270 DATAF6,1,60,38,85,0,E9,28,95,0
1275 DATA80,2,D6,1,60,F6,0,DO,2,F6,1
1280 DATA60,85,0,DO,2,D6,1,D6,0,60
1285 DATA84,11,A2,5,85,4,81,0,E0,5
1290 DATA DO,17,A5,3,DS,3,80,11,20,E2
1295 DATA98,A1,0,C9,22,90,5,D6,3,4C
1300 DATA7D,99,20,D6,98,A5,2,DS,2,80
1305 DATA11,20,F5,98,A1,0,C9,22,90,5
1310 DATA D6,2,4C,7D,99,20,EE,98,85,3
1315 DATA C5,3,80,11,20,D6,98,A1,0,C9
1320 DATA22,90,5,F6,3,4C,7D,99,20,E2
1325 DATA98,85,2,C5,2,80,11,20,EE,98
1330 DATAA1,0,C9,22,90,5,F6,2,4C,7D
1335 DATA99,20,F5,98,A5,3,DS,3,80,1A
1340 DATA20,E2,98,A1,0,C9,22,80,6,20
1345 DATA D6,98,4C,86,99,D6,3,C5,12
1350 DATA DO,3,85,F,60,95,4,A9,21,81
1355 DATA0,E0,5,DO,5,A2,A,4C,2,99,A2
1360 DATA3,DE,C8,8B,8D,C8,8B,C9,2F
1365 DATA DO,9,A9,39,9D,C8,8B,CA,4C
1370 DATA95,99,60,A2,6,A0,20,A9,A5
1375 DATA91,0,88,91,0,88,F0,8,A9,24
1380 DATA91,0,88,4C,AD,99,CA,DO,1,60
1385 DATA18,A5,00,69,A0,85,0,90,2,E6
1390 DATA1,4C,AB,99,A2,15,A9,A5,A0,0
1395 DATA91,0,48,98,18,65,2,AB,68,C4
1400 DATA3,DO,F3,CA,DO,1,60,48,A5,0
1405 DATA18,69,28,85,0,90,2,E6,1,68
1410 DATA49,81,4C,DS,99,A9,FC,85,2
1415 DATAA9,8B,85,3,A0,0,B1,2,C9,13
1420 DATA DO,9,A5,4,A6,5,85,5,86,4,60
1425 DATA C5,4,DO,4,A5,5,91,2,E6,2,DO
1430 DATA2,E6,3,4C,4,9A,A0,0,84,0,84
1435 DATA2,84,3,A9,5,85,1,A5,9C,C5,0
1440 DATA DO,7,A5,9D,C5,1,DO,1,60,B1
1445 DATA0,18,65,2,85,2,90,2,E6,3,E6
1450 DATA0,DO,2,E6,1,4C,30,9A
1455 CLS:CALL#9A24
1460 PRINT"CHECKSUM",DEEK(2)
1465 PRINT:PRINT"PRESS ANY KEY"
1470 A$=KEY$:GETA$:CLS
2000 REM INSTRUCTIONS
2005 FORA=1TOD2:PLOT12,A,CHR$(10)+CHR$(1)+"B R O O D":
NEXT
2010 PRINT:PRINT:PRINT:PRINT
2015 PRINT"By T.W.Phong "CHR$(96)" june 1984"
2020 PRINT:PRINT"You're inside an incubator in which"
2025 PRINT"eggs of the munzter are stored on a"
2030 PRINT"grid."
2035 PRINT"Your task is to destroy these eggs"
2040 PRINT"before they hatch."
2045 PRINT"An easy job if there hadn't been any"
2050 PRINT"brood-gridders coming after you."
2055 PRINT"Fortunately they can not leave the"
2060 PRINT"grid but they are able to get you"
2065 PRINT"when you come near the grid."
2070 PRINT"At any time you can freeze the brood-"
2075 PRINT"gridders with your z-ray. But as this"
2080 PRINT"also speeds up the hatching of the"
2085 PRINT"eggs, you should not use this weapon"
2090 PRINT"too often."
2095 PRINT"If time runs out the eggs hatch and"
2100 PRINT"the young munzters will kill you with"
2105 PRINT"their radiation."
2110 PRINT:PRINT
2115 PRINT"PRESS ANY KEY":
2120 A$=KEY$:GETA$:CLS
2125 PRINT"CHR$(137)"CHR$(136)". . . that's you"
2130 PRINT:PRINT"CHR$(137)"CHR$(136)". . . brood grider"
2135 PRINT:PRINT"CHR$(137)"CHR$(136)". . . egg"
2140 PLOT3,4,165
2145 PRINT:PRINT"CHR$(137)"CHR$(136)". . . young
munzter"
2150 PRINT:PRINT:PRINT
2155 PRINT"MOVEMENT CONTROL : "
2160 PRINT"the cursor-keys or a joystick (PAGE"
2165 PRINT"interface, right port)"
2170 PRINT:PRINT"ON/OFF SWITCH OF Z-RAY : "
2175 PRINT"space bar or fire button"
2180 PRINT:PRINT:PRINT
2185 PRINT"JOYSTICK CONTROL (Y/N) ?"
2190 GETA$:IFA$="Y"THENB00
2195 IFA$<>"N"THEN2190
2200 PRINT:PRINT
2205 PRINT"INPUT SOUND LEVEL (0-15) : "
2210 INPUTV
2215 IFV<0ORV>15THEN2210
2220 GOTO600
```


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COSMIC CAVERN is a machine-code game for the Commodore 64, incorporating smooth scrolling techniques with flicker-free display, and can be played with a joystick or from the keyboard. Shoot as many aliens as possible while avoiding crashing your spaceship into them or the walls of the cavern. Use a joystick to control your spaceship or:

N for left, M to move right.
Commodore key to move down.
Control key to move up.
Shift key to fire.

If you want to fire continuously, press the Shift Lock key rather than hold the fire button

or Shift key down all the time.

At regular intervals your spaceship will accelerate by a factor of one, shown on the speed indicator. At the same time a square pulsating anti-matter pod will appear in the cavern. If you shoot it the resultant shock wave slows down your spaceship by a factor of one.

However, in practice you may miss the pod and remain on speed level 2 which is more difficult to steer through. Should you go past speed level 7, you will return to speed 1 and be awarded a massive 100,000 points, but if you reach speed level 4, for example, you will see how difficult it is to steer down the cavern at

such high speed.

You are warned of the acceleration of your spaceship by the time indicator which counts down from right to left. The bullet indicator simply shows which of the seven torpedo barrels is to be fired next. The values of the various aliens are displayed on screen above the speed, bullet and time indicators.

Inevitably you will crash your spaceship, the computer will take over, showing all seven speed levels, and then stop. Press the fire button or space bar to return to the start, which will clear your score unless you attained the

CBM-64 Patrick Edmond takes you on a trip into the awesome caverns of the cosmos. As your ship speeds up and the aliens grow more hostile, can you stay in control?

```
2 GOSUB 200
4 POKE53280,0:POKE53281,0
6 PRINT"COSMIC CAVERN"
8 PRINT:PRINT"INSTRUCTIONS :";CHR$(14)
10 PRINT"PILOT YOUR SPACESHIP DOWN THE WINDING"
12 PRINT"CAVERN USING A JOYSTICK (IN PORT 2) OR"
14 PRINT"THE FOLLOWING KEYS : "
16 PRINT"/ - LEFT \ - RIGHT"
18 PRINT"- - DOWN CTRL - UP"
20 PRINT"SHIFT KEY TO FIRE,SHIFT LOCK=AUTO FIRE"
22 PRINT"WHEN THE GAME COMMENCES YOU ARE IN THE"
24 PRINT"ENTRANCE TO THE CAVERN,SO PRESS SPACE"
26 PRINT"BAR OR FIRE BUTTON TO ENTER THE CAVERN"
28 PRINT"....SHOOT THE ALIENS TO INCREASE YOUR"
30 PRINT"SCORE. AT REGULAR INTERVALS YOUR SHIP"
32 PRINT"ACCELERATES AND YOU MUST SHOOT THE "
34 PRINT"PULSATING ANTIMATTER POD WHICH APPEARS"
36 PRINT"AND THE EXPLOSION FORCE WILL SLOW DOWN"
38 PRINT"YOUR SHIP. HOWEVER, YOU CAN MISS IT AND"
40 PRINT"CARRY ON AT THE HIGHER SPEED IF YOU"
42 PRINT"WISH. PRESS A KEY TO CONTINUE":POKE198,0
44 GETA$:IFA$=""THEN44
46 PRINT"HERE ARE THREE INSTRUMENTS WHICH WILL"
48 PRINT"AID YOUR JOURNEY DOWN THE CAVERN : "
50 PRINT"1 SPEED : THIS INDICATES YOUR CURRENT"
52 PRINT"SPC(9):"SPEED BY A MARKER ON A SCALE."
54 PRINT"2 BULLET : THIS INDICATES WHICH BARREL"
56 PRINT"SPC(10):"OF THE TORPEDO GUN IS READY"
58 PRINT"SPC(11):"FOR FIRING."
60 PRINT"3 TIME : THIS INDICATES WHEN THE SHIP IS"
62 PRINT"SPC(8):"ABOUT TO ACCELERATE AND WHEN"
64 PRINT"SPC(8):"AN ANTIMATTER POD WILL APPEAR"
66 PRINT"SPC(8):"(BOTH EVENTS OCCUR"
68 PRINT"SPC(8):"SIMULTANEOUSLY)."
70 PRINT"THE TIME READOUT IS THE MOST USEFUL OF"
72 PRINT"THESE INSTRUMENTS."
74 PRINT"IF YOU REACH SPEED 7 AND ACCELERATE"
76 PRINT"AGAIN YOU WILL RETURN TO SPEED 1 AND"
78 PRINT"RECEIVE 100000 POINTS !"
80 PRINT"IF YOU CRASH,WAIT UNTIL THE SHIP STOPS"
82 PRINT"THEN PRESS SPACE BAR OR FIRE BUTTON TO"
84 PRINT"RETURN TO THE START."
86 PRINT"PRESS A KEY TO START":POKE198,0
88 GETA$:IFA$=""THEN88
90 SYS18048
200 PRINT"ENTERING DATA,PLEASE WAIT"
```



```
202 I=16384
204 READA$:IFA$=""THENRETURN
206 L=ASC(LEFT$(A$,1))-48
208 IFL>9THENL=L-7
210 R=ASC(RIGHT$(A$,1))-48
212 IFR>9THENR=R-7
214 POKEI,16*L+R:I=I+1:GOTO204
300 DATA9,3F,8D,11,D0,A9,18,8D
302 DATA18,D0,A5,F4,F0,19,C6,F3
304 DATA10,10,A9,11,8D,04,D4,A9
306 DATA08,E5,FF,0A,0A,0A,85,F3
308 DATAD0,05,A9,00,8D,04,D4,AD
310 DATA12,D0,18,C9,B0,90,F8,A9
312 DATA1F,8D,11,D0,A9,18,8D,18
314 DATAD0,A9,00,8D,8E,02,A9,00
316 DATA85,F1,85,F0,85,EF,A5,F4
318 DATAD0,03,4C,78,43,20,9F,FF
320 DATA8E,8D,02,8A,29,01,85,F1
322 DATA8A,29,02,85,F0,8A,29,04
324 DATA85,EF,AD,00,DC,29,10,49
326 DATA10,05,F1,85,F1,A5,C5,C9
328 DATA27,F0,07,AD,00,DC,29,04
330 DATAD0,0E,AD,00,D0,38,E5,FF
332 DATA8D,00,D0,B0,03,CE,10,D0
```


high score, and press fire button or spacebar again to commence journey into the cavern.

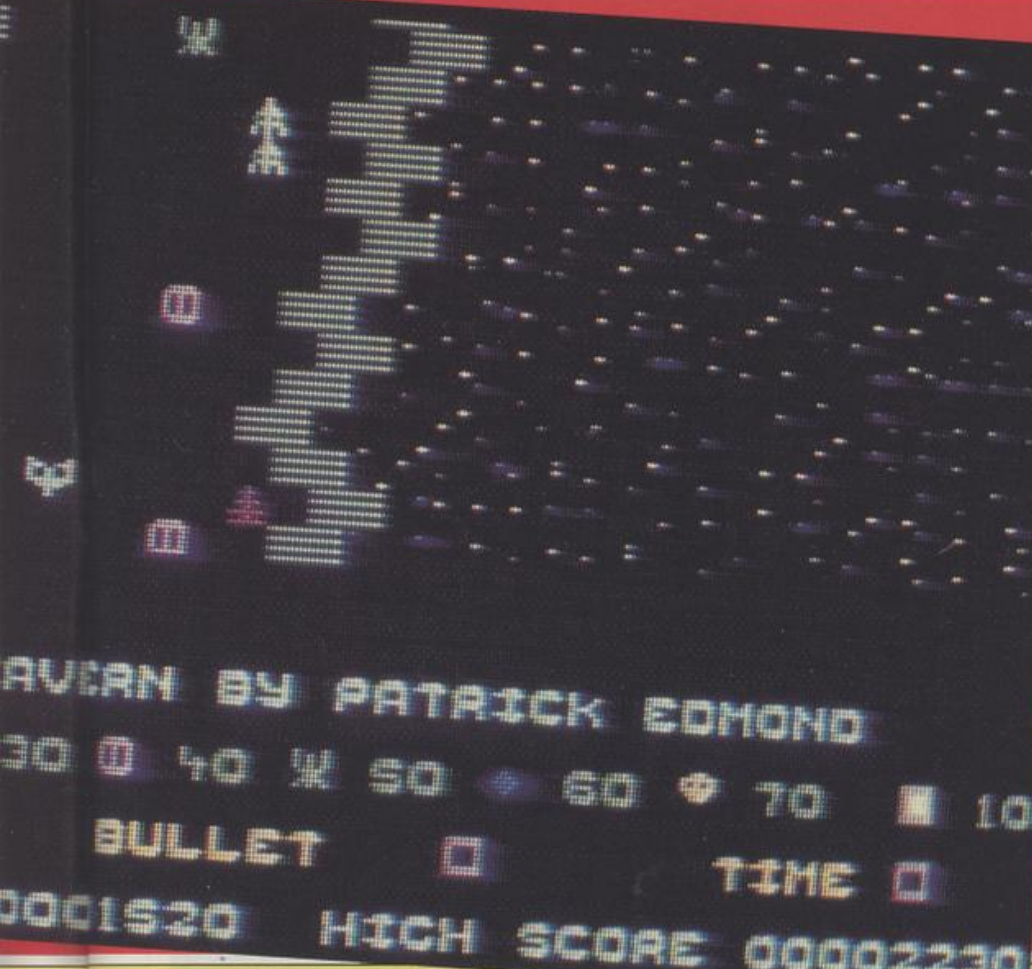
Cosmic Cavern can be typed in exactly as shown and Saved. However, if you own an assembler, type in lines 4 to 90 and add:

2 C = C + 1:IFC = 1 THEN LOAD""",1,1

and Save on cassette. Next enter the hex code of lines 900 to 904 directly into memory with your assembler beginning at 4000 hex, and Save 4000 to 4980 hex on cassette after the shortened Basic program just mentioned. Typing Cosmic Cavern in this way avoids the delay associated with the subroutine at line 200

(continued on page 103)

COSMIC CAVERN



```

426 DATA42,A0,0F,A2,27,BD,58,06
428 DATA9D,30,06,9D,30,DA,CA,10
430 DATAF4,88,F0,2C,C0,06,D0,03
432 DATA20,2F,43,AD,01,42,18,69
434 DATA28,8D,01,42,8D,04,42,90
436 DATA06,EE,02,42,EE,05,42,AD
438 DATAFE,41,18,69,28,8D,FE,41
440 DATA90,03,EE,FF,41,4C,FB,41
442 DATAAD,1B,D4,29,01,F0,0B,A5
444 DATAFD,C9,19,F0,0B,E6,FD,4C
446 DATA50,42,A5,FD,F0,02,C6,FD
448 DATAA9,00,A2,27,9D,58,06,CA
450 DATA10,FA,A6,FD,A9,0D,9D,58
452 DATA06,9D,59,06,9D,65,06,9D
454 DATA66,06,CA,30,0B,AD,1B,D4
456 DATA29,07,9D,58,06,CA,10,F5
458 DATAA5,FD,18,69,0F,AA,AD,1B
460 DATAD4,29,07,9D,58,06,E8,E0
462 DATA29,D0,F3,AD,1B,D4,29,1F
464 DATA18,C9,0A,B0,10,18,65,FD
466 DATAAA,E8,E8,AD,1B,D4,29,07
468 DATA69,10,9D,58,06,A5,F4,F0
470 DATA35,C6,F2,D0,31,A9,80,85
472 DATAF2,A5,FD,69,06,AA,A9,09
474 DATA9D,58,06,A6,FF,E8,8A,29
476 DATA07,85,FF,E0,03,D0,17,A2
478 DATA02,FE,A3,07,8D,A3,07,C9
480 DATA3C,D0,09,A9,32,9D,A3,07
482 DATACA,4C,C9,42,E6,FF,A6,FF
484 DATA8D,40,44,8D,22,D0,A5,F4
486 DATAD0,17,A5,FD,18,69,0A,0A
488 DATA0A,0A,8D,00,D0,AD,10,D0
490 DATA29,FE,90,02,09,01,8D,10
492 DATAD0,CE,23,D0,AD,11,D0,29
494 DATA7F,8D,11,D0,A9,A8,8D,12
496 DATAD0,AD,19,D0,09,81,8D,19
498 DATAD0,68,A8,68,AA,68,40,A2
500 DATA04,A0,C0,88,D0,FD,CA,D0
502 DATAF8,20,2F,43,4C,DE,42,A9
504 DATA10,05,FE,8D,11,D0,60,C9
506 DATA09,D0,0B,A5,FF,C6,FF,D0
508 DATA02,E6,FF,4C,56,43,C9,0D
510 DATAD0,0A,A9,00,9D,03,D0,95
512 DATAE1,4C,A8,41,29,EF,85,F7
514 DATAA9,00,91,F8,A9,03,8D,13
516 DATAD4,A9,05,8D,14,D4,A9,81
518 DATA8D,12,D4,A9,0F,8D,18,D4
520 DATAA9,80,8D,12,D4,4C,A8,41
522 DATAA2,80,CA,D0,FD,4C,D1,41
524 DATA10,10,00,3C,F0,00,33,30
526 DATA00,33,30,00,3F,F0,00,0F
528 DATAC0,00,03,00,00,03,00,00
530 DATA00,00,00,00,00,00,00,00
532 DATA00,00,00,00,00,00,00,00
534 DATA00,00,00,00,00,00,00,00
536 DATA00,00,00,00,00,00,00,00
538 DATA00,00,00,00,00,00,00,00
540 DATA01,00,00,02,00,00,01,00
542 DATA00,02,00,00,01,00,00,02
544 DATA00,00,01,00,00,02,00,00
546 DATA01,00,00,02,00,00,01,00
548 DATA00,02,00,00,01,00,00,00
550 DATA00,00,00,00,00,00,00,00
552 DATA00,00,00,00,00,00,00,00
554 DATA00,00,00,00,00,00,00,00
556 DATA00,00,00,00,00,00,00,00

```

(listing continued on page 103)

```

334 DATAA5,C5,C9,24,F0,07,AD,00
336 DATADC,29,08,D0,0E,AD,00,D0
338 DATA18,65,FF,8D,00,D0,90,03
340 DATAEE,10,D0,AD,01,D0,C9,36
342 DATAF0,11,A5,EF,D0,07,AD,00
344 DATADC,29,01,D0,06,CE,01,D0
346 DATAEE,01,D0,AD,01,D0,C9,94
348 DATAF0,11,A5,F0,D0,07,AD,00
350 DATADC,29,02,D0,06,EE,01,D0
352 DATAEE,01,D0,C6,FA,10,08,A9
354 DATA05,85,FA,A5,F1,D0,03,4C
356 DATA60,41,C6,FB,10,04,A9,06
358 DATA85,FB,A5,FB,A8,0A,AA,AD
360 DATA01,D0,9D,03,D0,AD,00,D0
362 DATA9D,02,D0,A9,01,0A,88,10
364 DATAFC,A8,49,FF,2D,10,D0,8D
366 DATA10,D0,AD,10,D0,29,01,F0
368 DATA07,98,0D,10,D0,8D,10,D0
370 DATAA9,04,95,E1,AD,00,D0,4A
372 DATA4A,4A,38,E9,02,95,E0,B0
374 DATA02,D6,E1,AD,10,D0,29,01
376 DATAF0,0B,B5,E0,18,69,20,95
378 DATAE0,90,02,F6,E1,AD,01,D0
380 DATA38,E9,32,29,F8,A8,18,75

```

```

382 DATAE0,95,E0,90,02,F6,E1,98
384 DATA0A,18,0A,90,02,F6,E1,18
386 DATA75,E0,95,E0,90,02,F6,E1
388 DATAA5,FA,A2,06,9D,28,D0,CA
390 DATA10,FA,A2,00,B5,E1,F0,38
392 DATA85,F9,B5,E0,85,F8,A0,00
394 DATAB1,F8,F0,03,4C,37,43,A0
396 DATA28,B1,F8,D0,F7,8D,03,D0
398 DATA18,69,08,9D,03,D0,18,C9
400 DATAA0,90,0A,A9,00,9D,03,D0
402 DATA95,E1,4C,A8,41,B5,E0,18
404 DATA69,28,95,E0,90,02,F6,E1
406 DATAE8,E8,E0,0E,D0,BE,A5,F4
408 DATAF0,1B,A5,F1,D0,06,A9,20
410 DATA8D,0B,D4,4C,C3,41,A9,21
412 DATA8D,0B,D4,A5,F8,4A,4A,4A
414 DATA09,20,8D,08,D4,A9,00,85
416 DATAF9,A5,FE,38,E5,FF,29,07
418 DATA85,FE,90,03,4C,1F,43,A9
420 DATA04,8D,FF,41,8D,02,42,A9
422 DATA28,8D,FE,41,A9,00,8D,01
424 DATA42,8D,04,42,A9,D8,8D,05

```


Stay cool. Stay low. Stay alive.



RIVER RAID

1-2 Players. Running on
Commodore 64, Sinclair Spectrum
from your usual software store.

You are commanding a squadron of four ground attack aircraft...

The mission is seemingly hopeless.

Fly along the river at zero altitude, twisting and turning crazily to stay within its tortuous banks, blasting at anything and everything in sight. Especially the bridges.

Three of your jets are held in reserve while you are pitched against Battleships, Enemy Aircraft, Land Tanks, Balloons, Helicopter Gunships. All intent only on your destruction.

And destroy you they will, if you don't get them first. You'll need to keep an eye on your fuel gauge. But take comfort, you can take fuel on board from one of the special depots.

If you get hit - and nobody has yet reached the end of the river - your next reserve starts at the last bridge you blasted on your way through!

Each target you destroy adds to your points score.

Like all Activision Software, River Raid will hold you and keep you coming back for more.

Chocks away!

Lose yourself in the world of

 **ACTIVISION®**

(continued from page 101)

every time you play the game, but if you don't own an assembler I'm afraid that every time you load Cosmic Cavern you will have to endure this delay while the Basic subroutine enters the data into memory. Please check carefully that the hex code has been entered correctly before running.

The heart of the program is an interrupt routine located at 4000 hex to 4380. In Cosmic Cavern all interrupt sources, such as the timer chips, are disabled except for the raster interrupt. The raster scan is controlled by the '64 transfers the screen memory on to the telec vision from top to bottom every 1/60th of a second, and the process takes about 1/60th of a second.

The raster position can be found in locations D011 and D012 hex, and in Cosmic Cavern a latch is set so that an interrupt request is

generated when the raster scan is about half way down the screen. This is explained in the programmer's reference guide. When this interrupt occurs the routine at 4000 hex commences, the '64 is set into 25 row mode so that the score and instruments are held stationary, the spaceship is moved according to joystick or keyboard and any bullets are moved down the screen.

Finally, the cavern is shifted up the screen by one bit — since smooth scrolling is involved the cavern is only moved a fraction of a whole character up the screen — multiplied by the spaceship speed, and the scroll position is updated in register D011 hex. If this movement exceeds seven bits the screen memory is shifted up one whole character and the cavern wall blocks and stars are added on to the bottom of the existing cavern. By now the raster has completed a scan, so return to the top

of the screen; the 64 is set in 24-row mode so that the smooth scroll position, lower three bits of D011 hex, takes effect and completes the interrupt.

Speed, bullet and time

The program running under this interrupt is responsible for the speed bullet and time instruments and also waits for the spaceship to collide with an alien or cavern walls — sprite to background collision detector D01F hex — if a collision does occur this program takes over control of the spaceship producing the crash effect and then resets for another game.


A cassette is available containing two copies of Cosmic Cavern for £3.00 including postage and packing.

Send a cheque or postal order to Patrick Edmond, "Le Nid", Scarborough Road, Driffield, East Yorks, YO25 7EQ.

(listing continued from page 101)

```
558 DATA00,00,00,00,00,00,03,00
560 DATA00,00,00,00,00,00,00,00
562 DATA01,00,00,00,00,00,00,00
564 DATA00,00,00,00,00,00,00,00
566 DATA00,00,00,00,00,00,00,00
568 DATA60,00,00,00,00,00,00,00
570 DATA00,00,00,00,00,00,00,00
572 DATA00,07,06,05,03,01,0B,02
574 DATAAA,AA,BE,BE,BE,BE,AA,AA
576 DATA00,00,00,00,00,00,00,00
578 DATAFF,FF,FF,FF,FF,FF,FF,FF
580 DATAFF,FF,D7,D7,D7,D7,FF,FF
582 DATAFF,55,55,55,55,55,55,55
584 DATA00,00,00,00,00,00,00,00
586 DATA00,00,00,00,00,00,00,00
588 DATA00,00,00,00,00,00,00,00
590 DATA18,3C,7E,C3,C3,7E,66,E7
592 DATA18,3C,18,7E,18,FF,18,FF
594 DATA18,18,3C,7E,5A,7E,DB,DB
596 DATA7E,FF,DB,DB,DB,DB,FF,7E
598 DATAC3,DB,DB,DB,7E,3C,7E,DB
600 DATA00,10,38,7C,FE,7C,38,10
602 DATA3C,FF,DB,FF,7E,3C,38,10
604 DATA00,7C,FE,C6,C6,FE,C6,C6
606 DATA00,FC,FE,C6,C6,FE,C6,FC
608 DATA00,7C,FE,C6,C6,FC,7C
610 DATA00,FC,FE,C6,C6,FE,C6,FC
612 DATA00,FC,FE,C6,C6,FC,FC,FC
614 DATA00,7C,FE,C6,C6,FC,C6,C6
616 DATA00,C6,C6,C6,FE,C6,C6,C6
618 DATA00,3C,FE,18,18,18,3C
620 DATA00,00,00,00,00,00,00,00
622 DATA00,00,00,00,00,00,00,00
624 DATA00,C0,C0,C0,C0,C0,FE,FC
626 DATA00,C0,C0,C0,C0,C0,FE,FC
628 DATA00,C6,EE,FE,D6,C6,C6,C6
630 DATA00,C6,E6,F6,DE,CE,C6,C6
632 DATA00,7C,FE,C6,C6,FE,7C
634 DATA00,7C,FE,C6,C6,FC,C0,C0
636 DATA00,7C,FE,C6,C6,CC,FE,76
638 DATA00,7C,FE,C6,FE,FC,C6,C6
640 DATA00,7C,FE,C0,7C,06,FE,7C
642 DATA00,7C,FE,18,18,18,18
644 DATA00,C6,C6,C6,C6,C6,FE,7C
646 DATA00,C6,C6,C6,C6,6C,7C,38
648 DATA00,C6,C6,C6,D6,D6,FE,7C
650 DATAFC,C0,FC,0D,FF,06,0C,18
652 DATA00,C6,C6,E6,7E,06,FE,7C
654 DATA30,60,C0,83,C3,DB,DB,FF
656 DATA00,7C,FE,C6,C6,C6,FE,7C
658 DATA00,18,38,18,18,18,3C
660 DATA00,7C,FE,06,0C,30,FE,7C
662 DATA00,7C,FE,06,1E,06,FE,7C
664 DATA00,60,60,6C,7E,0C,0C,0C
666 DATA00,7C,FE,C0,FC,06,FE,7C
668 DATA00,7C,FE,C0,FC,C6,FE,7C
670 DATA00,7C,FE,C0,FC,C6,FE,7C
672 DATA00,7C,FE,C6,FE,C6,FE,7C
674 DATA00,7C,FE,C6,FE,06,FE,7C
676 DATA11,00,33,32,00,12,00,34
678 DATA32,00,13,00,35,32,00,14
680 DATA00,36,32,00,15,00,37,32
682 DATA00,16,00,38,32,00,17,00
684 DATA39,32,00,00,00,00,33,32
686 DATA2A,27,1C,1C,1B,00,0C,0C
688 DATA0C,0C,0C,0C,0C,00,19
690 DATA2C,23,23,1C,2B,00,0C,0C
692 DATA0C,0C,0C,0C,0C,00,2B
694 DATA20,24,1C,00,0C,0C,0C,0C
696 DATA30,26,2C,29,00,2A,1A,26
698 DATA29,1C,00,32,32,32,32,32
700 DATA32,32,32,32,00,1F,20,1E
702 DATA1F,00,2A,1A,26,29,1C,00
704 DATA32,32,32,32,32,32,32,32
706 DATA00,00,00,00,1A,26,2A,24
708 DATA20,1A,00,1A,18,2D,1C,29
710 DATA25,00,19,30,00,27,18,2B
712 DATA29,20,1A,22,00,1C,1B,24
714 DATA26,25,1B,00,00,00,00,00
716 DATA78,A9,40,8D,15,03,A9,00
718 DATA8D,14,03,8D,20,0D,0D,21
720 DATAD0,A9,43,8D,19,03,A9,1E
722 DATA8D,18,03,A9,00,8D,0E,DD
724 DATA8D,0E,0C,8D,11,00,A2,00
726 DATAA9,00,9D,00,04,9D,00,05
728 DATA9D,00,06,9D,00,07,9D,00
730 DATA08,9D,00,09,9D,00,DA,9D
732 DATA00,DB,E8,00,E3,A9,00,9D
734 DATA00,D0,E8,E0,11,D0,F8,A2
736 DATA06,A9,21,9D,F9,07,CA,10
738 DATAFA,A9,36,8D,01,D0,A9,A0
740 DATA8D,00,D0,A9,FF,8D,15,D0
742 DATAA9,20,8D,F8,07,A2,80,8D
744 DATA80,43,9D,00,08,CA,10,F7
746 DATAA9,0D,8D,27,D0,A2,1F,A9
748 DATA00,95,E0,CA,10,FB,A9,00
750 DATA85,FF,A9,0A,85,FD,A9,FF
752 DATA8D,1C,D0,8D,25,D0,A9,03
754 DATA8D,26,D0,A9,07,8D,22,D0
756 DATA8D,23,D0,A9,28,85,A9,A0
758 DATA00,84,A8,98,91,A8,C8,D0
760 DATAFB,E6,A9,A5,A9,C9,40,D0
762 DATAF2,A9,34,8D,01,D4,8D,03
764 DATAD4,A9,07,8D,0C,D4,A9,61
766 DATA8D,0D,D4,8D,07,D4,8D,00
768 DATAD4,A9,81,8D,12,D4,A9,8F
770 DATA8D,18,D4,A9,FA,8D,0E,D4
772 DATA8D,0F,D4,A9,0F,8D,13,D4
774 DATA8D,14,D4,A9,00,8D,05,D4
776 DATA8D,06,D4,A9,08,8D,16,D0
778 DATAA9,80,85,F2,A9,FF,8D,91
780 DATA02,A2,00,8D,00,44,9D,00
782 DATA20,8D,00,45,9D,00,21,E8
784 DATAD0,F1,A2,27,8D,0E,45,9D
786 DATAF8,06,8D,58,46,9D,A8,06
788 DATA8D,08,46,9D,48,07,8D,30
790 DATA46,9D,98,07,A9,03,9D,A8
792 DATADA,9D,98,DB,A9,07,9D,48
794 DATA0B,A9,05,9D,F8,DA,CA,10
796 DATAD3,A9,09,8D,1C,DB,A2,00
798 DATA00,01,98,9D,F8,DA,8A,18
800 DATA69,05,AA,C8,C0,08,D0,F2
802 DATAA9,00,85,A8,AA,A9,04,85
804 DATAA9,A0,0B,A9,0B,91,A8,A0
806 DATA18,91,A8,A8,18,69,28
808 DATA85,A8,90,02,E6,A9,E8,E0
810 DATA10,D0,E6,A9,0B,A2,00,9D
812 DATA00,D8,9D,00,D9,E8,D0,F7
814 DATA9D,00,DA,E8,E0,58,D0,F8
816 DATAA9,81,8D,1A,D0,AD,1F,D0
818 DATAA9,18,8D,18,D0,A9,A8,8D
820 DATA12,D0,A9,10,8D,11,D0,AD
822 DATA19,D0,09,81,8D,19,D0,A9
824 DATAFF,85,F4,58,AD,00,DC,29
826 DATA10,F0,07,AD,01,DC,29,10
828 DATAD0,F2,A9,01,85,FF,AE,25
830 DATAD0,E8,8A,29,03,8D,25,D0
832 DATAA2,06,A5,F7,F0,18,FE,A3
834 DATA07,BD,A3,07,C9,3C,F0,05
836 DATAC6,F7,4C,50,48,A9,32,9D
838 DATAA3,07,CA,4C,56,48,A2,07
840 DATAA9,08,9D,4E,DB,CA,10,FA
842 DATAA9,0C,A6,FF,9D,4D,D8,A9
844 DATA08,A2,06,9D,5E,DB,CA,10
846 DATFA9,05,FB,09,0C,9D,5E,07
848 DATA9D,5E,DB,A5,FF,18,69,32
850 DATA8D,1E,07,A2,05,A9,08,9D
852 DATA6C,DB,CA,10,FA,A5,F2,4A
854 DATA4A,4A,4A,4A,A9,0C,9D
856 DATA6C,DB,AD,1F,D0,29,01,D0
858 DATA03,4C,46,48,A2,00,86,F4
860 DATAA9,1F,8D,05,D4,A9,8F,8D
862 DATA06,D4,8D,01,D4,8D,00,D4
864 DATAR2,40,A9,81,8D,04,D4,A9
866 DATA01,8D,15,D0,A9,21,8D,0B
868 DATAD4,A0,FF,88,D0,FD,A9,80
870 DATA8D,04,D4,A9,20,8D,0B,D4
872 DATA8A,4A,8D,08,D4,8D,01,D4
874 DATAAD,01,D0,18,CF,96,80,03
876 DATAEE,01,D0,A0,FF,88,D0,FD
878 DATACA,D0,C7,A5,FF,C9,07,F0
880 DATA05,E6,FF,4C,D0,48,A9,00
882 DATA8D,10,D4,A9,81,8D,04,D4
884 DATAA9,04,8D,01,D4,A9,80,8D
886 DATAD4,D4,A2,07,A0,FF,86,FF
888 DATA88,D0,FB,C6,FA,D0,F5,A9
890 DATA60,85,FA,CA,D0,E8,A9,00
892 DATA85,FF,A2,00,8D,A3,07,18
894 DATADD,B8,07,D0,08,E8,E0,08
896 DATAD0,F2,4C,62,49,90,08,A2
898 DATA07,BD,A3,07,9D,50,46,CA
900 DATA10,F7,AD,01,DC,29,10,F0
902 DATA07,AD,00,DC,29,10,D0,F2
904 DATA4C,80,46,00,00,00,00,00
906 DATA*
```

READY.



WOW! THIS
COMMODORE 16
STARTER PACK'S
WIZARD!

And cwikey! i

First we jolly well put everything you need to start home computing into one box.

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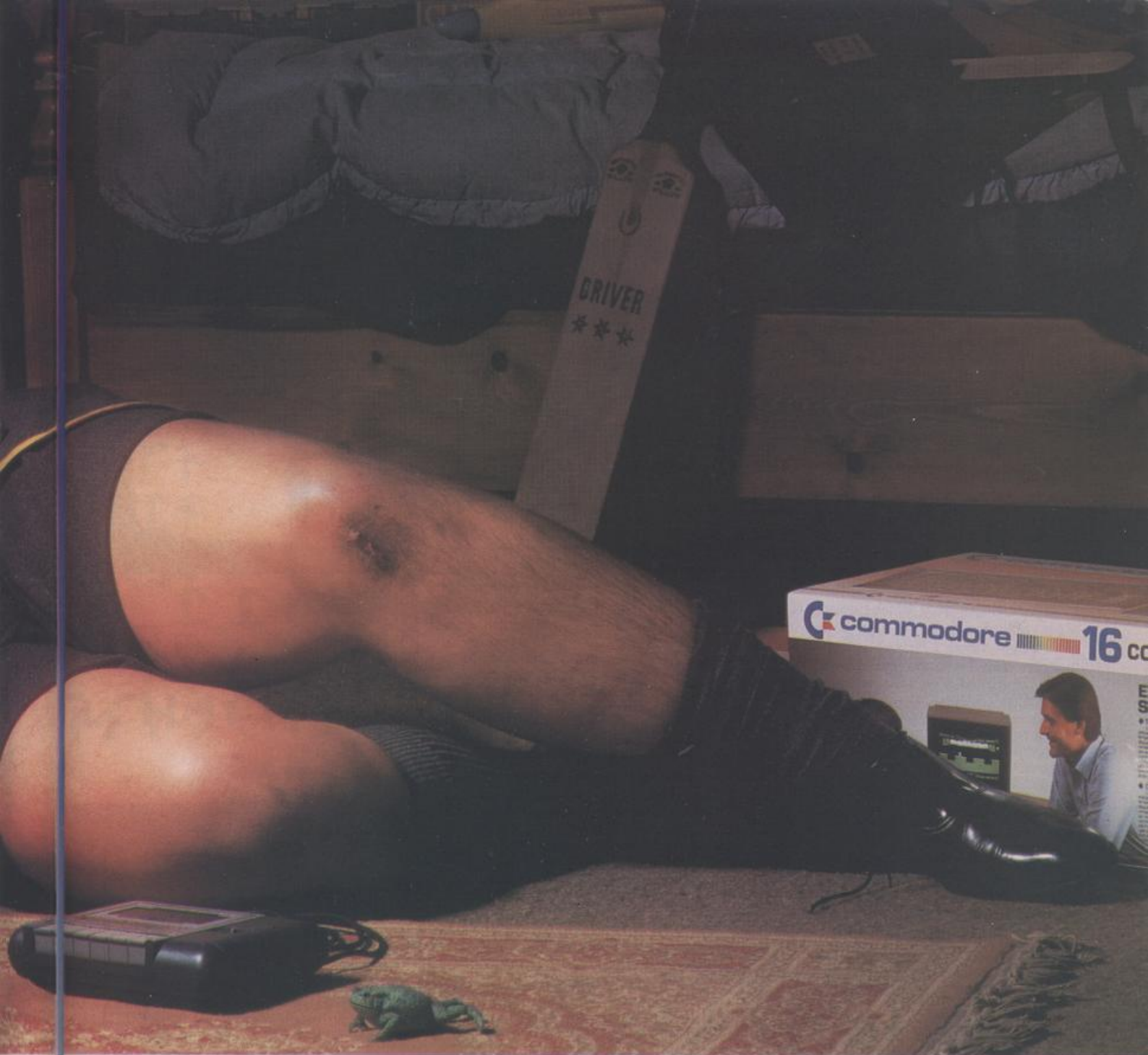
The computer has a 16K memory, real type-

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If you are thinking of starting home computing, there has never been a better time than now, with the Commodore 16 Starter Pack.

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commodore

ZOOM is an easy to use machine-code utility and allows the user to enlarge to full screen size the area of the screen enclosed within a window. This window can be varied in size from 8-256 pixels wide and from 3-192 pixels high. When in Magnify mode the magnified area can be viewed continuously as the window is moved. Since the magnified area can also itself be magnified, using the same window, infinite magnification is possible, even if of doubtful use. The routine does not magnify the colour but produces the magnification in the current permanent attribute colour.

The routine accesses various Basic variables for its parameters. This means you do not have to bother Poking any numbers, but just use a Let statement. If you call the routine without having assigned the following variables a "2 Variable not found" error will be given.

The machine code has comprehensive error checking. Zoom will not allow XPOS or YPOS to be values that make a part of the window off screen. If say, XPOS was 270, an illegal screen co-ordinate, Zoom would give XPOS a new value that ensured that the window was entirely on the screen, this value would vary with the size of the window. The width of the window can have values between 0 and 5, the depth can have values between 0 and 6. If the variables Width or Depth have values that are too big Zoom will change the value to the maximum permissible value. Likewise if either has a negative value Zoom will replace the value with 0. The width and depth numbers correspond to the following window sizes:

Width	Depth
0 256 Pixels	192 Pixels
1 128	96
2 64	48
3 32	24
4 16	12
5 8	6
6 —	3

Thus to have a window size 64 pixels by 12 pixels, Width would be 2 and depth would be 4. If you wish to see an example of Zoom error correcting, load up with the Zoom code and then run the following lines of Basic.

```
10 LET XPOS = 260: LET YPOS = -10
20 LET WIDTH = 6: LET DEPTH = -5
```

Having run the program type
RAND USR 50000

This will draw the Zoom window. In this case you will see a very tall, thin window. If you now type Print XPOS, YPOS, Width, Depth you will find that Width=5, Depth=0, XPOS=248 and YPOS=192. Since XPOS and YPOS denote the top left corner of the window, YPOS has been made 192 since the window is 192 pixels high i.e., this is the first value of YPOS above -10 that allows the window to appear/sit on the screen. XPOS has been rounded down until the window is on the screen, in this case 256-window width.

The algorithm used for Zoom takes each line of the window, places it in a buffer and keeps on doubling it in width until it is 32 bytes wide. It then puts the 32-byte buffer down on the screen — 192/(window y size) — times. The initial form of the screen is saved at 32768 and the magnified image is formed on the normal screen i.e., at 16384. To create Zoom, type in program A and then save it. Now try running it, if you have no errors, then save the code. The code can be used independently of program B, this program is provided to help you use Zoom.

Basic program commands.

- A ... Clear main screen and back-up.
- B ... Move back-up screen down to current window screen.
- L ... Load with new back-up screen.
- m ... Magnify area under window until next key press.
- M ... Continuously magnify. View can be moved around using normal direction keys.
- N ... Retrieve back-up screen.
- P ... Make magnified image current window screen.
- s ... Alter window movement step size.
- x ... Increase window width.
- X ... Decrease window width.
- y ... Increase window depth.
- Y ... Decrease window height.

Machine-code routines.

- Address
- 30000 XOR current window onto screen. Doing this twice will delete the window
 - 30003 Move screen from 32768 to 16384

Program A.

```
10 DATA "C373C4210080110040101
6210040110080180E21009B110040180
621004011009B01001B0C9C09C53
68F5C5721005801000372230B78B1207
93A56C64F05000C0049130FC0578325
9C63A55C5F5A720043E201807C3FCB3
FCB3FC3C258C6F106FF"
11 DATA 12409
20 DATA "04F0028038718F878325
7C6ED4B53C6CDD7C4325A603E408467E
B2100403A56C647C5D5E5C602C4D13A5
9C647C5D5E2113C6012000EDB0E1CD54C
4EB110EE1C64C4EB11104B3A58C64
70600C9CD48C43A57C647A7C8C52113C
61133C6010010C57EE5"
21 DATA 13621
30 DATA "6189A7280F050817F5CB1
5CB14F1CB15CB1410F3CB722373230BE
1231110E21033C61113C6012000EDB0C
110C6C9EB3A58C64F1113C60500EDB03
5FA6A7C05020132C6CB152B10FB5D1
8F1243E07A4C07C6206FD87C60857C
9C09C5E04B53C6CDD7"
31 DATA 13675
40 DATA "C41EFF15000E80A747280
8CB3CB13CB3910F8E5C5CDB0C4CB213
0030E012B3A56C6CDAEC4C1E13A56C63
DCDAEC4CDB0C4C9477E8977CD64C410F
8C93A55C6A7200406201807C3FCB3FC
B3F477E8A772C6B7B20037E8A7710F3C
93C0C3AC222A5D5CE5"
41 DATA 14484
```

1011
/\$="P"
RAND

- 30011 Move screen from 16384 to 32768
 - 30019 Move screen from 39680 to 16384
 - 30027 Move screen from 16384 to 39680
 - 30039 Magnify area under window
- The area 50708-50800 is used as work-space by Zoom and should be left clear.
32768-39679 Used to store screen during magnification.
39680-46591 Used to store back-up screen

```
50 DATA "E4D535d5ccdb228da2e1c2
3cdB433e1225d5cc978705f733779705
f733d54857074683d77659547483d110
3C5Cddcc4cdA22d7930043e05130b280
3af1806fe05330Ae05f1103C5C4e0C
5f15f16002106c0197e355C611fcd4C
ddcc4cdA22d7930043e"
51 DATA 13530
60 DATA "06180C2803A71807fe07d
A5B5C3E06F811fcd4Cde0C5f15f16002
10cc0197e355C611f8cc4cd4Cdaa020
d3003012c012300301000C5E13A58C63
C5f1600E023000d57b11f3C4Cde0C5C
1C5E111C100d52330A1bD57b11f3C4C
de0C5C179F811f3C4C4"
61 DATA 13805
70 DATA "dccc4cdA22d28051100001
81d3003012c01C5E13A55C6A72005110
000180b573E0095F1500Ed523809d57
b11f3C4Cde0C5C1E092253C6C92A5d5
ce5d535d5Ccd22dcdB228f43637003
003C32e1C224d5Ccd43725ce1225d5C
dff2c9008040201000"
71 DATA 13307
80 DATA "C06030180C0503"
81 DATA 801
5000 LET f=50000
5010 FOR h=1 TO 8: READ a$
5011 LET c=0
5020 FOR s=1 TO LEN a$ STEP 2
5030 LET a=CODE a$(s): LET b=COD
E a$(s+1)
5040 LET c=c+b*a
5050 IF a>98 THEN LET a=a-39
```


ZOOM

TH
IF
USF

TH
MT7

```

Y$="M" THEN
B 1400
Y$="A" THEN :
";a$: IF a$:
OMIZE USR 500
0011
INKEY$="P" THEN
039: RANDOMIZE U
INKEY$="N" THEN
019: RANDOMIZE U
J=0
TRIVEY/+-"/" THEN

```

Mark Jones takes you up, up and away ... with his instant enlarger for the bleary-eyed Spectrum.

Variables.

XPOS..... X co-ordinate of window
YPOS..... Y co-ordinate of window
WIDTH..... Width of window 0-5
DEPTH..... Depth of window 0-6

```

5050 IF b>96 THEN LET b=b-39
5070 LET a=a-48
5080 LET b=b-48
5090 POKE f,a+16+b
5100 LET f=f+1
5110 NEXT s
5111 PRINT "Line "h+10;" is O.K."
5120 READ tot: IF tot<>c THEN PR
INT "Error at line "h+10: STOP
5125 LET c=0
5130 NEXT h
5140 PRINT "No Errors"
5150 PRINT "Save code from addre
ss 50000, length 706 bytes,"

```

Program B. Demonstrates how little external control the machine code needs.

```

5 LET width=1: LET depth=1
10 LET xpos=100: LET ypos=100
25 LET a=1
30 LET mod=0
40 LIST 1500: REM put somethin
g on the screen
100 GO SUB 1500
110 IF INKEY$="" THEN GO TO 110
115 IF NOT mod THEN RANDOMIZE U
SR 50000
120 GO SUB 1000
140 GO TO 100
500 REM *****
1000 LET tot=xpos+ypos

```

```

1005 LET xpos=xpos+a+(INKEY$="S
")-(INKEY$="5")
1010 LET ypos=ypos+a+(INKEY$="7
")-(INKEY$="8")
1020 IF xpos+ypos<>tot THEN RETU
RN
1025 REM *****
1030 RANDOMIZE USR 50011: REM
(save screen temporarily.)
1040 LET depth=depth+(INKEY$="Y"
)-(INKEY$="y")
1050 LET width=width+(INKEY$="X"
)-(INKEY$="x")
1070 IF INKEY$="B" THEN RANDOMIZ
E USR 50039: PAUSE 0: PAUSE 0
1075 IF INKEY$="M" THEN LET mod=
1-mod: GO SUB 1400
1080 IF INKEY$="A" THEN INPUT "C
onfirm Y/n ? "a$: IF a$="Y" THE
N CLS: RANDOMIZE USR 50027: RAN
DOMIZE USR 50011
1085 IF INKEY$="P" THEN RANDOMIZ
E USR 50039: RANDOMIZE USR 50011
1090 IF INKEY$="N" THEN RANDOMIZ
E USR 50019: RANDOMIZE USR 50011
: LET mod=0
1100 IF INKEY$="s" THEN INPUT "s
tep size ? "a$: IF a<1 OR a>255
THEN GO TO 1100
1101 REM *****
1102 REM Use one or other of
these two versions.
1103 REM *****
1104 REM Microdrive Version

```

```

1105 IF INKEY$="L" THEN INPUT "s
creen to be loaded ? "a$: IF a$
<>" " THEN LOAD "M":1;a$CODE 396
80: RANDOMIZE USR 50019: RANDOMI
ZE USR 50011
1105 REM *****
1107 REM Tape Version
1108 IF INKEY$="L" THEN INPUT "s
creen name ? "a$: IF a$<>"exit"
THEN LOAD "CODE 39680: RANDOMI
ZE USR 50019: RANDOMIZE USR 5001
1
1109 REM *****
1110 IF INKEY$="B" THEN INPUT "A
re you sure ? (Y/n) "a$: IF a$=
"Y" THEN RANDOMIZE USR 50003: RA
NDOMIZE USR 50027
1120 RANDOMIZE USR 50003: REM
(Retrieve screen.)
1125 RETURN
1399 REM *****
1400 IF mod THEN RANDOMIZE USR 5
0011: RETURN
1405 RANDOMIZE USR 50003: RETURN
1499 REM *****
1500 IF NOT mod THEN RANDOMIZE U
SR 50000: RETURN: REM
(Window Mode.)
1510 RANDOMIZE USR 50039: REM
(Magnify Mode.)
1520 RETURN
1999 REM *****
2000 CLEAR 32767: LOAD "CODE

```




ALL HANDS ON DISK. NOW.

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(arcade game)

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THE CRACKER
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(arcade game)



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(language)

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BBC

Complete that unfinished symphony with Nick Lea's masterly BBC composition.

THIS PROGRAM will only run on a BBC 1.2 operating system with Basic 2 mainly because the word "OSCLI" is used. To check whether the computer you use is suitable, type:

OSCLI("FXO") (RETURN)

If no error message is produced then this program should run.

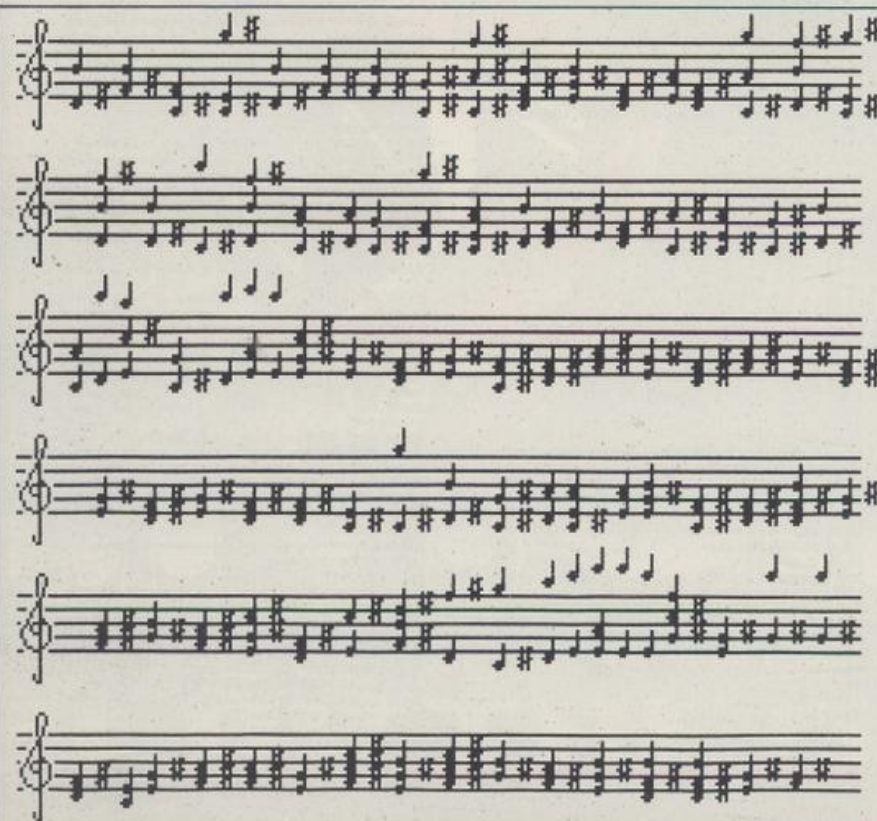
The program is a tool for use in the writing, development or simple playback of music. It uses the BBC's three pitch channels to produce a possible three-line tune with simultaneous screen and sound note output. Also included in the program are routines to save and load tunes to or from tape, making it possible to store away a masterpiece you are particularly pleased with. For the musically uninitiated, or the plain lazy, there is a harmonisation routine which generates pseudo-random harmonies to a tune entered.

In its entirety — well, in this un-REM-ed version — the program is rather long and may seem an effort to type in all in one go.

If certain procedures are left out, the program will run, until a non-existent option is selected, and if found to be useful, they can be added at a later date. The advantage of this is that it initially halves the program length.



MUSIC



The parts of the program which are optional to the main function are:

Line number	Procedure	Effect of losing it
2280	Procspeed	will not be able to change speed of playback
2A10	Procpitch	will not be able to change pitch of playback
25A0	Procsave	will not be able to save a tune to tape
2790	Procload	will not be able to load a tune from tape
3130	Procharmonise	will not be able to use the computer harmonise

Once the program — or section of the program — has been entered in the normal fashion, it can be run. This will produce a menu sheet with nine options open to the user. They are:

1. Play tune in memory.
2. Enter or edit a tune.
3. Change playback speed.
4. Change pitch of playback.
5. Save a tune onto tape.
6. Load a tune from tape.
7. Harmonise a tune in memory.
8. Clear memory.
9. Exit program.

When first run, there is no tune in the computer's memory. One can be entered using option 2, selected by just pressing 2. Option 2 (continued on next page)

(continued from previous page)

produces an instruction sheet which sets out the keyboard of a piano on to the BBC keyboard with the form as shown in table 1.

It shows how to change the lengths of notes using Shifted function keys. Three lines of music can eventually be built up so the line about to be used is asked for. A musical staff is then printed up and the tune can be entered. Return ends the tune and displays the menu sheet again. Selecting option 1 will now play the tune just put into the memory at its correct tempo. Tunes of up to 300 notes can be used

S	D	G	H	J	2	3	5	6	7					
Z	X	C	V	B	N	M	Q	W	E	R	T	Y	U	I
= notes														
Table 1.														

and up to three can be played at once. The routines to change playback speed and pitch are self-explanatory and simply alter the global variables: Del% and Oct%.

The backing store routines — saving and loading — are done using the Beeb's BPut and BGet statements, thus a tune is treated as a

machine-code file, but don't try to run it as one.

The last section of the program, and the last main option, produces harmonies on tracks two and three from a subject tune on track one. It requires the key signature of the tune, which is selected by pressing the appropriate note, and whether it is minor or major.

Music on the Beeb. Note that the italicised "b" in line 2050 is CHR\$ 22b.

10 REM***** MUSIC ON THE BEEB**

20 REM***** By Nick Lea

30 REM*****

40 MODE 4

50 REM MAIN PROGRAM

60 PROCinitialise

70 ON ERROR GOTO 70

80 PROCOptions

90 IF OPT=1 THEN PROCplay(0)

100 IF OPT=2 THEN PROCinput

110 IF OPT=3 THEN PROCspeed

120 IF OPT=4 THEN PROCpitch

130 IF OPT=5 THEN PROCsave

140 IF OPT=6 THEN PROCload

150 IF OPT=7 THEN PROCharmonize

160 IF OPT<8 THEN 180

170 IF FNyesno("Are you sure") THEN RU

180 IF OPT<9 THEN 80

190 *FX11,30

200 CLS

210 END

220 REM*****

230 DEFPROCplay(TX)

240 PROCsave

250 FOR IX=1 TO 3

260 PX(IX)=TUNE+(IX-1)*300:BX(IX)=0

270 NEXT IX

280 REM*****MAIN LOOP****

290 FX=0

300 REPEAT

310 KX=0:ZX=TIME AND DELX

320 FOR IX=1 TO 3

330 IF BX(IX)=0 THEN PROCn

ext(IX,TX)

340 NEXT IX

350 IF KX=1 THEN PROCmovescreen

360 FOR IX=1 TO 3

370 BX(IX)=BX(IX)-1

380 NEXT IX

390 REPEAT

400 DX=TIME AND DELX

410 UNTIL DX<ZX

420 UNTIL FX=3

430 ENDPROC

440 REM*****

450 DEFPROCnext(IX,TX)

460 IF IX=TX THEN PROCgetnote

470 IF 7*PX(IX)=0 THEN FX=FX+1:GOTO 520

480 PROCsounddisplay(7*PX(IX) AND 31),(

7*PX(IX) AND 224)/(32,IX)

490 BX(IX)=LX((7*PX(IX) AND 224)/32)

500 PX(IX)=PX(IX)+1

510 KX=1

520 ENDPROC

530 REM*****

540 DEFPROCmovescreen

550 SCX=SCX+SHX:SHX=1

560 IF SCX=192 THEN PROCsave

570 ENDPROC

580 REM*****

590 REM Pitch,Note length,Channel

600 DEFPROCsounddisplay(PX,NX,CX)

610 QX=GX(PX)

620 OSCLI("FX21,"+STR\$(CX+4))

630 SOUND CX,1,PX*4+OCTX,255

640 YZ=ABS(QX)*8+903-S*(GX AND 224)

650 XZ=(SCX AND 31)*32+64

660 MOVE XZ,YZ

670 VDU 233+NX

680 IF NX>3 THEN PLOT 0,-24,-24:PLOT 2

4,0:PLOT 0,20,24

690 IF QX<0 THEN VDU 240:SHX=2

700 ENDPROC

710 REM*****

720 DEFPROCgetnote

730 IF PX(IX)=TUNE+(300*IX)-1 THENB30

740 REPEAT

750 AX=GET

760 ?key=AX

770 CALLproc

780 IF AX=127 THEN PROCdelete

790 IF AX>127 AND AX<134 THEN LX

=AX-127

800 UNTIL ?key OR AX=13 OR AX=32

810 IF AX=13 THEN FX=3:7*PX(IX)=0

820 IF ?key<0 THEN 7*PX(IX)=32:LX=?key

830 ENDPROC

840 REM*****

850 DEFPROCdelete

860 IF PX(TX)=TUNE+(TX-1)*300 THEN 950

870 PX(TX)=PX(TX)-1

880 FOR WX=1 TO 3

890 IF WX=TX THEN 920

900 BX(WX)=BX(WX)+LX((7*PX(TX) AND 22

4) DIV 32)

910 IF BX(WX)=0 AND 7*PX(WX)=0 THEN FX=

FX-1

920 NEXT WX

930 BX(TX)=0

940 7*PX(TX)=0

950 ENDPROC

960 REM*****

970 DEFPROCinitialise

980 REM UDC for stave

990 VDU 23,225,0,0,0,0,0,0,255,0

1000 VDU 23,226,0,0,255,0,0,0,255,0

1010 REM Treble clef

1020 VDU 23,227,1,2,2,2,2,2,250,1

1030 VDU 23,228,128,64,64,64,128,128,19

1,0

1040 VDU 23,229,3,3,229,9,9,17,151,41

1050 VDU 23,230,0,0,127,0,0,128,207,32

1060 VDU 23,231,73,71,65,33,33,25,199,1

1070 VDU 23,232,32,32,47,32,64,128,63,0

1080 VDU 23,233,1,1,1,1,1,1,5,5,3

1090 REM*****NOTES*****

1100 VDU 23,235,8,8,8,8,8,56,120,48

1110 VDU 23,236,8,8,8,8,8,59,123,48

1120 VDU 23,237,8,8,8,8,8,56,120,48

1130 VDU 23,238,8,8,8,8,8,59,123,48

1140 VDU 23,239,0,0,0,0,0,48,120,48

1150 VDU 23,240,0,44,56,40,108,56,104,4

0

1170 DIM PX(3),BX(3),LX(6),GX(25),HX(12

4)

1180 DATA 1,2,3,4,6,8

1190 FORIX=1 TO 6:READ LX(IX):NEXT IX

1200 DATA 1,-1,2,-2,3,4,-4,5,-5,6,-6,7,

8,-8,9,-9,10,-11,12,-12,13,-13,14,15

1210 FOR IX=1 TO 25:READ GX(IX):NEXT I

X

1220 DATA 8,5,10,6,5,10,5,10,12,8,6,10,

1,8,1,8,10,1,8,12,3,10,1,10,3,10,3,10

1230 DATA 1,5,12,3,5,12,5,12,3,6,1,5,1,

5,1,5,5,8,3,8

1240 FOR IIX=1 TO 12:FOR IZX=1 TO 4

1250 READ HX(IIX,IZX)

1260 NEXT IZX:NEXT IIX

1270 DIM TUNE 900

1280 ?TUNE=0:?(TUNE+300)=0:?(TUNE+600)=

0

1290 OCTX=96:DELX=16:LX=2:SHX=1

1300 ENVELOPE 1,150,0,0,0,0,100,100,127

,20,-20,-20,126,20

1310 DIM key 1

1320 DIM proc 50

1330 DIM data 50

1340 FOR IX=0 TO 2 STEP 2

1350 FX=proc

1360 OPT IX

1370

1380 .loop LDX #25

1390 LDA data-1,X

1400 CNP key

1410 BEQ fnd

1420 DEX

1430 BNE loop

1440 LDA #0

1450 STA key

1460 RTS

1470 .fnd

1480 STA key

1490 RTS

1500 NEXT IX

1510 \$(data)="ZXDCVGBHJNMQWERTYUI

1520 *FX11,0

1530 *OPT 1,1

1540 ENDPROC

1550 REM*****

1560 DEFPROCstave

1570 SCX=0

1580 VDU 4:CLS

1590 FOR VX=1 TO 6

1600 VDU 10,227,228:PRINT STRING\$(32,CH

R(225))

1610 VDU 229,230:PRINT STRING\$(32,CHR\$(

226))

1620 VDU 231,232:PRINT STRING\$(32,CHR\$(

226))

1630 VDU 233,13,10

1640 NEXT VX

1650 VDU 5

1660 ENDPROC

1670 REM*****

1680 DEFPROCinput

1690 CLS

1700 PRINT

1710 PRINT"Editing or Entering a tune"

1720 PRINT"

1730 PRINT:PRINT"The computer's keyboard

d is set out"

1740 PRINT"like a piano keyboard with t

he form="PRINT

1750 PRINT" 2 3 5 6 7 (HIGH OCT

AVE)"

1760 PRINT" Q W E R T Y U I:"PRINT

1770 PRINT" S D G H J"

1780 PRINT" Z X C V B N M (LOW OCTA

VE)"PRINT

1790 PRINT" (Where Z & Q are 'C's)"

1800 PRINT:PRINT"The note lengths may b

e changed by="

1810 PRINT"[shift] F0....Quaver"

1820 PRINT"[shift] F1....Crotchet"

1830 PRINT"[shift] F2....Dotted Crotche

t"

1840 PRINT"[shift] F3....Minia"

1850 PRINT"[shift] F4....Dotted Minia"

1860 PRINT"[shift] F5....Semibreve"

1870 PRINT:PRINT"[delete] will delete t

he last note"

1880 PRINT"[return] returns to the opti

ons page"

1890 PRINT"[space bar] skips over the n

ext note"

1900 PRINT:PRINT"

"

1910 PRINT:PRINT"A full tune is compose

d of up to 3 "

1920 PRINT"lines.Please type in the lin

e to be "

1930 PRINT"played or edited (1-3)>";

1940 REPEAT

1950 AX=GET:AX=AX-48

1960 UNTIL AX>0 AND AX<4

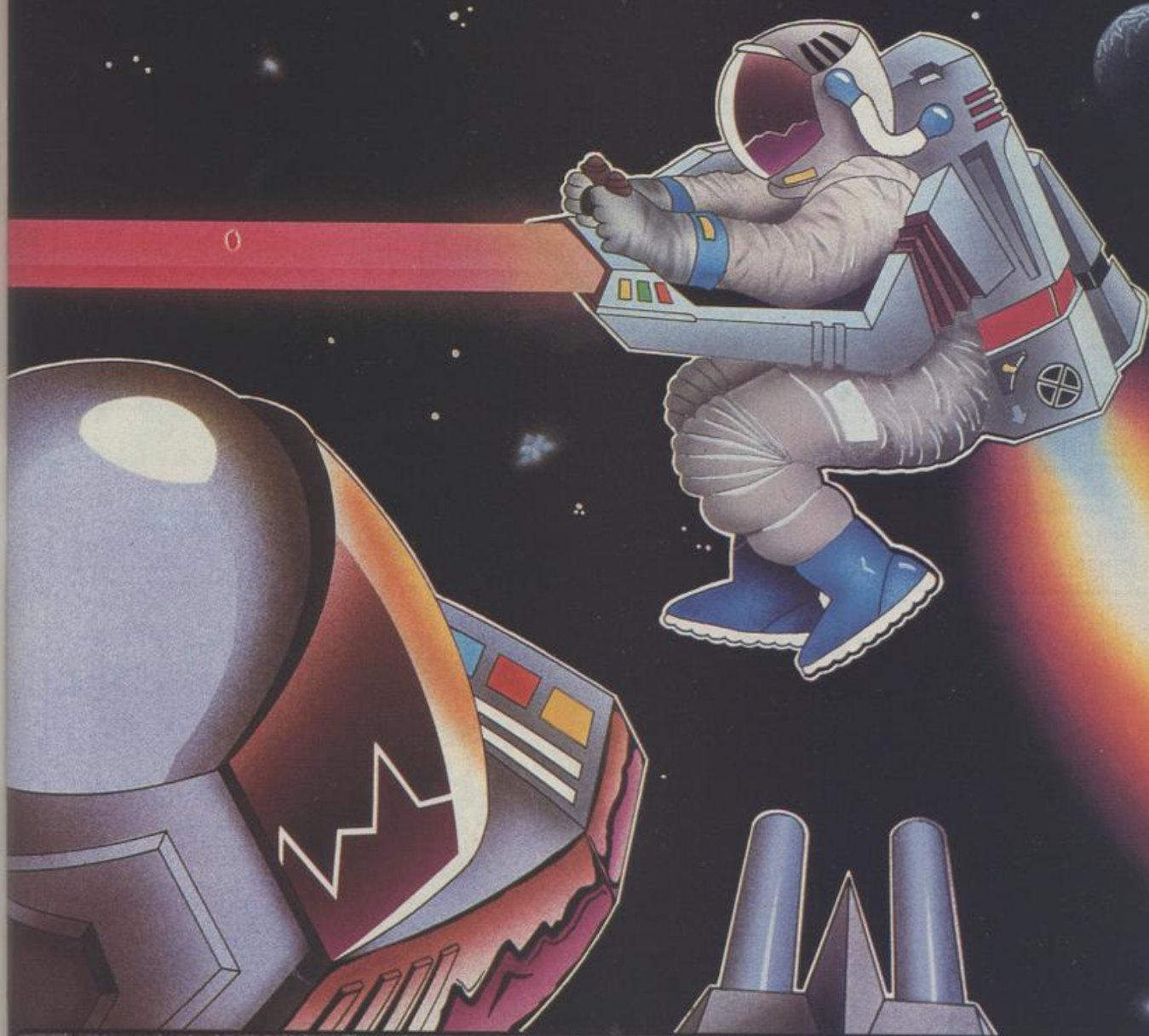
1970 PRINT STR\$(AX)

1980 PROCplay(AX)

1990 ENDPROC

BBC MODEL B 1.2 OS

TEST RACE



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(continued from page 110)

```

2460 IF AX=85 THEN PRINT"Up" ELSE PRINT
"Down"
2470 INPUT"By how many semitones (number,
return)",QX
2480 QX=QX+SGN(AX-75)*4
2490 IF QX+OCTX>0 AND QX+OCTX<150 THEN
OCTX=OCTX+QX:ENDPROC
2500 PRINT"That pitch change is too lar
ge"
2510 REM small delay
2520 QX=INKEY(100)
2530 ENDPROC
2540 REM=====
2550 DEFPROCsave
2560 CLS
2570 PRINT:PRINT"      Saving a tune on
to tape"
2580 PRINT"
"
2590 IF NOT FYesno("Are you sure") THE
N ENDPROC
2600 PRINT:PRINT"Please make sure that-
"
2610 PRINT"1.....A tape recorder is
connected"
2620 PRINT"2.....The levels are corr
ectly set"
2630 PRINT"3.....A usable tape is in
side"
2640 PRINT:PRINT"Filename of tune (max
length of 10)"
2650 INPUT">",F$
2660 IF LEN(F$)>10 THEN 2640
2670 file=OPENOUT F$
2680 FOR I=1 TO 3
2690 QX=TUNE+(I-1)*300-1
2700 REPEAT
2710   QX=QX+1
2720   BPUT# file,QX
2730 UNTIL ?QX=0
2740 NEXT I
2750 CLOSE# file
2760 PRINT:PRINT"File saved.Please stop the t
ape."
2770 QX=INKEY(200)
2780 ENDPROC
2790 REM=====
2800 DEFPROCload
2810 CLS
2820 PRINT:PRINT
2830 PRINT"  Loading a tune from tape"
2840 PRINT"
"
2850 PRINT:PRINT
2860 IF NOT FYesno("Are you sure") THE
N ENDPROC
2870 PRINT:PRINT"Please make sure that-
"
2880 PRINT"1.....A tape recorder is

```

```

connected"
2890 PRINT"2.....The levels are cor
rectly set"
2900 PRINT
2910 INPUT"Filename",F$
2920 IF LEN(F$)>10 THEN PRINT"Can't be
longer than 10 characters":GOTO 2910
2930 file=OPENIN F$
2940 FOR I=1 TO 3
2950 QX=TUNE+300*(I-1)-1
2960 REPEAT
2970   QX=QX+1
2980   ?QX=BGET# file
2990 UNTIL ?QX=0
3000 NEXT I
3010 CLOSE# file
3020 PRINT:PRINT"File loaded"
3030 QX=INKEY(200)
3040 ENDPROC
3050 REM=====
3060 DEFYNyesno(A$)
3070 PRINT:PRINT A$+"(Yes/No)?"
3080 REPEAT
3090   AX=GET
3100 UNTIL AX=B9 OR 78
3110 IF AX=B9 THEN PRINT"Yes" ELSE PRIN
T"No"
3120 =(AX=B9)
3130 REM=====
3140 DEFPROCharmonize
3150 CLS
3160 PRINT:PRINT
3170 PRINT"      H A R M O N I Z I N G"
3180 PRINT"      ~~~~~"
3190 PRINT:PRINT
3200 PRINT"  This harmonization routine
requires"
3210 PRINT"  that the tune to be harmo
nized is"
3220 PRINT"  is put onto LINE 1."
3230 PRINT"  The computer will then gen
erate "
3240 PRINT"  harmonies on LINES 2 & 3."
3250 PRINT:PRINT
3260 IF ?TUNE<0 THEN 3350
3270 PRINT"  There is no tune on LIN
E 1."
3280 PRINT:PRINT"      Please put one
on"
3290 PRINT"      ~~~~~"
3300 PRINT"  (Press [Space bar] to retu
rn to menu)"
3310 REPEAT
3320   AX=GET
3330 UNTIL AX=32
3340 ENDPROC
3350 PRINT"  Is the tune currently on
LINE 1"
3360 IF NOT FYesno("  to be harmoniz

```

```

ed") THEN 3280
3370 PRINT:PRINT"If the keyboard is arr
anged-"
3380 PRINT"  S D G H J"
3390 PRINT"  Z X C V B N M"
3400 PRINT:PRINT"then press the note co
rresponding to"
3410 PRINT"      the key >"
3420 REPEAT
3430   AX=GET
3440   ?key=AX
3450   CALL proc
3460 UNTIL ?key<0
3470 SX=(?key-1) MOD 12
3480 PRINT:PRINT"The key of harmonizati
on is :SX+1;" keys "
3490 PRINT"      up the keyboard"
3500 PRINT:INPUT"Major or Minor (MAJ/MIN
)":"AS
3510 IF AS<>"MAJ" AND AS<>"MIN" THEN 35
00
3520 IF AS="MIN" THEN SX=(SX+3) MOD 12
3530 REM=====HARMONIZATION=====
3540 POINTX=TUNE
3550 BASSX=1
3560 REPEAT
3570   PITCHX=?POINTX AND 31
3580   NX=(?POINTX AND 224) DIV 32
3590   SCX=(PITCHX+12-SX) MOD 12
3600   IF SCX=0 THEN SCX=12
3610   DIFFX=12
3620   FOR IX=1 TO 4
3630     HX=ABS(HX(SCX,IX)-1-BASSX)
3640     IF HX<DIFFX THEN VX=IX:DIF
FX=HX
3650   NEXT IX
3660   BASSX=HX(SCX,VX)
3670   H1X=BASSX+SX:IF H1X>12 THE
N H1X=H1X-12
3680   VX=VX+(RND(2)*2)-3:IF VX=0
THEN VX=2
3690   IF VX=5 THEN VX=3
3700   H2X=HX(SCX,VX)+SX
3710   IF H2X<H1X THEN H2X=H2X+12
3720   IF RND(4)=1 THEN H2X=1 ELSE
RX=0
3730   ?(POINTX+300)=32*NX+H1X
3740   ?(POINTX+600)=32*NX+RX+H2X
+ (1-RX)*H1X
3750   POINTX=POINTX+1
3760 UNTIL ?POINTX=0
3770 ?(POINTX+299)=32*NX+SX+1:?(POINTX+
599)=32*NX+SX+8
3780 ?(POINTX+300)=0:?(POINTX+600)=0
3790 CLS
3800 PRINT"HARMONIZATION COMPLETE"
3810 PRINT"
"
3820 AX=INKEY(100)
3830 ENDPROC

```



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CURSE OF ABU SIMBEL

Nick Stevens
unwraps a
new game
for the
Dragon 32

THE CURSE of Abu Simbel is an adventure game written for the Dragon 32. The object of the game is to find the Golden Mask of Abu Simbel — but beware of the Curse!

The game uses the standard Verb-Noun input format but with a few extras — pushing Shift and an arrow key will abbreviate the direction commands. For example, pressing Shift and up arrow will print Go North, press Enter to input.

Also, when getting an object, you can use It to refer to the object. Other features of the game are split screen scrolling, a real-time clock, a diagram of current exits and sound.

The Dragon's sound command has been re-defined for extra flexibility. The new format is Sound N,N — where N is any number between 1 and 65535. The second number now refers to number of cycles and the first is the pitch. The real-time clock is displayed at the top of the screen along with a compass and the room's exits.

First type in listing 1 and Save at the start of a blank tape. This program sets up the sound, clock and scroll routines, it also loads and runs the main program. Second type in listing 2. Do not attempt to run this program without first running listing 1, as it calls the machine-code routines set up in listing 1.

To aid debugging it would be useful to miss out lines 5 and 6 until the program is fully working. These lines disable the Break key, List and LList functions.

Now Save this program after the first by:
GOTO 9000

This will Save and autorun the program.

I will supply a copy of the program for £2.50. Please send a blank cassette and an S.A.E. to: Nick Stevens, 8 Hope Place, Musselburgh, East Lothian EH21 7QE.

Listing 1.

```
10 CLEAR500,31999:CLS:PRINT@38,"PLEASE WAIT A MOMENT."
20 PCLEAR1
30 X=32000
40 READA$:IF A$="END" THEN 60
50 POKEX,VAL("&H"+A$):X=X+1:GOTO40
60 EXEC32000
70 EXEC32141
80 PRINT@134,"LOADING MAIN PROGRAM."
90 CLOADM
100 DATA10,8E,7E,67,8E,80,33,10,BF,01,21,A6,80,A7,A0,8C,81,CA,25,F7,8E,7F,88,BF,
01,23
110 DATA8E,7D,21,BF,7F,CC,39,34,36,BD,8E,83,27,15,BF,01,44,35,36,BD,89,AA,34,36,
BD,8E,83
120 DATA8F,01,46,BD,00,A5,27,07,35,36,C6,02,7E,83,44,B6,FF,03,84,FE,B7,FF,03,B6,
FF,23,8A,0B
130 DATA87,FF,23,B6,FF,01,84,F7,B7,FF,01,10,BE,01,46,86,FD,B7,FF,20,BE,01,44,30,
1F,26,FC,7F,FF,20
140 DATA8E,01,44,30,1F,26,FC,31,3F,26,E6,B6,FF,23,84,F7,B7,FF,23,B6,FF,03,8A,01,
B7,FF,03,35,36,39
150 DATA30,CC,51,6F,84,6F,82,86,3B,A1,82,24,02,6F,84,86
160 DATA17,A1,82,24,02,6F,84,30,CC,0B,BF,01,0D,39,8E,9D
170 DATA3D,BF,01,0D,39,30,CC,2C,6C,84,86,32,A1,84,26,1E
180 DATA6F,84,6C,82,86,3C,A1,84,26,14,6F,84,6C,82,A1,84
190 DATA26,0C,6F,84,6C,82,86,18,A1,84,26,02,6F,84,7E,9D,3D,00,00,00,00
200 DATA8E,04,A0,A6,8B,20,A7,80,8C,05,DF,26,F6,39
210 DATA END
```

Listing 2.

```
5 POKE@198,6:POKE@19C,6:POKE@19D,6:POKE@19E,6:POKE@19A,6:POKE@19A,6:POKE@19A,6:POKE@19A,6
6 POKE@198,158:POKE@19C,120:POKE@19D,0
10 R=12:IF R=1:CRW:IF R=0:PP=0:IF R=0:MM=0:LL=0:Q=0
20 DIMR(68),V(31),N(22),D(48),P(23)
30 CLS1
40 FORA=0 TO 24 STEP2:PRINT@A,CHR$(172):CHR$(236):NEXTA:PRINT@STR$(6,128)
50 PRINT@32,STR$(6,128)
60 PRINT@34,"A":PRINT@65,"M":PRINT@89,"A":POKE@1090,42
70 PRINT@43,"LINE":POKE@1071,61
80 PRINT@75,CHR$(177):STR$(8,179):CHR$(178)
90 PRINT@105,CHR$(181):"00:00:00":CHR$(184)
100 PRINT@137,CHR$(180):STR$(8,188):CHR$(184)
110 PRINT@84,"EXIT":POKE@1113,58
120 PRINT@60,CHR$(206):CHR$(204):CHR$(205)
```

```
130 PRINT@92,CHR$(202):CHR$(128):CHR$(197)
140 POKE@1504,149
150 PRINT@134,CHR$(203):CHR$(193):CHR$(199)
160 SOUND2000,10
170 PRINT@456,"DOUBLE SPEED :?"
180 AB=INKEY$:IF AB="" THEN180
190 IF AB="Y" THEN PRINT@CHR$(8):"Y":POKE@5495,0 ELSE IF AB="N" THEN PRINT@CHR$(8):"N":POKE@5494,0 ELSE GOTO 170
200 SOUND20,60
210 AB=INKEY$:IF AB=CHR$(8) THEN SOUND30,80:GOTO170 ELSE IF AB=CHR$(13) THEN SOUND30,30:GOTO 220 ELSE 210
220 FORA=0 TO 41:EXEC32226:NEXTA
```

(continued on page 119)

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

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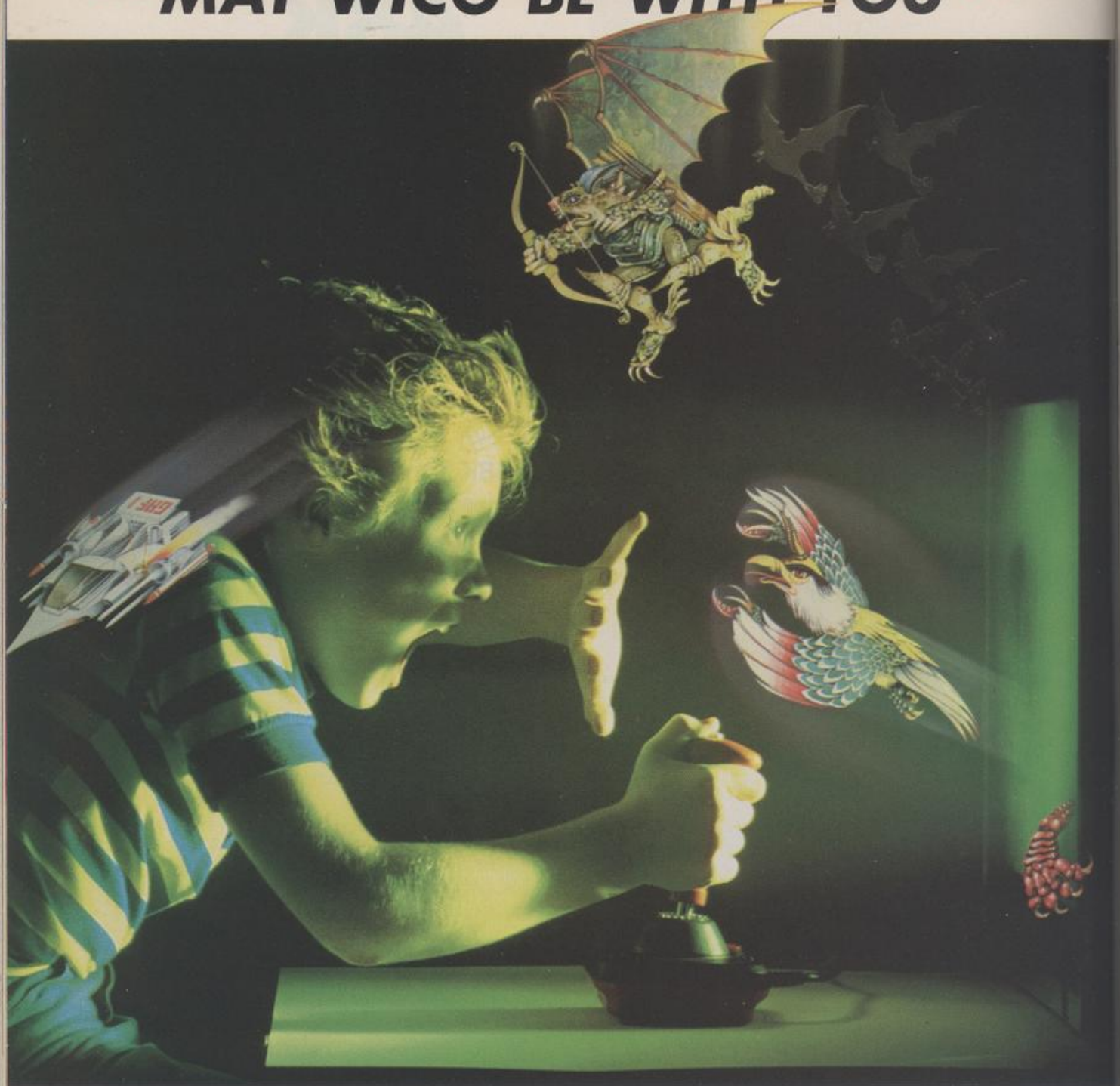
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(continued from page 115)

```
230 SOUND400,20
240 PRINT#449,"PLEASE WAIT!"
250 EXEC32226
260 READ#(FORA=1 TO 4:IN#(A)=A:NEXTA
270 READ#(5)
280 FORA=6 TO 9:IN#(A)=A:NEXTA
290 FORA=10 TO 68:READ#(A):NEXTA
300 SOUND400,20:EXEC32226
310 FORA=1 TO 68
320 FORB=0 TO 3
330 READ#(A,B)
340 NEXTB,A
350 SOUND400,20:EXEC32226
360 FORA=1 TO 31:READ#(A):NEXTA
370 SOUND400,20:EXEC32226
380 FORA=1 TO 22:READ#(A):NEXTA
390 SOUND400,20:EXEC32226
400 FORA=1 TO 5:EXEC32226:SOUND20,50:NEXTA
410 POKE32222,0:POKE32226,0:POKE32224,0
420 GOSUB3370
430 AB=IN#(R):GOSUB3380
435 IF R=44 THEN GOTO 435
440 FORA=1 TO 22:IF NP(A)=R THEN PRINT#449,"HERE'S (S (IN#(A))".:EXEC32226:SOUND9
0,5
450 NEXTA
460 GOSUB3720
470 IF R=29 AND MU=1 THEN PRINT#449,"A MAD MUMMY BLOCKS YOUR PATH!":EXEC32226:FO
RA=1 TO 5:SOUND90,10:SOUND400,20:NEXTA
480 IF R=53 AND CR=1 THEN CC=1:PRINT#449,"THE CROCODILES START MOVING!":EXEC322
26:FORA=1 TO 5:SOUND10,50:SOUND50,10:NEXTA ELSE CC=0:CC=0
490 IF CC=1 THEN CC=0:IF CC2 THEN PRINT#449,"THE REPTILES JUST MADE A REAL
:EXEC32226:PRINT#449,"OF YOU!":EXEC32226:GOTO3780
500 IF P=1 THEN PP=1:IF PP=10 THEN PRINT#449,"YOUR SKIN HAS BECOME RED AND IE
XEC32226:PRINT#449,"BLOODY! YOU MUST HAVE CAUGHT":EXEC32226:PRINT#449,"SOMETHING
IN THE TOMB!":EXEC32226:GOTO3780
510 IF PP=7 THEN PRINT#449,"YOU FEEL SICK!":EXEC32226:SOUND200,10
520 IF NP(19)=2 THEN P=0
530 IF R=43 OR R=45 OR R=67 THEN IF RND(5)=3 THEN PRINT#449,"THE FLOOR JUST COLA
PSED!":EXEC32226:R=31:FORA=1 TO 300 STEP 10:SOUND40,10:NEXTA
540 IF R=41 AND NP(5)=2 THEN PRINT#449,"THE DOOR SLAMS SHUT BEHIND YOU!":EXEC32
226:SOUND300,20:SOUND400,10
550 IF R=1 THEN MN=MN+1
560 IF MN=10 THEN NB(2)=A DEAD MONKEY?":R=0
570 IF NP(21)=2 AND RND(5)=2 AND MN=10 THEN NP(21)=1
580 IF L=1 AND R=21 AND NP(5)=2 THEN PRINT#449,"YOUR LIGHT REVEALS A":SOUND10,1
0:EXEC32226:PRINT#449,"PASSAGE LEADING SOUTH":SOUND10,10:EXEC32226:121,1:26:80
590 IF R=16 AND NB=WEST THEN IF RND(5)=2 THEN PRINT#449,"YOU SEEM TO HAVE DROW
NED!":EXEC32226:FORA=1 TO 20:SOUND40,10:GOTO3780:600 IF R=16 AND NB=WEST TH
610 GOSUB3370
620 CC=1:CC=0:NB=**
630 PRINT#449,"**"
640 SOUND500,10:SOUND400,10:SOUND300,10
650 X=1
660 PRINT#449,"POKE135,0
670 PRINT#449,"(C=1:FORA=1 TO 70:AB=IN#KEYS:IF AB=** THEN NEXTA:PRINT#449,"(B) "
1:FORA=1 TO 70:AB=IN#KEYS:IF AB=** THEN NEXTA:GOTO670:680 A=ASC(AB)
700 IF AB=PS THEN WB="GO NORTH":C=8:PRINT#449,"WE'VE STRUNG (18,32):PRINT#440,"":80
UND50,10:GOTO660
710 IF AB=9 THEN WB="GO SOUTH":C=8:PRINT#449,"WE'VE STRUNG (18,32):PRINT#440,"":80
UND50,10:GOTO660
720 IF AB=21 THEN WB="GO WEST":C=7:PRINT#449,"WE'VE STRUNG (19,32):PRINT#449,"":80
UND50,10:GOTO660
730 IF AB=93 THEN WB="GO EAST":C=7:PRINT#449,"WE'VE STRUNG (19,32):PRINT#449,"":80
UND50,10:GOTO660
740 IF AB=8 AND C1 THEN 660
750 IF AB=8 THEN PRINT#449,"(B)=LEFT(WB,LEN(WB)-1):C=C-1:GOTO660
760 IF A=13 THEN 830
770 IF A=32 THEN 660
780 C=C+1:IF C=26 THEN C=26:GOTO660
790 WB=WB+CHR$(A)
800 PRINT#449,"(A)
810 SOUND10,10
820 GOTO660
830 FORA=10 TO 20:SOUND40,20:NEXTA:GOSUB3380
840 EXEC32226
850 IF WB=** OR LEN(WB)=3 THEN 820
860 B=0:WB=WB+CHR$(A)
870 IF LEN(WB)=3 THEN 820 ELSE A=ASC(MID(WB,1,1)):IF A=45 OR A=90 THEN WB=RIGHT
(WB,LEN(WB)-1):GOTO870
880 A=INSTR(1,WB,"")
890 IF A=0 THEN WB=WB+NB="":GOTO920
900 WB=LEFT(WB,A-1)
910 NB=RIGHT(WB,LEN(WB)-A)
920 FORB=1 TO 31
930 IF LEFT(WB,B)=LEFT(WB(8),3) THEN 960
940 NEXTB
950 PRINT#449,"I DON'T UNDERSTAND!":EXEC32226:FORA=100 TO 50 STEP 1:1:SOUND4,1:NEX
TA:GOTO620
960 ON B GOTO 970,1030,1030,1170,1230,1290,1290,1380,1380,1400,1510,1550,1600,16
60,1710,1710,1830,1910,420,1950,2070,2500,2540,2540,2540,2590,2640,2640,1170,274
0,2780
970 IF NB="NORTH" AND B(8,0)=0 THEN R=D(R,0):GOTO 420
980 IF NB="SOUTH" AND B(8,1)=0 THEN R=D(R,1):GOTO 420
990 IF NB="WEST" AND B(8,2)=0 THEN R=D(R,2):GOTO 420
1000 IF NB="EAST" AND B(8,3)=0 THEN R=D(R,3):GOTO 420
1010 PRINT#449,"YOU CAN'T GO THAT WAY!":SOUND15,300
1020 EXEC32226:GOTO620
1030 IF NB="IT" THEN 1130
1040 IF NB="**" THEN PRINT#449,"GET WHAT?":EXEC32226:SOUND40,60:GOTO470
1050 FORA=1 TO 22
1060 O=INSTR(1,NB(A),NB)
1070 IF O=0 THEN NEXTA:PRINT#449,"YOU CAN'T!":EXEC32226:SOUND20,20:SOUND30,20:80
UND10,20:GOTO470
1080 IF NP(A)=C THEN PRINT#449,"IT'S NOT HERE!":SOUND50,10:SOUND70,10:SOUND20,1
0:GOTO470
1090 I=1:IF I=5 THEN I=5:PRINT#449,"IT'S TOO HEAVY!":SOUND50,10:SOUND25,20:80
UND70,10:EXEC32226:GOTO470
1100 NP(A)=2
1110 IF A=21 THEN 1130
1120 PRINT#449,"GOT IT!":EXEC32226:FORA=300 TO 1 STEP 20:SOUND4,5:NEXTA:GOTO470
1130 FORA=1 TO 22
1140 IF NP(A)=R THEN 1090
1150 NEXTA
1160 PRINT#449,"GET WHAT?":SOUND100,50:EXEC32226:GOTO470
1170 IF NB="**" OR NB="IT" THEN PRINT#449,"DROP WHAT?":EXEC32226:SOUND40,60:GOTO470
0
1180 FORA=1 TO 22
1190 O=INSTR(1,NB(A),NB)
1200 IF O=0 THEN NEXTA:PRINT#449,"YOU CAN'T!":EXEC32226:SOUND20,20:SOUND20,30:80
UND10,20:GOTO470
1210 IF NP(A)=C THEN PRINT#449,"YOU HAVEN'T GOT THAT!":EXEC32226:SOUND70,10:80
UND50,10:SOUND20,10:SOUND70,10:GOTO470
1220 I=1:INP(A)=R:PRINT#449,"DROPPED IT!":EXEC32226:FORA=30 TO 60:SOUND4,15:NEX
TA:GOTO470
1230 IF NB="**" THEN PRINT#449,"WHICH WAY?":SOUND90,70:EXEC32226:GOTO470
1240 IF R=10 OR R=14 OR R=21 THEN IF RND(5)=2 THEN PRINT#449,"THE SEA WASHED YO
U UP AGAIN!":EXEC32226:SOUND150,10:GOTO470
1250 IF R=10 OR R=14 OR R=21 THEN PRINT#449,"YOU SEEMED TO HAVE DROWNED!":EXEC32
226:FORA=30 TO 50:SOUND4,15:NEXTA:GOTO3770
1260 IF R=35 THEN 970
1270 IF R=58 THEN PRINT#449,"YUCK! IT'S ALL STICKY!":EXEC32226:SOUND60,40:PRINT#
449,"SOMETHING TOUCHED YOUR FOOT!":SOUND40,10:EXEC32226:NP(16)=58:1:GOTO470
1280 PRINT#449,"WHERE?":EXEC32226:SOUND10,70:GOTO470
1290 IF NB="**" THEN PRINT#449,"PULL WHAT?":EXEC32226:SOUND600,50:GOTO470
1300 IF R=40 THEN GOTO 1330
1310 IF R=51 THEN GOTO 1350
1320 PRINT#449,"YOU CAN'T!":EXEC32226:SOUND50,50:GOTO470
1330 IF LEFT(NB,3)=PAN THEN PRINT#449,"A PANNEL CREAKS OPEN!":SOUND40,80:SOUN
D50,80:SOUND40,80:EXEC32226:140,2:39:GOSUB3720:GOTO470
1340 GOTO1330
1350 IF LEFT(NB,3)=LEF OR LEFT(NB,3)=RIG THEN GOTO 1360 ELSE PRINT#449,"WH
ICH ONE?":SOUND10,90:EXEC32226:GOTO470
1360 IF LEFT(NB,3)=LEF THEN PRINT#449,"A PIT IN THE FLOOR OPENS!":EXEC32226:5
EC32226:PRINT#449,"YOU FALL THROUGH INTO...":FORA=90 TO 150:SOUND4,5:NEXTA:EX
1370 PRINT#449,"THE GATE SLIDES SLOWLY UP!":FORA=500 TO 400 STEP 10:SOUND4,10:NE
XTA:EXEC32226:151,1:40:GOSUB3720:GOTO470
1380 IF NB="**" THEN PRINT#449,"BREAK WHAT?":EXEC32226:SOUND40,60:GOTO470
1390 PRINT#449,"YOU CAN'T!":SOUND40,60:SOUND300,5:EXEC32226:GOTO470
1400 IF NB="**" THEN PRINT#449,"ENT!":SOUND40,50:EXEC32226:GOTO470
1410 IF LEFT(NB,3)=DRU THEN PRINT#449,"YOU CAN'T!":SOUND40,90:EXEC32226:GOTO
470
1420 IF NP(21)=2 THEN PRINT#449,"YOU HAVEN'T GOT IT!":SOUND50,80:EXEC32226:GOTO
470
1430 IF NP(11)=2 THEN PRINT#449,"WITH WHAT?":EXEC32226:SOUND50,75:GOTO470
1440 FORA=1 TO 5:SOUND500,15:FORX=1 TO 100:NEXTA
1450 NEXTA
1460 IF R=14 THEN PRINT#449,"NEAT BEAT!":EXEC32226:GOTO470
1470 PRINT#449,"THE BOULDER TREMBLES...":SOUND3000,10
1480 EXEC32226:PRINT#449,"AND ROLLS AWAY REVEALING A":EXEC32226:PRINT#449,"SMALL
CAVE!":EXEC32226
1490 114,3:151:GOSUB3720
1500 GOTO470
1510 IF NB="**" THEN PRINT#449,"SHAKE WHAT?":EXEC32226:SOUND50,80:GOTO470
1520 IF LEFT(NB,3)=TRE AND R=13 AND T=0 THEN PRINT#449,"BONK!":EXEC32226:FORA
=30 TO 50:SOUND4,1:NEXTA:SOUND50,50:NP(13)=NP(14):R=1:GOTO470
1530 IF LEFT(NB,3)=SKE AND R=41 THEN PRINT#449,"RATTLE! RATTLE!":EXEC32226:80
UND10,5:SOUND50,10:NP(15)=R:GOSUB3720:GOTO470
1550 IF NB="**" THEN PRINT#449,"LOAD WHAT?":EXEC32226:SOUND70,70:SOUND20,90:GOTO47
0
1560 IF LEFT(NB,3)=GUN AND NP(12)=2 AND NP(13)=2 THEN PRINT#449,"THE GUN IS
READY TO FIRE!":SOUND50,10:SOUND40,20:SOUND30,30:EXEC32226:G1:NP(13)=1:1:1:1
1570 IF LEFT(NB,3)=GUN AND NP(12)=2 THEN PRINT#449,"YOU HAVEN'T GOT A GUN!":
EXEC32226:SOUND50,10:GOTO470
1580 IF LEFT(NB,3)=GUN AND NP(13)=2 THEN PRINT#449,"WHAT WITH?":SOUND50,10:
EXEC32226:GOTO470
1590 PRINT#449,"YOU CAN'T LOAD THAT!":SOUND30,10:EXEC32226:GOTO470
1600 IF NB="**" THEN PRINT#449,"SHOOT WHAT?":EXEC32226:SOUND40,10:SOUND30,40:GOTO4
70
1610 IF LEFT(NB,3)=MUN AND G=1 AND NP(12)=2 AND R=29 THEN FORA=1 TO 4:PRINT#
449,"BANG!":SOUND200,50:EXEC32226:NEXTA:PRINT#449,"THE MUMMY FALLS DEAD!":EXEC32
226:SOUND40,80:PRINT#449,"A DARK PASSAGE IS REVEALED!":EXEC32226:A=1
1620 IF A=1 THEN SOUND40,40:129,1:48:MU=1:GOSUB3720:GOTO470
1630 IF NP(12)=2 THEN PRINT#449,"WHAT WITH?":EXEC32226:SOUND90,10:SOUND10,90:G
OTO470
1640 IF G=1 THEN PRINT#449,"THE GUN ISN'T LOADED!":SOUND40,40:EXEC32226:GOTO470
1650 PRINT#449,"BANG!":SOUND200,50:EXEC32226:PRINT#449,"YOU SHOT INTO THE AIR!":
EXEC32226:G=0:GOTO470
1660 IF NB="**" THEN PRINT#449,"LIGHT WHAT?":EXEC32226:SOUND90,90:GOTO470
1670 IF LEFT(NB,3)=LAN THEN PRINT#449,"YOU CAN'T LIGHT THAT!":SOUND30,30:SOU
ND40,40:EXEC32226:GOTO470
1680 IF NP(15)=2 THEN PRINT#449,"YOU HAVEN'T GOT THAT!":SOUND10,90:EXEC32226:100
GOTO470
1690 IF NP(14)=2 THEN PRINT#449,"WHAT WITH?":EXEC32226:SOUND210,20:GOTO470
1700 PRINT#449,"THE LANTERN SHINES BRIGHTLY!":EXEC32226:FORA=40 TO 200 STEP 10:8
UND50,1:NEXTA:1=1:GOTO470
1710 IF NB="**" THEN PRINT#449,"OPEN WHAT?":EXEC32226:SOUND200,10:SOUND10,200:GOTO
470
1720 IF LEFT(NB,3)=DOO AND R=30 THEN PRINT#449,"THE DOOR SQUEAKS NOISILY OPEN!":
EXEC32226:SOUND20,20:SOUND30,30:SOUND40,40:130,1:32:GOSUB3720:GOTO470
1730 IF LEFT(NB,3)=CHE AND R=36 AND NP(7)=2 THEN PRINT#449,"THE CHEST OPENS
RELUCTANTLY!":EXEC32226:SOUND40,90:NP(13)=R:GOTO470
1740 IF LEFT(NB,3)=DOO AND R=45 AND NP(13)=2 AND NP(16)=2 AND NP(17)=2 THE
N PRINT#449,"THE GREAT DOOR OPENS SLOWLY!":EXEC32226:SOUND3000,5:145,2:44:GOSUB
3720:GOTO470
1750 IF (R=41 OR R=50) AND LEFT(NB,3)=DOO THEN PRINT#449,"IT WON'T BUDDIE!":EX
EC32226:SOUND90,80:GOTO470
1760 IF (LEFT(NB,3)=GAT OR LEFT(NB,3)=POR) AND R=51 THEN PRINT#449,"IT'S T
O HEAVY TO OPEN!":EXEC32226:SOUND40,80:SOUND80,40:GOTO470
1770 IF R=38 AND LEFT(NB,3)=SAR THEN PRINT#449,"WHICH ONE?":EXEC32226:SOUND40
,10:GOTO470
1780 IF R=38 AND LEFT(NB,3)=THR THEN PRINT#449,"IT CREAKS OPEN!":EXEC32226:FO
RA=70 TO 90:SOUND4,5:NEXTA:PRINT#449,"REVEALING A SMALL PASSAGE!":EXEC32226:SOUN
D30,90:138,0:42:GOSUB3720:GOTO470
1790 IF R=38 AND (LEFT(NB,3)=ONE OR LEFT(NB,3)=TWO OR LEFT(NB,3)=FOU OR
0:SOUND40,50:SOUND90,50:GOTO470
1800 IF R=45 THEN PRINT#449,"IT'S LOCKED!":SOUND30,100:EXEC32226:GOTO470
1810 IF LEFT(NB,3)=DOO THEN PRINT#449,"WHAT DOOR?":EXEC32226:SOUND500,10:GOTO
470
1820 PRINT#449,"YOU CAN'T DO THAT!":SOUND150,50:EXEC32226:GOTO470
1830 IF NB="**" THEN PRINT#449,"READ WHAT?":EXEC32226:SOUND100,10:SOUND150,10:GOTO
470
1840 IF R=12 AND LEFT(NB,3)=SIG THEN PRINT#449,"IT SAYS : BEWARE THE CURSE OF
:EXEC32226:SOUND40,40:PRINT#449,"ABU STHEEL!":EXEC32226:SOUND90,40:SOUND40,80:G
OTO470
1850 IF LEFT(NB,3)=SCR AND NP(8)=2 THEN PRINT#449,"IT SAYS : ABU WAS HERE OK
!":EXEC32226:SOUND40,60:GOTO470
1860 IF R=39 OR R=14 THEN 1880
1870 PRINT#449,"YOU CAN'T!":SOUND20,20:EXEC32226:GOTO470
1880 IF R=14 AND (LEFT(NB,3)=BOU OR LEFT(NB,3)=HIE) THEN PRINT#449,"YOU CA
N'T READ HIEROGLYPHICS!":EXEC32226:SOUND10,90:GOTO470
1890 IF LEFT(NB,3)=WAL OR LEFT(NB,3)=WRI THEN PRINT#449,"IT SAYS : 'GOLD-
SILVER-COPPER'":EXEC32226:SOUND10,10:GOTO470
1900 GOTO1870
1910 IF NB="**" THEN 420
1920 IF LEFT(NB,3)=SCR OR LEFT(NB,3)=WAL OR LEFT(NB,3)=BOU THEN 1830
1930 IF R=68 AND LEFT(NB,3)=PED THEN PRINT#449,"THERE'S A SMALL HOLE!":EXEC32
226:SOUND10,10:GOTO470
1940 PRINT#449,"YOU SEE NOTHING SPECIAL!":EXEC32226:SOUND10,50:SOUND40,40:SOUNDB
9,70:GOTO470
1950 IF RND(2)=2 THEN PRINT#449,"NOT NOW!":EXEC32226:SOUND30,30:GOTO470
1960 IF R=13 THEN PRINT#449,"TRY THE FRUIT!":EXEC32226:SOUND50,70:GOTO470
1970 IF R=14 THEN PRINT#449,"WHAT ABOUT THE BOULDER?":EXEC32226:SOUND10,20:GOTO4
70
1980 IF R=21 THEN PRINT#449,"SOME LIGHT MIGHT HELP!":EXEC32226:SOUND10,30:GOTO47
0
1990 IF R=29 THEN PRINT#449,"KILL THE MUMMY!":SOUND10,20:EXEC32226:GOTO470
2000 IF R=36 OR R=45 THEN PRINT#449,"DON'T OPEN! UNLOCK IT!":EXEC32226:SOUND10,1
0:GOTO470
2010 IF R=37 AND R=42 THEN PRINT#449,"EXITS ARE NOT ALWAYS OBVIOUS!":EXEC32226:5
UND10,30:GOTO470
2020 IF R=33 THEN PRINT#449,"DO SOMETHING, QUICKLY!":EXEC32226:SOUND10,20:GOTO47
0
2030 IF R=50 THEN PRINT#449,"SOMETHING ELSE MAY HELP!":EXEC32226:SOUND10,10:GOTO
470
2040 IF R=68 THEN PRINT#449,"TRY THE PEDISTAL!":EXEC32226:SOUND10,20:GOTO470
2050 PRINT#449,"I CAN'T HELP YOU HERE!":EXEC32226:SOUND10,20:GOTO470
2060 PRINT#449,"DO YOU WISH TO SAVE YOUR?":SOUND10,10:EXEC32226:PRINT#449,"CURRE
N T POSITION :":SOUND10,10
2070 POKE5494,0
2080 AB=IN#KEYS:IF AB="**" THEN 2090
2090 IF AB="Y" THEN A=0:SOUND50,50:PRINT#449,"A=0:GOTO2130
2100 IF AB="N" THEN A=1:SOUND50,50:PRINT#449,"A=1:GOTO2130
2110 IF AB="X" THEN A=1:SOUND50,50:PRINT#449,"A=1:GOTO2130
2120 GOTO2090
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2100 IF A=1 THEN GOTO 2320
2110 PRINTB449,"PLEASE POSITION THE TAPE." :EXEC32226: SOUND10,10:PRINTB449,"PRESS
A KEY :":SOUND10,10:MOTOR ON:AUDIO ON
2200 AB=INKEY$:IF AB="" THEN GOTO 2200
2210 PRINTA1:EXEC32226:MOTOR OFF:AUDIO OFF
2220 PRINTB449,"PRESS RECORD." :SOUND40,80:EXEC32226:PRINTB449,"PRESS A KEY :":S
OUND10,10
2230 AB=INKEY$:IF AB="" THEN GOTO 2230
2240 PRINTA1:EXEC32226
2250 PRINTB449,"SAVING....":SOUND40,90:EXEC32226
2260 OPEN"O",#1,"DATA"
2270 PRINTB49,"I,M,I,MU,CR,CC,P,PP,T,M,NM,L,0
2280 FORA=1 TO25:PRINTB49,I,NP(A):NEXTA
2290 CLOSE#1
2300 PRINTB449,"DONE":SOUND30,50:EXEC32226
2310 GOTO420
2320 A=0:PRINTB449,"DO YOU WISH TO LOAD A GAME :?":SOUND10,10
2330 AB=INKEY$:IF AB="" THEN GOTO 2330
2340 IF AB="N" THEN PRINTCHR(8):AB=1:GOTO2370
2350 IF AB="Y" THEN PRINTCHR(8):AB=1:GOTO2370
2360 GOTO2330
2370 SOUND30,80
2380 AB=INKEY$:IF AB="" THEN GOTO 2380
2390 IF AB=CHR(8):THEN GOTO 2320
2400 IF AB=CHR(13): THEN GOTO 2420
2410 GOTO2380
2420 SOUND40,20:EXEC32226
2430 IF A=1 THEN PRINTB449,"VERY WELL." :EXEC32226:FORA=20 TO 40:SOUND40,50:NEXTA
2440 PRINTB449,"SEARCHING....":EXEC32226:SOUND10,10
2450 OPEN"i",#1,"DATA"
2460 PRINTB449,"LOADING....":EXEC32226:SOUND10,10
2470 INPUT#1,I,M,I,MU,CR,CC,P,PP,T,M,NM,L,0
2480 FORA=1 TO 25:INPUT#1,NP(A):NEXTA
2490 CLOSE#1:PRINTB449,"DONE":EXEC32226:SOUND20,20:GOTO420
2500 IF N="" THEN PRINTB449,"FIT WHAT?":EXEC32226:SOUND40,10:GOTO470
2510 IF R<68 THEN PRINTB449,"YOU CAN'T":EXEC32226:SOUND40,10:GOTO470
2520 IF NP(18)<2 THEN PRINTB449,"YOU CAN'T":EXEC32226:SOUND90,40:GOTO470
30:PRINTB449,"IT FITS INTO THE HOLE":EXEC32226:SOUND40,10:GOTO470
31:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
32:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
33:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
34:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
35:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
36:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
37:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
38:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
39:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
40:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
41:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
42:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
43:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
44:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
45:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
46:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
47:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
48:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
49:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
50:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
51:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
52:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
53:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
54:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
55:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
56:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
57:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
58:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
59:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
60:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
61:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
62:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
63:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
64:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
65:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
66:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
67:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
68:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
69:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
70:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
71:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
72:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
73:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
74:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
75:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
76:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
77:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
78:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
79:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
80:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
81:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
82:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
83:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
84:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
85:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
86:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
87:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
88:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
89:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
90:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
91:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
92:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
93:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
94:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
95:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
96:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
97:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
98:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
99:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
100:EXEC32226:FORA=30 TO 1 STEP-1:SOUND40,80:NEXTA:NP(17)=R:GOTO470
101:EXEC32226:FORA=30 TO 
```


For home or business the IBM compatible Advance



86^a

16 Bit Micro-Computer Under £350*

For the home user start with Model A with its massive 144K RAM and outstanding typewriter style keyboard that fits within the base unit for portability and storage.

Note the large return key and position of the numeric keyboard. Fast retrieval from storage and fast action on games is achieved by the use of the Intel 8086 True 16-bit micro-processor running at 4.77 MHz.

The Advance 86 runs IBM PC software.

Specification

CPU Type	True 16-bit 8086 running at 4.77 MHz.
RAM	128K or 256K with parity plus 16K video Basic
Languages Included	Basic
Type of Keyboard	Full 84 keys tactile
Keyboard Facilities	10 programmable keys
Character Set	256 in ROM
Method of Display	TV, RGB, Comp/Sync colour or monochrome monitor
Display Facilities	Full screen handling, 4 screen paged
Text	80 x 25 or 40 x 25
Graphics Resolution	320 x 200 or 640 x 200
Colours Available	16
Graphics Facilities	Scroll, reverse image
Cassette Recorder	Audio
Interfaces Included	Cassette port, light pen, joystick, Centronics
Sound	Built-in speaker
Operating System	Built-in ROM
Printers	Any using Centronics parallel interface
Comments	Hardware and software compatible with IBM PC Upgradeable to Model B Provision for 8087 Arithmetic Processor
Warranty	12 months



The business user can upgrade to Model B by adding the Advance Expansion box containing 2 x 5.25" disc drives providing 720K storage at £956.52 + VAT. The Advance 86 Model B offers the business micro-computer buyer an IBM compatible disk-based system with twin drives, with Perfect Writer/Speller, Calc and Filer Software (MS/DOS) included for only £1303.48 + VAT.

Advance 86 Models A & B are designed and marketed by Advanced Technology UK Ltd. Made by FERRANTI in Oldham. Delivery within 30 days from receipt of payment. 128K memory expansion £108.70 + VAT.

Advanced Technology UK Ltd.
8A Hornsey Street, London N7 8ZHB
Tel: 01-609 0061 for leaflet:

On site warranty for 12 months by National Advanced Systems (part of National Semiconductor) one of the largest companies in the U.S.A. for 86B.
*Ex VAT.

Benchmarks

The standard Benchmarks were run using Advance Basic, which is the equivalent of Microsoft GWBasic and Basica on the IBM PC.

Machine	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Advance 86 — 8086	0.8	3.3	7.3	7.4	8.1	14.6	23.9	26.0	11.4
ACT Apricot — 8086	1.6	5.2	10.6	11.0	12.4	22.9	35.4	34.4	16.7
IBM PC — 8088	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30.0	16.8

To Advance Technology UK Ltd., 8A Hornsey Street, London N7 8HB

- ☐ Please send Model 86A, Micro-Computer & Keyboard I enclose £399 including VAT
- ☐ Please send Model 86B which includes Model 86A plus Expansion Box & Software. I enclose £1499 inc. VAT.
- ☐ Please send 128K Memory Expansion £125 inc. VAT. Cheque/Barclaycard/Access No.

Name _____

Company _____

Address _____

Address _____

YC

AMSTRAD WORD PROCESSOR

Roger Hammond gives you a large range of options for printing pages, quitting, scrolling, or cataloguing the tape

Listing 1. The loader program.

```

10 MEMORY 35999
20 ZONE 6
30 FOR I=36000 TO 36266
40 PRINT I,:INPUT X%
50 POKE I,X%
60 NEXT I
70 FOR X=36000 TO 36260 STEP 10
80 PRINT X,
90 FOR I=0 TO 9
100 PRINT PEEK(X+I),
110 NEXT I
120 PRINT
130 NEXT X
140 INPUT "IS THIS CORRECT? (Y/N)";Q$
150 IF Q$="y" OR Q$="Y" THEN 190
160 IF Q$<>"N" AND Q$<>"n" THEN 140
170 INPUT "enter address and correct
    value seperated by a comma";ad,x%
180 POKE ad,x%:GOTO 70
190 INPUT "ENTER FILENAME";N$
200 SAVE N$,B,36000,267
    
```

The machine code.

36000	33	32	78	1	127	62	54	32	35	13
36010	32	250	14	0	5	32	245	201	42	189
36020	77	1	64	7	62	32	119	35	13	32
36030	251	14	0	5	32	246	201	42	189	77
36040	1	64	7	126	205	90	187	35	13	32
36050	248	14	0	5	32	243	201	17	96	134
36060	42	191	77	14	20	58	194	77	71	126
36070	18	19	35	16	250	58	193	77	71	35
36080	16	253	13	32	236	17	112	148	33	112
36090	148	14	3	58	194	77	71	126	18	35
36100	19	16	250	58	193	77	71	35	16	253
36110	13	32	236	237	91	196	77	42	196	77
36120	58	195	77	71	43	16	253	237	75	198
36130	77	237	184	235	19	33	112	148	237	75
36140	195	77	6	0	237	176	237	91	191	77
36150	33	96	134	14	20	58	194	77	71	126
36160	18	19	35	16	250	58	193	77	71	19
36170	16	253	13	32	236	201	33	112	148	6
36180	240	54	32	35	16	251	201	17	96	134
36190	42	191	77	14	20	58	194	77	71	126
36200	18	19	35	16	250	58	193	77	71	35
36210	16	253	13	32	236	237	75	198	77	237
36220	91	200	77	42	202	77	237	176	58	204
36230	77	71	54	32	43	16	251	237	91	191
36240	77	33	96	134	14	20	58	194	77	71
36250	126	18	19	35	16	250	58	193	77	71
36260	19	16	253	13	32	236	201	0	0	0

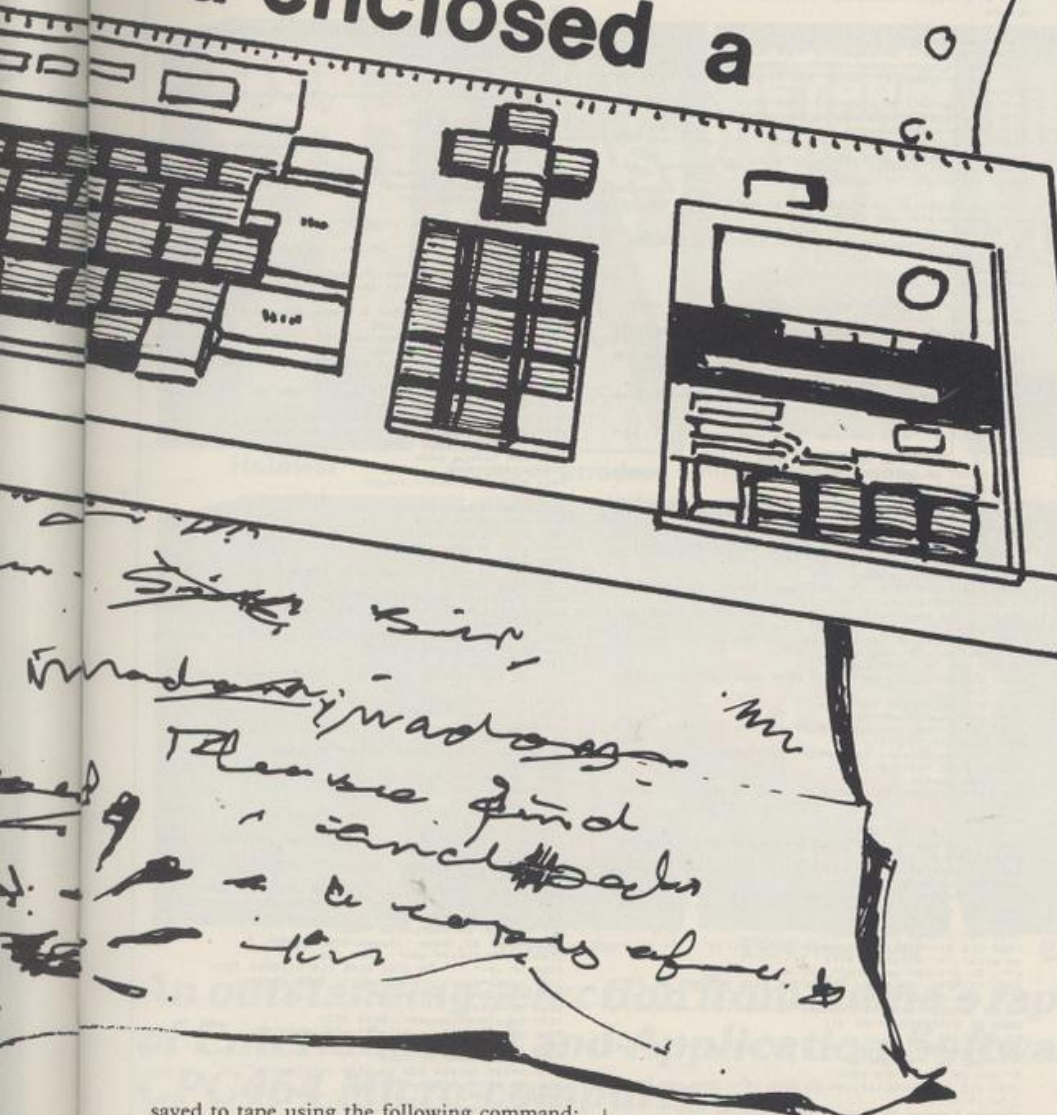


ROBWRITE is a word-processing program that allows the user to Save and Load files, use different sizes of text if his printer permits, change margins, access nine different pages of 20 lines which can easily be printed consecutively and exercise full editing functions. It has been written for an Epson RX-80 F/T but should run on most printers with little alteration.

The machine code should be entered and saved to tape first as the program will probably crash if it is not present. Listing 1 will load this if you enter the values given in the decimal dump. The machine code should be

Dear madam

I find enclosed a



saved to tape using the following command:
SAVE <FILENAME>,B,START ADDRESS,267

Do not try calling the machine code other than from the main program as it uses variables Poked from Basic.

Once the machine code is in memory and has been saved, enter the Basic program. The program will normally load the code itself when it is run but, during development, if you are sure that the code is present above Himem it may be a good idea to turn line 290 into a Rem statement or to remove the exclamation

mark from within the quotes so that the computer will warn you that it is about to attempt to load.

When you have debugged the program save it with the machine code after it, making certain that line 290 is back to its original form.

There are about two kilobytes left free in Basic for any additions you may feel like adding and the area above Himem from 36267 to 37999 is also free.

(continued on next page)

The main program.

```
10 REM*****ROBRI
11 *****
20 SPEED WRITE 1
30 OPENOUT "dummyfile"
40 MEMORY 19000
50 CLOSEOUT
60 EPHASISX=1:STRIKEX=1:TYPEX=1:SETX=1:SPACEX=6:INSE
TX=1
70 BOTTOMX=20
80 DIM TABX(80):FOR I=1 TO 80:TABX(I)=0:NEXT
90 MODE 2:ZONE 0,10:BORDER 10:INK 1,26
100 WINDOW #0,1,80,1,22:WINDOW #1,1,80,22,25:WINDOW #2
,60,70,25,25
110 PRINT"robwrite2","by Robin J.R. Hammond","....
120 PRINT"Use the following keys to control the progr
am"
130 ZONE 30
140 PRINT"ARROWS","to move the cursor"
150 PRINT"DEL","to delete text"
160 PRINT"ENTER","for carriage return"
170 PRINT"TAB","to move to the next tab position"
180 PRINT"CTRL and TAB","to set a tab position"
190 PRINT"CLR","to clear all tab stops"
200 PRINT"CTRL and :CHR$(93)","to enter delete mode"
210 PRINT"CTRL and :CHR$(91)","to enter insert mode"
220 PRINT"COPY","to display options"
230 ZONE 80
240 PRINT #1,"PLEASE WAIT"
250 LOAD "36000
260 CLS #1
270 PRINT "....PRESS ANY KEY TO CONTINUE...."
280 IF INKEY="" THEN 280
290 WIDTH 80
300 CLS:PRINT CHR$(7):PRINT "PLACE THE PRINTER ON LIN
E."
310 PRINT #0,CHR$(27):"A":CLS
320 PRINT #0,CHR$(27):"E":
330 PRINT #0,CHR$(27):"O":
340 PRINT #0,CHR$(27):"A":CHR$(SPACEX):
350 PRINT #0,CHR$(27):"P":
360 PRINT #0,CHR$(27):"C":CHR$(0):CHR$(1):
370 PRINT #0,CHR$(27):"N":CHR$(12):
380 PRINT #0,CHR$(13):
390 PRINT"Current printer settings are:...."
400 PRINT"PICT SIZE PRINT","EMPHASIZED PRINT","DOUBLE
STRIKE OR","6/72 INCH LIN
E SPACING","11 INCH PAPER LENGTH","1 INCH DIP OVER PE
RFORMATION SETTING"
410 PRINT"....These may be changed at any time during
operation of the program b
y pressing COPY and selecting the appropriate optio
n. Changing any setting w
ill however cause the paper to move up slightly."
420 PRINT"....PRESS ANY KEY TO CONTINUE...."
430 IF INKEY="" THEN 430
440 PRINT CHR$(7):CLS:PRINT #1,"Do you want standard
margins? Press Y or N"
450 Q$=INKEY:IF Q$="" THEN 450 ELSE IF Q$="Y" OR Q$="
Y" THEN GOSUB 3370 ELSE IF
Q$="N" OR Q$="N" THEN GOSUB 3390 ELSE 450
460 CLS #1
470 FOR I=19901,820:FOR J=19902,84E
480 CALL 36000
490 CALL 36176
500 I=I+20:O=O+1:IF I=9999:GOTO 510
510 CLS:ZONE 25:GOSUB 3410
520 N$="1234567890123456789012345678901234567890123456
78901234567890123456789012
34567890"
530 LOCATE 1,2:PRINT N$:
540 X=1:Y=1:Y2=Y+1
550 PAGEX=1
560 PRINT CHR$(7):
570 PRINT #2,"page ":PAGEX:
580 B$=INKEY$
590 PRINT CHR$(22):CHR$(1)
600 LOCATE X,Y:PRINT " "
610 PRINT CHR$(22):CHR$(0)
620 IF B$="" THEN 580
630 IF B$=CHR$(13) THEN 760 ELSE IF B$=CHR$(127) THEN
800 ELSE IF B$=CHR$(240)
HEN 870 ELSE IF B$=CHR$(241) THEN 910 ELSE IF B$=CHR$(
242) THEN 950 ELSE IF B$=C
H$(243) THEN 990 ELSE IF B$=CHR$(224) THEN 1910
640 IF B$=CHR$(9) THEN 1030 ELSE IF B$=CHR$(225) THEN
1110 ELSE IF B$=CHR$(16)
HEN 1120 ELSE IF B$=CHR$(27) THEN 1140 ELSE IF B$=CHR$(
129) THEN 1450
650 IF INKEY$=1 THEN 660 ELSE INQ$=INQ$:IF INQ$=POS
INQ$ THEN PRINT CHR$(7):G
OTO 580
660 IF X=RIGHT$-5 THEN SOUND 1,60,10,2
670 LOCATE X,Y:PRINT B$:
680 FOR H,ASC(B$)
690 IF Y2=bottomX AND X=rightX THEN 580
700 H=H+1
710 X=X+1
720 IF X=rightX THEN 580
730 X=leftX:Y2=Y+1
740 H=leftX-rightX+79
750 GOTO 580
760 REM "..." CR
770 IF Y2=bottomX THEN 580 ELSE LOCATE X,Y:PRINT CHR
$(PEEK(n))
780 H=leftX-X+80:X=leftX:Y2=Y+1
790 GOTO 580
800 REM "..." DELETE
810 IF X=leftX AND Y2=1 THEN 580
820 LOCATE X,Y:PRINT CHR$(PEEK(n))
830 X=X-1:IF X=leftX-1:IF X=leftX-1 THEN GOSUB 860
840 LOCATE X,Y:PRINT " "
850 GOTO 580
860 X=rightX:Y2=Y-1:IF X=rightX-1:IF X=rightX-1:RETURN
870 REM cursor up
880 IF Y2=1 THEN 580 ELSE LOCATE X,Y:PRINT CHR$(PEEK
(n))
890 Y2=Y-1:IF Y2=0:LOCATE X,Y:PRINT CHR$(PEEK(n))
900 GOTO 580
910 REM cursor down
920 IF Y2=bottomX THEN 580 ELSE LOCATE X,Y:PRINT CHR
$(PEEK(n))
930 Y2=Y+1:IF Y2=80:LOCATE X,Y:PRINT CHR$(PEEK(n))
940 GOTO 580
950 IF X=leftX AND Y2=1 THEN 580 ELSE LOCATE X,Y:PR
INT CHR$(PEEK(n))
960 IF X=rightX THEN 980
970 X=X-1:IF X=leftX-1:LOCATE X,Y:PRINT CHR$(PEEK(n)):G
OTO 580
980 X=rightX:Y2=Y-1:IF X=rightX-1:IF X=rightX-1:LOCATE X,Y:
PRINT CHR$(PEEK(n)):GOTO
580
990 REM cursor right
1000 IF X=rightX THEN 1020 ELSE LOCATE X,Y:PRINT CH
R$(PEEK(n))
1010 X=X+1:IF X=rightX:LOCATE X,Y:PRINT CHR$(PEEK(n)):G
OTO 580
1020 SOUND 1,80,20,2:IF Y2=bottomX THEN 580 ELSE LOCAT
E X,Y:PRINT CHR$(PEEK(n))
1030 X=X+1:IF X=rightX:IF X=rightX:GOTO 580
1040 FOR I=X+1 TO rightX
1050 IF TABX(I)=1 THEN 1080
1060 NEXT I
```

(listing continued on next page)

and [are pressed for a second time. It can be edited normally.

Delete: press Ctrl and J. Up to 255 characters can be deleted, starting with the character to the left of the cursor. Press Del until the cursor is under the last character to be deleted then Ctrl and J. If you move the cursor too far press the right cursor arrow.

Tab Stops: press Ctrl and Tab to set a tab stop or CLR to clear all tab stops. When Tab is pressed the cursor will advance to the next tab stop if one exists or else the beginning of the

Cursor keys: they move the cursor one space or line in the given direction, within the confines of the margins and screen, without overwriting the text.

Copy key: gives a large range of options for printing a page or pages. If you load a file that is longer than the amount of room you have allocated for it, the machine code will be overwritten and the program will crash. If you are not using an Epson printer consult your printer manual and check lines 360 to 430.

```

1980 FOR i=1 to 2 to finish
1990 PRINT #0,CHR$(PEEK(i))
2000 NEXT i
2010 CLS #1:GOTO 270
2020 start=top:finish=top+80000:is=RETURN
2030 start=top:finish=top+15999:RETURN
2040 start=20000:finish=54399:RETURN
2050 CLS #1:INPUT #1,"enter first and last names separated by a comma:page1X,page2X
2060 IF page1X:1 OR page2X:9 OR page1X:page2X THEN 2050
2070 start=18400+1600*page1X:finish=19999+1600*page2X:RETURN
2080 CLS #1:INPUT #1,"Enter the last page that you want to print:page2X
2090 IF page2X:1 OR page2X:9 THEN 2080
2100 start=20000:finish=19999+1600*page2X:RETURN
2110 CLS #1:INPUT #1,"Enter the first page to be printed:page1X
2120 IF page1X:1 OR page1X:9 THEN 2110
2130 start=18400+1600*page1X:finish=54399:RETURN
2140 REM printer options
2150 CLS #1:PRINT #1,"1) form feed?","2) set/reset italic?","3) change line separation?","4) advance 1 lines?","5) type options?","6) main options?","7) continue
2160 q$=INKEY$:IF q$="" OR q$<"1" AND q$<"2" AND q$<"3" AND q$<"4" AND q$<"5" AND q$<"6" AND q$<"7" THEN 2160
2170 CLS #1:q$=VAL(q$):GOTO 2190,2210,2230,2250,2300,2340,1910,270
2180 REM #1
2190 PRINT #0,CHR$(12):GOTO 2150
2200 REM italics
2210 IF set%i THEN PRINT #0,CHR$(27):"I"; ELSE PRINT #0,CHR$(27):"5";
2220 IF page1X:1 OR page2X:9 OR page1X:page2 THEN 2210
2230 set%i=not%i:FOR delay=0 TO 1000:NEXT:PRINT #0,CHR$(13):GOTO 2150
2240 REM line separation
2250 CLS #1:PRINT #1,"Line separations are currently set at "spaceX"/72 of an inch."
2260 INPUT #1,"what value n/72 do wish to reset it to:spaceX
2270 IF spaceX<0 OR spaceX>255 THEN 2260
2280 PRINT #0,CHR$(27):"A";CHR$(spaceX):PRINT #0,CHR$(13):GOTO 2150
2290 REM advance 1 lines
2300 CLS #1:INPUT #1,"How many lines do you want to advance the paper:1X
2310 IF 1X:1 THEN 2300
2320 FOR nX=1 TO 1X:PRINT #0,CHR$(10):NEXT nX:GOTO 2150
2330 REM screen options
2340 CLS #1:PRINT #1,"1) set/reset emphasis?","2) set/reset double strike?","3) change type size?","4) printer options?","5) main options?","6) continue?","7)
2350 q$=INKEY$:IF q$="" OR q$<"1" AND q$<"2" AND q$<"3" AND q$<"4" AND q$<"5" AND q$<"6" THEN 2350
2360 CLS #1:q$=VAL(q$):GOTO 2380,2340,2480,2150,1910,270
2370 REM set/reset emphasis
2380 emphasis="emphasis
2390 IF emphasis="" THEN PRINT #0,CHR$(27):"E"; ELSE PRINT #0,CHR$(27):"F";
2400 IF emphasis="" THEN PRINT #1,"Print is now emphasized." ELSE PRINT #1,"Print is now normal."
2410 FOR delay=0 TO 1000:NEXT:PRINT #0,CHR$(13):GOTO 2150
2420 REM ds
2430 strikeX="strikeX
2440 IF strikeX="" THEN PRINT #0,CHR$(27):"G"; ELSE PRINT #0,CHR$(27):"H";
2450 IF strikeX="" THEN PRINT #1,"Printing is now in double strike mode." ELSE PRINT #1,"Printing is now in normal mode."
2460 FOR delay=0 TO 1000:NEXT:PRINT #0,CHR$(13):GOTO 2150
2470 REM change type size
2480 CLS #1:PRINT #1,"1) pica?","2) elite?","3) enlarged pica?","4) enlarged elite?","5) printer options?","6) main options?
2490 PRINT #1,"WARNING: CHARACTER SIZE MAY NOT BE SUITABLE FOR YOUR PRINTING. CHARACTERS WILL BE CHANGED SO THAT LEFT AND RIGHT EDGES OF ALTERNATE TYPE 312 ARE COINCIDENT."
2500 q$=INKEY$:IF q$="" OR q$<"1" AND q$<"2" AND q$<"3" AND q$<"4" AND q$<"5" AND q$<"6" THEN 2500
2510 CLS #1:q$=VAL(q$):GOTO 2520,2520,2520,2520,2150,1910,270
2520 IF typeX=3 OR typeX=4 THEN PRINT #0,CHR$(27):"M"; GOTO 2500
2530 typeX=typeX+1:GOTO 2520,2570,2590,2610
2540 REM pica
2550 PRINT #0,CHR$(27):"P";PRINT #0,CHR$(13):GOTO 2150
2560 REM elite
2570 PRINT #0,CHR$(27):"M";PRINT #0,CHR$(13):GOTO 2150
2580 REM enlarged pica
2590 PRINT #0,CHR$(27):"P";PRINT #0,CHR$(27):"M";CHR$(13):PRINT #0,CHR$(13):GOTO 2150
2600 REM enlarged elite
2610 PRINT #0,CHR$(27):"M";PRINT #0,CHR$(27):"M";CHR$(13):PRINT #0,CHR$(13):GOTO 2150
2620 CLS #1:PRINT #1,"1) scrap this page?","2) scrap all pages?","3) next page?","4) previous page?","5) page 1?","6) main options?","7) continue
2630 q$=INKEY$:IF q$="" OR q$<"1" AND q$<"2" AND q$<"3" AND q$<"4" AND q$<"5" AND q$<"6" THEN 2630

```

```

5"3" AND q$="4" AND q$<"5"
5"5" AND q$<"6" AND q$>"7" THEN 2630
2640 CLS #1:q$=VAL(q$):ON q$ GOTO 2650,2700,2720,2760,
2800,1910,570
2650 IF 1990,1,256*(top/256)-INT(top/256):!POKE 1990
2,INT(top/256)
2660 CALL 36018:CLS:GOSUB 3410
2670 x$=left$y$+1:ht=top+left$-1
2680 LOCATE 1,21:PRINT n$;
2690 GOTO 570
2700 PRINT #1,"ARE YOU SURE? (Y OR N)"
2710 q$=INKEY$:IF q$="Y" OR q$="y" THEN 460 ELSE IF q$
="N" OR q$="n" THEN 2620 E
2720 GOTO 2710
2730 IF page$<9 THEN page$=0
2730 page$=page$+1:top=18400+1600+page$*ht=top+left$-1:
x$=left$y$+1
2740 CLS #1:GOSUB 3430
2750 GOTO 570
2760 IF page$<9 THEN page$=10
2770 page$=page$+1:top=18400+1600+page$*ht=top+left$-1:
x$=left$y$+1
2780 CLS #1:GOSUB 3430
2790 GOTO 570
2800 CLS #1:INPUT #1,"which page do you want to change
to:page$
2810 IF page$<1 OR page$>9 THEN 2800
2820 top=18400+1600+page$*ht=top+left$-1:x$=left$y$+1
2830 CLS #1:GOSUB 3430
2840 GOTO 570
2850 CLS #1:PRINT #1," save?","2) load?","3) continu
e?"
2860 q$=INKEY$:IF q$="s" OR q$<"1" AND q$<"2" AND q$<"3"
2870 CLS #1:q$=VAL(q$):IF opt$<3 THEN 570
2880 CLS #1:PRINT #1," this page?","2) all nine page
s?","3) pages 1 to j?"
2890 IF opt$<2 THEN PRINT #1,"WARNING:CONTENTS OF PRES
ENT PAGE WILL BE OVERWRITTEN!"
2900 q$=INKEY$:IF q$="s" OR q$<"1" AND q$<"2" AND q$<"3"
2910 q$=VAL(q$):ON q$ GOSUB 3050,3060,3080
2920 CLS #1:INPUT #1,"what is the filename:n$
2930 IF opt$<2 THEN 2990
2940 REM save a page
2950 WINDOW SHAP 0,1:CLS
2960 SAVE n$,start,length
2970 CLS
2980 WINDOW SHAP 0,1:GOTO 570
2990 REM load a page
3000 WINDOW SHAP 0,1:CLS
3010 LOAD n$,start
3020 CLS:WINDOW SHAP 0,1
3030 x$=left$y$+1:ht=top+left$-1:GOSUB 3430
3040 GOTO 570
3050 start=top:length=1600:RETURN
3060 start=20000:length=14400:IF opt$<2 THEN top=20000
3070 RETURN
3080 CLS #1:INPUT #1,"Enter the first and last pages s
eparated by a comma:frist
,last$%
3090 IF first$<1 OR last$<9 OR first$>last$ THEN 3080
3100 start=18400+1600+first$*length=(last$-first$+1):
600:IF opt$<2 THEN top=sta
rt:page$=first$
3110 RETURN
3120 LOCATE x$,y$:PRINT CHR$(PEE(h)):
3130 GOSUB 3390
3140 x$=left$y$+1
3150 ht=top+left$-1
3160 GOSUB 3430
3170 GOTO 570
3180 REM scroll pages
3190 CLS #1:PRINT #1," from present page?","2) from
page 1?","3) continue?"
3200 q$=INKEY$:IF q$="s" OR q$<"1" AND q$<"2" AND q$<"3"
3210 CLS #1:q$=VAL(q$):ON q$ GOTO 3220,3290,570
3220 CLS #1:PRINT #1:PRINT #1,"PRESS SPACE BAR TO CONT
INUE SCROLLING. ANY OTHER
KEY TO STOP ON DISPLAYED PAGE."
3230 PRINT #1,"page "page$:GOSUB 3430
3240 q$=INKEY$:IF q$=" " THEN 3240
3250 IF q$=" " THEN 3260 ELSE CLS #1:GOTO 3300
3260 page$=page$+1:IF page$<10 THEN page$=1
3270 top=18400+1600+page$
3280 GOTO 3250
3290 top=20000:page$=1:GOTO 3220
3300 ht=top+left$-1:x$=left$y$+1:GOTO 570
3310 tab$(x$)=1:GOTO 580
3320 WINDOW SHAP 0,1:CLS
3330 PRINT "press ESC to stop cataloging."
3340 ON BREAK GOSUB 3500
3350 CA?
3360 CLS:WINDOW SHAP 0,1:GOTO 570
3370 left$=Bright$+72
3380 RETURN
3390 PRINT CHR$(7):CLS #1:INPUT #1,"enter left then r
ight margins separated by
a comma:left$,right$:CLS #1
3400 IF left$<1 OR right$<10 OR left$>right$ THEN 339
0 ELSE RETURN
3410 MOVE left$-9,80:DRAW @left$-9,40,1:MOVE B@rig
ht$+1,80:DRAW B@right$+1,4
0,1
3420 RETURN
3430 POKE 1990,1,256*(top/256)-INT(top/256)
3440 POKE 19902,INT(top/256)
3450 LOCATE 1,1
3460 CALL 36037
3470 GOSUB 3410
3480 RETURN
3490: MODE 2:END
3500 ON BREAK STOP
3510 RETURN
3520 RETURN

```


the only choice

Kuma

AMSTRAD CPC464

software



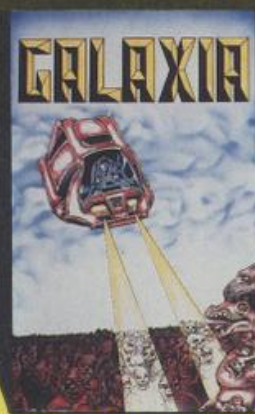
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Gems of Stradus



Star Avengers



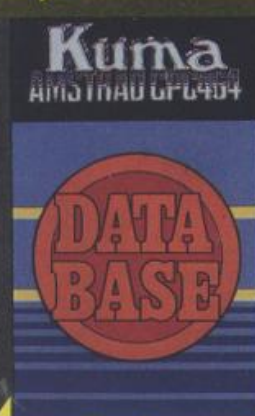
Galaxia



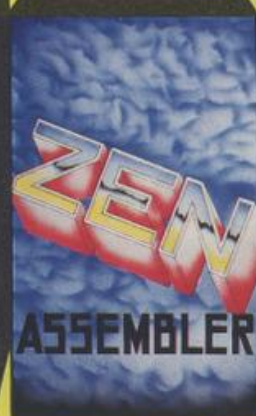
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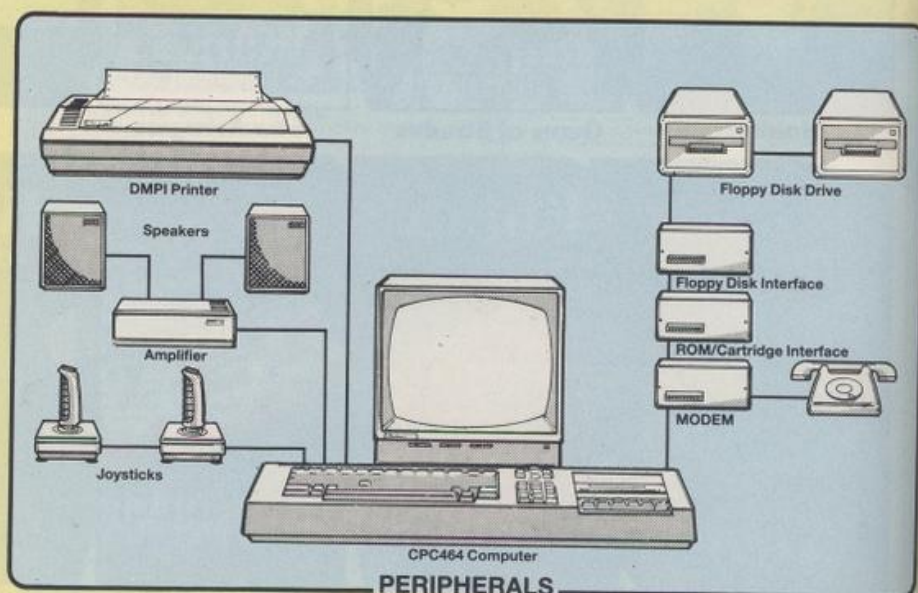
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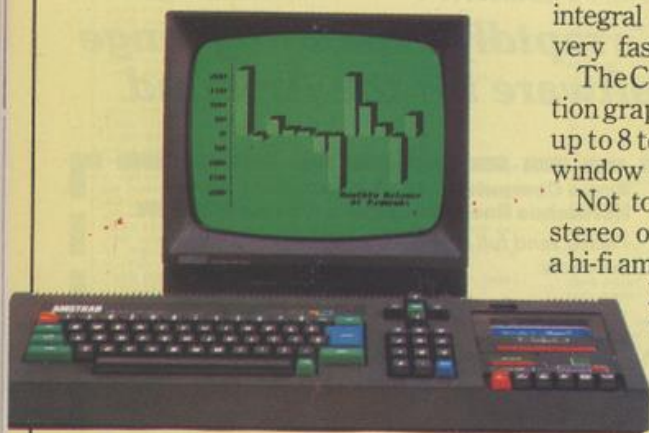
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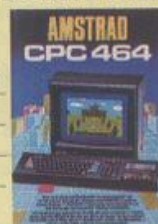


Figure 3. List of DMACTL and GRACLT options.

GRACLT Poke No.	LOCATION 53277 Action
1	enable missiles
2	enable players
3	enable players + missiles

E.G. Poke 53277, 2 enables players.

DMACTL LOCATION 559	Action
+4	enable missiles
+8	enable players
+12	enable players + missiles
+16	enable single resolution
+0 (default)	enable double resolution

E.G. Poke 559, Peek (559) + 12 + 16 enables players + missiles in single resolution.

The default for DMACTL, from power on or from system reset is 34.

Figure 4. Other player/missile registers.

Name(s)	Location(s)	Purpose
HPOSP0 (-3)	53248-51	Player horizontal Position Registers
HPOSM0 (-3)	53252-55	Missile horizontal Position registers
Size P0 (-3)	53256-59	Player size Registers
Size M	53260	Missile size Register
COLPM0 (-3)	704-707	Player/missile Colour registers

Figure 5. Priority Register.

Prior location 623
Priorities in this order
PF0, PF1, P0-3, PF2-3, background — 8
PF0-3, P0-3, background — 4
P0-1, PF0-3, P2-3, background — 2
P0-3, PF0-3, background — 1
E.G. Poke 623,2
PF = Playfield i.e. colours 0-3
P = Player 0-3

Figure 6. Collision Registers.

Location	Collision detection
53248	M0 to playfield
53249	M1 to playfield
53250	M2 to playfield
53251	M3 to playfield
53252	P0 to playfield
53253	P1 to playfield
53254	P2 to playfield
53255	P3 to playfield
53256	M0 to player
53257	M1 to player
53258	M2 to player
53259	M3 to player
53260	P0 to player
53261	P1 to player
53262	P2 to player
53263	P3 to player

53278 — HITCLR — Poke with any to clear collision registers.

Figure 7.

PMSTART = START + (512 + (512*RES))
+ PLAYER (128 + (128*RES))
MSB = INT (PMSTART/256)
LSB = PMSTRT - (MSB*256)
FOR T = TO 6
READ A,B
POKEA,MSB;POKEB,LSB;NEXT T
DATA 1562, 1561, 1569, 1568, 1580, 1579,
1605, 1604, 1612, 1611, 1623, 1622
RETURN

Patrick Nevison helps your screen come alive with Atari animation

ANIMATION WITH most personal computers is a time consuming and tedious process. To make a finely detailed image move across the screen involves the following process:

- ☐ Look at the background ahead of the image and temporarily store the contents.
- ☐ Erase the old image — draw in the background colour.
- ☐ Draw the new image.
- ☐ Restore the background at the previous image position.
- ☐ Repeat from step 1.

An example of this type of animation is given in listing 1. There has to be an easier and faster method. Machine code is one answer but is not easy to write or debug and one error can be catastrophic. Atari owners, among others, have a solution in hardware. Sprite, or as Atari call them player/missile graphics. A player is a graphic object which is shape and colour definable, and when moved over any background — playfield — image does not erase or alter it in any way. Type in listing 2 and see the same animation but using player graphics. In fact, there is a delay loop in listing 2 to make the two comparable.

So, what do we have in Atari computers — four user-definable objects all of independent

colour, independent shape, moving rapidly anywhere in any graphics mode without disturbing anything else. Sounds too good to be true. In fact, there are a few complications. Atari Basic is now showing its age against newer structured and more capable Basics.

Specifically, as regards P/M graphics, there are no commands to deal with this type of animation in Atari Basic. Thus, all dealings with P/M are done with the immortally incomprehensible Peek and Poke. Never fear, although the details are tedious and time consuming — though well worth it for the displays they make — the principles are quite straightforward.

As Atari Basic does not recognise P/M graphics, we must cordon off an area of memory to hold all of the data, so that Basic does not corrupt the information. The high end of memory is ideal for this and location 106 contains the number of "pages" — 256 bytes to a page — free at any one time. In changing the contents of location 106 we fool the computer into thinking it has less memory than is actually there, thus providing a safe place to store all of the P/M data.

Players are all eight bits — dots, pixels, whatever — wide, but can come in two heights. They are up to 128 bits high — double resolution — or up to 256 bits high — single resolution. There are swings and roundabouts in choosing which type you will



Listing 1.

```

10 REM LIST 1
20 GRAPHICS 7+16
30 FOR T=1 TO 100
35 REM DRAW IMAGE
40 COLOR 1
50 PLOT T,30:DRAWTO T+5,30:DRAWTO T+6,31:DR
  TO T-1,31
60 DRAWTO T-1,32:DRAWTO T,32:PLOT T+2,32:DR
  TO T+3,32
70 PLOT T+5,32:DRAWTO T+6,32:DRAWTO T+6,33:DR
  AWTO T-1,33:DRAWTO T-1,34
80 PLOT T+1,34:DRAWTO T+4,34:PLOT T+6,34:DR
  AWTO T+6,35:DRAWTO T+5,35
90 PLOT T,35:DRAWTO T-1,35:DRAWTO T-1,36:DR
  AWTO T+6,36:DRAWTO T+5,37:DRAWTO T,37
100 REM ERASE IMAGE
110 COLOR 0
120 PLOT T,30:DRAWTO T+5,30:DRAWTO T+6,31:DR
  AWTO T-1,31
130 DRAWTO T-1,32:DRAWTO T,32:PLOT T+2,32:DR
  AWTO T+3,32
140 PLOT T+5,32:DRAWTO T+6,32:DRAWTO T+6,33:DR
  AWTO T-1,33:DRAWTO T-1,34
150 PLOT T+1,34:DRAWTO T+4,34:PLOT T+6,34:DR
  AWTO T+6,35:DRAWTO T+5,35
160 PLOT T,35:DRAWTO T-1,35:DRAWTO T-1,36:DR
  AWTO T+6,36:DRAWTO T+5,37:DRAWTO T,37
170 NEXT T
180 GOTO 30:REM LOOP ENDLESSLY

```

Listing 2.

```

10 REM LIST 2
20 A=PEEK(106)-4:POKE 106,A:GRAPHICS 2+16:REM
  SET ASIDE P/M AREA
30 PMSTART=A*256
40 REM CLEAR PLAYER 0 AREA
50 START=PMSTART+512
60 FOR T=START TO START+128:POKE T,0:NEXT T
70 REM DEFINE PLAYER
80 FOR T=START+30 TO START+30+7
90 READ N
100 POKE T,N
110 NEXT T
120 DATA 126,255,219,255,189,195,255,126
130 REM SET PMBASE
140 POKE 54279,A
150 REM SET DMACTL
160 POKE 559,42
170 REM SET GRACLT
180 POKE 53277,2
190 REM SET PLAYER 0 COLOUR
200 POKE 704,14
210 REM MOVE PLAYER 0
220 FOR T=70 TO 180
230 POKE 55248,T
240 REM DELAY—SLOW IT DOWN

```

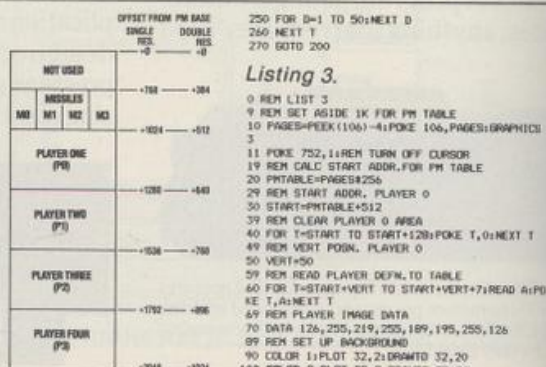


Figure 1. Player missile memory map.

Listing 3.

```

0 REM LIST 3
9 REM SET ASIDE 1K FOR PM TABLE
10 PAGES=PEEK(106)-4:POKE 106,PAGES:GRAPHICS
  3
11 POKE 752,1:REM TURN OFF CURSOR
19 REM CALC START ADDR.FOR PM TABLE
20 PMTABLE=PAGES*256
29 REM START ADDR. PLAYER 0
30 START=PMTABLE+512
39 REM CLEAR PLAYER 0 AREA
40 FOR T=START TO START+128:POKE T,0:NEXT T
49 REM VERT POSN. PLAYER 0
50 VERT=50
59 REM READ PLAYER DEFN. TO TABLE
60 FOR T=START+VERT TO START+VERT+7:READ A:P0
  KE T,A:NEXT T
69 REM PLAYER IMAGE DATA
70 DATA 126,255,219,255,189,195,255,126
89 REM SET UP BACKGROUND
90 COLOR 1:PLOT 32,2:DRAWTO 32,20
100 COLOR 2:PLOT 22,2:DRAWTO 22,20
110 COLOR 3:PLOT 12,2:DRAWTO 12,20
119 REM SET PMBASE
120 POKE 54279,PAGES
129 REM SET DMACTL
130 POKE 559,46
139 REM SET GRACLT
140 POKE 53277,2
149 REM PLAYER 0 COLOUR
150 POKE 704,14
159 REM SET HORIZONTAL POSITION
160 HPOSP0=53248
169 REM SET PRIORITY
170 POKE 623,4
179 REM MOVE PLAYER+CHECK COLLISIONS
180 FOR T=190 TO 40 STEP -1
190 POKE HPOSP0,T
200 ? "COLLISION" :PEEK(53252)
209 REM RESET USING HITCLR
210 POKE 53278,1
220 NEXT T
229 REM LOOP ENDLESSLY
230 GOTO 180

```

Listing 4.

```

0 REM LISTING 4 PM VERT MOVE ROUTINE
10 GOSUB 25150:REM INSTALL VERT MOVE ROUTINE
20 POKE 106,40:REM RESERVE RAM FOR TABLE
30 ? "V":POKE 752,1:POKE 710,6:POKE 709,0:REM
  CLEAR SCREEN

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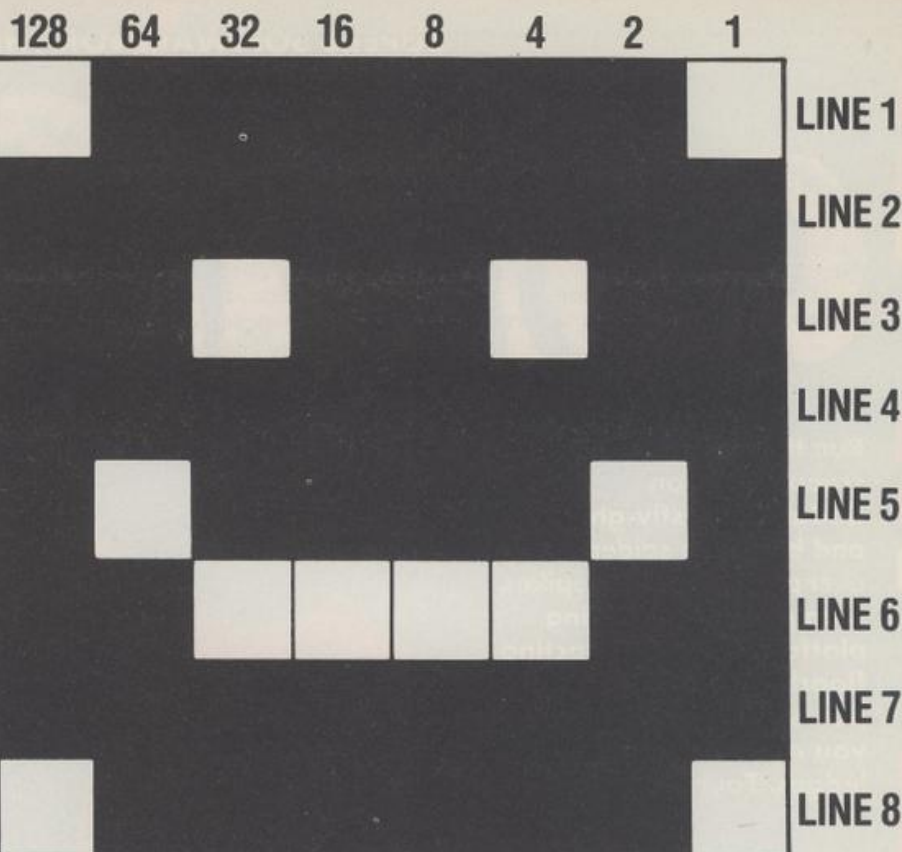
use. Double resolution uses less memory — 1K in total for all four players — and is faster to animate, but its resolution or image quality is poorer.

The single resolution players use 2K of memory, are slower to move out have a better quality image. For the sake of argument, I will discuss double resolution and point out where details differ between the two types. So, we need to set aside 1K of memory for the player missile table. This 1K is equal to four pages of memory — $4 \times 256 = 1024 = 1K$ — hence: $A = \text{PEEK}(106) - 4 : \text{POKE } 106, A (-8 \text{ for single resolution})$

will “hide” our P/M table from Basic. We then must tell the computer, actually the Antic video chip, exactly where in memory our table is located. Location 54279 is called the Player Missile Base Address Register — PMBase. Using our previously defined variable A, give the instruction,

POKE 54279,A

This is in fact just the start address of the table, and figure 1 shows how each of the players and missiles are located in the table. You will notice that the Player areas do not start until half way down the table. The first 384 bytes — 768 for single resolution — are unused, but can make a valuable place for storing machine code routines or tables of data as Basic leaves all areas above PMBase untouched.



ANIMATION

Locations 384-512 in the table are the Missile definitions. The next step after making your table secure is to clear the areas to be used. On many computers, when you turn them on much of the memory is filled with random numbers.

This will affect the Player image and so they must be cleared. You do not need to clear all of the table, just the parts you are going to use. For example, if you are only going to use the first 2 players, the instructions would read something like,

```
FOR T = A*256 + 512 TO
A*256 + 768
POKE T,0
NEXT T
```

The definition of the player's image is perhaps the most difficult part to grasp straight away, but is crucial to fully exploiting player/missile animation. Examine figure 2 which gives a simple Player definition. All players are eight bits wide and I have made this one eight bits high. The definition runs from top to bottom: Each horizontal line — eight bits wide always — has its “on” bits coloured.

These bits are then added up from left to right according to the Binary number system. So each horizontal “slice” of the definition ends up having a number to define it. Each of these bytes is then Poked into the relevant

section in the P/M table. These “bit maps” have to be positioned in each section according to the vertical position on the TV.

If you put the definition at the start of the section of the table, the image will appear at the very top of the TV screen. Place your definition in the centre of the table and it will appear in the centre of the screen, and so on.

As an example. If the beginning of Player 0 section of the table in memory is given by the variable START, and we want to place the image 10 dots from the top of the screen, we would have

```
FOR T = START + 10 TO START + 10 + 7
READ N
POKE T,N
NEXT N
DATA 126,255,219,255,189,195,255,126
```

The players can be placed, or moved about anywhere within their own section, and this is how vertical motion is achieved, but it is up to the programmer to make sure that they do not move into another player's area. Horizontal motion is very much easier. Each player has a Horizontal Position Register — HPOSPO to HPOSP3. To move Player 0 from left to right, simply increase the number in location 53248.53249-51 to cover the other players. The colours of the players and missiles are read from 704-707. The colours follow the standard Atari colour numbers:

POKE 704,COLOUR*16 + LUMINANCE

where Colour = 0 to 15 and Luminance = 0 to 15.

Each player also has a Size register (53256-59). 0 = Normal width, 1 = Double width and 3 = Quadruple width. Experiment with this to see its effect.

The missiles mentioned before behave in most respects like miniature players. They are only two bits wide. They have their own horizontal position registers, but take the colour of their associated player, and have only one size register, making all four missiles the same width.

When using PM graphics, one drawback is that the Antic video chip “steals” time from the main 6502 chip to move and display them. This means that when P/M are in use all other functions will slow down slightly. Consequently, Atari has made the use of P/M optional. Two auxiliary registers are used to switch P/M graphics on and off. Graphics Control Register — GRCTL — and Direct Memory Access Control Register — DMACTL. These must be enabled before P/M can be used. A list of the various Pokes and their effect are given in figure 3. A summary of the other P/M Registers is given in figure 4.

(continued on page 131)

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(continued from page 129)

One of the most useful qualities that P/M graphics offers to games programmers is that of automatic "collision detection". Collision is the name given when any player or missile occupies the same position on the screen as any other Player, Missile or any of the screen colours — playfield. When a collision occurs the computer automatically sets the appropriate register and all the programmer has to do is Peek that register to see if the collision has occurred.

Listing 3 shows this collision detection at work by moving player 0 across 3 vertical lines drawn in different colours. The text window shows the state of the collision detection register. Also shown in this program is another very powerful P/M technique known as Priority.

Priority means that when a Player and another object collide — either another player, missile or playfield colour — it will appeal to pass either behind or in front of the other object. Used properly this can make a very attractive tool. A list of some of the priority settings is given in figure 5. Figure 6 gives all of the Collision Detection Registers. The register you are scanning may give one of several values, depending on which object your player has collided with.

For Example, location 53252 — PO to playfield — is the register displayed in the text window in listing 3, and depending which coloured bar the player is in contact with the register will contain a different value. A complete list of all possible collisions of players, missiles and playfield colours is too long to publish here, but experiment yourself and you will find that perhaps you only need to use a couple of registers depending on what program you are using them in. When a collision has occurred all collision registers have to be reset by Poking any number into HITCLR location 53278.

Just a word on the difference between TV sets. All TVs are subject to a thing called Overscan. This means that all TV pictures are

not centred perfectly — particularly among the cheaper makes — and is the reason why all computers designed to be used with TVs and not exclusively monitors have a border around the screen. Player Missile graphics are not restricted to the main screen area and can go beyond the border.

This means that of all the combinations of the horizontal registers only the positions 40-190 will be visible on the screen. Take care that if you are writing software that will be used by other people on differing screens, not to use the areas of screen beyond the normal borders for playfield graphics or text, for if their TV is different from yours, they may miss the images off to one side of their screen. Happily, a good use can be put to Overscanning.

If you execute any Graphics instructions after setting up your P/M graphics you will have to reset PMBase, GRACtl and DMACTL. This only takes a very short time, but can cause an annoying "flicker" from any player or Missile on the screen. This is solved by setting the Horizontal positions of the players and missiles so that they are off the visible screen area while you reset Graphics modes and the auxiliary registers.

Only one problem remains to speed P/M animation from basic vertical movement. To animate vertically we need to move the whole bit map of the player or missile higher — down the screen — or lower — up the screen — within its relevant section in the Player Missile table.

A machine-code subroutine is the only way of achieving this speed. Such a routine is listing 4. This can be integrated into your own programs, and movement is achieved by passing variables through a USR command.

Finally, listing 5 gives a player editor program. This allows you to design a player up to 20 bits high using a joystick in port 1. Colour, resolution — single or double — and width are all changeable from the function keys, allowing you to see exactly how the player will look on the screen. Data from the

image is given to include in your own program. Instructions are in the program.

Listing 4 is only equipped to deal with one player at a time. Embedded in the routine is an address which assumes that the player section of the table starts at 15872. This is equivalent to the highest place in memory that a 16K machine can place a double resolution player 0. To accommodate a different player and/or a different amount of RAM, 12 numbers have to be changed.

Add the short Basic routine below to your program and call this routine whenever you wish to change the player that you are moving vertically. Three variables need to be passed on to the routine. Start being the beginning of the entire P/M table in memory. Player being the player number you wish to use — 0, 1, 2 or 3. Res is 0 for double resolution and 1 for single. The routine can be placed anywhere in your program and called by a Gosub command, and ending the routine with a Return command — see figure 7.

There are two places to call the machine-code routine from.

To move down the screen (up in memory) call
A = USR(1536, LENGTH, HEIGHT, SPEED)

To move up the screen (down in memory) call
A = USR(1588, LENGTH, HEIGHT, SPEED)

The three variables Length, Height and Speed must be updated by the user's Basic program.

Length is the number of bytes in the player definition.

Height is the number of bytes offset from the start of the players section in the table, to the actual start of the player.

Speed is the number of points or spaces to move the player up or down in any one call. Length and Speed will probably remain constant throughout a program, though they need not. But every time a vertical move is made, the Height variable must be updated.

A = USR(1536, LENGTH, HEIGHT, SPEED): HEIGHT = HEIGHT + SPEED
or A = USR(1588, LENGTH, HEIGHT, SPEED): HEIGHT = HEIGHT - SPEED

(listing 4 continued from page 129)

```
35 POSITION 0,10:7 "INSERT JOYSTICK INTO PORT
11:7 "UP PLAYER:7 "DOWN PLAYER"
40 START=60256+POSTART+512
50 FOR T=PO TO PO+128:POKE T,0:NEXT THEN CLE
AR PLAYER:0 AREA
60 HEIGHT=0:HEIGHT=3:LENGTH=8
65 RESTORE 0
70 FOR T=PO+HEIGHT TO PO+HEIGHT+7
80 READ A:POKE T,A:NEXT THEN DEFINE PLAYER 0
90 DATA 128,255,219,255,189,195,255,128
100 POKE 54279,POSTART/256
110 POKE 53277,2
120 POKE 559,42
130 POKE 53248,100
140 POKE 704,14
150 A=STICK(0):IF A=15 THEN 150
160 IF A=13 THEN A=USR(1536,LENGTH,HEIGHT,SPE
ED):HEIGHT=HEIGHT+SPEED
170 IF A=14 THEN A=USR(1588,LENGTH,HEIGHT,SPE
ED):HEIGHT=HEIGHT-SPEED
180 POSITION 0,0:7 "HEIGHT":HEIGHT: " "GOTO
150
2150 REM DATA FOR P/M VERT MOVE ROUTINE
2151 REM EVERY OCCURRENCE OF 0,62 IS THE ADDR
ESS OF PLAYER 0 SECTION OF THE TABLE
2152 REM SINCE 624256=640*15872
2153 RESTORE 21510
2155 FOR T=1536 TO 1630:READ A:POKE T,A:NEXT
T
2160 DATA 104,104,104,133,203,104,104,133,20
4,104,104,133,203,165,204,24,101,203,133,204,
198,204
2161 DATA 164,204,189
2162 DATA 0,62
2163 DATA 133,206,169,0,153
2164 DATA 0,62
2165 DATA 165,206,166,205,200,202,208,232,15
3
2166 DATA 0,62
2167 DATA 198,204,198,203,208,227,96
2168 DATA 104,104,104,133,203,104,104,133,20
4,104,104,133,203,164,204,189
2169 DATA 0,62
2170 DATA 133,206,169,0,153
2171 DATA 0,62
2172 DATA 165,206,166,205,136,202,208,252,15
3
2173 DATA 0,62
25174 DATA 230,204,198,203,208,227,96
25175 RETURN
Listing 5
10 REM *****
20 REM ** ATARI SPRITE EDITOR **
30 REM ** (C) 1983 PAT NEVISON **
40 REM *****
50 GOSUB 10000:REM SET UP VARIABLES
60 GOSUB 11000:REM DRAW SCREEN+BITMAP
70 POKE 53248,10
100 REM MAIN EDITOR LOOP
105 POSITION COL,0:7 "POSITION 24,ROW:7 "
110 ST=STICK(0):SG=STICK(0)
120 IF ST=15 AND SG=1 THEN 200:REM GOTO SCAN
CONSOLE KEYS
130 GOTO 300:REM JOYSTICK EDITING
200 CON=PEEK(53279):IF CON=7 OR CON=6 THEN 10
:REM NO CONSOLE KEY PRESSED
205 POSITION 2,22:7 "JUST A SECOND...":GOSUB 1
3000:REM UPDATE PMDATA
210 IF CON=3 THEN POKE 53248,180:GOSUB 20000:
REM OPTION PRESSED GOTO VIEW MENU
220 IF CON=5 THEN 1000:REM NOT SELECT
230 ? "1:7 " PLAYER DATA BYTE NUMBER"
240 FOR T=1 TO 20:7 " "ASC(PMDATA(T
,T)): " "T
250 NEXT T
260 ? "1:7 " PRESS SPACE TO RETURN TO EDITOR":
270 POKE 764,255
280 IF PEEK(764)+255 THEN 280
290 GOSUB 11000:GOTO 100
300 REM JOYSTICK EDITING
310 IF ST=5 OR ST=6 OR ST=9 OR ST=10 THEN 100
315 IF SG=0 THEN 400
320 POSITION COL,0:7 " "POSITION 24,ROW:7 "
"
330 IF ST=14 THEN ROW=ROW-1:(ROW<3)
340 IF ST=13 THEN ROW=ROW-1:(ROW<20)
350 IF ST=11 THEN COL=COL-1:(COL<28)
360 IF ST=7 THEN COL=COL-1:(COL<353)
370 POSITION COL,0:7 " "POSITION 24,ROW:7 "
380 GOTO 100
400 REM FILL CURSOR
410 LOCATE COL,ROW:DOT:IF DOT=160 THEN POSITI
ON COL,ROW:7 " "GOSUB 16000:GOTO 100:REM ERA
SE DOT FROM BIT MAP
420 LOCATE COL,ROW:DOT:IF DOT=32 THEN POSITI
ON COL,ROW:7 " "GOSUB 17000:GOTO 100:REM FILL
DOT ON BIT MAP
10000 REM SET UP VARIABLES
10010 PMBASE=64:POKE 106,PMBASE:GRAPHICS 0:PO
KE 710,0:POKE 752,1
10015 POSITION 12,12:7 "INITIALISING..."
10020 DIM PMDATA(25):COL=27:ROW=2
10030 DIM PPM(180):PPM= " "PPM(159)= " "PPM(2
)=PPM
10040 GOSUB 13000:REM CHANGE PPM TO PMDATA
10050 HP=180:COLPO=54:RES=1
10060 CL=3:LM=10:SIZE=0
10070 VALDMACTL=PEEK(559)+8+(RES*16-16)
10080 GOSUB 15000:REM SET UP PM DISPLAY
10200
11000 REM CLEAR SCREEN SET UP BIT MAP
11005 ? "1:7 "POKE 710,0
11010 POKE 82,25:POKE 83,26:POSITION 25,2:7 "
0102030405060708091011121314151617181920":PO
KE 82,2:POKE 83,39
11020 POSITION 2,1:7 " "SPRITE EDITOR":7 "
"JOYSTICK CONTROLS"
11030 ? "1:7 " "UP CURSOR":7 " "DOWN CURSOR":7 "
LEFT CURSOR":7 " "RIGHT CURSOR"
11035 ? "1:7 " "FILL/ERASE CURSOR"
11040 ? "1:7 " "OPTION-VIEW MENU":7 " "SEL
ECT-LIST DATA"
11050 POSITION 27,1:7 "76543210"
11060 POKE 82,27:POKE 83,34:POSITION 27,2:7 P
PM:POKE 82,2:POKE 83,40
11070 RETURN
13000 REM CONVERT PPM TO PM DATA AND POKE TO
PM TABLE
13010 FOR T=0 TO 19
13020 PMDATA(T)=RESTORE 13100:FOR N=1 TO 8
13030 READ A:IF PPM(T*8+N,T*8+N)= " " THEN PPM
OUNT=PMCOUNT+A
13040 NEXT N
13050 PMDATA(T+1,T+1)=CHR$(PMCOUNT)
13060 NEXT T
13070 RETURN
13100 DATA 128,64,32,16,8,4,2,1
15000 REM SET UP PM DISPLAY
15005 FOR T=PPMBASE+256+(SIZE*(RES-1)*512) TO
PPMBASE+256+(640+(RES-1840)):POKE T,0:NEXT T
15010 FOR T=1 TO 20
15020 POKE PMBASE+256+(576+(RES-1)*576))+T,A
SE(PMDATA(T,T))
15030 NEXT T
15040 POKE 54279,PMBASE:REM TELL ANTIC
15050 POKE 559,VALDMACTL:REM TELL DMACTL
15060 POKE 53277,2:REM TELL GRACtl
15070 POKE 704,COLPO:REM COLOUR
15080 POKE 53248,HP:REM HORIZ POS.
15090 RETURN
16000 REM ERASE POINT IN PPM
16010 PPM(COL-26+(ROW-2)*8),COL-26+(ROW-2)*
8)= " "FOR T=1 TO 10:NEXT T:RETURN
17000 REM FILL POINT IN PPM
17010 PPM(COL-26+(ROW-2)*8),COL-26+(ROW-2)*
8)= " "FOR T=1 TO 10:NEXT T:RETURN
20010 ? "1:7 " "VIEW OPTION":7 "PRESS START TO
RETURN TO EDITOR"
20020 ? "1:7 " "JOYSTICK CONTROLS":7 " "UP C
CURSOR":7 " "DOWN CURSOR"
20030 ? "1:7 " "DEC.LUMINANCE":7 " "INC.LUMINANCE"
20040 ? "1:7 " "OPTION-SIZE":7 " "SELECT-RESOLUT
ION"
20050 ? "1:7 " "CURRENT COLOUR NO. "COLPO:7
"CURRENT SIZE "SIZE:7 "CURRENT RESOLU
TION "
20055 GOSUB 15000
20060 ST=STICK(0):IF ST=15 THEN 20200
20070 IF ST=14 THEN CL=CL+1:(CL<14)
20080 IF ST=13 THEN CL=CL-1:(CL<1)
20090 IF ST=11 THEN LM=LM+1:(LM<14)
20100 IF ST=7 THEN LM=LM-1:(LM<1)
20110 CLPO=CL*16+LM:POKE 704,COLPO
20120 POSITION 22,17:7 "COLPO"
20130 FOR T=1 TO 50:NEXT T
20140 GOTO 20060
20200 CON=PEEK(53279):IF CON=7 THEN 20060
20210 IF CON=3 THEN 20300
20220 IF SIZE=3 THEN SIZE=0:GOTO 20290
20230 IF SIZE=1 THEN SIZE=3:GOTO 20290
20240 IF SIZE=0 THEN SIZE=1:GOTO 20290
20290 POKE 53256,SIZE:POSITION 22,18:7 "SIZE"
"FOR T=1 TO 50:NEXT T:GOTO 20060
20300 IF CON=6 THEN POKE 53248,10:GOTO 60
20310 IF CON=5 THEN 20060
20320 IF RES=1 THEN RES=2:VALDMACTL=VALDMACTL
+16:GOTO 20340
20330 VALDMACTL=VALDMACTL-16:RES=1
20340 POSITION 22,19:IF RES=1 THEN ? "DOUBLE
"
20350 IF RES=2 THEN ? "SINGLE "
20360 GOSUB 15000:GOTO 20060
```


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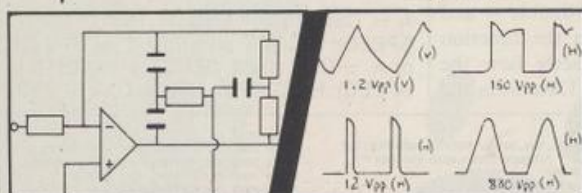
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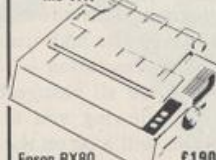
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To help you create hand-crafted machine code for the QL Philip Holliday delves deep into the machine.

DISASSEMBLER

The QL Disassembler.

```

10 REMark Copyright P.A.Holliday 1984
100 MODE 4:CSIZE 1,0:CLS
110 INPUT("Start address?") !
first$:first=2*INT(convert(first$)/2)
120 INPUT("End address?") ! last$:last=convert(last$)
130 INPUT("output device?") ! o$
140 IF o$="" THEN o$="con_448x200a32x16_128"
150 OPEN#15,o$
160 INPUT("Name of file of data areas?") ! f$
170 IF f$<>"" THEN
180   OPEN_IN#14,f$:get_t
190 ELSE
200   t1=last+2:t2=t1
210 END IF
220 IF o$(1 TO 3)=="con" OR o$(1 TO 3)=="scr" THEN
CLS#15
230 address=first
240 REPEAT loop
250   IF address>last THEN EXIT loop
260   IF address=t2 THEN get_t
270   IF address >= t1 THEN
275     diss_data
280   ELSE
285     diss
290   END IF
295   address=address+2
300 END REPEAT loop
310 CLOSE#15:STOP
1000 DEFine PROCedure diss
  
```

(listing continued on next page)

FINALLY THE QL arrived. The first task seemed to be to write a disassembler so that I could both delve into the inner workings of the machine and crack some of the QDOS operating system calls, and also check hand-assembled machine-code programs entered as data for correctness by disassembling the result. There is as yet no assembler available. The result is presented here.

Next month I will present the first of a three-part series on 68000 machine code.

The 68008 instruction set is extremely regular, making the job of writing the disassembler a relatively straightforward one, both from the point of view of length of the resulting program and also from the time taken to test it. In fact the disassembler consists in the main of select statements — SuperBasic equivalent of the case or switch construct available in most structured languages — which breaks the opcode down until the actual instruction has been found, together with a set of functions which enable the whole of the instruction to be synthesised from the code.

Motorola mnemonics have been used throughout. A # character preceding a number indicates that it is immediate data; a \$ prefixing a number indicates that hex notation is being used. This disassembler presents all numbers in hex. A suffix of .B, .W or .L indicates that the instruction operates on byte (continued on next page)

68008 QL

(continued from previous page)

— 8 bits; word — 16 bits — or long word — 32 bits of data respectively.

After entering and saving the program it can be run. It prompts for the start and end addresses of the section of code to be disassembled. These addresses can be entered in

decimal, or in hex by prefixing the response with a \$. The letters A to F can be entered in upper or lower case.

Try a start address of \$168 which is where the QL initially starts execution. It will then prompt for the output device. Just hit Enter for output to the console or else the output device name, i.e., SER1 for output to a printer if you have one. The last prompt is for the name of a Microdrive file which contains pairs of addresses of start and end of blocks of text or data which should not be disassembled as instructions.

This file can be generated simply by opening it and printing addresses to it, and then closing it again. Alternatively you can use Quill to edit the contents of this file. However certain points must be borne in mind. There must be no empty lines, no header or footer and only one entry per line.

The file must be generated by using the

Quill Print command, and the installed print driver should not generate any preamble code. If you do not wish to specify a file containing text and data addresses hit Enter.

The assembly listing produced is in four fields. The address field — 5 bytes — and opcode field — 2 to 10 bytes — are both displayed in hex but without a \$ prefix. The instruction itself is next, followed by an error message which is given if an illegal or unimplemented instruction is found. Note that the error-checking in this disassembler is by no means exhaustive.

For those of you who do not have the energy to type out the program the author is prepared to copy it onto your supplied Microdrive cartridge. Please state whether the cartridge is formatted or not and include £2.00 to cover postage, packing and time. Send it to Philip Holliday, 44 Lennard Road, London SE20 7LX.

(listing continued from previous page)

```
1010 instr=PEEK_W(address):IF instr<0 THEN
instr(instr+65536)
1020
addr$=address$(address):obj$=word$(instr):er$=""
1030 instr_type=INT(instr/4096):LET
opfield=instr-instr_type*4096
1040 SELECT ON instr_type
1050   =0:op$=bit_man$
1060   =1:op$=move$(0)
1070   =2:op$=move$(2)
1080   =3:op$=move$(1)
1090   =4:op$=misc$
1100   =5:op$=add_sub$
1110   =6:op$=branch$
1120   =7:op$=moveq$
1130   =8:op$=or_div$
1140   =9:op$=sub_subx$
1150   =11:op$=cmp_eor$
1160   =12:op$=and_mul$
1170   =13:op$=add_addx$
1180   =14:op$=shift_rot$
1190   =REMAINDER:op$="":er$=er$ & "unassigned op
code"
1200 END SELECT
1210 PRINT#15,addr$ ! obj$ TO 27; op$ ! er$
1220 END DEFine diss
5000 DEFine FuNction hex$(a)
5010 RETURN CHR$(a+48+7*(a>9))
5020 END DEFine hex$
5030 DEFine FuNction address$(x)
5040 LOCAL y
5050 y=INT(x/65536)
5060 RETURN hex$(y) & word$(x-65536*y)
5070 END DEFine address$
5080 DEFine FuNction word$(x)
5090 LOCAL y,z
5100 z=x
5110 IF z<0 THEN z=z+65536
5120 y=INT(z/256)
5130 RETURN byte$(y) & byte$(z-256*y)
5140 END DEFine word$
5150 DEFine FuNction byte$(x)
5160 LOCAL x%
5170 x%=x-256*INT(x/256)
5180 RETURN hex$(x% DIV 16) & hex$(x% MOD 16)
5190 END DEFine byte$
5200 DEFine FuNction eff_addr$(eff_mod,reg,size)
5210 LOCAL x
5220 SELECT ON eff_mod
5230   =0:RETURN "D" & reg
5240   =1:RETURN "A" & reg
5250   =2:RETURN "(A" & reg & ")"
5260   =3:RETURN "(A" & reg & "+)"
5270   =4:RETURN "-(A" & reg & ")"
5280   =5:RETURN "$" & s_word$(advance) & "(A" & reg
& ")"
5290   =6:x=advance
5300   IF x < 0 THEN
5310     d_a$="A"
5320   ELSE
5330     d_a$="D"
5340   END IF
5350   IF x && 2048
5360     w_l$=".L"
5370   ELSE
```

```
5380     w_l$=".W"
5390   END IF
5400 RETURN "$" & s_byte$(x) & "(A" & reg & ", " &
d_a$ & (INT(x/4096) MOD 8) & w_l$ & ")"
5410 =7:SELECT ON reg
5420   =0:RETURN "$" & word$(advance)
5430   =1:RETURN "$" & word$(advance) &
word$(advance)
5440   =2:x=advance:RETURN "$" &
address$(address+x)
5450   =3:x=advance
5460   IF x<0
5470     d_a$="A"
5480   ELSE
5490     d_a$="D"
5500   END IF
5510   IF x && 2048
5520     w_l$=".L"
5530   ELSE
5540     w_l$=".W"
5550   END IF
5560 RETURN "$" & s_byte$(x) & "(PC," & d_a$ &
(INT(x/4096) MOD 8) & w_l$ & ")"
5570 =4:RETURN immediate$(size)
5580 =REMAINDER:er$=er$ & "eff addr
error":RETURN ""
5590 END SELECT
5600 END SELECT
5610 END DEFine eff_addr$
5620 DEFine FuNction source_ea$(size)
5630 LOCAL x,y
5640 x=opfield DIV 8 MOD 8:y=opfield MOD 8
5650 RETURN eff_addr$(x,y,size)
5660 END DEFine source_ea$
5670 DEFine FuNction dest_ea$(size)
5680 LOCAL x,y
5690 x=opfield DIV 64 MOD 8:y=opfield DIV 512
5700 RETURN eff_addr$(x,y,size)
5710 END DEFine dest_ea$
5720 DEFine FuNction size$
5730 LOCAL x
5740 x=opfield DIV 64 MOD 4
5750 SELECT ON x
5760   =0:RETURN ".B"
5770   =1:RETURN ".W"
5780   =2:RETURN ".L"
5790   =REMAINDER:er$=er$ & "error in size
field":RETURN ""
5800 END SELECT
5810 END DEFine size$
5820 DEFine FuNction condition$
5830 LOCAL x
5840 x=opfield DIV 256 MOD 16
5850 SELECT ON x
5860   =0:RETURN "T"
5870   =1:RETURN "F"
5880   =2:RETURN "HI"
5890   =3:RETURN "LS"
5900   =4:RETURN "CC"
5910   =5:RETURN "CS"
5920   =6:RETURN "NE"
5930   =7:RETURN "EQ"
5940   =8:RETURN "VC"
5950   =9:RETURN "VS"
5960   =10:RETURN "PL"
```

(continued on page 136)

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extensive Manual (170 pages plus) and at £45+VAT it is superb value.

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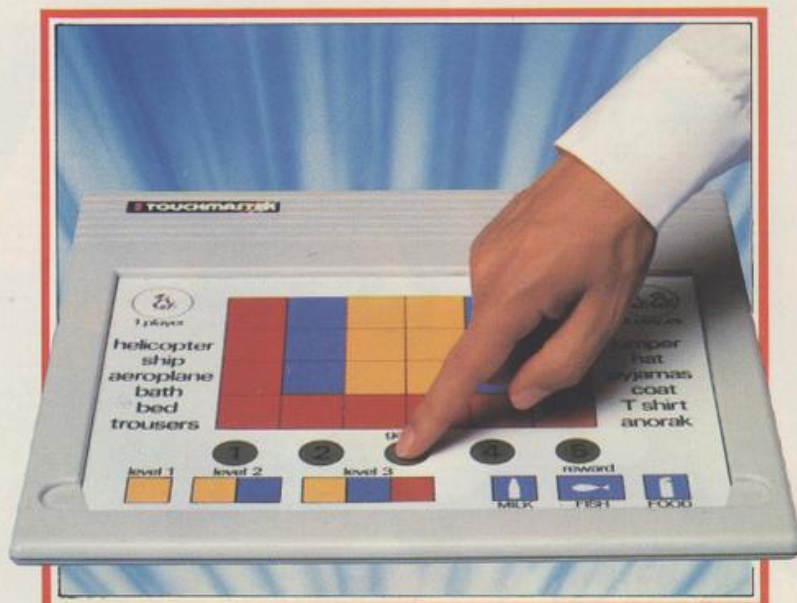
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```

5970      =1:Return "M"
5980      =12:Return "GE"
5990      =13:Return "LT"
6000      =14:Return "GT"
6010      =15:Return "LE"
6020  END Select
6030  END Define condition$
6040  Define Function displ$
6050    Local x
6060    x=opfield MOD 256
6070    IF x<0 THEN
6080      IF x>127 THEN LET x=x-256
6090      Return "*" & address$(address + x + 2)
6100    ELSE
6110      x=advance
6120      Return "*" & address$(address + x)
6130    END IF
6140  END Define displ$
6150  Define Function dat$
6160    Local x
6170    x=opfield DIV 512
6180    IF x=0 THEN x=8
6190    Return "*" & x
6200  END Define dat$
6210  Define Function displ64$
6220    Return "*" & address$(address + advance)
6230  END Define displ64$
6240  Define Function immediate$(size)
6250    Local x,y
6260    x=advance
6270    Select ON size
6280      ON size=0
6290        x=x MOD 256
6300        IF x < 128 THEN
6310          Return "*" & byte$(x)
6320        ELSE
6330          END IF
6340      ON size=1
6350        IF x>=0 THEN
6360          Return "*" & word$(x)
6370        ELSE
6380          Return "*" & word$(2*16-x)
6390        END IF
6400      ON size=2
6410        IF
6420          IF y<0 THEN
6430            x=2*16-(x + NOT y)
6440            Return "*" & word$(x) & word$(y)
6450          ELSE
6460            Return "*" & word$(x) & word$(y)
6470          END IF
6480      REMAINDER 16-x=8 & "size field
6490  error"IFReturn ""
6500  END Select
6510  END Define Immediate$
6520  Define Function type$
6530    Local x
6540    x=opfield DIV 64 MOD 4
6550    Select ON x
6560      =0:Return "TST"
6570      =1:Return "LHU"
6580      =2:Return "CLR"
6590      =3:Return "SET"
6600  END Select
6610  END Define type$
6620  Define Function op$
6630  IF opfield 55 64 THEN Return "L"
6640  ELSE Return "u"
6650  END IF
6660  END Define op$
6670  Define Function advance
6680    Local x
6690    address=address+2:IFFEEL_M(address)obys=ob,
6700    word$(x)
6710  Return x
6720  Define Function direction$
6730  IF opfield 55 256
6740  Return "L"
6750  ELSE
6760  Return "R"
6770  END IF
6780  END Define direction$
6790  Define Function shift$
6800    Local x
6810    x=opfield DIV 512 MOD 4
6820    Select ON x
6830      =0:Return "AB"
6840      =1:Return "LS"
6850      =2:Return "ROX"
6860      =3:Return "RO"
6870  END Select
6880  END Define shift$
6890  Define Function convert(string$)
6900    Local x,y,z:base
6910    = IF string$(1) < "S"
6920    base=10
6930    ELSE
6940    base=(6:string$=string$(2 TO
6950    END IF
6960    x=0
6970    FOR y=1 TO LEN(string$)
6980      z=CODE(string$(y))
6990      Select ON z
7000        =40 TO 127:z=z-48
7010        =65 TO 70:z=z-55
7020        =97 TO 102:z=z-87
7030      REMAINDER 1:PRINT "not acceptable number"
7040    END Select
7050    x=x*base + z
7060  END FOR y
7070  Return x
7080  END Define convert$
7090  Define Procedure diss_data
7100  word=FEEL_M_address$
7110  PRINT$(15,address$address! + word):
7120  END Define diss_data
7130  Define Procedure get_t
7140  IF NOT EOF(14)
7150  INPUT #14,t1
7160  t1=last+2
7170  END IF
7180  END IF
7190  IF NOT EOF(14)
7200  INPUT #14,t2
7210  ELSE
7220  t2=last+2
7230  END IF
7240  t1=2*INT(t1/2):t2=2*INT(52/2)
7250  END Define get_t
7260  Define Function s_word$(x)
7270    Local y
7280    IF x<0
7290      y=2*16-x
7300      Return "-" & word$(y)
7310    ELSE
7320      Return word$(x)
7330    END IF
7340  END Define s_word$
7350  Define Function s_byte$(x)

```

```

7260 LOCAL y
7370 y=x&&255
7380 IF y>127
7390 RETURN ~y& byte&(256-y)
7400 ELSE
7410 RETURN byte&(y)
7420 END IF
7430 END DEFINE a_byte&
7440 DEFINE function multiple&
7450 LOCAL aa&,x,y
7460 x=address
7470 aa=" "
7480 IF opfield=2240 AND opfield<2247 THEN
xreverse&
7490 IF x<0 THEN x=x+2*16
7500 FOR i=0 TO 15
7510 y=(x-INT(x/4))/4
7520 SELECT ON y
7530 +="aa"&aa&+CHR&(60-3&(1 DIV B))&+(1 MOD B)
7540 +="IF aa<0 THEN aa=a&+"
7550 +="31 IF LEN(aa&)>1 THEN aa=a&+
7560 CHR&(60-3&(1 DIV B))&+(1 MOD B)&+"
7570 END SELECT
7580 x=INT(x/2)
7590 END FOR i
7590 RETURN aa
7600 END DEF multiple&
7610 DEFINE function reverse&(x)
7620 LOCAL i,y,z
7630 y=0
7640 IF x<0 THEN x=x+2*16
7650 FOR i=0 TO 15
7660 z=INT(x)/2
7670 y=y+(x-INT(x)/2)*2*(16-i)
7680 END FOR i
7690 IF x>2*15 THEN x=x-2*16
7700 RETURN y
7710 END DEFINE reverse
10000 DEFINE function move&(size)
10010 LOCAL n&
10020 aa="MOVE";IF opfield DIV 64 MOD 8=1 THEN
aa="MOVEA"
10030 SELECT ON size
10040 +="RETURN n& & "B" & source_aa&(size) &
" & dest_aa&(size)
10050 +="RETURN n& & "W" & source_aa&(size) &
" & dest_aa&(size)
10060 +="RETURN n& & "L" & source_aa&(size) &
" & dest_aa&(size)
10070 END SELECT
10080 END DEFINE move&
10090 DEFINE function branch&
10100 LOCAL x
10110 x=opfield DIV 256
10120 SELECT ON x
10130 +="RETURN "BRA" & displ&
10140 +="RETURN "BGR" & displ&
10150 +="REMAINDER:RETURN "B" & condition& & " &
displ&
10160 END SELECT
10170 END DEFINE branch&
10180 DEFINE function add_sub&
10190 LOCAL v,size
10200 x=opfield DIV 64 MOD 4
10210 x=opfield DIV B MOD 64
10220 SELECT ON x
10230 +="TO 231;RETURN "ADDQ" & size& & " &
dest_aa&(size) & source_aa&(size)
10240 +="32 TO 55;RETURN "SUBQ" & size& & " & data&
& " & source_aa&(size)
10250 +="57,57;RETURN "DB" & condition& & " & "D"
& (opfield MOD 8) & " & displ&
10260 +="REMAINDER:RETURN "B" & condition& & " &
source_aa&(size)
10270 END SELECT
10280 END DEFINE add_sub&
10290 DEFINE function move&
10300 LOCAL MOVE,MOVE,aa&,b_byte&(opfield MOD 256) &
" & D" & (opfield DIV 8)
10310 END DEFINE move&
10320 DEFINE function bit_wand&
10330 LOCAL x,y,size
10340 x=opfield DIV 256
10350 size=opfield DIV 64 MOD 4
10360 SELECT ON x
10370 +="RETURN "ORI" & size& & " &
immediate&(size) & " & " & source_aa&(size)
10380 +="RETURN "ANDI" & size& & " &
immediate&(size) & " & " & source_aa&(size)
10390 +="RETURN "SUBI" & size& & " &
immediate&(size) & " & " & source_aa&(size)
10400 +="RETURN "ADDI" & size& & " &
immediate&(size) & " & " & source_aa&(size)
10410 +="RETURN "B" & type& & " &
immediate&(size) & " & " & source_aa&(size)
10420 +="RETURN "EORI" & size& & " &
immediate&(size) & " & " & source_aa&(size)
10430 +="RETURN "CMPI" & size& & " &
immediate&(size) & " & " & source_aa&(size)
10440 +="REMAINDER:IF opfield DIV B MOD 8
10450 SELECT ON y
10460 +="RETURN move&
10470 +="REMAINDER:RETURN "B" & type& & " & "D"
& (opfield DIV 512 MOD B) & " & " & source_aa&(size)
10480 END SELECT
10490 END SELECT
10500 END DEFINE bit_wand&
10510 DEFINE function move&
10520 LOCAL x
10530 x=opfield DIV 64 MOD 8
10540 SELECT ON x
10550 +="RETURN "MOVE,W" & displ& & "A" &
(opfield MOD B) & " & " & "D" & (opfield DIV 512)
10560 +="RETURN "MOVE,L" & displ& & "A" &
(opfield MOD B) & " & " & "D" & (opfield DIV 512)
10570 +="RETURN "MOVE,W" & "D" & (opfield DIV 512)
512) & " & " & displ& & "A" & (opfield MOD B) & " & "
10580 +="RETURN "MOVE,L" & "D" & (opfield DIV 512)
512) & " & " & displ& & "A" & (opfield MOD B) & " & "
10590 END SELECT
10600 END DEFINE move&
10610 DEFINE function block
10620 LOCAL v,size&
10630 size=opfield DIV 64 MOD 4
10640 SELECT ON opfield
10650 +="TO 191;RETURN "NEG" & size& & " & " &
source_aa&(size)
10660 +="192 TO 255;RETURN "MOV,S" &
source_aa&(size)
10670 +="216 TO 703;RETURN "CLR" & size& & " & " &
source_aa&(size)
10680 +="1024 TO 1215;RETURN "NEG" & size& & " & " &
source_aa&(size)
10690 +="1216 TO 1279;RETURN "MOVE,W" &
source_aa&(size) & " & "CCB"
10700 +="1536 TO 1727;RETURN "NOT" & size& & " & " &
source_aa&(size)
10710 +="1728 TO 1791;RETURN "MOVE,W" &
source_aa&(size) & " & "BP"
10720 +="2048 TO 2111;RETURN "NBCD,B" &
source_aa&(size)
10730 +="2112 TO 2119;RETURN "SWAP,B" & (opfield MOD B)
10740 +="2120 TO 2175;RETURN "FEA,L" &
source_aa&(size)
10750 +="2176 TO 2183;RETURN "EXT,W,D" & (opfield
MOD B)
10760 +="2184 TO 2239;+248 TO 3203;RETURN "MOVE,W"

```

```

828 & " " & multiplies & " " & source_eax(size-1)
10770 <<2240 to 2247:RETURN "EXT.L D" & (copfield
MOD B)
10780 <<2560 to 2751:RETURN "TST" & size& " " &
source_eax(size)
10790 <<2752 to 2915:RETURN "TAS.B " &
source_eax(size)
10800 <<3200 to 3327:RETURN "RETURN "MOVEM" &
&sz& " " & source_eax(size-1) & " " & ts
10810 <<3648 to 3663:RETURN "TRAP # " & byte&
(copfield MOD B)
10820 <<3664 to 3671:RETURN "LINK A" & (copfield MOD
B) & " " & word&(advance)
10830 <<3672 to 3679:RETURN "URLK A" & (copfield MOD
B)
10840 <<3680 to 3687:RETURN "MOVE USP,A" &
(copfield MOD B)
10850 <<3688 to 3695:RETURN "MOVE A" & (copfield MOD
B) & " " & USP&
10860 <<3696:RETURN "RESET"
10870 <<37:RETURN "NOP"
10880 <<3696:RETURN "STOP " & immediate&(1)
10890 <<3699:RETURN "RTE"
10900 <<3701:RETURN "RTS"
10910 <<3702:RETURN "TRAP#"
10920 <<3703:RETURN "RTR"
10930 <<3712 to 3775:RETURN "JSR " & source_eax(1)
10940 <<3776 to 3839:RETURN "JMP " & source_eax(1)
10950 <<REMAINDER: <copfield DIV 64 MOD 4
10960 <<SEL: <copfield DIV 64 MOD 4
10970 <<6:RETURN "CHK " & source_eax(1) & " " & D" &
(copfield DIV 512)
10980 <<7:RETURN "LEA " & source_eax(2) & " " & A" &
(copfield DIV 512)
10990 <<REMAINDER: <error& "error in misc
group":RETURN " "
11000 END SELECT
11010 END SELECT
11020 <<END DEFINE size&
11030 DEFINE Function sub_size
11040 RETURN "SUB" & com_add_size
11050 END DEFINE sub_size
11060 DEFINE Function com_add_size
11070 RETURN "ADD" & com_add_size
11080 END DEFINE com_add_size
11090 DEFINE Function com_add_size
11100 LOCAL x,y,size
11110 <copfield DIV B MOD 64
11120 size<copfield DIV 64 MOD 4
11130 SELECT ON x
11140 <<32,40,48:RETURN "X" & size& " " & D" &
(copfield MOD B) & " " & D" & (copfield DIV 512)
11150 <<32,41,49:RETURN "X" & size& " " & " & A" &
(copfield MOD B) & " " & " & A" & (copfield DIV 512) & " "
11160 <<REMAINDER: <copfield DIV 64 MOD B
11170 SELECT ON y
11180 <<0 to 2:RETURN " " & source_eax(size) &
"D" & (copfield DIV 512)
11190 <<3:RETURN "A.W" & source_eax(1) & " " & A" &
(copfield DIV 512)
11200 <<4 to 6:RETURN "D" & (copfield DIV 512) & " "
& source_eax(size)
11210 <<7:RETURN "A.L" & source_eax(2) & " " & A" &
(copfield DIV 512)
11220 END SELECT
11230 END SELECT
11240 END DEFINE com_add_size
11250 DEFINE Function com_cop_size
11260 LOCAL x,y,size
11270 <copfield DIV 64 MOD 64size& MOD 4
11280 SELECT ON x
11290 <<0 to 2:RETURN "CMV" & size& " " & " " &
source_eax(size) & " " & D" & (copfield DIV 512)
11300 <<3:RETURN "CPMA.W" & source_eax(1) & " " & A" &
(copfield DIV 512)
11310 <<7:RETURN "CPMA.L" & source_eax(2) & " " & A" &
(copfield DIV 512)
11320 <<REMAINDER: <copfield DIV B MOD 64
11330 SELECT ON y
11340 <<32,41,49:RETURN "CMV" & size& " " & A" &
(copfield MOD B) & " " & A" & (copfield DIV 512) & " " & A" &
11350 <<4:RETURN "CMV" & size& " " & D" &
(copfield DIV 512) & " " & D" & (copfield DIV 512) & " " & D" &
(copfield DIV 512) & " " & source_eax(size)
11360 END SELECT
11370 END SELECT
11380 END DEFINE com_cop_size
11390 DEFINE Function shift_rot&
11400 LOCAL x,y,z
11410 <copfield DIV 64 MOD 4
11420 SELECT ON x
11430 <<3:RETURN "shift & directions" & size& " " & " "
& source_eax(1)
11440 <<REMAINDER: <copfield DIV 32 MOD 2
11450 SELECT ON y
11460 <<0:RETURN "div 512 if z=0 THEN let z=0"
11470 <<RETURN "shift & directions" & size& " " & " "
& z & " " & D" & (copfield MOD B)
11480 <<1: <copfield DIV 512
11490 <<2:RETURN "shift & directions" & size& " " & D"
& z & " " & D" & (copfield MOD B)
11500 END SELECT
11510 END SELECT
11520 END DEFINE shift_rot&
11530 DEFINE Function op_div&
11540 LOCAL x,y,size
11550 <copfield DIV 64 MOD B
11560 SELECT ON x
11570 <<3:RETURN "DIVU " & source_eax(1) & " " & D" &
(copfield DIV 512)
11580 <<7:RETURN "DIVS " & source_eax(1) & " " & D" &
(copfield DIV 512)
11590 <<REMAINDER: <copfield DIV B MOD 64size& MOD 4
11600 SELECT ON y
11610 <<0 to 23:RETURN "OR" & size& " " & " " &
source_eax(size) & " " & D" & (copfield DIV 512)
11620 <<24:RETURN "ABCD B" & (copfield MOD B) & " "
& D" & (copfield DIV 512)
11630 <<33:RETURN "SBCD -A" & (copfield MOD B) & " "
& " & A" & (copfield DIV 512) & " " & " "
11640 <<REMAINDER: RETURN "OR" & size& " " & D" &
(copfield DIV 512) & " " & source_eax(size)
11650 END SELECT
11660 END SELECT
11670 END DEFINE op_div&
11680 DEFINE Function and_and&
11690 LOCAL x,y,size
11700 <copfield DIV 64 MOD B
11710 SELECT ON x
11720 <<3:RETURN "MULU " & source_eax(1) & " " & D" &
(copfield DIV 512)
11730 <<7:RETURN "MULS " & source_eax(1) & " " & D" &
(copfield DIV 512)
11740 <<REMAINDER: <copfield DIV B MOD 64size& MOD 4
11750 SELECT ON y
11760 <<0 to 23:RETURN "AND" & size& " " & " " &
source_eax(size) & " " & D" & (copfield DIV 512)
11770 <<24:RETURN "ABCD B" & (copfield MOD B) & " "
& D" & (copfield DIV 512)
11780 <<33:RETURN "ABCD -A" & (copfield MOD B) & " "
& " & A" & (copfield DIV 512) & " " & " "
11790 <<40:RETURN "EXG A" & (copfield DIV 512) & " "
& A" & (copfield MOD B)
11800 <<41:RETURN "EXG A" & (copfield DIV 512) & " "
& A" & (copfield MOD B)
11810 <<42:RETURN "EXG D" & (copfield DIV 512) & " "
& A" & (copfield MOD B)
11820 <<REMAINDER: RETURN "A" & size& " " & D" &
(copfield DIV 512) & " " & source_eax(size)
11830 END SELECT
11840 END SELECT
11850 END DEFINE and_and&

```


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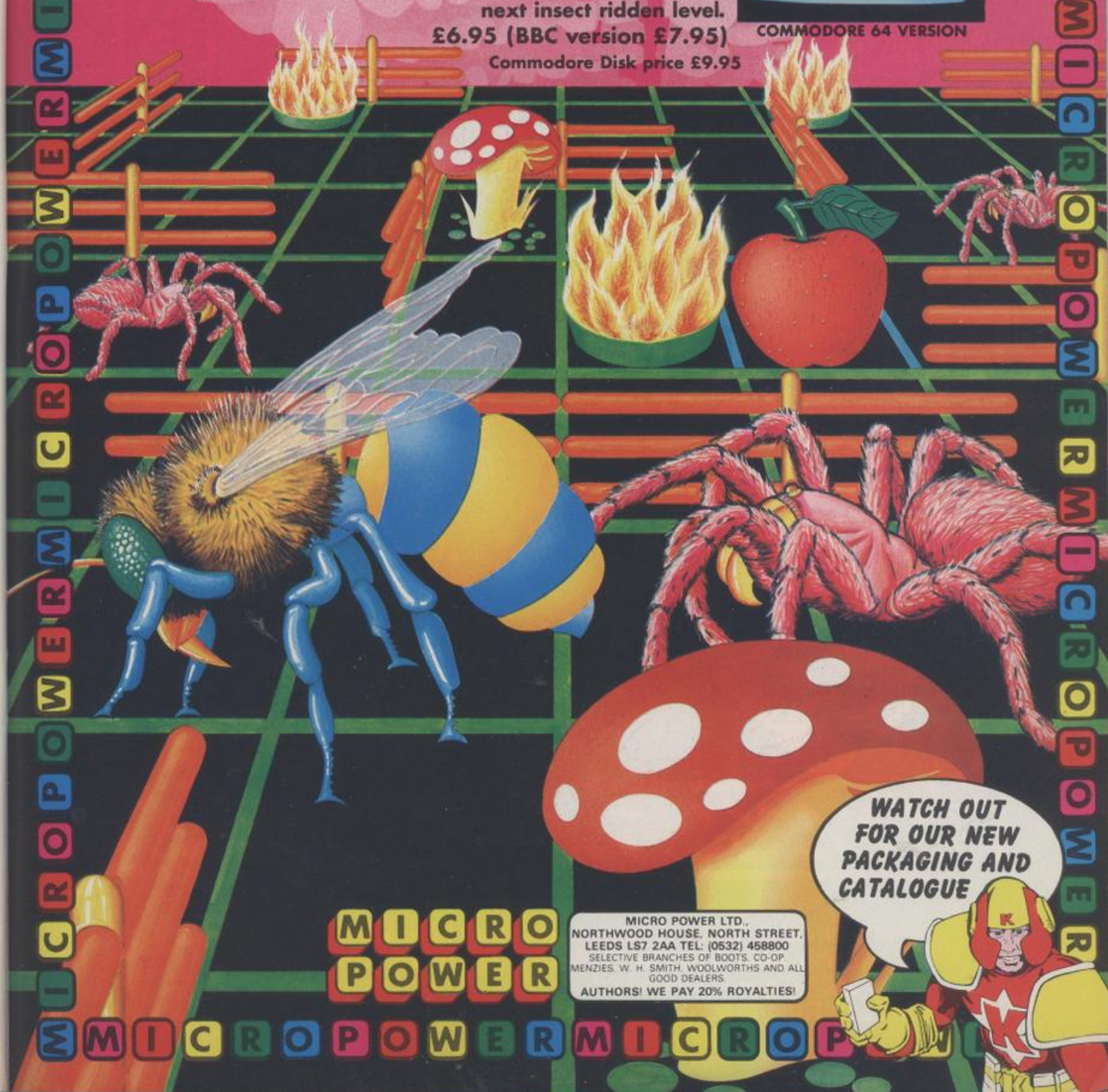
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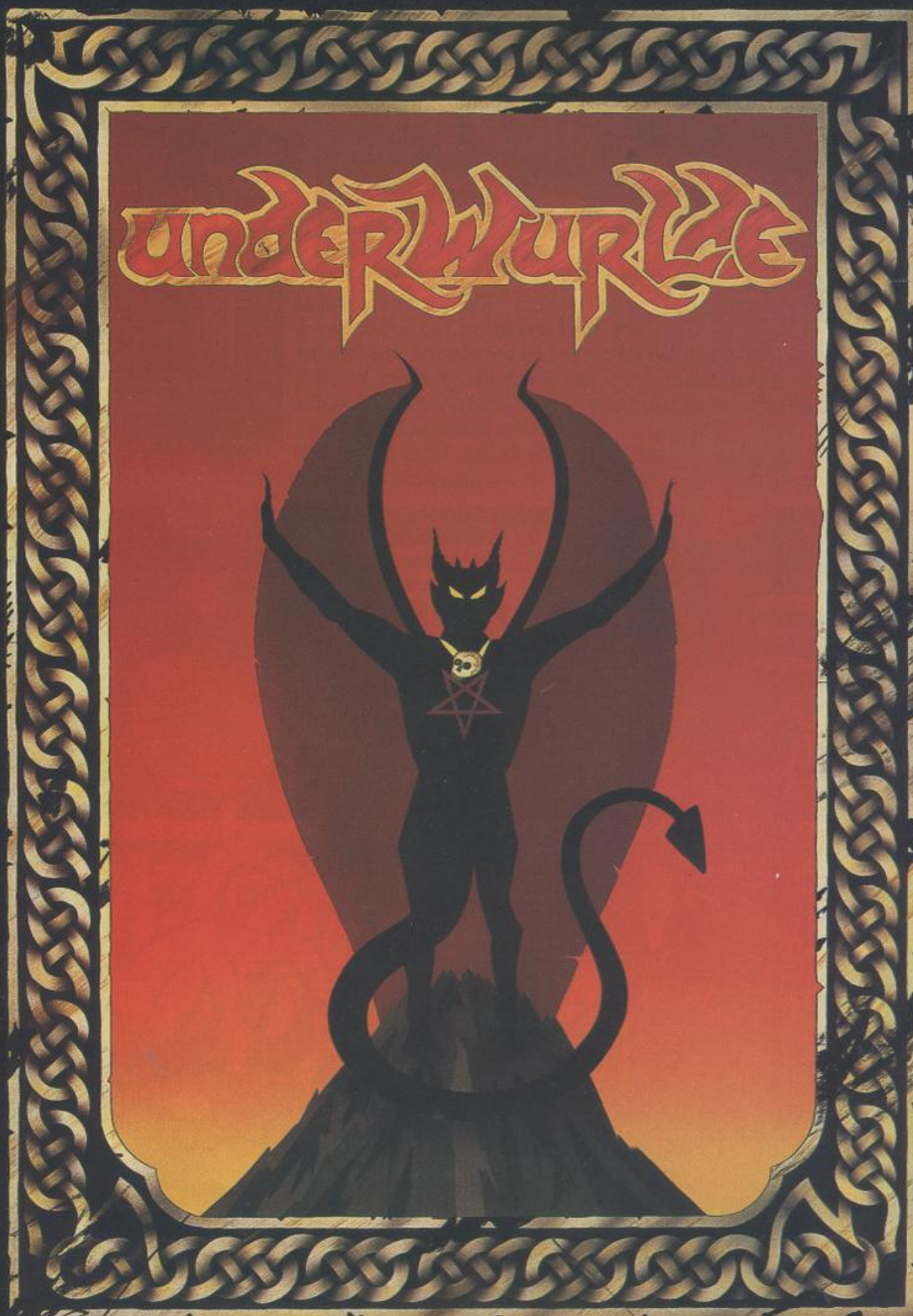
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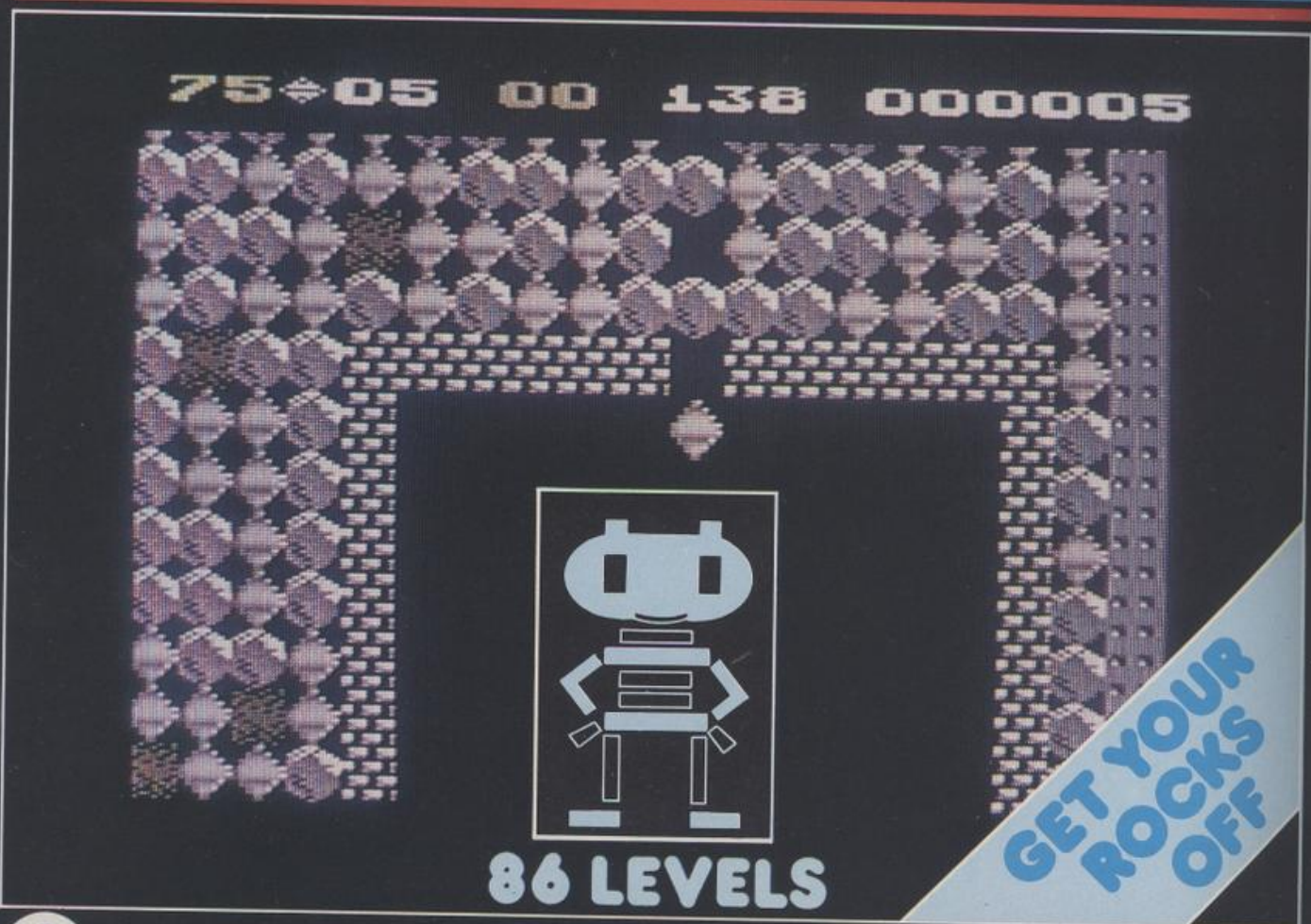
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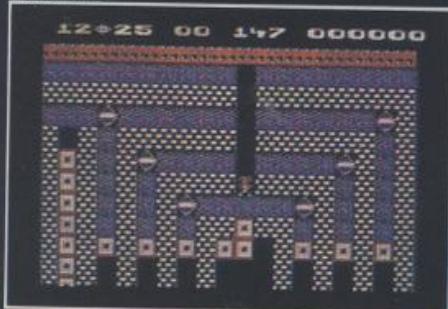
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Really Something Else



```
LD HL, (DISPLAY FILE)
PUSH HL
LD DE, 7
ADD HL, DE
LD (DFCC), HL
LD B, 64
XOR A
RST 10H
DJNZ ZEROACC
LD B, 4
LD A, CODE " "
RST 10H
DJNZ PTRACC
LD BC, 256
XOR A
RST 10H
DEC BC
LD A, B
OR C
JR NZ, BLANKLNS
POP HL
LD E, S1
ADD HL, DE
LD (SHIPAD), HL
CALL PTRSHIP
LD A, 255
LD (SUBCOUNT), A

LD HL, (RAND)
INC HL
LD (RAND), HL
LD A, (HL)
LD HL, SUBCOUNT
INC HL
INC HL
AND 7
INC A
INC A
LD (SUBLINE), A
ADD 7
LD (HL), A
LD B, A
LD C, 26
CALL PTRPOS
LD HL, (DFCC)
LD (SUBAD), HL
LD HL, (SUBAD)
PUSH HL
LD B, 5
LD (HL), C
INC HL
DJNZ -4
POP HL
DEC HL
LD (SUBAD), HL
LD A, (HL)

CP NEULINE
JRZ NEWSUB
LD B, 5
LD (HL), CODE " "
INC HL
DJNZ -5
DEC HL
DEC HL
DEC HL
LD (HL), CODE " "
LD A, (FRAMES)
AND 30
LD C, A
LD B, 0
CALL PTRPOS
LD HL, (DFCC)
LD D, 0
LD A, (HL)
CP " "
LD A, CODE " "
JR Z, 1
DEC A
LD (HL), A
LD B, 2
PUSH BC
LD HL, (SHIPAD)
LD A, (LAST-K)
```

Had any close encounters with machine code? Now's the time to meet it head on with Anthony Nwokoye.

ZX-81

ASSEMBLER

THIS PROGRAM WAS written for ZX-81 owners who would like to move on to machine code but who do not want to buy all the necessary assemblers, monitor, etc. It only occupies 3.75K of memory, above RAMtop, and has features you would expect to find from the top commercial products. These features are:

- The ability to assemble any Z-80 instruction — pages 181 to 187 of ZX-81 Basic Manual.
- It assembles to any part of the memory.
- It handles all labels, including those which require 16-bit address.
- It accepts decimal, hex or binary numbers.
- The ability to have messages imbedded in your code by putting the message between quotes.
- Comments and reminders may be placed

after an asterisk. You can also have multiple instruction, with each separated by a semi-colon — the whole code could be assembled from one line.

With these facilities, it would make it easier to write fast and smooth arcade-type games, and improve your machine-code techniques.

The machine code itself is stored in a Rem line 3,871 bytes long. This is obtained by first entering

1 REM 221 characters.

then edit line 1 and change it to 2 and edit 2 and change it to 3 and so on, until you have 1 to 17 lines.

Then add

18 REM 7 characters

then you POKE 16512,15

POKE 16511,28

then you enter the hex loader. Once you've entered the code and saved it to tape you can try out the assembler.

Load the program. When it has been loaded you should list it. You will see a long Rem statement followed by a mixture of weird characters. This is the machine-code assembler and the computer is only listing the first 400 bytes or so of the code. This code needs to be about RAMtop, so to do this you type:

PRINT USR 16514 ... (Newline)

and then you will see the computer New itself as it sends the code above RAMtop and clear itself.

Now that the computer is clear and the machine code is above RAMtop, you are ready to enter your mnemonics. I am going to have difficulty explaining this, so please stay awake!

Before entering your mnemonics, you need to enter a Rem line that is suitable to hold the code. The code does not have to start at 16514, it can start at, say, 22000. Before any mnemonics are entered you need a Rem line with an opening bracket, so the assembler knows where the code begins such as;

1 Rem ... necessary bytes

10 Rem (open brackets

(continued on page 143)

The Hex Loader

```
99 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=S TO F STEP 8
150 LET T=0
160 PRINT N; " "
170 INPUT A$
180 PRINT A$; " "
190 INPUT TOT
200 PRINT TOT
210 LET Z=0

220 FOR K=1 TO LEN A$ STEP 2
230 LET C=(CODE A$(K)-28)*16+CD
DE A$(K+1)-28
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GO TO 310
290 PRINT "ERROR - PLEASE INPUT AGAIN"
300 GO TO 150
310 NEXT N
```


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program smoothly scrolls the landscape, the second animates the other characters. This is undoubtedly one of **White Lightning's** most powerful features.

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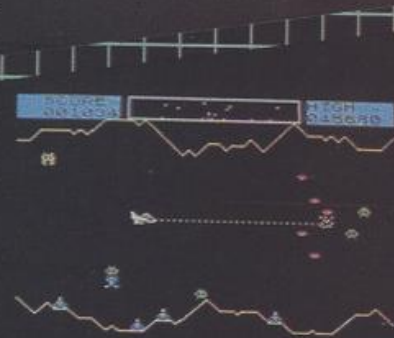
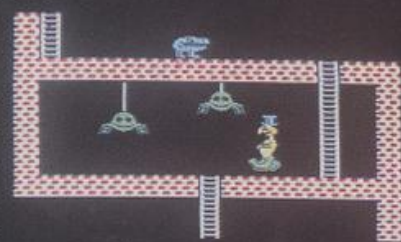
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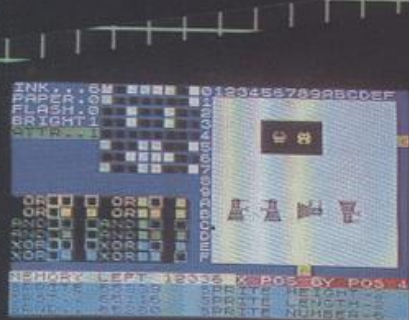
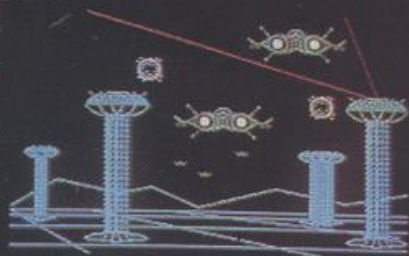


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YC 10

(continued from page 141)

all mnemonics are entered in Rem lines like so:

1 Rem ...

10 Rem (

20 Rem Ld A.0

to have multiple statements use a semicolon:

1 Rem ...

10 Rem (

20 Rem LD A.0; RST16; BIT 7.(HL); etc

The use of labels makes any assembler, with-

out doubt, much easier to use. They are used in instructions like JR or DJNZ, and you can even have 16-bit labels where the computer fills in the necessary two bytes. To enter a label you have to type a colon followed by an L and then the label number, and then again a colon. You have to do this before the required statement, like so:

1 Rem ...

10 Rem (

20 Rem: L1:INC HL; JR L1

The label number can be anything from 0 to 255 and must not exceed these values as the labelling system won't work correctly.

Now for the 16-bit label. In an operation like so:

1 Rem ...

10 Rem (

20 Rem :LO:SET 7.A;XORA etc ...

(continued on next page)

Assembler hex dump

168514	11AB6CED53044A021	717	17474	C0047A78FE27C86D	1055	18442	1C422F1C42301C42	377	18410	3430303030303030	773908	340
168515	9440010A0FED80C	846	17482	702AF37F9081C77	990	18450	201C422F1C42301C42	380	18411	3430303030303030	773908	340
168516	0303030303030303	918	17490	2AF17FE7E7E7E7E7	902	18455	422C1C422C1C422C1C42	380	18412	3430303030303030	773908	340
168517	0303030303030303	918	17495	0000000000000000	772	18465	1C42301C42301C42301C42	380	18413	3430303030303030	773908	340
168518	0303030303030303	918	17505	0000000000000000	434	18474	201C42301C42301C42301C42	380	18414	3430303030303030	773908	340
168519	0303030303030303	918	17515	0000000000000000	434	18485	422C1C422C1C422C1C42	380	18415	3430303030303030	773908	340
168520	0303030303030303	918	17525	0000000000000000	434	18495	1C42301C42301C42301C42	380	18416	3430303030303030	773908	340
168521	0303030303030303	918	17535	0000000000000000	434	18505	201C42301C42301C42301C42	380	18417	3430303030303030	773908	340
168522	0303030303030303	918	17545	0000000000000000	434	18515	422C1C422C1C422C1C42	380	18418	3430303030303030	773908	340
168523	0303030303030303	918	17555	0000000000000000	434	18525	1C42301C42301C42301C42	380	18419	3430303030303030	773908	340
168524	0303030303030303	918	17565	0000000000000000	434	18535	201C42301C42301C42301C42	380	18420	3430303030303030	773908	340
168525	0303030303030303	918	17575	0000000000000000	434	18545	422C1C422C1C422C1C42	380	18421	3430303030303030	773908	340
168526	0303030303030303	918	17585	0000000000000000	434	18555	1C42301C42301C42301C42	380	18422	3430303030303030	773908	340
168527	0303030303030303	918	17595	0000000000000000	434	18565	201C42301C42301C42301C42	380	18423	3430303030303030	773908	340
168528	0303030303030303	918	17605	0000000000000000	434	18575	422C1C422C1C422C1C42	380	18424	3430303030303030	773908	340
168529	0303030303030303	918	17615	0000000000000000	434	18585	1C42301C42301C42301C42	380	18425	3430303030303030	773908	340
168530	0303030303030303	918	17625	0000000000000000	434	18595	201C42301C42301C42301C42	380	18426	3430303030303030	773908	340
168531	0303030303030303	918	17635	0000000000000000	434	18605	422C1C422C1C422C1C42	380	18427	3430303030303030	773908	340
168532	0303030303030303	918	17645	0000000000000000	434	18615	1C42301C42301C42301C42	380	18428	3430303030303030	773908	340
168533	0303030303030303	918	17655	0000000000000000	434	18625	201C42301C42301C42301C42	380	18429	3430303030303030	773908	340
168534	0303030303030303	918	17665	0000000000000000	434	18635	422C1C422C1C422C1C42	380	18430	3430303030303030	773908	340
168535	0303030303030303	918	17675	0000000000000000	434	18645	1C42301C42301C42301C42	380	18431	3430303030303030	773908	340
168536	0303030303030303	918	17685	0000000000000000	434	18655	201C42301C42301C42301C42	380	18432	3430303030303030	773908	340
168537	0303030303030303	918	17695	0000000000000000	434	18665	422C1C422C1C422C1C42	380	18433	3430303030303030	773908	340
168538	0303030303030303	918	17705	0000000000000000	434	18675	1C42301C42301C42301C42	380	18434	3430303030303030	773908	340
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168542	0303030303030303	918	17745	0000000000000000	434	18715	201C42301C42301C42301C42	380	18438	3430303030303030	773908	340
168543	0303030303030303	918	17755	0000000000000000	434	18725	422C1C422C1C422C1C42	380	18439	3430303030303030	773908	340
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168545	0303030303030303	918	17775	0000000000000000	434	18745	201C42301C42301C42301C42	380	18441	3430303030303030	773908	340
168546	0303030303030303	918	17785	0000000000000000	434	18755	422C1C422C1C422C1C42	380	18442	3430303030303030	773908	340
168547	0303030303030303	918	17795	0000000000000000	434	18765	1C42301C42301C42301C42	380	18443	3430303030303030	773908	340
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168549	0303030303030303	918	17815	0000000000000000	434	18785	422C1C422C1C422C1C42	380	18445	3430303030303030	773908	340
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168551	0303030303030303	918	17835	0000000000000000	434	18805	201C42301C42301C42301C42	380	18447	3430303030303030	773908	340
168552	0303030303030303	918	17845	0000000000000000	434	18815	422C1C422C1C422C1C42	380	18448	3430303030303030	773908	340
168553	0303030303030303	918	17855	0000000000000000	434	18825	1C42301C42301C42301C42	380	18449	3430303030303030	773908	340
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168560	0303030303030303	918	17925	0000000000000000	434	18895	201C42301C42301C42301C42	380	18456	3430303030303030	773908	340
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168566	0303030303030303	918	17985	0000000000000000	434	18955	201C42301C42301C42301C42	380	18462	3430303030303030	773908	340
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168569	0303030303030303	918	18015	0000000000000000	434	18985	201C42301C42301C42301C42	380	18465	3430303030303030	773908	340
168570	0303030303030303	918	18025	0000000000000000	434	18995	422C1C422C1C422C1C42	380	18466	3430303030303030	773908	340
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168572	0303030303030303	918	18045	0000000000000000	434	19015	201C42301C42301C42301C42	380	18468	3430303030303030	773908	340
168573	0303030303030303	918	18055	0000000000000000	434	19025	422C1C422C1C422C1C42	380	18469	3430303030303030	773908	340
168574	0303030303030303	918	18065	0000000000000000	434	19035	1C42301C42301C42301C42	380	18470	3430303030303030	773908	340
168575	0303030303030303	918	18075	0000000000000000	434	19045						

(continued from previous page)

30 Rem LD BC, LO — here, BC is loaded with the 16-bit address of where label 0 would be when the mnemonics are assembled.

or:

20 Rem: LO:SET 7A;XOR A etc ...

30 Rem Call LO — the address is automatically done when assembled. In all the examples I've used decimal numbers, but I could easily use hex or even binary numbers. To enter a hex number, you must put an asterisk before it like so:

LD A.*2A, or LD DE.*B2CA

For a binary number, you put a plus sign before it like so:

LD, HL, +0110101010000101, or
LD C, +10100011

One of the special features of this assembler, is that you can have messages imbedded in your code. These can also be labelled and are put between quotes. Here is an example:

1 Rem ...

10 Rem (

20 Rem "THIS IS A MESSAGE"

and label the same like so:

1 Rem ...

10 Rem (

20 Rem:LS:"THIS IS A MESSAGE"

30 Rem LD HL,LS;LD BC, etc.

To have reminders and comments in your mnemonics, so you know which part does

what, you use an asterisk. This is put before the reminder.

Like so:

1 Rem ...

10 Rem (

20 Rem *THIS IS A COMMENT

30 Rem LD HL, 2A0K; etc

40 Rem * THIS IS etc and so on.

Now when you've finished your mnemonics, you enter a Rem) close brackets. This has to be at a line, at the end of your mnemonics. This is so the assembler knows when the end of assembling has been reached. Then you type in this short program to run the assembler:

9990 LET ADD=16514

9991 POKE 32767, INT (ADD/256)

9992 POKE 32766, ADD - 256*INT

(ADD/256)

9993 LET A=USR 27819

The value of Add doesn't have to be 16514, but can be any address where memory is reserved for the code, except 27819 or upwards as this holds the assembler and the label stack. Both address 32766 and 32767 will hold the address of the place the assembler should dump to.

Now for the moment of truth. Type Run. You should see the screen flicker and at the top of the screen:

LOOP ACCOMPLISHED

should have been written. This means that if you now List the program, you will see at line

number 1 the compiled machine code, and all is well.

However, if the computer prints:

I CAN'T ASSEMBLE ONE OF THE CODES then it means that you've made an error with one of the mnemonics. To help you find the error the computer displays at the bottom of the screen a 9 followed by a / sign. After this is the number logo where the mistake occurred so:

9/5

would mean a mistake has happened at loop 5.

If the computer prints:

YOU HAVE MISSED A LABEL USING JUMP it simply means that you have in the mnemonics requested a label using JR, DJNZ etc when this label doesn't exist. YOU HAVE MISSED A LABEL USING CALL would mean that you've requested a non-existent label, maybe using CALL L92, LD HL, L12 etc.

There must only be one space between the command and the next number or register in the mnemonics. For example LD (65535). A is acceptable, while LD (65635). A is not. You use a full stop or a space to separate each section. For example, LD A.B. is good, as is LD A B. All RST should have their numbers in decimal and have the numbers close to the letters like: RST48. All label numbers should be in decimal, and there should be no space at the end of the line.

Example program 1.

```
1 REM .....
.....
5 REM EXAMPLE1
10 REM (
20 REM *RANDOM PLOT*
25 REM *(THIS MUST BE LOADED
WITH ASSEMBLER ABOVE RAMTOP.)
30 REM *READY TO BE ASSEMBLED
WITH SUPER "SEMBLER AT ADDRESS
16514.
40 REM *BREAK M/C WITH SHIFT*
50 REM JR L1
60 REM :L0:RAND;LD HL,(16434)
70 REM LD DE,(16435);ADD HL,DE
80 REM LD DE,(16436);ADD HL,DE
;LD (16434),HL;LD A,L;RET
90 REM :L1:CALL L0;AND 63
100 REM LD C,A
110 REM :L2:CALL L0;AND 63
120 REM CP 44;JR NC L2;LD B,A
130 REM CALL 2994
140 REM LD A,(16422);CP 254;RET
Z;JR L1
150 REM )
9990 LET ADD=16514
9991 POKE 32767,INT (ADD/256)
9992 POKE 32766,ADD-256*INT (ADD
/256)
9993 LET A=USR 27819
```

Example program 2.

```
1 REM .....
.....
5 REM EXAMPLE2
10 REM (
20 REM *PRINT ROUTINE*
25 REM *(THIS MUST BE LOADED
WITH ASSEMBLER ABOVE RAMTOP.)
30 REM *READY TO BE ASSEMBLED
WITH SUPER "SEMBLER AT ADDRESS
16514.
```

```
40 REM LD B,52;:L0:PUSH BC
50 REM LD DE,L2;PUSH DE
60 REM LD B,14;:L1:LD A,(DE);A
DD A,128;LD (DE),A
70 REM INC DE;DJNZ L1
80 REM POP DE;LD BC,14
90 REM CALL 2923
100 REM POP BC;DJNZ L0;RET
110 REM :L2:"YOUR COMPUTER,"
120 REM )
9990 LET ADD=16514
9991 POKE 32767,INT (ADD/256)
9992 POKE 32766,ADD-256*INT (ADD
/256)
9993 LET A=USR 27819
```

Example program 3.

```
1 REM .....
.....
5 REM EXAMPLE3
10 REM (
20 REM *CHARACTER SET*
25 REM *(THIS MUST BE LOADED
WITH ASSEMBLER ABOVE RAMTOP.)
30 REM *READY TO BE ASSEMBLED
WITH SUPER "SEMBLER AT ADDRESS
16514.
40 REM LD C,127;:L0:PUSH BC
50 REM LD DE,(16396);LD C,24
60 REM :L1:LD B,32;:L2:INC DE;
LD A,(DE);INC A
70 REM BIT 6,A;JR Z L3;RES 6,A
;SET 7,A
80 REM :L3:LD (DE),A;DJNZ L2
90 REM INC DE;DEC C;JR NZ L1
100 REM LD DE,650;:L4:DEC DE;LD
A,D;CP 255;JR NZ L4
110 REM POP BC;DEC C;JR NZ L0
120 REM RET
130 REM )
9990 LET ADD=16514
9991 POKE 32767,INT (ADD/256)
9992 POKE 32766,ADD-256*INT (ADD
/256)
9993 LET A=USR 27819
```


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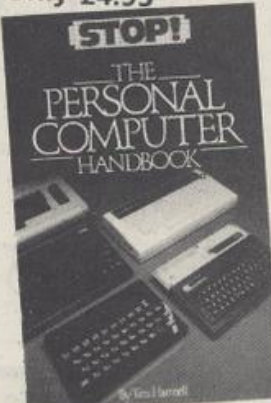
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MULTITASKING

ONE OF THE most advanced features of the Amstrad micro is its ability to handle interrupts directly from Basic. In other machines such as the Spectrum, interrupts are a tool available only to the machine-code programmer. Amstrad Basic releases the power of interrupts to all in a simple but comprehensive manner.

Although Spectrum interrupts can be harnessed quite readily — at least on the 48K machine — from machine code, the Basic programmer is left out in the cold with no commands to support interrupt-driven programming. Presented here is a program which rectifies this shortcoming by equipping Spectrum Basic with a number of interrupt commands, as well as the On Error and On Break commands found in Microsoft Basic. Due to the problems associated in accessing interrupts, even from machine code, on a 16K machine, it will only operate on the larger model.

The machine code resides above RAMtop, occupying addresses 63866 to 65367. Type in listing 1 and Run it. The program automatically lowers RAMtop and proceeds to Poke the code into memory. Each of the 23 data lines holding the code in a hexadecimal form has an associated checksum. If at any time the code in a line doesn't tally with its checksum then the computer stops, displaying the line at which the discrepancy was found.

When the code is in a form that the computer will readily accept — i.e., correct — you can save the code using the command below. Don't worry about the long delay while the computer Pokes the code; it takes a couple of minutes and don't be concerned by the blank screen, the computer hasn't crashed — hopefully.

SAVE "MULTI-TASK" CODE 63866,1413

You can reload at any time with:
CLEAR 63000: LOAD "" CODE

The 10 new Basic commands provided by the program can be accessed by typing them in

Easy multitasking with
Richard Taylor's
After and Every.

WE INTERRUPT THIS PROGRAMME
TO BRING YOU THE NEWS OF
THE BIRTH OF ANOTHER
ROYAL BABY....

WHAT AGAIN!
SEEMS TO HAPPEN
EVERY FEW MINUTES!



SPECTRUM INTERRUPTS

in Rem statements. There's a limit of one command per Rem and, as usual, a Rem statement must be the last item on a line. To make the computer treat Rems in this new fashion it is necessary to initialise the machine code by using a Randomise USR 63866 as the first line of your program. Subsequently, Rems will be treated in the new manner with no further need

for USR calls. The full command list is as follows:

AFTER	ON ERROR GOTO
EVERY	ON BREAK STOP
DISABLE	ON BREAK GOSUB
ENABLE	IGNORE BREAK
DROP	RESUME

I'll now deal with each of the commands individually. The simplest command is Ignore Break. As you would expect this command forces a program to ignore the break key and therefore prevents you from breaking into it. As an example, type in the following short program, but only if there's nothing important in memory.

```
10 RANDOMIZE USR 63866
20 REM IGNORE BREAK
30 GOTO 30
```

Pulling out the plug is the only way out of this program. The command in line 20 is typed in letter by letter, a little more laborious than single key entry but certainly a lot less confusing. You can type in either upper or lower case but upper case tends to look a bit neater. If the first character of a Rem is an asterisk then the rest of the line is ignored. In this way you are still able to add comments to a program.

The next command, On Break Stop restores normality to the break key:

(continued on next page)

Listing 1.

```
10 REM      MULTITASKING
20 REM      BASIC EXTENSION
30 REM
40 REM      By Richard Taylor
50 REM
60 CLEAR 63000
70 LET A=63866
80 FOR I=0 TO 22
90 LET T=0: READ V,A$
100 IF LEN A$>2 THEN INT (LEN A$/2)
110 FOR C=1 TO LEN A$ STEP 2
120 LET X=CODE A$(C)-48-7*(A$(C)
130 LET Y=CODE A$(C+1)-48-7*(A$(C
140 POKE A+16*X+Y
150 LET T:=16*X+Y
160 LET A=A+1
170 NEXT C
180 NEXT I
190 IF V<>1 THEN GO TO 500
200 PRINT "Data OK - Now SAVE"
210 STOP
500 PRINT "ERROR in line ";8000
+1+10
510 STOP
5000 DATA 7555,"C321FDC31AFDC321
5001FDC321FDC321FDC321FDC321FDC321
5002FDC321FDC321FDC321FDC321FDC321
5003FDC321FDC321FDC321FDC321FDC321
5004FDC321FDC321FDC321FDC321FDC321
5005FDC321FDC321FDC321FDC321FDC321
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5341FDC321FDC321FDC321FDC321FDC321
5342FDC321FDC321FDC321FDC321FDC321
5343FDC321
```


(listing continued from previous page)

[illegible]

ected the computer does a Go To to the line — not a Gosub although the com- does remember where the error occurred.

error handling routine should be able to competently handle any error that can occur in a program. In common with break subroutines, error routines may just consist of a Run command to restart the program if an error occurs.

```
10 DEF FN v(a)=USR 63872: RANDOMIZE USR 63866
20 REM ON ERROR GOTO 1000
30 LET a=b: REM *What b?
1000 PRINT "Oh dear, there's been an error!"
1010 REM RESUME
```

The use of Verify or Load commands from within a program often causes problems if there is a tape error since you are left in command mode once the error has been reported. If the program is going to be used by people other than its author, then it is necessary to print instructions on the screen of what to do in the event of a tape error to re-enter the program. This works, but is hardly state of the art in user-friendliness.

Inside the error routine, FN v(8) returns the line at which the error occurred. The self-list-routine is as follows, you might find it a time saving debugging aid:

```
DEF FN v(a) =USR 63862: RANDOMIZE
USR 63866
REM ON ERROR GOTO 9990
<Rest of program>
PRINT "Error ";CHR$ FN v(10);" at line
";FN v(8); ";;;FN v(9)
PRINT
LIST FN v(8)
I v(9) returns the statement number of the
neous command and CHR$ FN v(10)
```

The major function of the program is of course to provide interrupt handling. This is implemented in the form of the commands: After, Every, Disable, Enable and Drop. The scheme of things is basically this; there is a timer available counting at a rate of 50 units per second — the Frames rate. Using the After command you can set the timer to a specific value. Immediately, the timer starts counting down towards zero. Your program can happily continue, not having to worry about the timer any further. When the counter reaches zero the flow of your main program is temporarily diverted to a certain subroutine; just as if a

until you answer no to the "scroll?" (continued on page 150)

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(continued from page 148)

Gosub had been magically inserted in the right position in the program.

The subroutine is not terminated by a Return command but by the normally innocuous Continue. The syntax of the After command is After x, Gosub y. The Gosub has to be typed out in full. It is necessary, I'm afraid, to type in the seemingly redundant comma just before the Gosub bit.

The ability for a program to be freely interrupted in this way is often loosely termed Multitasking or parallel processing.

Here's a silly example — a listing for a computerised egg timer.

```
10 RANDOMIZE USR 63866
20 REM AFTER 9000,GOSUB 1000
30 PRINT "Start boiling the egg. I'll just
  brush up on my mental arithmetic."
40 LET a = INT (RND*1000)
50 LET b = INT (RND*1000)
60 PRINT a;" "b;"=";"a+b
70 FOR c = 1 TO 100: NEXT c
80 POKE 23692,255: REM *Allow
  automatic scrolling
90 GO TO 40
1000 PRINT "The egg is done"
1010 STOP
```

Line 20 sets up the time delay of 9000 1/50ths of a second — three minutes. Lines 30 to 90 just waste type by doing something completely unrelated with eggs, adding numbers together. Lines 1000 and 1010 are the subroutine called when the three minutes are up. The After command is a "single shot" command in that the subroutine is called only once, after which the timer becomes inactive. In most applications you would want a certain routine to be called at regular intervals. You could do this with the After command if you re-initialised the timer with After at the start of the subroutine.

However, a much better way is to use the Every command. Every is used in exactly the same manner as the After command. When the "interrupt service routine" — the subroutine called when the timer reaches zero — is reached the timer is automatically re-armed to its starting value ready for the next time. This program will constantly update the time at the top left-hand side of the screen even while another program is running:

```
10 RANDOMIZE USR 63866
20 LET min = 0: LET sec = 0
30 REM EVERY 50,GOSUB 9900
40 LET a = 0
50 PRINT AT 21,0;a: LET a = a + 1
60 GO TO 50
9900 LET sec = sec + 1
9910 IF sec > 59 THEN LET min = min + 1:
  LET sec = 0
9920 PRINT AT 0,0;"0" AND min < 10;min;
  " " "0" AND sec < 10;sec
9930 CONTINUE
```

The delay time in an After or Every command can be up to 65,535 units, about 21 minutes 51 seconds. If you need longer delays than this for some reason then you could use the following method. For instance a delay of one hour could be produced by setting up an interrupt service routine — or ISR if you like abbreviations — called every 10 minutes. At the start of the program you would initialise a variable — a, say — to zero.

Each time the ISR is called the value in a is incremented and when it reaches six, an hour has passed. Bear in mind, however, that the

Spectrum's clock isn't very accurate and you could end up with a quite drastic error with such a long delay.

So far I've talked about the "timer" in a singular sense. There are, in fact, eight timers. All eight are completely independent of one another in all respects. You can direct information to specific timers in an Every or After command by tapping another number in after the delay time, e.g.,

```
AFTER 100,7,GOSUB 9000
```

uses timer 7.

The timers are numbered 0 to 7. If you miss the timer number out, as in previous examples, then it defaults to timer 0.

The Disable command enables — no pun intended — you to suspend the operation of one or all of the timers. Disable used on its own disables all eight timers whereas Disable followed by a number disables only that particular timer. The inverse command is Enable which is used in a similar fashion to re-enable previously disabled timers.

```
10 RANDOMIZE USR 63866
20 REM AFTER 100,GOSUB 1000
30 REM DISABLE 0
40 GO TO 40
1000 PRINT "Time up!"
1010 STOP
```

Does nothing unless you remove the disable statement at line 30 or put in an enable command at line 35. You'd usually use the Disable/Enable commands to protect certain parts of a program from being interrupted, possibly because that part manipulates variables used by the ISR(s) and could leave the variables in temporary states that may upset the ISR(s).

The last command connected with interrupts is Drop. In an analogous way to normal Gosubs, before an ISR is called the current line and statement numbers are stored away on a stack so that normal program execution can continue quite happily when the ISR is finished. In some circumstances, however, you might not want to ever return from the ISR. For example, in a game you might wish to set a time limit to complete a certain task, say 10 seconds. You could use After 500, Gosub 8000 so that when the time is up a jump to line 8000 will be made. Obviously you wouldn't want to return from the ISR to continue that particular part of the game.

To save leaving the stack in an unbalanced state you would use the Drop command. This command simply makes the computer take the top item of its stack and throw it in its electronic dustbin. In an application such as this you can disarm the timer with an After 0, Gosub x as soon as the task's been completed otherwise you could find the computer calling the ISR at a rather inappropriate time.

When a timer counts down to zero the computer remembers that a certain line is to be called by placing its line number on yet another stack. When the statement currently being executed is finished it looks at the number it remembered and calls the appropriate ISR. Because ISR calls are not processed until the current statement is completed Input, Pause, Load, Save, Merge and Beep may hold things up. The computer, being a meticulous beast by nature, carefully piles up all the numbers of the ISR's it's got to call in preparation for such a time when it is able to process them.

Eventually the computer will run out of room and will no longer bother to store the lines. The amount of room the computer has got for stack storage is determined by how much memory you leave free between RAMtop and the start of the program at 63866. A good value for RAMtop is 63000 which leaves room for all but the most complex applications. Using the user-defined function introduced under the On Error command it is possible to interrogate any of the timers and find their current status. Use FN v(x) where x is the timer you wish to look at, numbered 0 to 7.

```
10 DEF FN v(a) = USR 63872:
  RANDOMIZE USR 63866
20 REM AFTER 1000,5,GOSUB 4000
30 PRINT AT 0,0;FN v(5);" "
40 GO TO 30
1000 STOP
```

The program displays the time remaining on timer 5 as it plunges towards zero. The function will return a zero if the timer is either inactive or disabled.

Unlike error and break handler routines, ISRs will nest to as many levels as you like although in practice the number of levels is determined by the amount of free memory available above RAMtop for the stack. One thing to avoid is to define an Every command with a time interval smaller than the time needed to execute the associated ISR. The routine will "interrupt itself" in such a circumstance as the next interrupt will have occurred before the ISR to handle the previous interrupt is finished.

Eventually the computer will get clogged up with an enormous stack of return lines which it never quite gets round to using. If this sort of situation is a possibility in your program then disable the timer right at the start of the ISR and enable it again right at the end. When writing ISRs, as with break and error handlers, it is important to remember that the routine should not do anything to unduly upset the main program by changing the value of one of the variables it is using, for instance.

The computer looks after you a bit by automatically storing the print and plot positions at the start of the ISR and restoring them to those values when the ISR is terminated. Print and plot positions are therefore "local" to the ISR. If you print and draw from within an ISR then the computer will automatically tidy any damage you might have done by changing the print/plot position.

There are a couple of points of interest to Interface 1 users. First, you should not use Open # and Close # commands in conjunction with this program. More precisely, programs using the interrupt facilities; On Error and On Break etc., don't matter. Secondly, any other Microdrive/Interface 1 commands should be immediately followed by

```
RANDOMIZE USR 63869: POKE 23728,0
```

sequences. Rem statements typed in as direct commands are treated in the normal way and cannot, therefore, contain any new commands. The Continue statement cannot be used in the normal way as when an error is actually reported (in contrast to an error handler being called) then all the new stacks are cleared and the timers are all forced inactive. Continue will not, then, resume a program without actually clearing or changing anything.

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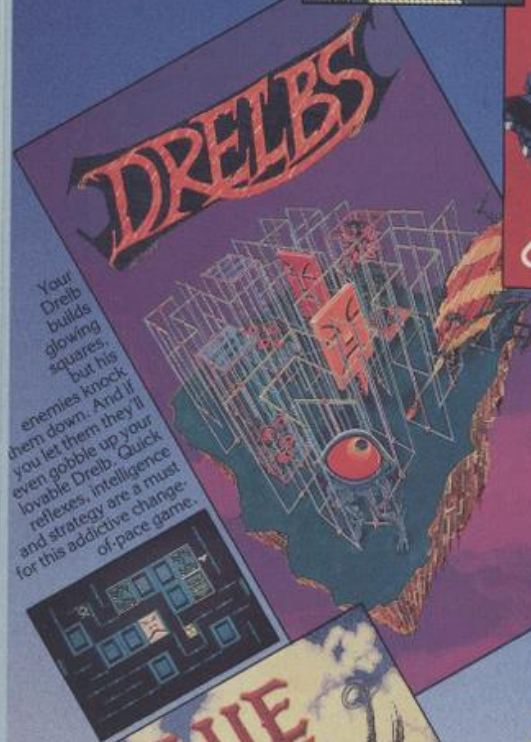
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THE PRODUCTION of massive quantities of add-on or "retro-fit" equipment for the BBC Microcomputer must be having some effect on the unemployment situation in the U.K. For those of you with some money to spend, or the hope that someone else will spend it for you, here is a pre-Christmas selection of hardware and software for the BBC computer. Prices range from less than £15 up to rather more than £120.

It's actually quite difficult to keep up with all the gadgets and programs that are being developed and advertised for the BBC machine. In the course of writing this article I have found a second and third ROM extension cable mentioned in advertisements, several more ROM extension boards, two or three more versions of Forth and so on.

No frustration or disgust

Only a few of the items in this review create any new capabilities for the BBC Micro; you can, after all, save programs on to tape, exchange Eproms using the four sockets in the ordinary machine and process words using any one of a number of programs. What the devices and software discussed here do achieve is an increase in your productivity by saving time, reducing fatigue and errors and encouraging you to concentrate on the task rather than the machine. The gain is so great in some cases that a job becomes possible where before you would have given up in frustration or disgust.

Multi-Forth 83 from Skywave has been written by David Husband who produced an earlier version of the language for the ZX-81. It

is impossible to thoroughly test a piece of software like multi-Forth 83 in the course of a couple of weeks. That applies also to both the other chips — Ade and View A2.1 — discussed in this review. It is possible to give you some idea of the capabilities of the program and its underlying ideas and any gross faults.

Multi-Forth 83 comes as a 27128 16K Eprom and Skywave says that while it normally operates a return of post service, the worldwide shortage of these chips means that their initial stock is unlikely to last for very long while the price of £40 may have to change to reflect the Eprom supply situation.

A 176-page manual completes the standard package and a demonstration disc holding one program is available to round off a "de luxe" system. The manual contains a comprehensive description of the multi-Forth 83 system although you will need a separate Forth textbook if you are not familiar with the language.

Forth is a Threaded Interpretive Language and it is an intrinsic quality of TILs that they run quickly. Multi-Forth 83 is said to operate 17 times faster than BBC Basic — when it is performing one task. That seems a reasonable claim, particularly when you see the system multi-tasking and still operating quickly.

Normal programs execute a series of program instructions and stop. Multi-tasking allows you to place several complete programs into the computer's memory and the computer is then directed to hop around from one program to another so fast that it looks as though all the programs are running simultaneously.

Multi-Forth 83 will run up to 28 tasks at one time! The demonstration disc shows five tasks

operating at once and the screen output is very impressive. If you start a foreground task it is noticeable that some of the others slow down, the screen display of the clock, for example, may only be updated every two seconds, but the overall performance of multi-Forth 83 is stunning.

You can print a listing of a program at the same time that you are doing something with the keyboard, sending commands to a robot via the user port and reading the position of a joystick.

The Forth position

The 1983 standard Forth definition has a lot of useful words in addition to those in the earlier 1979 standard and David Husband has included many BBC-specific commands from the operating system. Words are available also to control Sound, Envelope, Colour and Time. The editor allows the use of the BBC cursor keys as well as the usual single-key Forth commands.

Standard Forth uses integer numbers and multi-Forth 83 keeps to this policy offering 16-bit and 32-bit number-handling words. You can, of course, write your own floating-point words but the integer and fixed-point words in multi-Forth 83 will do very well for most applications.

Multi-Forth 83 will appeal greatly to anyone who is already familiar with the use of Forth; additionally, it should be considered by owners of the BBC computer who wish to start learning about Forth. Multi-Forth 83 does not

(continued on page 157)

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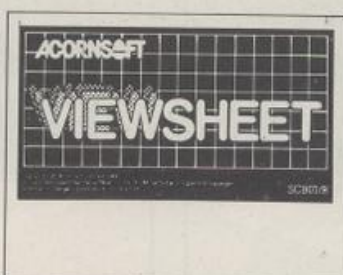
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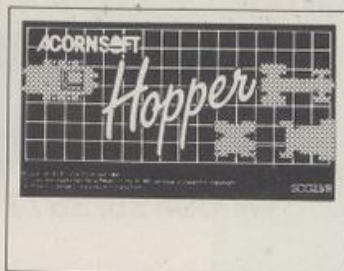
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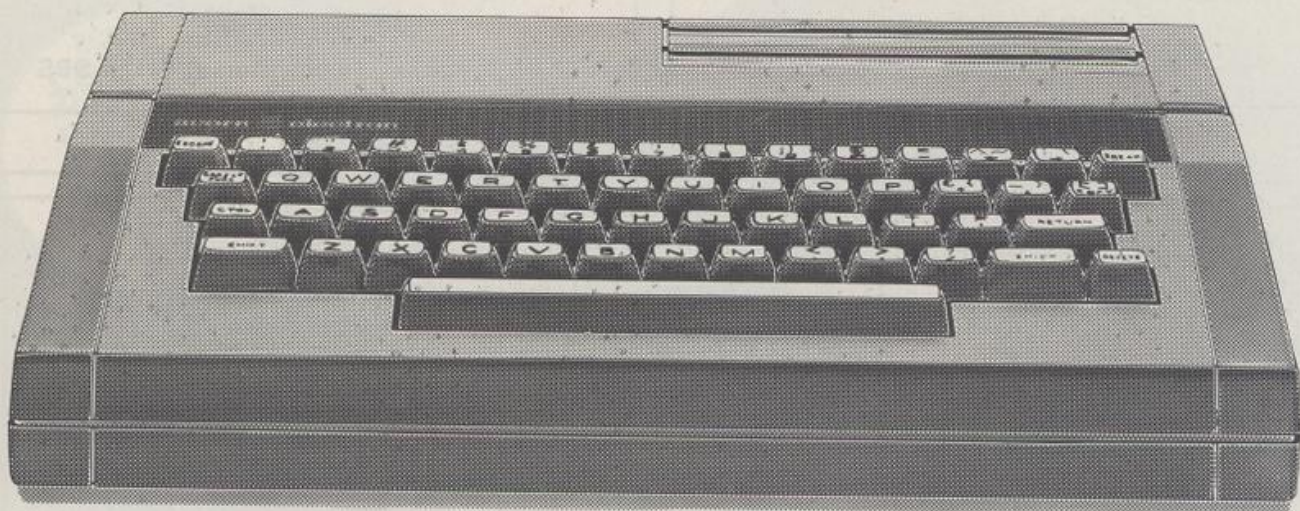


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
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(continued from page 153)

have to be complex to use but it can keep pace with your developing skills for a long time to come.

The Ade chip is made by System of Sheffield. Ade stands for Assembler Debugger Editor and the 16K chip is a complete, assembly language development system for the BBC. While it is possible to use the assembler in BBC Basic as a macro assembler, it is rather clumsy for programs of any length.

If you want to add short sections of machine code to a Basic program to speed up certain critical sections then you do not need the Ade package. If, on the other hand, you want to write a complete program in machine code then the Ade macro assembler and front panel monitor will become trusted tools.

Ade will assemble a source file whose length is limited only by the disc capacity. 29 pseudo-ops give you almost all the control and facilities that you might need. One or two of the pseudo-ops that I have used in Merlin — a macro assembler for the Apple II — are absent, but they are esoteric and not really essential facilities.

The editor in Ade is based on a DEC mini-computer editor called Teco. In addition to immediate commands you may set up a deferred command line which can be a very powerful combination of editing commands.

priority Eprom socket I can move easily around various programs from Basic to View A2.1, from Commstar to Ade and so on.

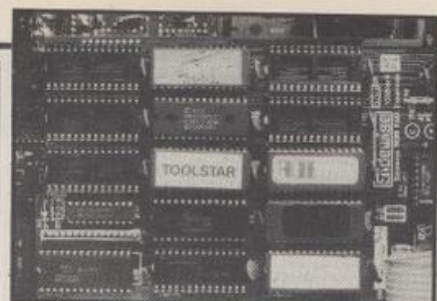
The Ade reference manual contains more than 80 pages of concentrated, well laid out information. Altogether very good value for serious assembly language programmers.

Clares' Replica II is supplied on a 40 or 80 track disc and its purpose is to take copies of cassette tape based programs on to the disc with very little fuss or bother. The Replica II program has space for up to 16 programs and neither the programs nor the copying software can be copied from disc to disc.

In other words you are allowed to make a disc copy of a cassette program. When the disc is full you will need to buy another Replica II disc if you wish to copy further programs.

Replica II costs £12 and worked well on my Acornsoft Lisp and Forth tapes as well as my Computer Concepts' Logo. You must be using Basic when you start to run the Replica program; it won't work from any other Eprom. I entered the number of sections in each cassette program and told Replica II that the cassette instructions were to Chain the program.

The transfer to disc proceeded automatically and all the programs I have loaded ran normally. Both Forth and Lisp continued to default to the cassette for file handling. Ordinary



on Wordwise then you should consider paying the extra £12 for a View A2.1 chip.

If you write professionally, when the productivity you achieve is important to you in terms of money, you will recover the additional cost in a couple of weeks or less.

View A2.1 has more facilities than Wordwise and the full screen editing makes it much easier to use. Twenty-nine formatting and editing commands are available using the red function keys and a further 23 formatting and printer commands can be embedded in the text. Although you will need the printer driver program to make the best use of your printer, there are two highlight commands in View which can be used to send control codes of your choice to a printer.

The Search, Change and Replace commands have powerful wildcard facilities. There are commands — Edit, More, Finish or Quit — to cope with documents longer than the available RAM in the BBC Micro. Working forwards through a text is easy but it is a more complicated matter to transfer a section of text backwards over the boundary between text on the disc and text in the computer.

Nevertheless View does allow you to handle long documents using an 80-column display. Wordstar, a CP/M-based word processor, is easier to use in this respect but costs six times as much as View! In some other ways View is more powerful than Wordstar and has a better ergonomic design.

On top of all the powerful text editing functions, for example, you can type in a list of names and addresses and then merge these automatically into a standard letter.

You cannot select certain categories of people from within a list, but that is no disadvantage for many purposes. View will produce all the footers, headers and two-sided headers that you might need for writing a book and can print one chapter after another from disc or tape without any intervention by you.

I think that the full screen editing is the feature of View that I like most and the one that separates it most clearly from Wordwise. Some Apple word processors costing more than £80 work in the same way that Wordwise does and the effect of the text moving around a cursor fixed on the centre line of the screen can be tiring and confusing.

Professional word processors must be easy to use for prolonged periods and View A2.1 meets this requirement. The View A2.1 instruction manuals are excellently produced and clearly written. One or two things are missing in the manuals. There is, for example, a page layout command called CO — comment — which is mentioned at the back of one manual but explained nowhere.

Despite this minor omission View A2.1 is a new piece of software that now represents better value for money than its more well

(continued on next page)

DFS assumed to cost £95						
Average 5.25 SS 40T 100K disc £130						
Phloopy costs £113.85						
	200K £170					
Discs/tapes	10	20	30	40	50	60
tapes	43.10	86.20	129.30	172.40	215.50	258.60
discs	18.00	36.00	54.00	72.00	90.00	108.00
Phloopy total	156.95	200.05	243.15	286.25	329.35	372.45
5.25 total	243.00	261.00	279.00	297.00	315.00	333.00
5.25 200K	274.00	283.00	292.00	301.00	310.00	319.00
Phloopy advantage against 100K disc	86.05	60.95	35.85	10.75	-14.35	-39.45

Table 1.

You can also define an editing macro command which will be performed whenever you press the Copy key. I like the Ade package very much even though I have spent hundreds of hours working with Merlin. The Ade editor works differently to the Merlin program but appears to be at least as powerful and, as System points out, you can use other editors such as Wordwise. I tried to edit one file using View but that was not very successful; I don't yet know why.

The third part of the Ade system is the debugger or front panel monitor and disassembler. Unlike many other BBC disassemblers, the Ade program produces machine-code listings which can be saved on to disc, loaded into the editor and reassembled after modification. The front panel commands are comprehensive.

One small but very useful feature is that Ade starts with an asterisk and whatever you type on that line is treated as a "star" command. I have always found it tedious to have to press the Shift key and the Asterisk key together before typing the name of the program I want to use and by mounting Ade in the highest

games programs caused no problems although Clares is careful to say in the instructions "Whilst Replica II has been made as wide ranging as possible there are and there always will be exceptions".

Copy protected discs and locked tapes make me cross and nervous at the same time. Clares says "Should the disc become corrupted either through a drive fault or incorrect usage Clares will undertake to re-copy the disc for a cost of £1.00 cash... If it is found upon investigation that the problem was caused by Replica II we will re-copy and refund your £1.00".

That seems a fair offer. Certainly I am delighted to have the accessory languages that I use from time to time available quickly rather than having to wait interminably while the cassette recorder grinds away. Good value.

The original View word processor was plagued by a number of bugs and never achieved the popular acclaim given to Wordwise. View A2.1 is a new, error-free version, and is a far better word processor than Wordwise for all sorts of reasons. I have been using View for the last couple of weeks and I have no doubt that if you are thinking of spending £46

(continued from previous page)
known competitor.

Toolstar is a chip containing a set of utility programs. Unlike an ordinary machine-code monitor, Toolstar is transparent to the MOS. This means that each of the routines in Toolstar "performs its function with stealth and afterwards leaves no trace of its operation".

Using no Basic program RAM, Toolstar functions can be called from within a high level program and the comprehensive manual lists a complete disc editor program written in Basic and using many Toolstar sub-programs.

You can extend the routines within Toolstar by writing your own code and calling it using the *Extend command. Eight Basic tools can be used to modify, edit or repair Basic programs and there are 10 machine-code commands which make up a formidable set of monitor tools.

Tools for industry

Toolstar has four disc filing system commands which do away with the annoying necessity for a formatting disc by providing Format and Verify functions as well as disc sector Load and Save commands. Good value for money, especially for people working with machine code.

Floppy disc drives for the BBC Micro-computer make up a high proportion of all the disc drives sold in the U.K. Despite the benefits, a floppy disc drive with the associated integrated circuits — floppy disc controller, disc filing system ROM and so on — is an expensive addition to your machine.

Table 1 shows the real costs of the Phloopy system from Phi Mag Systems Ltd compared with a floppy disc drive with the same storage capacity. The table was constructed to show how the initial cost advantage of the Phloopy systems is progressively eroded as you purchase more discs or tapes.

The break-even point occurs at 44 tapes assuming that there is no change in relative prices. However, you should not be put off by the relatively high cost of the tapes as you will have 4.4 Megabytes of programs or data stored away before the floppy disc becomes more economical.

The Phloopy drive differs from the Hobbit and Ultradrive systems which use cassettes of tape wound from one spool to another to store and retrieve information. Instead, the Phloopy uses a continuous loop of tape like the Sinclair Microdrive. However, the Phloopy is unique in that it stores in parallel format on tape.

By storing data eight bits wide with a ninth clock track, the Phloopy system offers a high packing density and short access times. The drive mechanism and data transfer are controlled by an 8049 microprocessor inside the Phloopy case while a 6821 chip acts as the interface to the main computer. Once you have passed a command to the Phloopy microprocessor, *Format, for example, you can get on and do something else with the BBC while the Phloopy carries out the command.

The Phloopy interface is not compatible with the interface for ordinary floppy disc drives. Installation should not be difficult; you are required to insert four components on to the main board while a couple of resistors must be

disconnected.

The following new commands are available in the Phloopy "LFS" — Linear Filing System?

*HELP PHLOOPY	*PHLOOPY
*DELETE	*RENAME
*DRIVE	*TITLE
*FORMAT	*UNLOCK
*LOCK	*VERIFY
*INFO	*COPY
*TRANSFER	*anothername

Additionally, all the normal Basic file handling instructions are available. The new commands are a subset of those in the floppy disc filing system but seem adequate for the tape drive.

*Transfer is a new command that will load a program from a normal cassette tape and transfer it automatically to a Phloopy tape. "*another name" means that the system will look for a machine-code file with a matching name and then load and *Run it.

The delay while you wait for the tape to reach the start of your program is certainly longer than you will experience using floppy discs. Conversely, it is far faster to use a Phloopy than it is to store programs on ordinary cassettes. If you have a limited amount of money and reckon that you can cope with transfers of data to and from other computers using the RS-423 port — with the excellent Commstar, for example — then I think the Phloopy tape system could be a very good buy.

The Viglen ROM system makes clever use of the hole in the top cover of the BBC machine just to the left of the keyboard. Designed originally to accept a ROMpack which would load serial data for the speech processor, the hole has been used by Viglen to mount a socket which is connected directly to one of the paged EPROM sockets on the main circuit board.

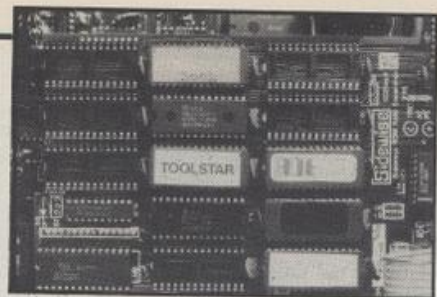
One immediate advantage of the system is that you need not open the case of the computer to change ROMs but there are other benefits as well. The Viglen ROM extension contains only passive components and uses no power until

CONCLUSIONS

■ There is some very sophisticated software available for the BBC Micro at some very competitive prices. The British Broadcasting Corporation's decision to renew their contract with Acorn Computer for another four years will reinforce the strength of the BBC Micro both in the U.K. and in many countries abroad.

■ The BBC computer is quite expensive but the initial capital cost is a very good investment if you seriously wish to use your computer for more than one job. If you want to play games only then the BBC machine may give you what you want. If you want to use a computer for word processing, laboratory or instrument control, small scale-number-crunching, teaching normal or handicapped children, communicating with other computers — then the BBC Micro is supreme.

■ The additional software and hardware described in this review do add to the BBC Micro's capabilities; whether one or another item will help you or entertain you at a price you can afford is for you to decide.



you plug a cartridge into the socket.

Consequently, you will have more power to use for other purposes from the internal power supply and less heat inside the machine's case. If you need to transfer a ROM or Eeprom from one machine to another, in a classroom, for example, the Viglen system could be very attractive.

Equally, if you want to install a special board inside the case of the BBC Micro you may find that it won't fit alongside an ordinary expansion ROM board.

A set of five empty cartridges will cost you over £27 in addition to the £19.95 for the original cable. Other single ROM extension cables are becoming available using zero-insertion force sockets to hold the EPROM.

Only you will be able to judge the relative merits for your own needs — certainly the Viglen ROM system works well and does offer good physical protection to your — expensive — paged ROMs.

There are a number of ROM extension boards made for the BBC Micro; most of them will work satisfactorily in an unexpanded machine. Whether or not a board will operate with one of the second processors or with one of the numerous double-density disc filing systems is another matter. Ideally you should see the ROM board installed and working in your machine before paying for it. Having said that, the ATPL Sidewise board from Advanced Technology Products has a good reputation.

The ATPL board expands the paged ROM facility of the BBC Micro from the original four sockets to the full 16 supported by the operating system. Links can be made or cut to allow you to install either 8K or 16K ROMs or Eeproms in the first 10 sockets; another link permits the use of 4K 2732 chips in the first three sockets.

The 15th socket is split into two and may be filled either by 8/16K ROMs or by two 8K CMOS RAM chips. The Sidewise board contains the circuitry to provide battery back-up for the CMOS RAM — a kit can be obtained from ATPL to upgrade the board. The CMOS RAM chips can be write protected and, with the additional battery, can then act like read only memory.

There are 10 integrated circuits on the ATPL board apart from the Eeproms and these are all small chips that will draw comparatively little power from the computer's power supply.

The installation instructions are not difficult to understand or carry out except that you must be careful of two power supply connectors on some later issue machines. No soldered connections are necessary; the Sidewise board simply plugs into two IC sockets — the displaced chips fit into the extension board.

My ATPL board works perfectly in my otherwise standard BBC Micro. It saves time and provides a permanent housing for the Eeprom programs that I have collected.



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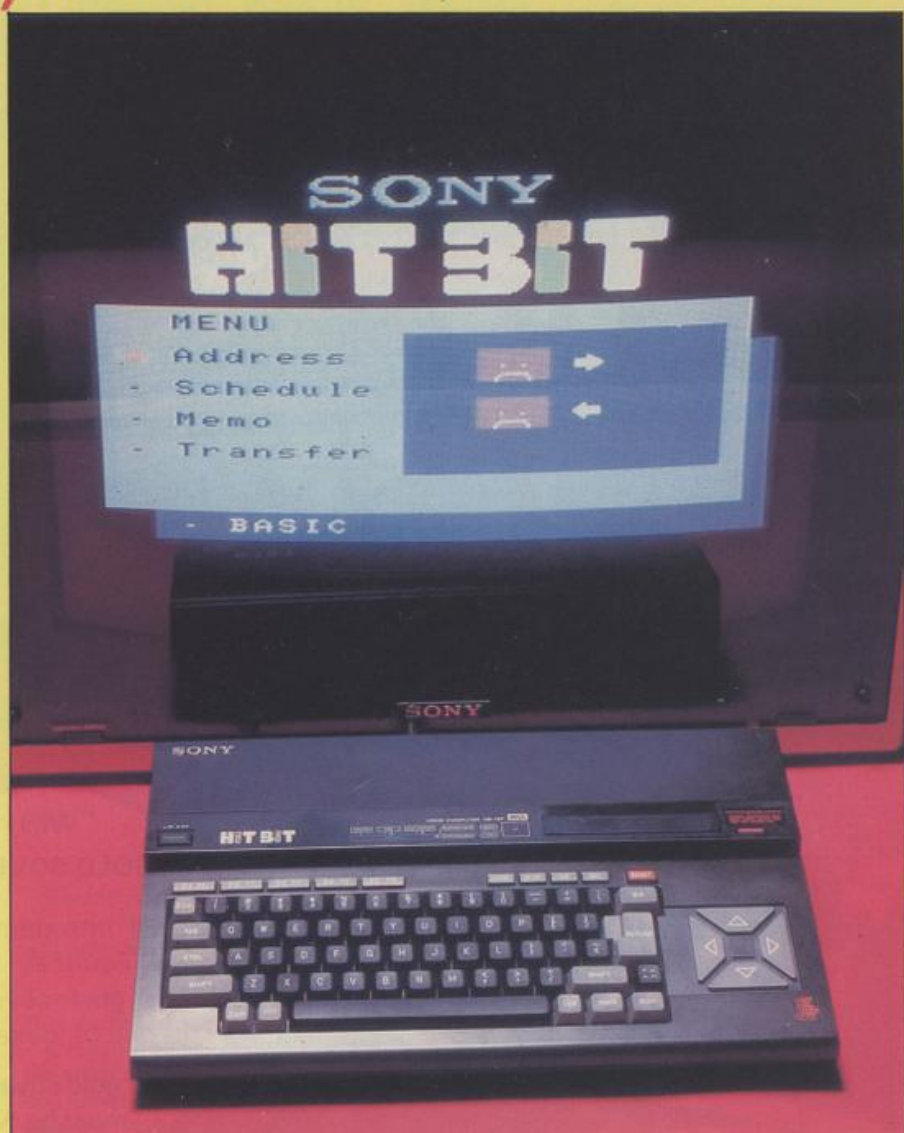
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RED ANTS

Carlo Delhez explains how Red Ants will make your ZX-81 top of the heap

THIS GAME MAKES full use of the capabilities of your ZX-81: it consumes the entire 16K RAM and gives fast, smooth and impressive action-graphics during the play.

The game is set in an enormous ants'-nest, measuring more than eleven times the size of the screen. The top of the maze is a long corridor — at ground level — from which lots of galleries are dug into the earth, all coming to a dead end sooner or later after being split up several times. The ants'-nest maze has no exit. Each time you start a new game, a new nest will be "dug"; this takes some five seconds.

Sixteen ants walk through the nest while laying their eggs. It's your mission to collect as many eggs as possible, while watching out for these awful ants: they do not chase you, but as the game progresses they run faster and faster, which makes avoiding them increasingly difficult.

You need imagination, patience, quick reactions, persistence and, of course, a supply of luck to play this game. But these abilities are also needed when entering the program. So, brace yourself!

The program consists of 3355 bytes machine code, stored in one large Rem, and 1786 bytes Basic. The rest of the RAM will be filled by variables.

Entering the machine code is the toughest part. First, clear your ZX-81 by typing:

```
RAND USR 0
```

Second, space needs to be reserved for the machine code. Enter a line 1 Rem followed by 128 characters — i.e., four full lines. Then, edit this line 23 times to get lines 2 up to 24 inclusive. Finally, edit line 24, change to 25 and add five characters. By now 3355 bytes should be reserved. Verify this by:

```
PRINT PEEK 16396 + 256 * PEEK
16397 - 16509
```

If a number other than 3355 is printed, you must start all over again.

Third, enter the hex-loader — program 1. Before running the hex-loader, enter subjoined Pokes as direct commands.

```
POKE 16510,0
POKE 16511,23
POKE 16512,13
POKE 16514,118
POKE 16515,118
```

These Pokes will convert the 25 Rem lines to one large Rem statement, stored in line 0. List will only show:

```
0 REM
```

List 1 will show the rest of the program. Now Run the hex-loader.

It expects two inputs — the start address and the finish address. Enter 16514 for the start. If you intend to type in the entire program in one go enter 19863. But if you prefer to type it in over several sessions enter a lower figure; save the code you have already typed and when you resume typing start up where you finished previously.

■ Enter Code; Press E. Type the starting-address in decimal. Now you can enter a string of hexadecimal numbers. If the program finds anything wrong in this input, the screen will be cleared, the address where things went wrong is displayed, and a new input asked. Enter a single Q to quit and return to the main menu.

■ Check Code; Press C. Enter the starting-address in decimal. The screen will then be filled with the hexadecimal address-contents from this address onwards. Pressing Q during the printing or after a screen-fill will return to the main menu. Pressing any other key after a screen-fill will show the contents of the next 168 addresses.

■ Save Code; Press S. The program will be Saved. It is best to repeat this several times while entering the code, in case the final version won't Load properly.

If everything has been entered correctly,

delete the hex-loader and make a few tape-copies of the code. When you have reached this stage, you are very near the finish. Just a little more patience ...

The final stage is to enter a small Basic-program. Don't make mistakes, especially don't be mistaken with addresses preceded by USR and Poke.

You will find that space-saving-techniques, like the use of Val, have been applied. These are really necessary, so do not omit them or the program won't run properly.

By now, you have reached the end. First Save the program by:

```
SAVE "RA*BACK-UP"
```

and then

```
RUN
```

The program will be Saved once again and then ... the long awaited result. If now, or at any other stage later on, a crash occurs reload the program containing both the complete Rem with machine code and the hex-loader, and re-check the code. If you cannot find an error, reload the back-up copy by

```
LOAD "RA*BACK-UP"
```

and check the Basic-program in which you should find the error.

Let's hope you did not come across a crash. Press Y to get instructions. Read them carefully. If you think the instructions scroll up too fast or too slow, break out directly after the instructions, when "press any key" occurs, and change the number Poked in line 110. A number higher than 160 will make them go slower, a number less than 160 will speed them up. Run again by

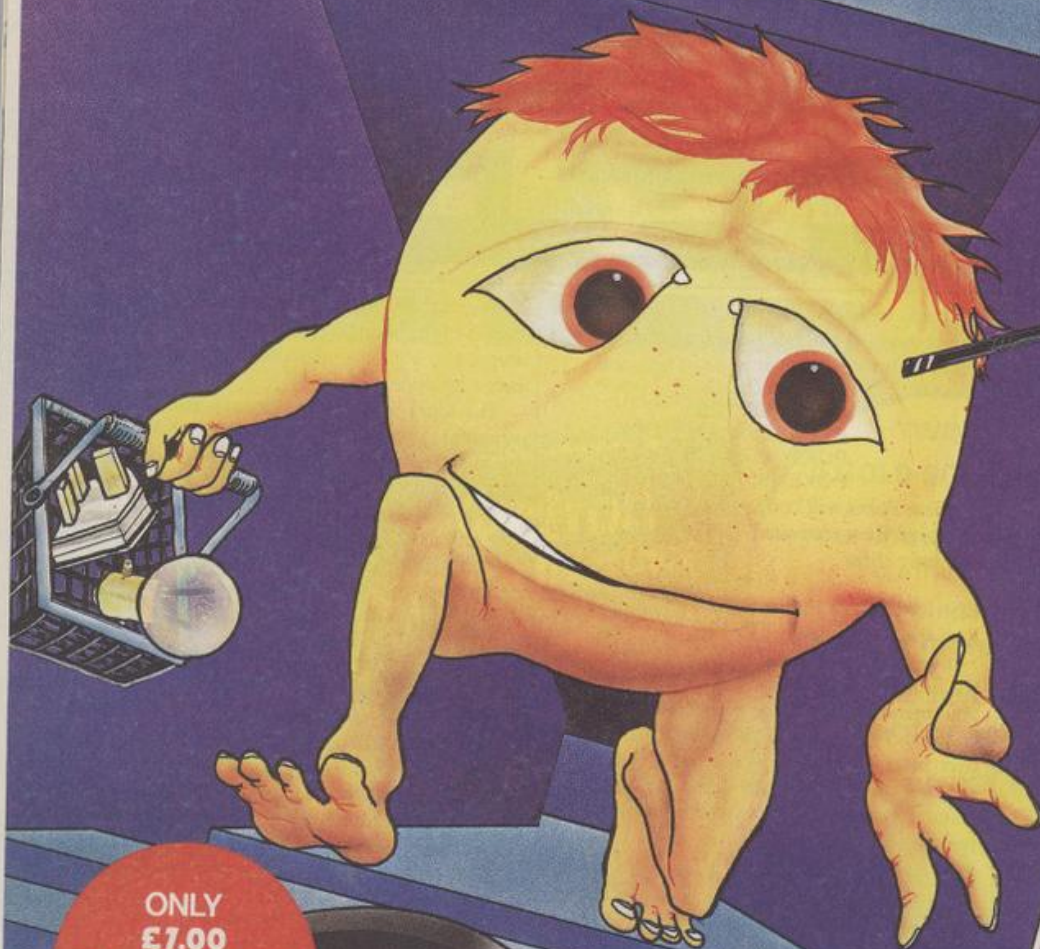
```
RUN 10
```

If you have read the instructions, you are asked to press a key after which the starting-temperature can be adjusted. To do this, press 8 to increase or 5 to decrease the temperature. If the correct temperature has been gained,

(Continued on page 165)

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(Continued from page 163)

press Newline. A temperature of less than 22 degrees makes the ants move slower than you, at 22 degrees, they move at the same speed as you, and a temperature of more than 22 degrees will make them move faster than you do. At 30 degrees, the game is hardly playable. You'd better start with 0 degrees.

When the temperature has been adjusted, a message appears to say the game will start within five seconds. During this period, the ants-nest is "dug". It's advisable to press the F-key during this period and to keep it pressed. For when the game starts, there will be no action at all until you release the key. So, keep F pressed.

Now you will see the ants'-nest. Three quarters of the screen is blank; this is the outside of the maze. One quarter, in the bottom right-hand corner, shows a maze. In the top left-hand corner of this maze — the middle of the screen — you see an asterisk. That's you. A few lines underneath you, there's a nought; that's an ant. Take your finger off the key for a short moment; the ant will move and leave full stops behind it. These are the eggs. Now you can release the F-key and start walking. Use the keys: I = up; Z = left; C = right; M = down.

Begin by pressing C for some moments. You will see that you keep steady, while the maze moves to the left.

When you eat the first egg, you will see some bars running across the screen. This also happens every 1000 points. The ants will then speed up.

If you get bitten, you'll see this three times in succession and you will be repositioned in the top left-hand corner of the maze. The ants will then slow down.

After being bitten three times, a nice "Game Over" appears. Press any key to start all over again.

Finally, here are a few useful hints concerning some possible alterations.

If you do not like the key combinations for steering, or there is a need for other keys in order to use a certain joy-stick, you can easily alter the keys for movement. This is done as follows:

```
POKE 18664 )
)
POKE 18712 > ,Code of character Up
POKE 18834 )
)
POKE 18869 )
```

Hex loader.

```
99 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=S TO F STEP 8
150 LET T=0
160 PRINT N; " - ";
170 INPUT A$
180 PRINT A$; " = ";
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN A$ STEP 2
230 LET C=CODE A$(K)-28)*16+CO
DE A$(K+1)-28
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GO TO 310
290 PRINT "ERROR - PLEASE INPUT
AGAIN"
300 GO TO 150
310 NEXT N
```

```
> ,Code of character Left
POKE 19852 )
)
POKE 18681 )
> ,Code of character Right
POKE 19825 )
)
POKE 18695 )
> ,Code of character Down
POKE 19843 )
```

Basic program.

```
6 REM (S)TAN GOSUB 22:V PR
INT LN 2:U AND RETURN COPY CODE
LN 2:LN 4:U AND RETURN COPY CODE
7 REM RETURN C4:Y 7ZPI RETURN
I4:Y 7ZPI RETURN M4:Y 7ZPI RETU
RN 2TAB 2AND 7ZPI XXX
8 SAVE "RED ANT"
10 LET Q=PEEK VAL "19780"
11 LET ZS=0
12 RND
13 POKE VAL "18418",SIN PI
20 LET Q=USR VAL "17338"
30 PRINT AT VAL "7",SIN PI,ZS
40 PRINT AT VAL "4",VAL "4"
50 PRINT AT VAL "18",VAL "6"
50 PRINT AT VAL "13",
VAL "6"
50 PRINT AT VAL "14",VAL "8"
50 PRINT AT VAL "15",VAL "8"
50 PRINT TAB VAL "2","PRESS ""
N"" TO SKIP-OVER THEM"
65 POKE VAL "17554",VAL "2"
70 LET NO=USR VAL "17720"
80 LET Q=USR VAL "17428"
90 GOSUB 500
100 IF Q=VAL "61312" THEN GOTO
VAL "140"
110 POKE VAL "18226",VAL "160"
120 LET Q=USR VAL "18157"
120 DIM LS(VAL "30")
125 PRINT AT VAL "22",PI/PI
130 IF INKEY$="" THEN GOTO 130
130 PRINT AT 22,LS
135 LET NO=VAL "11"
135 GOSUB 500
140 PRINT AT 10,1:"ADJUST THE I
```

Not only has the steering been changed by these Pokes, but the instructions have also been altered accordingly.

The hi-score is stored at the addresses 17046 up to 17051 inclusive. You can Poke in some hi-score or reset it to zero. Resetting to zero, however, can just as well be done by reloading the program.

If you are satisfied with the program, and you do not want to change it any more, it can be made break-proof. This means that, if you try to break while the computer executes a Basic-line, this interrupt-driven routine will respond with the execution of a RST 0, i.e., a full system-reset. To achieve this, edit line 10 and change the Peek into USR. Now Run, record on tape and try to press Break. There will not be much program left if the cursor reappears. This is a very good protection against burglary.

I am fully aware of the fact that typing this program is anything but a pleasant occupation. Therefore, I can supply you with a good-quality tape version. To obtain such a tape, send £3 to Carlo Delhez, Emmastraat 3, 4651 BV Steenberg, Holland.

```
NITIAL TEMPERATURE 0 = A BORING
GAME, 30 = A HARD GAME, USE KE
Y 8, 8 AND N/L.
150 PRINT AT 16,8:"
DEGREES "AT
17,8:"
180 PRINT AT VAL "16",VAL "10"
190 POKE 17104,VAL "5+5+USR 19
200 LET Q=USR VAL "17428"
210 LET NO=VAL "12"
220 GOSUB 500
230 LET AS="*****"
240 PRINT AT 10,1:AS TO 30:AT
10,4:"THE GAME WILL BE STARTED"
AT 13,8:"WITHIN A MOMENT",AT 15
1,AS TO 1
250 LET Q=USR VAL "17428"
260 CLEAR
270 POKE VAL "17554",PI/PI
280 DIM S(1E4)
290 LET Q=USR VAL "18516"
300 POKE 19787,VAL "406-PEEK 19
310 LET Q=USR VAL "19788"
320 POKE 19787,VAL "406-PEEK 19
330 LET Q=USR VAL "17720"
340 LET NO=VAL "22"
350 GOSUB 500
360 LET ZS=" "
370 PRINT AT 22,1:"RED ANT"
380 PRINT AT 22,1:"ADDICTIVE M
AZE-GAME."
390 GOTO VAL "30"
400 POKE 18224,201
410 FOR K=1 TO NO
420 LET Q=USR VAL 18188
430 NEXT K
440 POKE 18224,1
450 RETURN
```

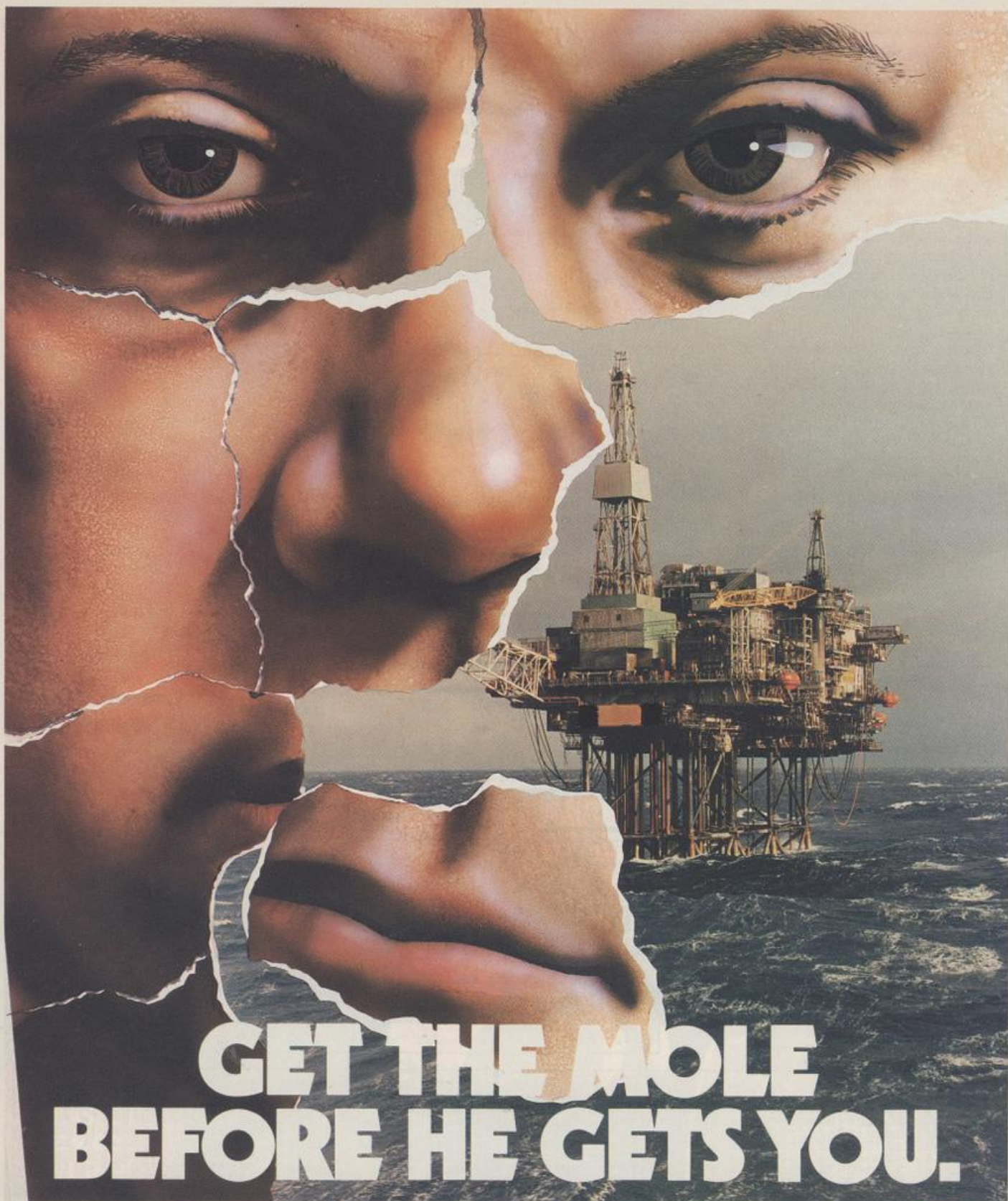
Hex dump.

```
16514: 7678CDE7433E80CD = 1134
16522: 0D40E516241E65CD = 908
16530: 8540152805C0C340 = 775
16538: 18F53E88F1E5C085 = 1307
16546: 4006457711640019 = 400
16554: 772310F710CDB540 = 895
16562: C3E84AD577231020 = 922
16570: FBD1092A7840C352 = 1167
16578: 41D53E880231D280 = 570
16586: 3600231D20F4D1C9 = 804
16594: E5E2A0C4011420019 = 455
16602: E8E1C92A10401170 = 924
16610: 0419C901009BFFFF = 895
16618: FFE1013223116600 = 685
16626: 19F0382100FD3521 = 704
16634: 282F3A32408785FD = 780
16642: 77338187FD8634FD = 1126
16650: 7732D80330FCED44 = 991
16658: 30F7E821E5401600 = 773
16666: 5F19E821E5401600 = 820
16674: 7EEBF821E5401600 = 1044
16682: 123C230020C30E32 = 392
16690: 10B8DC9C42CDD440 = 1120
16698: 1E653E89D5CDB540 = 993
16706: 11391B19D13CDB55 = 781
16714: 402A104011E20419 = 458
```

```
16722: 2278403617E5CDBA = 918
16730: 43E10500287E04FE = 725
16738: 8820F978FE0F303E = 918
16746: 3221402A7B4048AF = 623
16754: 47E042118D03ED52 = 854
16762: 0DD2403E15FE553E = 1098
16770: 0F914F971313120D = 459
16778: 20F813FD46212E0F = 735
16786: 60EDA03D20FE113 = 1113
16794: 01650009FD4E21F1 = 716
16802: 3D20D0AC313422A7B = 786
16810: 400600237E04FE58 = 625
16818: 20F978FE0F3037FD = 1026
16826: 77212A784011C003 = 655
16834: A7E0520615CDD240 = 892
16842: 1313081081E5EDA0 = 823
16850: 033D20FAE11AFE93 = 998
16858: 2805AF121318FE13 = 946
16866: D511650019D1FD7E = 944
16874: 2110DDC31342A7B = 716
16882: 40119C03AFDE5C2C = 830
16890: D240851513135E0E = 830
16898: 1EED4A030D20FAE1 = 950
16906: 13D511850019D110 = 800
16914: E0608C5CDD1843C1 = 933
16922: 10F9CDB80255147C = 966
16930: BD40444DCBD077E = 925
16938: FE262001C9FE2B28 = 863
```

```
16946: E9C3704CDB40FE25 = 1161
16954: D2B040C052187215A = 904
16962: 424F0600095E2356 = 975
16970: 2A7B403600197EFE = 608
16978: 1B2300DF1CCACB44 = 834
16986: FE00C2B040C35241 = 1043
16994: E5CDA244E1C35241 = 1031
17002: FFFF65009BFF0100 = 1020
17010: C9010099FFFFF65 = 1020
17018: 00C9382834372A0A = 460
17026: 101C101C101C0031 = 217
17034: 2E3B2A380E171717 = 208
17042: 002D0E0E101C101C = 217
17050: 101C00D040015804 = 638
17058: 09061011D542ED03 = 647
17066: 1643EB1AF8E02803 = 647
17074: 1318F83E1AF8E02803 = 647
17082: 7223360012336002 = 328
17090: 0EAF5130020F010E = 738
17098: 3E183215433E0630 = 334
17106: 1440C093300010074 = 553
17114: 609BFF1A19BFFBFB = 918
17122: 609BFF1A19BFFBFB = 918
17130: 6301001940100001 = 410
17138: 6401000755010000 = 310
17146: 6501000156010055 = 469
17154: 6701000156010055 = 381
```

(Continued on page 167)



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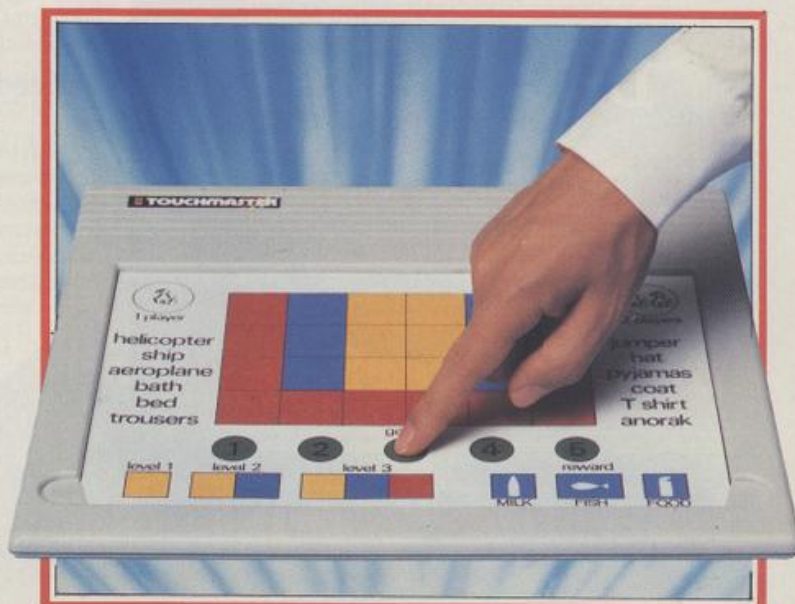
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17618	44217C4C20602111S	=	337
17626	00197EFE1728072B	=	516
17634	10F8353C31045333A	=	708
17642	1442300C3D14422478	=	443
17650	4036000CD4011166	=	727
17658	0019C35241217C42	=	590
17666	11060003E5111400	=	314
17674	19D1E80565C9C0FF	=	114
17682	441A4E89380A2004	=	463
17690	231314075CDBA43C9	=	974
17698	C0FF44F7E12231310	=	742
17706	FA18F1133C07A7E00	=	10
17714	Q2B101E1A76760E15	=	688
17722	2A0C40111440019E5	=	457
17730	061E380E02310FBE1	=	631
17738	0208051121001EE	=	370
17746	2A0C401114001911	=	245
17754	88451AE554F060009	=	681
17762	131ACB522004723	=	557
17770	1BF6FECDD2804CBB7	=	115
17778	18EAEE1131AEFE728	=	107
17786	060121009F9180CDD	=	493
17794	BB0222C0F8F850504	=	734
17802	4487C020685C4A0546	=	690
17810	060304444372A29CD	=	424
17818	0602044287014605	=	293
17826	83004426333938CD	=	605
17834	3C04044020838301	=	342
17842	47868301060304CD	=	555
17850	03860142060000C66	=	344
17858	44870601433870605	=	493
17866	CD04054187010555	=	583
17874	0204430802014336	=	282
17882	83010685804CD0337	=	491
17890	0141020404878701	=	347
17898	42870143080555CD	=	494
17906	03064428786020106	=	355
17914	0441870843060304	=	290
17922	43050508606304CD	=	300
17930	030583038609389	=	559
17938	0505030241378741	=	419
17946	050005448523000CD	=	413
17954	0887044102438509	=	413
17962	09064402044186833	=	421
17970	01050004543668301	=	324
17978	CD008705044446509	=	586
17986	02085440545050605	=	167
17994	CD028644310909982	=	686
18002	418306698102020541	=	346
18010	06030408303038383	=	486
18018	03830909830334C82	=	486
18026	0300CD00786090906	=	373
18034	40868301060304CD	=	561
18042	0667011806062044F	=	367
18050	0203000CD05870141	=	547

[illegible]

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(Continued from page 167)

18506	FF3534382E392E34	= 617	18954	2A26382A381BFFA8	= 584	19410	FF1E000000000000	= 400
18514	332A29002E330039	= 288	18955	3433382A381BFFA8	= 400	19411	FF1E000000000000	= 400
18522	202A003934350031	= 288	18956	39313E1A002E3339	= 399	19412	1010000000000000	= 400
18530	2A283915FF2D2E33	= 353	18957	39313E1A002E3339	= 399	19413	1010000000000000	= 400
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18546	00342B002E330039	= 288	18959	39313E1A002E3339	= 399	19415	1010000000000000	= 400
18554	333437332A343A3F	= 600	18960	39313E1A002E3339	= 399	19416	1010000000000000	= 400
18562	3933393316332A38	= 373	18961	39313E1A002E3339	= 399	19417	1010000000000000	= 400
18570	391B00002D2A372A	= 463	18962	39313E1A002E3339	= 399	19418	1010000000000000	= 400
18578	2B373432003E343A	= 373	18963	39313E1A002E3339	= 399	19419	1010000000000000	= 400
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18938	002E2E33FF372A2E	= 510				19464	1010000000000000	= 400
18946	002E2E33FF372A2E	= 510				19465	1010000000000000	= 400

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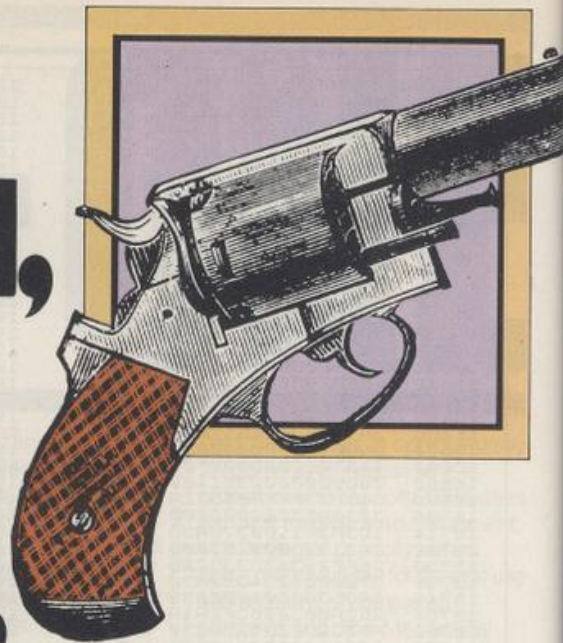
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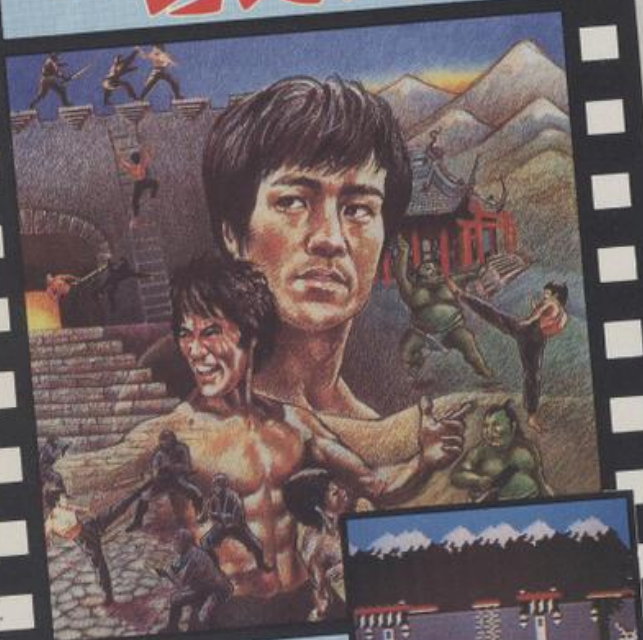
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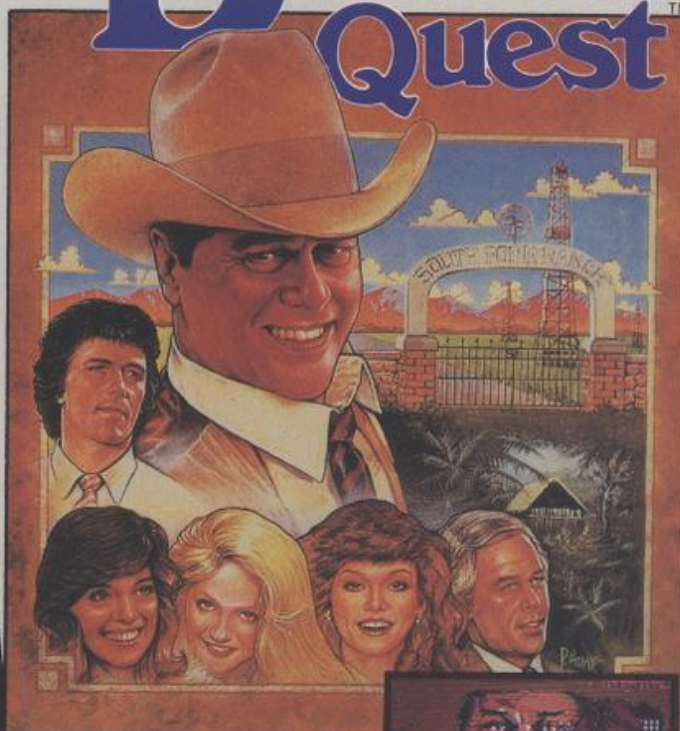
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Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

STATIC MICRO

I am 16 years old and have had many problems with computers. My first computer was a 16K Spectrum. This worked well for a month but developed keyboard trouble and was returned for a replacement. The replacement wouldn't Save, so was sent back for a refund. With this money, I bought a TI 99/4a. This was found to have faulty colour, so was replaced. Since then, I have had four more TI 99s, all of which have developed various faults, the most serious of which was a total loss of function — couldn't even get the "power on" light to work. A friend of my mother's said he had heard that some people cannot use computers because of bodily static electricity. Is this possible, or have I just had bad luck? Incidentally, I have used a friend's computer regularly, without any trouble. I hope you will answer this, as I am still interested in computers and hope to get an Electron if I get a positive reply.

Andrew McDermott,
Halifax.

SHADES OF The Omen! Your story, Andrew, about static electricity seems to me to be as valid as the fear many parents have that using a computer connected to the TV will somehow ruin the television. Certainly, some computer components can be destroyed by static electricity but this is the first time I've heard a claim that evil powers in the operator would render the computer inoperative.

My experience with TI 99/4a's has been all positive. They seem to work reliably — albeit excruciatingly slowly — and friends of mine who have them have reported no excessive failure rate.

The fact that you can use your friend's computer without causing it to self-destruct suggests, to me, that there may be problems — if such things are possible — in the wiring of your house. Unusual electrical surges could be, at least, blowing fuses — which sounds like what happened with your fourth TI. For what it's worth, you might like to chat with an electrician about your house wiring and enquire at the same time regarding the stability of the power supply in your area. Have you tried running your friend's computer at your home?

SPECTRUM BUG?

I think I have found yet another bug in the Sinclair Spectrum ROM. I was writing a simple program in which the user

enters the three lengths of the sides of a triangle. The length of the longest side is entered first, followed by the other two. The program then prints a message showing if the triangle is a right-angled one. When I was testing the program — which I was sure was correct — I entered the numbers for the 26, 24, 10 right-angled triangle. To my surprise, the computer told me the triangle I had entered was not a right-angled one — which it is! Is it me or my Sinclair computer which is wrong? Here's the program:

```
10 INPUT "LONGEST SIDE FIRST":A
20 INPUT "NEXT SIDE":B
30 INPUT "NEXT SIDE":C
40 IF C^2 + B^2 = A^2 THEN PRINT
  "A RIGHT ANGLED TRIANGLE":
  PAUSE 1:PAUSE 0:RUN
50 PRINT "NOT A RIGHT ANGLED
  TRIANGLE":PAUSE 1:PAUSE 0:
  RUN
```

Darren Patridge,
Tiptree,
Nr Colchester.

CLAIMS LIKE THIS, Darren, are heard very frequently. The problem lies not in your Spectrum, but in the way which all computers store numbers. They are never stored exactly. Even my IBM PC will inform me that 85/100 equals 0.849999. Certain micros available on the UK market will solemnly inform you that 4/2 does not equal 2 — because the computer stores 4/2 as 2.000001.

The way to test what your computer is really doing, in this and any other program in which you wish to compare the results of calculations, is to get the computer to print out its findings, i.e., tell it to Print C^2, B^2, A^2 and compare the three. Then, instead of looking for an exact match, get the computer to look for a minimum difference. In your case, line 40 could read:

```
40 IF ABS((C^2 + B^2) - A^2) < .0001
  THEN PRINT "A RIGHT ANGLED
  ..."
```

HOW GOOD IS MSX?

I have read a lot about MSX Basic in the past few months. I understand that it is a new standard so that you can run software written for one MSX computer on another. How well is MSX going to be accepted in the UK?

Martin Barlow,
Albany.

IF I COULD PREDICT the future, Martin, I would not be writing for Your Computer. No-one knows whether or not MSX will ever get off the ground. Certainly, Microsoft in America, who invented it, are pushing for it to become the standard. More

than 30 — at last count — Japanese manufacturers have either embraced the standard — or said they will in due course. My guess is that it will gain a certain acceptance over the next two years, so that it runs parallel to the de facto standards we have here such as Sinclair Basic and BBC Basic. It has, I believe, little chance of dislodging Microsoft Basic — as in PC-DOS on the IBM PC — in the States — although Microsoft and MSX Basics are very, very close; except for the graphics and sound.

The MSX standard is built around a Z-80A processor, and specifies such things as sprite control in the graphics, single channel sound, a Centronics printer interface, Atari-type joystick ports, cassette output — 1200/2400 baud — and three graphics modes — two text 32 x 24 and 40 x 24 and one "hi-res", which is 256 x 192.

So long as you stick with one of the biggies in the UK — such as the Spectrum or the Beeb — you have little chance of buying a machine whose support dwindles to nothing in the next 18 months.

CHEAPER BEEB

At the moment, I am saving up for an Electron, but I would have preferred a BBC Model B. Could you please tell me if the BBC Model B will be coming down in price in the near future?

S G Hornby,
Warton,
Preston.

ONE NEVER knows what thoughts lurk in the minds of those at Acorn, but the chances of the Beeb coming down in price seem to me to be very, very slim.

BUSINESS PROGRAMS

I have a Vic-20 micro and cassette recorder in good working order. My problem is that I had a brain stroke two years ago which has impaired my memory and manual dexterity. I find the manual entry of a program very difficult and boring. I want a micro offering software with simple home and business accounting programs, not games. What do you advise, since I am prepared to sell my Vic-20?

K F Searle,
Watford.

FIRST OF ALL, be prepared for a grave disappointment if you try to sell your Vic-20. The money you would get for it will be very, very little compared to what you paid for it. You do not mention how much you wish to spend on a computer which makes giving you specific advice fairly difficult. I imagine that a computer which allows use of discs, rather than a cassette recorder would be easier to use and therefore suggest you could consider a BBC Micro with discs. This, however, is not cheap.

Before you do anything, I would suggest you look through the advertisements in this issue of Your

Computer and call a Commodore dealer, describe your software requirements, and see if you can get anything suitable for your Vic-20.

TAPE TO DISC

I have recently purchased a Cumana disc drive for my BBC Micro, and would like to save programs on disc from tape — Basic and machine code. I have little knowledge of machine code and assembler. Could you tell me how it could be done?

P A Jamison,
Virginia Water,
Surrey.

MANY PEOPLE, including myself, would love to know how to do this. However, we dare not risk the wrath — and the lawyers — from Acorn. One magazine printed a routine for busting the locks on cassette software from Acornsoft, so it could be transferred to disc, and got hit with a £70,000 fine for their trouble.

PRINTER ADVICE

Can you advise of a printer with a superior width of presentation to the ZX printer?

J A Jones,
10 Shalbourne Rise,
Camberley,
Surrey.

THERE ARE a number of interfaces now available to allow you to hook a "real" printer to your Spectrum. However, as far as I know, they do not offer a "superior width". However, I have printed your address in full so any manufacturer who thinks he can help can get in touch with you directly.

In an earlier issue of *Your Computer*, I gave a way of adding a line numbered zero to a Spectrum program. Mike O'Donnell of Palacefields, Runcorn, Cheshire, has sent me a method of adding line zero which he says has two advantages. One, it is easier than the method I outlined, and two, it can be removed. Here's Mike routine:

First enter your line number, as 1 REM ...
Next POKE 23756,0
Press Enter then List

To remove the line:
POKE 23756,1
Press Enter and List

Thanks for this routine, Mike, which I note you acknowledge as having been shown to you at your local computer club. I agree that it is simpler than my method, but the very fact that it can be removed makes its inclusion rather pointless. I was trying to give a way to put a copyright notice within a program which could not be removed.

POWER UP!



Your First Commodore 64 Program

R. Zaks £ 7.95

You can learn to write simple programs without any prior knowledge of mathematics or computers! Guided by colorful illustrations and step-by-step instructions, you'll be constructing programs within an hour or two.

ISBN: 0-89588-172-1, 7"x11", 182 pp, illustrated

also available for VIC-20, APPLE II, ATARI, IBM, TI99/4A



Your Second Commodore 64 Program

G. Lippman £ 8.95

The many colorful illustrations in this book make it a delight for children and fun for adults who are mastering BASIC programming. A sequel to **Your First Commodore 64 Program**, the book follows the same thorough, detailed approach and brings you to the next level of programming skill. With these BASIC language techniques, you'll soon be creating your own applications!

ISBN: 0-89588-152-7, 7"x11", 240 pp, illustrated

also available for APPLE II



ATARI BASIC Programs in Minutes

St. R. Trost £ 8.95

You can use this practical set of programs without any prior knowledge of BASIC! Application examples are taken from a wide variety of fields, including business, home management, and real estate. Just type them in and they're ready to run!

ISBN: 0-89588-143-8, 6"x9", 170 pp, illustrated



Power Up! Kids' Guide to the Commodore 64

M. DeJonghe/C. Earhart £ 7.95

Colorful illustrations and a friendly robot highlight this guide to the Commodore 64 for kids 8-11.

The hands-on approach features short, easy lessons, and the spiral binding makes it ideal for use right at the computer. The engaging exercises are full of surprises and discoveries. By the end of the book, kids will be programming their own guessing games, "all-purpose" thank-you notes, multi-colored pictures, and simple animation. The authors are elementary school teachers with several years of computer experience.

ISBN: 0-89588-188-8, 9"x7", 192 pp, illustrated



Graphics Guide to the Commodore 64

Charles Platt £ 9.95

This easy-to-understand book is the first to answer the need for a Commodore-specific graphics guide. It will appeal to anyone who wants to master the Commodore 64's powerful graphics features. You'll learn to move images across the screen, build your own character sets, and create impressive headlines and detailed pictures on the screen. A full color collection of screen displays is included, as well as instructions on how to create your own video games.

ISBN: 0-89588-138-1, 7"x9", 261 pp, illustrated

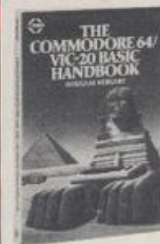


Programming the 6809

Zaks/Labiak £ 11.95

Get more out of your 6809 microprocessor — this book is chock full of programming tricks to show you how. Start with the basics of assembly language programming, and go on to understand registers and buses, subroutines, the 6809 instruction set, addressing modes, I/O techniques and devices, data structures, and useful applications. Give your 6809 processor 16-bit performance with 8-bit economy. No prior programming knowledge is required.

ISBN: 0-89588-078-4, 6"x9", 362 pp, illustrated



The Commodore 64/VIC-20 BASIC Handbook

D. Hergert £ 9.95

In this dictionary-style handbook, you'll find clear descriptions and examples of each word in the Commodore 64/VIC-20 BASIC vocabulary. The proper syntax of every keyword and function is explained carefully and thoroughly in easy-to-understand English. Short example programs illustrate the correct use of each command, and special notes provide insight into subtleties and extra features of Commodore 64/VIC-20 BASIC.

ISBN: 0-89588-116-0, 6"x9", 185 pp, illustrated

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Software File gives you the opportunity to have your programs, ideas and discoveries published. We will accept contributions for any home computer provided they are submitted to *Your Computer* exclusively. Please double-check your programs and specify the memory they require before sending them, preferably on cassette. We pay between £6 and £36 for contributions published.

Karate!

Alexis and
Mario Chiotis,
Finchley,
London N12.



KARATE IS A two-player game based on the Japanese form of martial art, for the Commodore 64.

Using the multicolour sprite facility on the 64, we have created many of the elements of the real thing for example punching, kicking etc., without the pain. To play you will need two joysticks and quite a bit of skill.

When the program is run you will be allowed to choose the colour of your Karate suit. This is done using F1 and F3. To continue, press F7. You will then be asked how long the fight will last, and also the names of the players.

The next scene is where the fighting takes place. The two men stand on their lines, bow, and are then ready to fight. By using the combination of joystick movements, shown on the chart, some complicated and exciting fights can be achieved.

After a little practice, you will soon master these techniques and produce some startling effects.

Finally, the winner will be displayed showing off his skills by attacking a brick wall.

If you would like a copy of Karate, just send £3.50 including post and packaging to: Karate Offer, 7 Torrington Grove, Finchley, London N12 9NA.

Joystick port one (controls player 2).

North: Jumps in the air and kicks.

North-west: Does a high kick towards opponent's chest.

West: Moves player two forward.

Fire: Kicks towards opponent's stomach.

West and Fire: Blocks oncoming punches and high kicks.

South-West: Sweeps opponent's legs away. South: Ducks. Can also be used to pull opponent's legs away.

East: Steps back.

East and Fire: Punches.

Joystick Port two (controls player 1).

North: Jumps and does a high kick.

North-east: Does a high kick towards opponent's chest.

East: Moves player 1 forward.

East and Fire: Blocks oncoming punches and high kicks.

South-east: Sweeps opponent's legs away.

South: Ducks. Can also be used to pull opponent's legs away.

West: Steps back.

West and Fire: Punches.

Variables.

C1: Colour of player one's karate suit.

C2: Colour of player two's karate suit.

J1: Peek of joystick port one.

J2: Peek of joystick port two.

P1: Player 1 score.

P2: Player 2 score.

S1: Sprite 1, i.e., 2040.

S2: Sprite 2, i.e., 2041.

T\$: Time.

```

1 00000000
2 CLR C1:1:2:1:PRINT "C1:00000000:00000000"
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9 00000000
10 00000000
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[illegible][illegible]

Barry O'Reilly,
Kells,
County Meath,
Ireland.

HAVING JUST GRADUATED from college with an arts degree you find the permissive world totally engrossed in watching junior blasting the bug-eyed-bouncers before they eat his cat and kill his grandmother, or vice versa. There seems no place for conscientious objects like you, so despondently you don the disguise of an inconspicuous paint-brush and venture out to make your fortune in the menial post of exterior decorator.

For those of you who have never had the experience of being a paint-brush I shall try to

describe the feeling. You are situated on the wall of a house and may move anywhere you wish, painting as you go. Inevitably there are a collection of hazards to be avoided and, equally inevitably, bonuses to be collected.

Death can also be found in the form of a dry paint brush. To avoid this, paint-pots are placed about the wall, running over these will replenish the linear scale at the bottom of the screen. About one minute of diligent swishing is enough to complete a wall and then be prepared for . . . Oh it's all in the program anyhow.

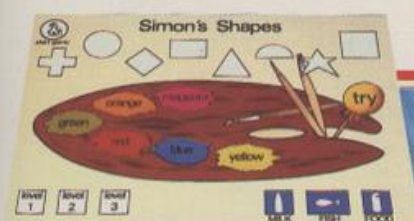
Key in the program as listed even though the numbering appears unbearably erratic. Then save it under your favourite file name using the suffix Line 8000 so as to display the instructions on loading.

```

BONUS STAGE" TAB 0
4010 PRINT AT 3,16, INK 6;"L"
NK 4;"= 250, AT 12,8, PAPER 0,
INK 2, FLASH 1;" PRESS ANY KEY
4020 PAUSE 200 BORDER 2: PAPER
0: CLS
4030 FOR n=28 TO 228 STEP 40: PL
OT n,16, DRAW 0,143: NEXT n
4040 FOR n=28 TO 140 STEP 16
4050 GO TO 4060+10*(RND(.5)
4060 PLOT 28,n: DRAW 40,0: PLOT
108,n: DRAW 40,0: PLOT 188,n: DR
AW 40,0: GO TO 4080
4070 PLOT 68,n: DRAW 40,0: PLOT
148,n: DRAW 40,0
4080 NEXT n
4090 PRINT AT 20,INT (RND*6)+5+3
, INK 6;"L"
4100 LET y=3: LET x=1: INK 6
4110 FOR n=1 TO 5+RND*35: PRINT
AT x,y;"C": BEEP .067: IF INKEY
$<" " THEN GO TO 4135
4120 PRINT AT x,y;" " LET y=y+5
IF y>28 THEN LET y=3
4130 NEXT n
4135 PAPER 1
4140 LET r5=POINT (y*8-8,(21-
8+4)): LET r6=POINT (y*8+8,(21-
8+4)): LET r6=POINT (y*8+4,(21-x
)*8-4)
4150 BEEP .005,x+y: PRINT AT x,y
: PAPER 1;" " IF r5 AND r6 THEN
LET dy=-1: LET cs="A"
4160 IF r6 AND r8 THEN LET dy=1:
LET cs="C"
4170 IF r6 AND NOT r5 AND NOT r8
THEN LET x=x+1: LET dy=0: LET c
s="D"
4180 LET y=y+dy: PRINT AT x,y;cs
IF x<>19 THEN GO TO 4140
4200 PRINT AT x,y;" "
4210 IF ATTR (20,y)<>6 THEN GO TO
0,4250
4220 PRINT AT 19,y: PAPER 1;" "
FLASH 1,AT 20,y: INK 6;"D": AT 1
1,14, INK 4;"250": LET s=s+50: F
OR n=10 TO 30: BEEP .005,n: NEXT
n: FOR n=30 TO 0 STEP -1: BEEP
.01,n: NEXT n
4230 FLASH 0: FOR n=0 TO 3: FOR
w=144 TO 147: PRINT AT 20,y: INK
6;CHR$ w: BEEP .01,n*(w-144): N
EXT w: NEXT n
4240 PAUSE 0: GO TO 1100
4250 PRINT AT 20,y;"D": BEEP .1
3: BEEP 2,0: BEEP .3,-4: BEEP
4,-9: BEEP .5,-12: GO TO 1100
5500 RETURN
7000 GO TO 600
7100 LET s=s+4: GO TO 200
8000 PAPER 0: INK 0: BORDER 2: C
LS
9010 PRINT INK 2;AT 1,11: FLASH
1;" " AT 2,11;" " FLASH
0;"PAINTER" FLASH 1;" " AT 3,1
1;" "
9020 PRINT TAB 4: INK 1;"© 1984
Barry P.O'Reilly"
9030 FOR n=0 TO 31: PRINT INK 4,
n: NEXT n
9040 PRINT "An unemployed Leo
nardo, your only hope of work
s at Mrs. Pritchewood's read
rick house which she has deci
ed to coat with a sprightly b
ue paint."
9050 PRINT "An easy job for o
of your calibre one would
hink, but it's not quite so
simple."
9060 PRINT "You must avoid at
(continued on page 181)

```


FORGET SOFTWARE THINK TOUCHWARE



Simon's Shapes



Simon Says



MultiSound Synthesiser



Dick's Diamonds



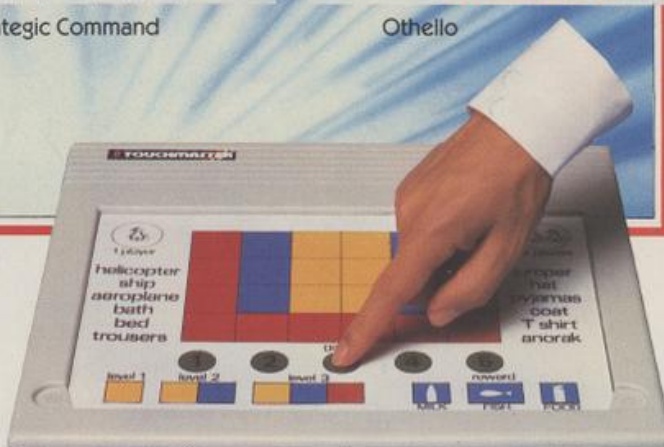
Strategic Command



Othello



Graphics Editor



Simply Simon

An expanding range of totally new Touchware is now available for Touchmaster (software houses throughout the UK and Europe are continuously adding to it). Due to the enhanced concept behind both Touchmaster and its Touchware, they combine to expand your use of the computer - dramatically and easily.

Experience the expanding range of Touchware - Arcade Games, Graphics packages, early education programs, Synthesiser, Board Games.

They all take on a new dimension with Touchmaster - some examples are shown above.

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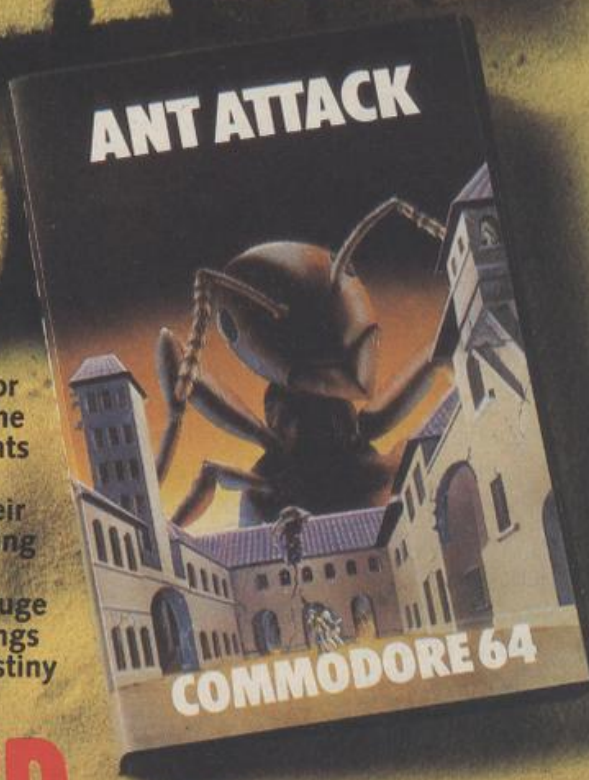
**They came from out of the desert to
the lost city of Antescher and discovered
the HORROR of the ANTS...**

ANT ATTACK 3D

The Walled City of Antescher has rested for a thousand, thousand years in the midst of the Great Desert inhabited by only the deadly Ants who have made it their home.

Then one day He and She arrive to play their games through the wind-swept streets, ousting the Ants from their exclusive occupation.

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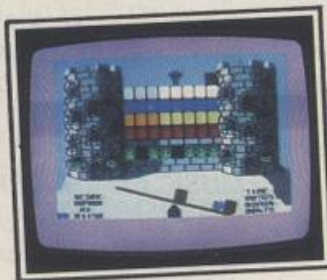
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A GAME OF STRATEGY THAT WILL TEST
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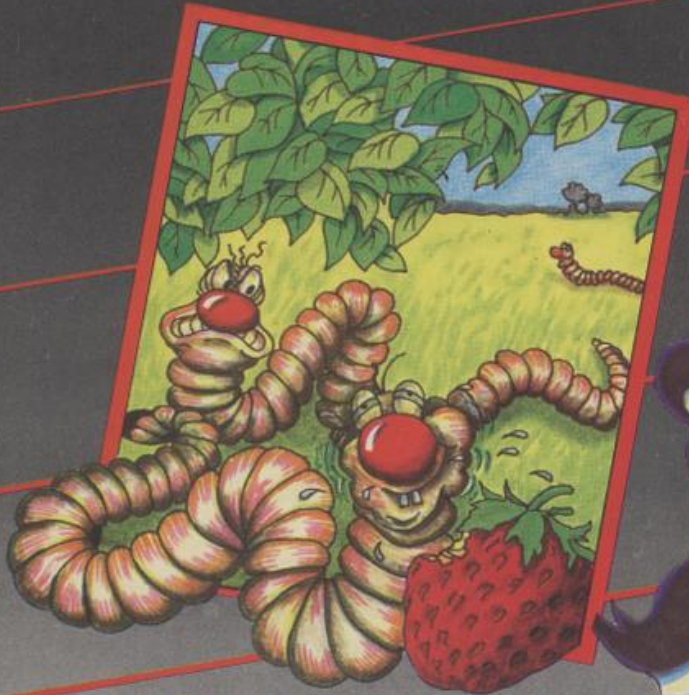


The Evil Castle Lord has trapped the members of the brotherhood in his castle. Only you, the Grand Master, can rescue them, but to do this you must vault the castle walls and unlock their cells...

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PROFISOFT GMBH, SUTTHAUSER STRASSE 50/52, 4500 OSNABRUECK, WEST GERMANY

(continued from page 176)

```

1 that seek to thwart your eff
orts: The pestilent bees, th
e skulking soap-bubbles and o
f course no handiwork on dear
old Mrs. Pritchettwood's win
dows.
8070 GO SUB 9500
8080 IF INKEY$="" THEN GO TO 80
90: REM Press any key.
8085 GO TO 8080
8090 PAPER 0: INK 0: FOR n=6 TO
21: PRINT AT n,1: PAPER 0:
NEXT
n
8100 PRINT AT 5,1: "The kind old
lady offers £1 for each squa
re and £5 if you manage to cov
er a crack."
8110 PRINT "Extra cash can be
earned at the bonus stage by
teaching the gold paint pot."
8120 PRINT "Collecting paint

```

```

Pots will replenish your bru
sh during the game, but be t
hrifty, the supply is limi
ted.
8130 PRINT "Fingers ready: 3-
LEFT 4-RIGHT TAB 17;"8-UP U-D
OWN"
8140 GO SUB 9500
8500 RESTORE 903: FOR n=USR "a"
TO USR "n"
8510 READ s: POKE n,s: NEXT n
8520 PAUSE 0: RUN
9000 DATA 95,175,112,191,127,175
,112,150
9010 DATA 170,85,-1,125,24,s,s,s
9020 DATA 5,14,13,-2,-3,14,13,6
9030 DATA 24,s,s,s,125,-1,170,85
9040 DATA 127,s,s,0,-9,s,0
9050 DATA 35,24,219,-1,198,126,6
,189
9060 DATA 32,82,37,2,32,82,37,2
9070 DATA -1,127,97,s,s,127,s,97
9080 DATA -1,-2,134,s,s,-2,s,134
9090 DATA 97,s,s,s,s,s,127,-1

```

```

9100 DATA 134,s,s,s,s,s,-2,-1
9110 DATA 50,55,125,70,90,70,94,
125
9120 DATA 95,80,158,36,82,135,14
8,35,s
9140 DATA 5,13,14,-3,-2,13,14,5
9500 FLASH 1: INK 7: PRINT AT 0,
0:
" #1: FLASH 1: AT 0,0: PAPER 0
":
": FOR n=1 TO 21: PRINT AT n,0
": AT n,31: "I": NEXT n: FLASH
0
9510 IF INKEY$="" THEN GO TO 95
10
9520 FOR n=22721 TO 23231: IF n/
32<>INT (n/32) AND (n+1)/32<>INT
((n+1)/32) THEN POKE n,135: BEE
P .001,30: POKE n,5
9530 IF INKEY$="" THEN RETURN
REM Dismiss instructions by
pressing any key
9540 NEXT n
9550 RETURN

```

Chicks

Stuart Smalley,
Selby,
North Yorkshire.



CHICKS IS FOR a model B BBC computer and involves directing a man about the screen by the use of the Z, X — left, right — and, ;, / for up, down. The idea is to herd a flock of chicks into a chicken coop. The chicks always move

away from the man but the man has moves at three times their speed.

The game can be speeded up by changing the multipland on line 140 or even by deleting the whole line.

```

10REM (C) STUART SMALLEY.1984
20SZ=0
30DIM chicksx%(8),chicksy%(8)
40MODE 7
50PROCdifficulty
60MODE1
70PROCinitialise
80REPEAT
90PROCmove man
100COLOUR1
110PRINTTAB (coopx%-1,coopy%-1)CHR$130+CHR$131+CHR$13
2
120COLOUR3
130PRINTTAB (coopx%-1,coopy%)CHR$133+CHR$134+CHR$135
140FORdelay%=1 TO (7-flock%)*30:NEXT
150PROCmove man
160PROCchicks
170PROCmove man
180UNTIL FALSE
1000DEFPROCmove man
1010X=X+(INKEY(-98) AND X>0)-(INKEY(-67) AND X<39
)
1020Y=Y+(INKEY(-73) AND Y>0)-(INKEY(-105) AND Y<2
9)
1030COLOUR1
1040PRINTTAB(X,Y)CHR$128
1050IF oldx<>X OR oldy<>Y THEN PRINTTAB(oldx,old
Y) " "
1060oldx=X:oldy=Y
1070ENDPROC
2000DEFPROCchicks
2010SOUND1,1,200,1
2020FORI=1 TO flock%
2030AX=chicksx%(I):BY=chicksy%(I)
2040PROCmove chicks
2050PRINTTAB(A,B) " "
2060COLOUR2
2070PRINTTAB(chicksx%(I),chicksy%(I))chick$
2080IFchicksx%(I)=coopx% AND chicksy%(I)=coopy% THE
N PROCcooped
2090NEXT
2100ENDPROC
3000DEFPROCmove chicks
3010IF X>chicksx%(I) THEN chicksx%(I)=chicksx%(I)
-1:chick$=CHR$129 ELSE IF X<chicksx%(I) THEN chicksx
%(I)=chicksx%(I)+1:chick$=CHR$136
3020IF Y>chicksy%(I) THEN chicksy%(I)=chicksy%(I)
-1 ELSE IF Y<chicksy%(I) THEN chicksy%(I)=chicksy%(
I)+1
3030IF chicksx%(I)<1 THEN chicksx%(I)=RND(4) ELSE I
F chicksx%(I)>37 THEN chicksx%(I)=33+RND(4)
3040IF chicksy%(I)<1 THEN chicksy%(I)=RND(4) ELSE I
F chicksy%(I)>28 THEN chicksy%(I)=24+RND(4)
3050ENDPROC
4000DEFPROCcooped
4010flock%=flock%-1
4020IF flock%=0 THEN PROCsuccess:ENDPROC ELSE FOR sou
nd%=50 TO 150 STEP 20:SOUND 1,-15,sound%,1:SOUND 2,-15
,sound%,1:SOUND 3,-15,sound%,1:NEXT
4030FOR J=I TO flock%
4040chicksx%(J)=chicksx%(J+1)
4050chicksy%(J)=chicksy%(J+1)
4060NEXT
4070I=J%

```

```

4080ENDPROC
5000DEFPROCsuccess
5010time%=TIME DIV 100
5020score%=25*difficulty%-time%
5030difficulty%=difficulty%+1
5040IF difficulty%>7 THEN difficulty%=7
5050CLS
5060PRINTTAB(5,8)"CONGRATULATIONS!!"
5070PRINTTAB(0,12)"You captured all the chicks"
5080IF score%>0 THEN PRINT"in ";time%;" seconds" ELSE
PRINT"But took too long!"
5090PRINT""You scored ";score%
5100flock%=difficulty%
5110IF score%>8 THEN SZ=score%:PRINT""You have the
highest score!"
5120PROCfanfare
5130PROCinitialise
5140PRINT""PRESS <space> CONTINUE"
5150REPEAT UNTIL INKEY(-99)
5160CLS
5170ENDPROC
6000DEFPROCdifficulty
6010FORI=0 TO 9
6020FORJ=0 TO 39 STEP 2
6030PRINTTAB(J,I)CHR$(128+RND(7))+CHR$157
6040NEXT
6050SOUND1,-15,I*10,1
6060NEXT
6070PRINTTAB(13,2)CHR$132+CHR$157+CHR$141+CHR$135+"CH
ICKS"
6080PRINTTAB(13,3)CHR$132+CHR$157+CHR$141+CHR$135+"CH
ICKS"
6090PRINTTAB(5,6)CHR$134+CHR$157+CHR$132+"(C) STUART
SMALLEY, 1984"
6100PRINTTAB(0,11)"All the baby chicks have escaped a
nd your job is to return them to the coop."
6110PRINT""To do this you control a man who moves by
pressing:-"
6120PRINT""'=UP '''=DOWN 'Z'=LEFT 'X'=RIGHT"
6130PRINT""The chicks always move away from you."
6140PRINT""PRESS KEYS 1-5 FOR LEVEL OF DIFFICULTY"
6150REPEAT A$=GET$:UNTILINSTR("12345",A$)
6160difficulty%=VAL(A$)+2
6170ENDPROC
7000DEFPROCfanfare
7010FOR I=1 TO 3
7020FOR sound%=10 TO 150 STEP 15
7030SOUND &201,-15,sound%,1
7040SOUND &202,-15,sound%,1
7050SOUND &203,-15,sound%,1
7060NEXT
7070NEXT
7080FOR sound%=150 TO 10 STEP -15
7090SOUND &201,-15,sound%,1
7100SOUND &202,-15,sound%,1
7110SOUND &203,-15,sound%,1
7120NEXT
7130ENDPROC
8000DEFPROCinitialise
8010FORI=1 TO 8
8020chicksx%(I)=RND(30)
8030chicksy%(I)=RND(30)
8040NEXT

```

(continued on page 183)



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SOFT

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(continued from page 181)

```
8050VDU23,128,24,60,24,60,126,219,24,54
8060VDU23,129,56,120,24,14,31,31,14,17
8070VDU23,130,0,0,0,0,1,3,7,15
8080VDU23,131,16,56,124,254,255,255,255
8090VDU23,132,0,0,0,0,0,128,192,224
8100VDU23,133,7,7,7,7,7,7,7,7
8110VDU23,134,255,255,199,131,131,131,131
8120VDU23,135,192,192,192,192,192,192,192
8130VDU23,136,28,30,24,112,248,248,112,144
```

```
8140VDU23;8202;0;0;0;0;
8150ENVELOPE 1,1,5,5,-10,30,30,30,50,0,0,1,100,100
8160flock%=difficulty%
8170chick%=CHR#129
8180oldx%=10:oldy%=10
8190X%=10:Y%=10
8200coopx%=RND(20)+10:coopy%=RND(15)+10
8210TIME=0
8220ENDPROC
```

```
1 LET HI=0
2 LET LE=10
3 LET L=1
4 LET SCORE=0
5 LET BALLS=7
6 GOSUB 1000
7 GOTO 1000
8 FAST
9 LET A=7
10 FOR N=9 TO 42
11 FOR F=0 TO (20+SQR (N/15))-1
12
13
14 PLOT N+10,F
15 NEXT F
16 NEXT N
17 FOR F=0 TO 17
18 FOR N=53 TO 63
19 PLOT N,F
20 NEXT F
21 NEXT N
22 FOR N=0 TO 19
23 PLOT N,0
24 NEXT N
25 SLOW
26 LET Z=INT (RND*3)+25
27 LET U=9
28 RETURN
29 FAST
30 FOR F=0 TO 63
31 PLOT F,0
32 NEXT F
33 FOR N=0 TO 33
34 FOR F=0 TO (22+20*SIN (N/32
+PI))-30
35 PLOT N+16,F
36 NEXT F
37 NEXT N
38 LET U=18
39 LET Z=INT (RND*5)+23
40 UNPLOT 32,12
41 SLOW
42 RETURN
43 FAST
44 CLS
45 PRINT AT 5,0;" "AT 21,0;" "
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73 FOR F=10 TO 20
74 FOR N=2 TO (RND*7)
75 PRINT AT N+5,F;" "AT 21-N,
" "
76 NEXT N
77 NEXT F
78 LET U=18
79 LET Z=INT (RND*6)+21
80 SLOW
81 RETURN
82 FAST
83 CLS
84 PRINT AT 21,0;" "
85
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102
103 FOR F=10 TO 20 STEP 2
104 FOR N=21 TO (RND*10)+5 STEP
-1
105 PRINT AT N,F;" "
106 NEXT N
107 NEXT F
108 PRINT AT 13,12;"CARMEIN"AT
109 14,14;" "AT 20,14;" "AT 2
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132 PRINT AT 10,20;" "
133 AT 21,0;" "
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Castles of Carmain

John Wood,
Wednesbury,
West Midlands.

ZX-81

THIS IS A PROGRAM for the 16K ZX-81 called the Castles of Carmain. All the castles must be destroyed by typing in the angle of elevation, followed by the velocity of the cannon ball.

The castles appear randomly on each game but are always possible to hit. The cave is also drawn randomly.

```
1450 GOTO 1000
2000 IF SCORE>HI THEN LET HI=SCORE
3000 PRINT AT 2,0;"NO CANNONBALL
S LEFT TO REPLAY";"HI SCORE="
;HI
2010 IF INKEY$="" THEN GOTO 2010
2020 IF INKEY$="R" THEN GOTO 2
2030 STOP
2040 SAVE "CASTLES"
2050 RUN
3000 CLS
3010 FOR F=0 TO 21
3020 PRINT TAB F;"WELL DONE"
3030 NEXT F
3040 PRINT AT 0,20;" "AT 1,2
0;" "AT 2,20;" "AT 3,20;"
3050 PRINT AT 18,0;" "AT 19,
0;" "AT 20,0;" "AT 21,0;"
3060 PRINT AT 11,0;" "SCORE=";SCORE
E;" "HI=";HI
3070 IF SCORE>HI THEN LET HI=SCORE
3080 PRINT HI
3090 PRINT "R" TO REPLAY ANY OT
HER TO STOP
3100 GOTO 2010
9000 CLS
9010 PRINT AT 0,0;"THE CASTLES O
F CARMEIN";"USING YOUR TRUSTY
CANNON, YOU MUST DESTROY ALL T
HE CASTLES SURROUNDING THE CI
TY OF CARMEIN. FIRST ENTER THE AN
GLE OF THE CANNON, THEN THE SP
EED OF THE BALL. ALTHOUGH THE
CASTLES APPEAR IN SLIGHTLY
DIFFERENT POSITIONS EACH GAM
E IT WILL ALWAYS BE POSSIBLE
TO HIT THEM. THE ANGLE OF ELEVA
TION MUST BE GREATER THAN 10
, NOT EXCEEDING 80 DEGREES. IT IS P
OSSIBLE TO SHOOT A BALL OFF T
HE SCREEN AT A HIGH ANGLE AND H
IT A CASTLE ON THE BALLS DESCE
NT."
9020 PRINT AT 21,7;"PRESS NEWLIN
E"
9030 IF INKEY$<<CHR# 116 THEN GO
TO 9030
9040 CLS
9050 RETURN
```

Subhunt

Mark Stewart,
Balerno,
Edinburgh.

ORIC

SUBHUNT IS WRITTEN in machine code and it runs on the Oric-1 or Atmos 16K or 48K. The

Atmos version has no sound.

The first program enables you to type in the code — program 2. Program 3 is the Basic controller program.

You have to guide a frogman through enemy waters to plant mines on the hulls of ships. The enemy has laid mines which you

have to avoid and have filled the waters with mutant jellyfish and cloned sharks. Use A for up, Z for down and space bar to plant a mine.

48K owners must add:

4 POKE 8960,76:DOKE 8961, #A300

I can supply it on cassette for £3. Send a cheque to Mark Stewart, 12 Whitelea Road.

Program 1.

```
2300
10 CLS
20 INPUT"ENTER START ADDRESS ":"ST
30 PRINT"ENTER 'STOP' TO END."
40 PRINT
50 PRINTEX$(ST):".?":INPUTA$
55 IFA$="STOP"THENSTOP
60 V=VAL(A$):POKEST,V
70 ST=ST+1
80 GOTO50
```

Program 2.

```
12AFB #20,#00,#A6,#EA,#20,#00,#A5,#EA
#2B00 #20,#00,#A4,#EA,#20,#00,#A0,#EA
#2B08 #20,#A8,#2F,#EA,#20,#C5,#32,#EA
#2B10 #20,#16,#2E,#60,#FC,#F4,#AD,#08
#2B18 #02,#C9,#84,#F0,#01,#60,#20,#18
#2B20 #F4,#60,#FD,#76,#4E,#E2,#CA,#2A
#2B28 #2C,#2F,#47,#4B,#55,#B5,#7D,#E7
#2B30 #8C,#DB,#CF,#5C,#AD,#08,#02,#C9
#2B38 #38,#F0,#01,#60,#A9,#AA,#BD,#08
#2B40 #02,#20,#A8,#2F,#60,#61,#4E,#E1
#2B48 #20,#FB,#2A,#EA,#20,#FD,#34,#20
#2B50 #FB,#2A,#20,#FD,#34,#60,#EA,#20
```

```
#2B58 #34,#2B,#60,#DB,#92,#5F,#E3,#3A
#2B60 #DB,#37,#2F,#E0,#02,#B2,#7F,#0C
#2B68 #B0,#63,#76,#2A,#32,#7B,#72,#E7
#2B70 #7C,#B4,#6B,#4F,#DC,#94,#99,#65
#2B78 #6A,#BE,#05,#35,#91,#BF,#3A,#4A
#2B80 #47,#63,#F4,#B5,#9A,#52,#6B,#10
#2B88 #BA,#F1,#6A,#BB,#E2,#3B,#93,#F9
#2B90 #9D,#02,#BE,#BB,#CC,#BB,#BB,#30
#2B98 #AD,#24,#4A,#06,#69,#2C,#92,#77
#2BA0 #AD,#05,#7B,#76,#B0,#5E,#5B,#69
#2BA8 #15,#B6,#74,#04,#B0,#B7,#2B,#96
#2BB0 #B6,#09,#FA,#3B,#74,#44,#91,#02
```

(continued on next page)



THE ROTRONICS DR2301 COMPUTER/ AUDIO CASSETTE RECORDER

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the lead supplied and you are ready to start. The built-in interface circuitry ensures that SAVEing and LOADing is completely reliable – even when using commercially produced software. The DR2301 also allows the

computer to sense when the PLAY key has been depressed.

Additional features are auto-stop, tape counter, in-built microphone and foldaway carrying handle. The DR2301 is also compatible with the ZX81, Spectrum

and many other popular home computers.

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PHLOOPY's special secret



The heart of the invention is a brilliantly designed "byte-wide" magnetic head, made by Phi Magnetronics who build multi-track heads for professional use. PHLOOPY's head records and reads nine tracks across the width of a quarter-inch tape. That means the tape loop can be much shorter, so the typical time to access a file is reduced to a mere 3 seconds. If you're used to waiting for a cassette tape to trundle programs into your BBC, you'll be amazed at PHLOOPY's performance.

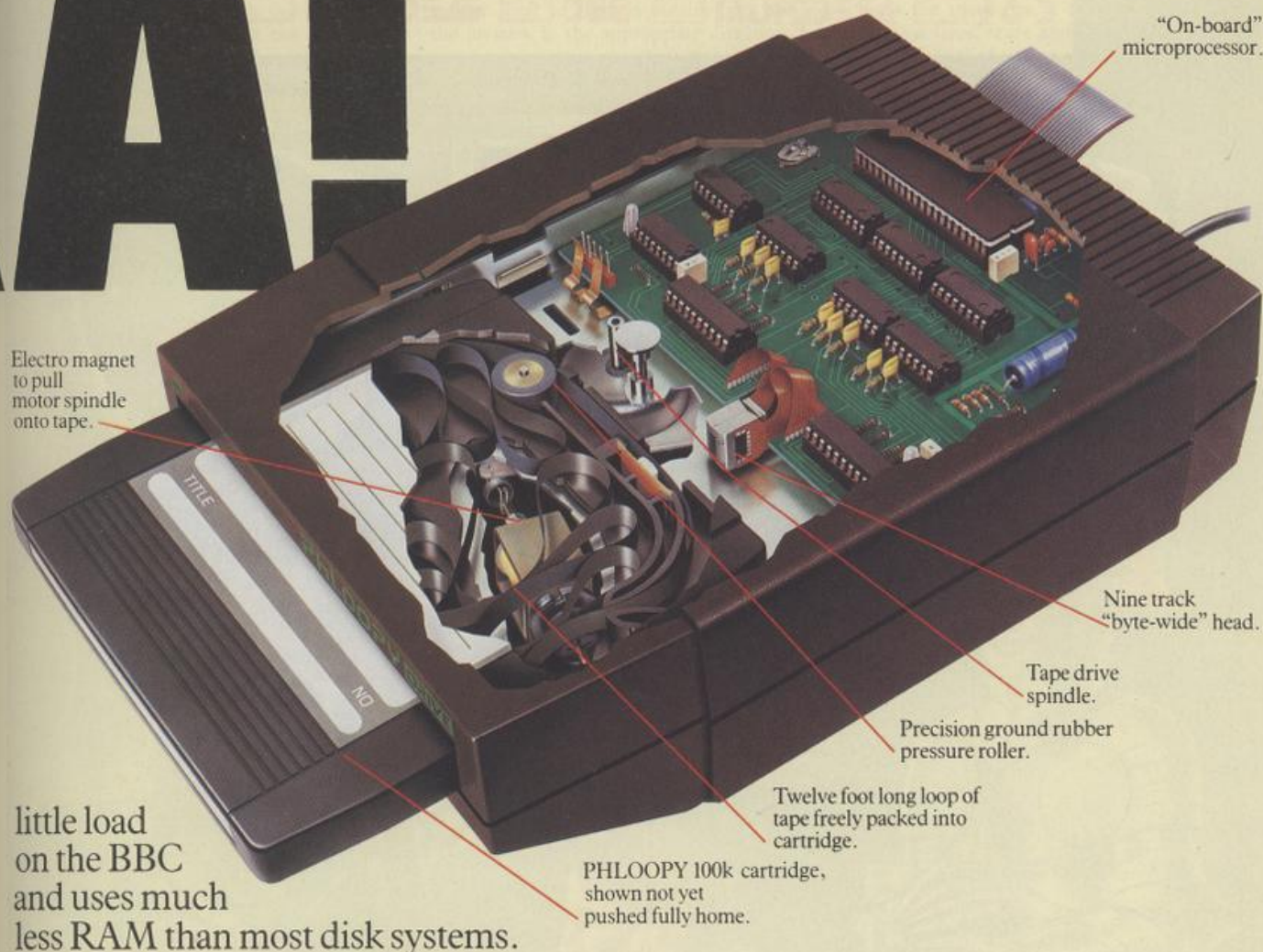
Getting it right every time

In addition, we've included a feature we know you will appreciate. PHLOOPY has full error detection and correction, so you can be certain you will get back what was originally written onto the tape.

Talking to your PHLOOPY

PHLOOPY's own software, contained in ROM, responds to standard BBC filing system and Basic commands. Most programs written to run on disk or cassette should run on PHLOOPY without problem.

And because PHLOOPY contains its own intelligent microprocessor – a second computer which does most of the hard work – PHLOOPY puts very



little load
on the BBC
and uses much
less RAM than most disk systems.

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PHLOOPY cartridges hold a full 100k of data or programs. Two of them come free with the drive and extra ones cost £3.75 each plus VAT. They are moulded of high impact polymers for protection and store easily on a bookshelf. Many programs will be available to purchase on PHLOOPY.



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*No graphics on these versions.

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(continued from page 184)

to drop them into the volcano on the right. You have three men which can be lost by hitting the scenery, running out of time on each bombing run, being hit by either the bird or helicopter or by being struck by lightning. To make it more difficult, with each run, the

scenery gets slightly more difficult.

Also the controls of the glider are difficult to master. Left or right is obtained by moving the joystick in the appropriate direction, but to go up or down you have to hit a thermal and they may not be where you want them. You get 100 points for each bomb that lands

on target which is done by pressing the fire button. When all your men have been lost press the space bar to continue. The screen displays lives, score and time for each run.

If the task of typing in the program is too daunting it can be obtained from me for £4 at 3 Greenfield House, Greenfield Road, Colne.

Program 1.

[illegible]

Program 2.

```

1 L=13 POKE36879,232:IT=779:P=1 POKE36878,9:Z=7678 GOT062
2 IF(PEEK(17)C32)THENPOKEV+1,32 POKEY+38,32 POKE1,32 GOT090
3 POKE3,32 POKE1,5:P=9+1 IF(7768)THEN7798 POKE1,38,32
4 S=22:Q=1 POKE1+5,1 IFP=1-1 THENS=23
5 RETURN
6 POKE01,32:ZZ=Z-1,1 IFPEEK(Z)C32)THENPOKEV+1,32 POKEZZ,32 GOT090
7 POKEZZ,43:1FZZ=7648)THENZZ=7678 POKEZZ=38,32
8 01=ZZ POKEZZ=4,18 RETURN
9 H=V+V+38 POKEH+31,32 POKEH+38,32 POKEH+31,32:IF(PEEK(V)ORPEEK(V+1))C32)THEN9
10
11 IF(1F=7768)THEN9
12 IF(1F=1)AND(RND(9))>.9)THENGOTO10
13 R=8 POKE36877,INT(V/33):1F=1 THENPOKEV+68,32 POKEH+61,32 POKEH+38,32 POKEH+31,32
14 POKEV+31+C,6:POKEV+1+C,2
15 POKEV+01,POKEV+2,POKEV+1,02:POKEV+38,M POKEV+38+C,H POKEV+31,K POKEV+31+C,L
16 IFU=1)AND(0=1)THENPOKEV+61,29
17 POKE36877,INT(V/33):1F=1)AND(0=1)THENPOKEV+68,29
18 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
19 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
20 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
21 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
22 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
23 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
24 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
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103 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
104 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
105 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
106 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
107 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
108 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
109 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
110 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
111 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
112 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
113 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
114 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C,0
115 IF(1F(1)AND(0=1)THENPOKEV+68,29:POKEV+68+C
```


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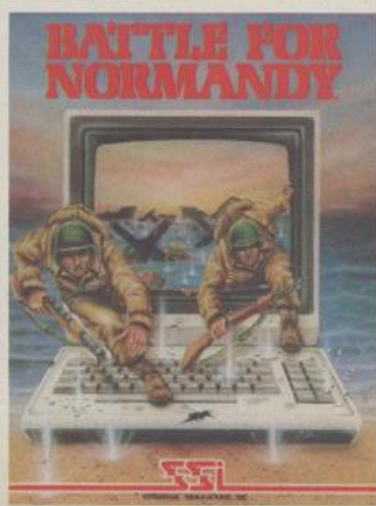
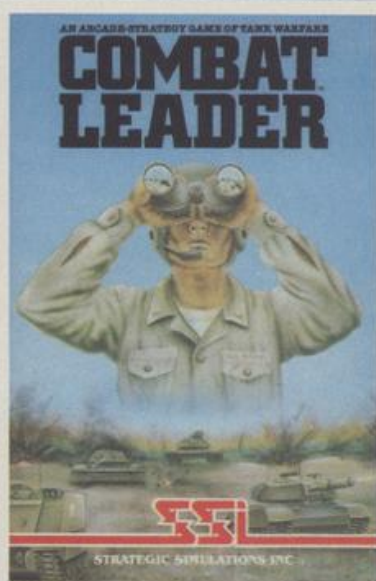
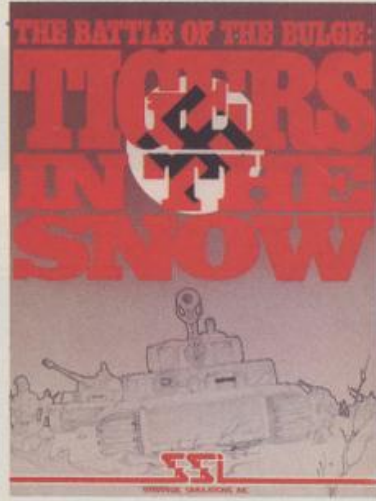
Who will be the victor and who the vanquished?

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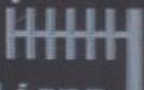






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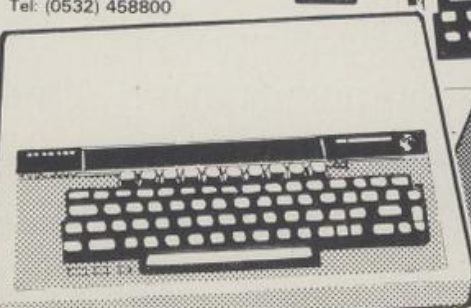
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```

PEN 2:PRINT TAB(16) "ROULETTE"
1910 PEN 3:PRINT:PRINT "Instructions":PRINT:PRINT 1
1:PRINT " This is a version of the famous casino game "
    "ROULETTE" in which you w
111 play against the "AMSTRAD CRC-464" &CHRS(161+).Yo
    will be given $50 to begin with."
150 PRINT:PRINT " You can borrow up to $500 (like you
    have less than $50, there is no house limit on g
    ambling but the bank w
11 break an $50 million."
1950 PRINT:PRINT:PRINT " press any key for instruct
    ions on how to gamble."
1940 IF INKEY="" THEN 1940
1950 CLS:PEN 2:PRINT TAB(16) "ROULETTE"
1960 PEN 3:PRINT:PRINT "Instructions.":PRINT:PRINT 1
1:PRINT "bet on any of the 37 numbers
    (including 0)
    the odds are 35-1."
1970 PEN 3:PRINT:PRINT "a cheval":PEN 1:PRINT "bet on t
    he either horizontally or vertically adjacent nu
    mbers the odds are 17-1."
1980 PEN 3:PRINT:PRINT "a cheval":PEN 1:PRINT "bet
    on a row of three numbers. You must"
1980 PRINT "enter the first of the three numbers. od

```

```

ods are 11-11:"PRINT:OPEN 3:PRINT"en carre":PEN 1:"PRINT"
four numbers arranged on
the table in the shape of a square e.g. 7,8,10,11.
The odds are 8-1:"PEN 2"
1990 LOCATE 1,25:PRINT press any key to continue
a". IF INKEY="" THEN 1990
2000 CLOSE:PRINT TAB(16)"ROULETTE":PEN 3:PRINT:PR
NT:PRINT"Instructions."
2010 PRINT:PRINT"transversal six":PEN 1:"PRINT" bet on
two adjacent rows, and you must input the first & low
est number in the two r
ows, the odds are 5-1:"PEN 3:PRINT:PRINT"a column":PEN
1
2020 PRINT"bet on of one three colours of twelve nu
mbers, the odds are 2-1:"PRINT:PEN 3:PRINT"a dozen":PEN
1
1:PRINT"bet on one of
three sets of twelve numbers (1-12,13-24,25-36) b
t handle odd numbers: PEN 3:PRINT"low high":PEN 1
2030 PRINT"bet on either low numbers (1-18) or h
igh (19-36) the odds are 1-1:"PEN 2:LOCATE 1,25:PRINT"
PRESS ANY KEY TO C
OK":TRUE"
2040 IF INKEY="" THEN 2040
2050 CLOSE:PRINT TAB(16)"ROULETTE":PEN 3:PRINT:PR
NT:PRINT"Instructions."
2060 PRINT:PRINT"red or yellow":PEN 1:"PRINT" bet on a

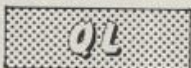
```

```

2070 If you red or yellow numbers the odds are 1-1:PRINT:PEN
3:PRINT:odd or even:=PE
N 15PRINT* bet on odd numbers or even numbers the odds
are 1-1:PRINT:PEN 3:PRINT*Isorisoned:IPEN 1
2070 PRINT* If you have bet on odd,even,red,yellow, hi
gh or low and the ball lands on 0 then the bet is
lost. If the ball lands on 00 then the bet is
thrown again, if it again lands on 0 then the bank
takes half the bet.*
2080 RESTORE
2090 READ A:IF A=1 THEN 2110
2100 SOUND 1,A,23,15:GOTO 2090
2110 PEN 2:LOCATE 1,25:PRINT*
PLAY*
2120 IF INKEY$="" THEN 2120 ELSE 100
2130 IF eo/50 THEN 220
2140 CLS 83:PRINT83,* borrowing money:PRINT83:PRINT
83,* you can borrow up to:83:INPUT 83,*how much do you
wish to borrow*:PRINT83:IF A
=bor OR eo=0 THEN 2140
2150 eo=eo-bor:bor=bor-83*bor:GOTO 490
2160 CLS:MODE 0:PRINT:PRINT* You have broken the bank.
Would you like to start again (Y/N)
2170 a$=UPPER(INKEY$):IF a$>"Y" AND a$<"N" THEN 217
2180 IF a$<"Y" THEN DIME

```

Victor Card,
Horley,
Surrey.



not. The limitations imposed by the vertical play of this game makes it necessary for the player to think ahead, or risk being outmanoeuvred by the micro.

At each turn, the counter is placed above the required column using the cursor keys. Pressing the spacebar will drop the counter into the column selected until it comes to rest upon another counter or comes to rest upon the bottom of the grid. You should be careful not to press too long on the spacebar, however, since the QL has automatic repeat on all keys and a very effective keyboard buffer which can mean that you inadvertently play several goes ahead if you delay on the keys.

Although written in Basic, the program has been designed to make full use of the

advanced graphics facilities of the QL and a reasonable fast and powerful game ensues. The human player always plays the green counters, and the computer always plays red. These colours have been selected to give effective displays on both colour and monochrome televisions and monitors. There are three optional skill levels and the previous loser always takes first go. The computer visually displays a winning line when one is achieved and keeps a running tally of the game score.

If typing in a program of this length proves too daunting a task then I can supply a copy on Microdrive cartridge for a cost of £7.50 including postage and packing. Please send all enquiries to Victor Card, 5 Cartersmead Close, Horley, Surrey RH6 9LG.

```

100 initialise
110 Repeat again
120 goes=0:CLS:CLS E2:DIM b(5,6)
130 FOR i=10 TO 130 STEP 20
140   FOR j=10 TO 110 STEP 20
150     INK i:FILL i:CIRCLE j,1,j
160   NEXT j
170 NEXT i
180 Repeat game
190 IF colour=4 THEN
200   colour=2
210 ELSE
220   colour=4
230 END IF
240 IF colour=4 THEN
250   humansgo
260 ELSE
270   Gloop
280 END IF
290 check fours row,colour
300 IF winner=colour THEN
310   show winner:EXIT game
320 END IF
330 goes=goes+1
340 IF goes>42 THEN
350   INK E8,7:AT E8,1.5:PRINT E8,'stale mate':EXIT game
360 END IF
370 END Repeat game
380 update scores:offer new game
390 END Repeat again
400 REMark *****
410 DEFINE Procedure initialise
420 REMark *****
430 MODE B:PAPER i:CLS:INK 7:colour=0
440 DIM column,score(6):DIM name$(8)
450 WINDOW 260,160,180,50:SCALE 120,-3,0
460 PAPER 0:CLS: BORDER 2,4
470 PAPER 0:i:CLS 0:CSIZE E0,2,1
480 WINDOW E2,150,160,50,50
490 PRINT "hello i a Q\\"\`what's your name"
500 INPUT name$
510 CLS:AT 1,4:PRINT "Let's play"
520 RESTORE
530 FOR i=1 TO 7
540   READ x,v,v2
550   AT x,v:PRINT "Q" i:AT x,v2:PRINT "L"
560 NEXT i
570 INK 6:FLASH 1
580 AT 0,6:PRINT "udrup :AT 8,13:PRINT "ets"
590 DATA 5,8,9,6,7,10,7,6,11,8,5,12,9,6,11,10,7,10,11,
9,9
600 FLASH 0:FOR i=1 TO 5000:NEXT i:CLS
610 Repeat query
620 AT 0,1:PRINT "skill level (1-3)"
630 skill=INKEY$
640 IF skill=>"1" OR skill=>"2" OR skill=>"3" THEN EXIT query
650 END Repeat query
660 OPEN E8,scr 260,30a180,20:SCALE E8,120,-3,0
670 PAPER E8:i:CLS B
680 QL_score=0:your_score=0:colour=2
690 END DEFINE initialise
700 REMark *****
710 DEFINE Procedure humansgo
720 REMark *****
730 AT E2,0:PRINT E2, use keys i-\CHR$(180))" and
iCHR$(189)) to move \\\space bar \\\ to play
740 x=B0+y=50:col=0
750 INK E8,colour:FILL E8,1:CIRCLE E8,x,v,50
760 Repeat vourgo
770 IF INKEY$(1)
780   IF x=0 THEN x=50:col=col+1:IF col=6 THEN

```

```

790 drop EXIT yourgo
800 END IF
810 CLS EB
820 n=i+106*(CODE(a$)+200)-106*(CODE(a$)+192)
830 IF n=80 THEN n=80
840 IF n=716 THEN n=716
850 col=(n-80)/106
860 INK EB.colour:FILL EB,1:CIRCLE EB,x,v,50
870 END REPEAT yourgo
880 END DEFINE humansgo
890 REMark *****
900 DEFINE PROCEDURE drop
910 REMark *****
920 CLS B:row=0
930 REPEAT until rest
940 INK colour:FILL i:CIRCLE 10*col*20,110-row*20,9
950 IF row=5 THEN
960 b:row,col=row
970 END DEFINE drop
980 END IF
990 IF b:row+1,col=0 THEN
1000 b:row,col=colour
1010 END DEFINE drop
1020 END IF
1030 FOR i=1 TO 100:NEXT i
1040 INK i:FILL i:CIRCLE 10*col*20,110-row*20,9
1050 row=row+1
1060 END REPEAT until rest
1070 END DEFINE drop
1080 REMark *****
1090 DEFINE PROCEDURE Qsago
1100 REMark *****
1110 n=80+v*50:col=0:CLS E2
1120 find_best_sovv
1130 Repeat svgo
1140 FOR i=1 TO 100:NEXT i
1150 CLS E8
1160 IF (x-80)/106=col THEN
1170 drop:END DEFINE Qsago
1180 END IF
1190 x=x+106
1200 INK EB.colour:FILL EB,1:CIRCLE EB,x,v,50
1210 END REPEAT svgo
1220 END DEFINE Qsago
1230 REMark *****
1240 DEFINE PROCEDURE check_fours(row,mark)
1250 REMark *****
1260 winner=0
1270 search row,mark,0,1
1280 IF winner=0 THEN
1290 rowmark=0:colmark=1
1300 END DEFINE check_fours
1310 END IF
1320 search row,mark,-1,-1
1330 IF winner<>0 THEN
1340 rowmark=1:colmark=1
1350 END DEFINE check_fours
1360 END IF
1370 search row,mark,1,-1
1380 IF winner<>0 THEN
1390 rowmark=-1:colmark=1
1400 END DEFINE check_fours
1410 END IF
1420 search row,mark,1,0
1430 IF winner<>0 THEN
1440 rowmark=1:colmark=0
1450 END IF
1460 END DEFINE check_fours
1470 REMark *****
1480 DEFINE PROCEDURE search(row,mark,deltax1,deltay1)
1490 REMark *****
1500 count=1:pointax1=0
1510 search row,mark,deltax1,deltay1

```

```

1520 search1 row,mark,-deltax1,-deltay1
1530 IF count=4 THEN winner:=colour
1540 END DEFINE search1
1550 REMARK *****
1560 DEFINE PROCEDURE search1(row,mark,deltax,deltay)
1570 REMARK *****
1580 newrow:=row+newcol:=col+start=0
1590 REPEAT 1000
1600   newrow:=row+deltax
1610   IF newrow<0 OR newrow>5 THEN EXIT look
1620   newcol:=col+deltay
1630   IF newcol<0 OR newcol>6 THEN EXIT look
1640   IF b(newrow,newcol)=colour THEN
1650     points:=points+1
1660     IF start=0 THEN count:=count+1
1670   END IF
1680   IF b(newrow,newcol)≠colour THEN
1690     start=1
1700     IF b(newrow,newcol)≠mark THEN EXIT look
1710     points:=points+1
1720   END IF
1730 END REPEAT look
1740 IF mark=0 AND points=4 AND colour_score(col)=1
THEN colour_score(col)=colour_score(col)+count-1
1750 END DEFINE search1
1760 REMARK *****
1770 DEFINE PROCEDURE show_winner
1780 REMARK *****
1790 endrow:=row+endcol:=col
1800 newrow:=row+newcol:=col
1810 REPEAT endpoint
1820   newrow:=newrow+newcol:=col+1
1830   IF newrow=6 OR newrow=5 THEN EXIT endpoint
1840   newcol:=newcol+1
1850   IF newcol<0 OR newcol>6 THEN EXIT endpoint
1860   IF b(newrow,newcol)≠winner THEN EXIT endpoint
1870   endrow:=newrow+endcol:=newcol
1880 END REPEAT endpoint
1890 FOR i:=1 TO 20
1900   INK i:flash_counters
1910   INK i:winner:flash_counters
1920 NEXT i
1930 END DEFINE show_winner
1940 REMARK *****
1950 DEFINE PROCEDURE flash_counters
1960 REMARK *****
1970 FOR i:=0 TO count-1
1980   newrow:=row+newcol:=col+1
1990   newcol:=newcol+col:=col+1
2000   s:=10*20+newcol:=110+20*newrow
2010   FILL i:CIRCLE s,x,y,9
2020 END FOR i
2030 END DEFINE flash_counters
2040 REMARK *****
2050 DEFINE PROCEDURE find_best_move
2060 REMARK *****
2070 col:=1
2080 FOR i:=0 TO colour_score(i)+2:NEXT i
2090   REPEAT for_all_cols
2100     row:=col+1
2110     IF col>6 THEN EXIT for_all_cols
2120     s:=80+10*col:=row+1
2130     CLS i:INK i:col:=colour:FILL i:1:CIRCLE i:s,x,y,50
2140     FILL i:row:=all_rows
2150     IF row>4 THEN EXIT for_all_rows
2160     IF b(row,col)<0 THEN EXIT for_all_rows
2170     row:=row+1
2180 END REPEAT for_all_rows
2190   IF row=1
THEN colour_score(col)=i
2200   colour_score(col)=i
2210   NEXT for_all_cols

```

(continued on page 197)



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```

2220 END IF
2230 b(row,col)=colour
2240 IF skill<>'1' THEN
2250   check_four row,0
2260 ELSE
2270   check_four row,colour
2280 END IF
2290 IF winner=colour THEN
2300   b(row,col)=0
2310   CLS :B:column_score(col)=100
2320   END Define find_best_move
2330 END IF
2340 row=row+1
2350 IF row<=1 THEN
2360   b(row,col)=colour
2370   check_four row,colour
2380 IF winner=colour AND skill='3' AND colmark<>0
THEN column_score(col)=1
2390   b(row,col)=0
2400   can_huan_win row,4
2410   IF winner=4 THEN column_score(col)=0
2420 END IF
2430 can_huan_win row,0

```

```

2440 IF winner=4 THEN column_score(col)=99
2450 colour=2*(row,col)=0
2460 IF col=6 THEN EXIT for_all_cols
2470 END Repeat for_all_cols
2480 max=-1*10
2490 for i=0 to 6
2500 IF column_score(i)=max THEN n=i
2510 IF column_score(i)>max THEN
2520   col:=max(column_score(i))=n
2530 END IF
2540 NEXT i
2550 IF n=0 THEN END DEFINE find_best_move
2560 where=RND(1)
2570 FOR i=0 TO 6
2580 IF column_score(i)=max THEN
2590   where=where+1
2600   IF where=1 THEN col=i
2610 END IF
2620 NEXT i
2630 END DEFINE find_best_move
2640 RETURN *****
2650 DEFINE PROCEDURE can_human_win(row,col)
2660 RETURN *****
2670 colour=2*(row,col)=colour

```

```

2680 check_four_row,mark
2690 brow=col+1
2700 END DEFINE can_human_win
2710 REMark *****
2720 DEFINE procedure update_score
2730 REMark *****
2740 IF winner=2 THEN GL_score=GL_score+1
2750 IF winner=4 THEN your_score=your_score+1
2760 CLS COPIRINT C;" SCORE      GL  "GL_score;name;
      " "your_score
2770 END DEFINE update_score
2780 REMark *****
2790 DEFINE procedure offer_new_game
2800 REMark *****
2810 REPEAT question
2820 CLS K2
2830 AT 22,0:PRINT G;"do you want to "another qu?"
      yes or no
2840 a$=INKEY(=1)
2850 IF a$="Y" OR a$="y" THEN EXIT question
2860 IF a$="N" OR a$="n" THEN STOP
2870 END REPEAT question
2880 CLS K8
2890 END DEFINE offer_new_game

```

Nigel Bates,
Bradford,
West Yorkshire.



THIS PROGRAM has been written on a 48K ZX Spectrum but will run on both 16K and 48K machines. The machine code is stored in data statements from line 30 to line 110 and is Poked into memory by line 10 and line 100, the machine code is used to move and display the scores and the ink jet.

The rest of the program is in Basic and controls the number of lives, screen number, screens, bonus and high scores. It makes full use of the 16K of memory, colour, sound, high resolution graphics and includes four different screens.

Program notes.

lines	10-110	Pokes machine code into memory
	998-1000	Initialises game
	1000-1020	Initialises go and calls the machine code
	1020-1160	Selects bonus
	2000-2070	Sub routine to draw screens
	2100-2499	Data for screens

Variables

h\$	Highscore	(6 digits)
a\$	Score	(6 digits)
b\$	Bonus	(4 digits)
c\$	Messages	
1	Lives	
s	Level or Screen	

Other variables have miscellaneous uses — a,b,x,y and n\$.

Just type in the program as listed and run.
To save use

SAVE "Hard Lines"

The program uses either the Sinclair Interface 2 or the keys: 6 Left; 7 Right; 8 Down; 9 Up; 0 Accelerate.

Guide the ink jet around the maze to try and reach the centre without hitting either the walls of the maze or your trail. You have a limited ink supply and are timed, if you can reach the centre before your time reaches 600 then you are awarded a bonus of 1,000 points plus a 500 point bonus for reaching the centre dot. If you complete a maze you are confronted with a new maze, there are four different screens and then it returns to the first screen.

```

1 LET h$="000000"
5 BORDER 0: PAPER 0: INK 7: 5
RIGHT
RESTORE : FOR a=32255 TO 32
450 READ n: POKE a,n: NEXT a
20 LET c$=""
30 DATA 30,20,23,1,8,174,62,120,48,2
11,254,33,255,12,5,62,123,95,120,62,54
30,25,30,25,1,133,203,306,123,95,120,62,54
03,32,1,133,203,306,123,95,120,62,54
1,32,1,1,4,203,306,123,95,120,62,54
1,32,1,62,239,211,306,123,95,120,62,54
1,32,1,40,4,52,21,32,254,1,203,306,123,95,120,62,54
3,53,32,1,52,21,32,254,1,203,306,123,95,120,62,54
3,20,254,0,32,255,12,5,62,123,95,120,62,54
34 DATA 6,101,197,120,205,177,
34,71,4,62,1,15,16,253,193,85,18
22,119,185,200,16,71,4,48,5,158,120,62,54
202,33,255,127,190,40,15,119,120,62,54
62,62,22,215,62,1,215,62,331,1
65,0,127,1,48,6,33,247,127,62,62,62,62,62
12,215,62,0,215,62,11,215,205,0
35 DATA 193,33,254,125,53,32,2
1,54,8,197,43,70,14,0,225,120,200
117,34,54,129,225,193,52,62,17
130,200
39 DATA 62,251,219,254,203,95,
194,5,128,201
100 RESTORE 110: FOR a=32512 TO
32536: READ n: POKE a,n: NEXT a
110 DATA 125,214,10,32,5,43,52,2
5,24,2,198,40,119,129,215,62,2,8
215,62,6,215,43,15,232,301
995 POKE 32253,0: FOR a=32750 T
0 32767: POKE a,a-a: NEXT a
999 LET I=INT PI: LET S=L/L
1000 INK RND44+INT PI: CL3 PLO
3:1
1001 FOR a=L-L TO 21: PRINT "■":
NEXT a: GO SUB 200
1002 FOR a=32750 TO 32765: POKE
a,a-a: NEXT a: POKE 32253,a-3: P
LOT 125,88: DRAW 2,a-a: DRAW a-a-
-2: DRAW -2,a-a: DRAW a-a,2
1010 PRINT AT a-s,2: INK 6: PAPE
A 1: "HARD LINES BY NIGEL BATES
S" #1: AT a-s,5: PAPER 2: SCORE
HIGH SCORE: AT PAPER 1
INK 7: 5: LIVES: AT PAPER 1
VEL: S: AT 1,22: TIME: AT 0,0:
LET c=USR 32256
1020 LET b=INT (bc/255): LET c=b
c-b+55
1030 LET a$="000000": FOR a=1 TO
6: LET a$(a)=CHR$(PEEK (32753+
a-148)): NEXT a
1050 IF (b=88 OR b=93 OR b=97) A
ND (c=128 OR c=129 OR c=130) THE
N PRINT AT S,b/b: PAPER 1: INK 7
"GREAT! NOW TRY THE NEXT LEVEL
LET s=s+1: LET a$=STR$(VAL a
+500): LET b$="0500": LET c$="
EXTRA BONUS " IF PEEK 32754=5: T
HEN LET a$=STR$(VAL a$+1000): L
ET b$="1500": LET c$=c+CHR$(22)

```

[illegible][illegible]

Character definer

*J Gardiner,
Wymondham,
Norfolk.*



THIS PROGRAM IS a comprehensive character definer. It is very user-friendly and allows redefinition of characters on the Amstrad CPC-464 micro.

As well as the standard "pixel-by-pixel"
(continued on page 201)

100



Be a great writer getting yourself to paper.

It takes only two minutes and £59.80 to transform your BBC Micro into the heart of a word processor with VIEW from Acornsoft.

The VIEW word processing system is programmed into a single chip, a 16K plug-in ROM. Once it's installed into your BBC Micro – a simple job for your local dealer – you just switch on and VIEW is operating. (You can switch to other programs, like BASIC, with a single command.)

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If you want to go even further, the simple addition of ViewIndex, just £14.95, means you can select and index words, complete with page or section numbers.

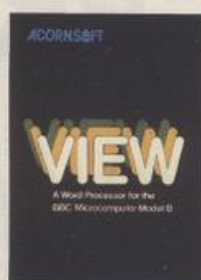
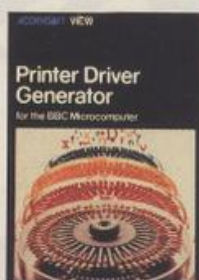
And of course, when you're ready, any printer that will operate with your BBC Micro will operate with VIEW. But if you want to use the printer's special facilities, such as bold printing or underlining, Acornsoft's Printer Driver Generator (£9.95 on cassette, £11.50 on disc) enables you to do so.

For the more specialised user who wants to take advantage of the extra power offered by the 6502 Second Processor, Hi-VIEW (£59.80) provides 47K of text space in any of the BBC Micro's screen modes.

So whether you're composing a 300 page business document, a letter to the gas board, or a bit of Victorian nonsense, you can polish it to your heart's content, wasting precious little time. And even less paper.

You can get VIEW products from your Acorn dealer. Just phone 01-200 0200 for your local stockist.

Alternatively, you can send off for the View Family brochure and order through the post by contacting Acornsoft, c/o Vector Marketing, Denington Industrial Estate, Wellingborough, Northants NN8 2RL. Tel: 0933 79300.



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A&F Software, Unit 8, Canal Side Industrial Estate,
Woodbine Street East, Rochdale, Lancs OL16 5LB.
Telephone: 0706 341111

(continued from page 197)

definition procedure, it also enables the user to:

- Rotate the character to the right by 90 degrees.
- Flip all the character's bits to produce the "inverse" character.
- Produce a mirror image — in the vertical plane — of the current character.
- Save the defined character's data map to tape.
- Read in previously saved data maps.

Definition takes place on an eight-by-eight grid, over which the user moves a cursor using the cursor keys. Pixels of the character can be "toggled" on and off using the Copy key.

Pressing R rotates the character by 90 degrees to the right; F inverts all the bits; M produces a vertical mirror image of the character and D allows the reading in of a

saved data map for further adaption. Pressing C when the character is complete produces a print out of the data map in both decimal and hexadecimal. At this point the user is given the option of saving the data map to tape, and then whether he wants to rerun the program.

Conversion of this program to run on other micros may prove to be difficult. This is due to the fact that it uses a pair of windows on the screen and also that it uses a transparent mode of character printing. Windows are a feature found on only a handful of other home micros and the "transparent" printing is — to my own knowledge — unique to the Amstrad.

A stripped-down version of this program can be produced, but it would involve redesigning the screen layout and completely changing the screen-handling routines. Also the Symbol command would have to be replaced with Pokes to define a character.

The program allows you to dump the characters you have just defined to tape as a binary file called Char.

If you want to load these into your games program, or back into the editor for further editing then follow the procedure shown in lines 70 and 75.

SYMBOL AFTER 128
LOAD "CHAR"

Although Himem will normally be the same, problems could be caused by the user attaching add-ons to the machine which will alter Himem.

In this case, if you say add a disc drive to your system and still want to use characters you defined before getting it;

SYMBOL AFTER 128: CLOW = HIMEM + 1
LOAD "CHAR", CLOW

will put the characters into the correct position in memory.

```
10 REM ***** CHARACTER DEFINER *****
20 REM ***** BY *****
30 REM ***** J. & A. GARDNER 1984 *****
40 REM *****
50 REM *****
60 REM *****
70 SYMBOL AFTER 256: CLOW = HIMEM
75 SYMBOL AFTER 128: CLOW = HIMEM + 1
80 INK 0,0 : INK 1,24 : INK 2,8 : BORDER 1
90 DIM a(8,8),r(8,8),z(8)
100 MODE 1
110 x=12 : y=4 : z=0
120 WINDOW #1,1,40,1,15 : WINDOW #2,0,40,16,25
130 WINDOW SWAP 0,1
140 GOSUB 690
150 LOCATE 1,4
160 FOR q=1 TO 8 : PRINT TAB(10);q : NEXT q
170 PRINT TAB(12);"12345678"
180 LOCATE 23,4 : PRINT "Character"
190 PLOT 410,324,2
200 DRAW 26,0 : DRAW 0,26
210 DRAW -26,0 : DRAW 0,-26
220 PRINT2,"Use cursor keys to move"
230 PRINT2,"F" to flip all the bits"
240 PRINT2,"R" to rotate right 90:CHR$(129)
250 PRINT 82,"M" for vertical mirror image"
260 PRINT2,"D" to read in a saved data map"
270 PRINT2,"COPY" to reset point"
280 WINDOW SWAP 0,2
290 PEN 3 : PRINT : PRINT TAB(3);"PRESS 'C' WHEN COMPL"
300 PEN 1 : PRINT
310 REM ***** MAIN LOOP *****
320 a=LOMER$(INKEY$)
330 x=x+1 : y=y+1
340 GOSUB 550
350 IF a=" " THEN 320 ELSE a=ASC(a$)
360 IF a="224" THEN GOSUB 480
370 IF a="4" THEN GOSUB 1150
380 IF a="r" THEN GOSUB 1210
390 IF a="R" THEN GOSUB 1520
400 IF a="d" THEN GOSUB 1360 : GOTO 220
410 v=y+(a=240):-(a=241)
420 w=x+(a=242):-(a=243)
430 IF a=239 AND a=244 THEN GOSUB 620
440 IF a="c" THEN GOTO 770
450 GOSUB 690
460 GOTO 320
470 REM ***** RESET POINT *****
480 v=x-1 : w=y-3
490 a(x,v)=ABS(a(x,v))-1
500 i=ABS(a(x,v))-1
510 IF i=1 THEN ch=143 ELSE ch=32
520 LOCATE x,y
530 PRINT CHR$(ch)
540 RETURN
550 REM ***** PRINT CURSOR *****
560 PRINT CHR$(22)+CHR$(1) REM SET TRANSPARENT M
570 LOCATE x,y
580 PEN 2 : PRINT CHR$(202)
590 PEN 1
600 PRINT CHR$(22)+CHR$(0) REM TURN OFF TRANSPARE
```

```
NT MODE
510 RETURN
520 IF v=12 THEN x=x+1 ELSE IF v=19 THEN x=x-19
530 IF v=4 THEN v=v+4 ELSE IF v=11 THEN v=v-11
540 LOCATE x,v : PEN 0
550 PRINT CHR$(32)
560 IF a=v-11,v-5+1 THEN LOCATE x,v : PEN 1 : PRI
570 NT CHR$(143)
580 RETURN
590 REM ***** PLOT DEFINED CHARACTER *****
600 DEF FNbit(b)=a(1,b)+128*a(2,b)+64*a(3,b)+32*a(4,b)
+16*a(5,b)+8*a(6,b)+4*a(7,b)+2*a(8,b)
700 FOR x=1 TO 8
710 z(x)=FNbit(a(x))
720 NEXT x
730 REM *****
740 SYMBOL 255,z(1),z(2),z(3),z(4),z(5),z(6),z(7),z(8)
750 PEN 1 : LOCATE 27,6
760 PRINT CHR$(255)
770 RETURN
780 CLS #2
790 WINDOW SWAP 1,0
800 WINDOW SWAP 0,2
810 PRINT "Character is "CHR$(255)""
820 PRINT : PRINT "Is this correct?"
830 x="" : WHILE x="" : x=LOMER$(INKEY$) : WEND
840 IF x="n" THEN WINDOW SWAP 2,0 : WINDOW SWAP 0,1 :
850 CLS #2 : GOTO 220
860 IF x="y" THEN MODE 1 : GOTO 870
870 PRINT : PRINT "Data map is " : PRINT TAB(6);"dec.", "h"
880 PRINT
890 FOR q=1 TO 8 : PRINT TAB(5);z(q);TAB(10);HEX$(z(q)) :
900 NEXT q
910 PRINT "Do you wish to save the data map ? (y/n)"
920 IF x="y" THEN 1030
930 IF x="n" THEN PRINT : INPUT "Please input a file n"
940 FILE#="file" ELSE 910
950 PRINT : PRINT "Please insert a cassette"
960 PRINT "Press PLAY/RECORD and press any key"
970 FILE#="file" : OPENOUT FILE#
980 FOR x=1 TO 8
990 PRINT #9;z(x)
1000 NEXT x
1010 CLOSEOUT
1020 PRINT : PRINT "Data saved as "FILE#";(file#),2)
1030 PRINT:PRINT "Enter number of character to redefine"
1040 PRINT:PRINT "ASCII code 128-256."
1050 PRINT : PRINT "Enter 0 if no definition required."
1060 INPUT num
1070 IF (num<128 OR num>254) AND num>0 THEN 1030
1080 IF num=0 THEN 1100
1090 SYMBOL num,z(1),z(2),z(3),z(4),z(5),z(6),z(7),z(8)
1100 PRINT:PRINT "Character "num" is now "CHR$(num)""
1095 GOSUB 3000
```

```
1100 PRINT : PRINT "Do you wish to run again ? (y/n)"
1110 x="" : WHILE x="" : x=LOMER$(INKEY$) : WEND
1120 IF x="y" THEN RUN 80
1130 MODE 1 : END
1140 REM ***** FLIP ROUTINE *****
1150 FOR q=1 TO 8
1160 FOR k=1 TO 8
1170 a(1,k)=ABS(MOD(a(1,k)-1))
1180 NEXT k
1190 GOSUB 1290
1200 RETURN
1210 REM ***** ROTATE *****
1220 FOR q=1 TO 8
1230 FOR q=1 TO 8
1240 r(9-q,q)=a(p,q)
1250 NEXT q,p
1260 FOR p=1 TO 8 : FOR q=1 TO 8
1270 a(p,q)=r(p,q)
1280 NEXT q,p
1290 FOR q=1 TO 8
1300 FOR k=1 TO 8
1310 LOCATE 11+q,3+k
1320 IF a(1,k)=1 THEN PRINT CHR$(143) ELSE PRINT CHR$(
1330 NEXT k
1340 RETURN
1350 REM ***** READ IN DATA *****
1360 WINDOW SWAP 0,2 : CLS : PRINT : PRINT
1370 OPENIN "file"
1380 FOR k=1 TO 8
1390 INPUT #9,z(k)
1400 NEXT k
1410 CLOSEIN
1420 WINDOW SWAP 2,0
1430 FOR q=1 TO 8
1440 a(q)=BIN$(z(q),8)
1450 FOR k=1 TO 8
1460 a(1,k)=VAL(MID$(a(q),k,1))
1470 NEXT k
1480 GOSUB 1290
1490 CLS #2
1500 RETURN
1510 REM ***** MIRROR IMAGE *****
1520 FOR q=1 TO 4
1530 FOR k=1 TO 8
1540 r(1,k)=a(1,k)
1550 NEXT k
1560 x=1
1570 FOR q=5 TO 8
1580 FOR k=1 TO 8
1590 a(1,k)=a(1,k)
1600 a(1,k)=1-inc(1,k)
1610 NEXT k
1620 inc=inc+2
1630 NEXT q
1640 GOSUB 1290
1650 RETURN
1660 PRINT "Do you wish to save the character set ? (y/n)"
1670 x="" : WHILE x="" : x=LOMER$(INKEY$) : WEND
1680 IF x="y" THEN 1690 THEN RETURN
1690 SAVE "CHAR",CLOW,CLOW,CLOW
1700 PRINT "Saved as file "CHAR"
1705 RETURN
```

Autopause

Ian Cash

ORIC

A USEFUL FEATURE on many games is a pause control, allowing the player to take a breather from zapping all those aliens. However, not all games have this ability, and this is where my program helps.

It was written on a 48K model, but should work with any Oric using the V1.0 operating system and should not be too difficult to convert for other Orics. As the program relies on interrupts it will not work with games which do not use them — but this is a minority I'm sure. The only other drawback is a small delay in keyboard response when typing in direct mode, but as this does not apply to games I'm sure it will not be noticed.

Any key may be used as the pause control — including Ctrl and Shift keys — by simply changing line 60 according to table 1. The game will pause as long as this key is pressed and continue on release.

After typing in the program and checking carefully, Run it, and then Cload the game. The routine can be disabled by

POKE #230, 64

Table 1. For Ctrl, LShift and RShift, the first number on line 60 should be changed to # 09.

The last number should be chosen from the list of keyboard values to replace the 130 for whichever key you wish to use as the pause control.

Naturally this should not be a key already used in the program.

Table 1 continued

```
5 REM Oric Autopause by I.Cash
10 FORA=#231TO#248:READ D:POKEA,D:NEXTA
20 FORA=#271TO#288:READ D:POKEA,D:NEXTA
30 POKE#230,234 'enablePoke #230,64 to stop.
40 DATA #0E,#42,#02,#8A
50 DATA #0E,#0B,#4B,#AD
60 DATA #0B,#02,#C9,130 'See text.
70 DATA #D0,#5E,#4C,#7A
80 DATA #02,#FF,#FF,#FF
90 DATA #FF,#4C,#46,#02
100 DATA #AD,#43,#02,#F0
110 DATA #35,#BD,#00,#01
120 DATA #BD,#44,#02,#A9
130 DATA #46,#9D,#00,#01
140 DATA #E8,#BD,#00,#01
150 DATA #BD,#45,#02,#A9
160 DATA #02,#9D,#00,#01
170 DATA #A9,#00,#BD,#43
180 DATA #02,#F0,#17,#AD
190 DATA #43,#02,#D0,#12
200 DATA #AD,#44,#02,#9D
210 DATA #00,#01,#E8,#AD
220 DATA #45,#02,#9D,#00
230 DATA #01,#A9,#FF,#BD
240 DATA #43,#02,#AE,#42
250 DATA #02,#6B,#40
```


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PSION ORGANISER RESULTS

THREE PSION ORGANISERS plus a choice of software were up for grabs in our September competition. To enter you needed to place eight of the machine's features in order of importance. As a tiebreaker we wanted you to suggest an original use for the database facility.

As usual our panel of judges made heavy weather of the business of picking the winning list. All agreed that the crucial features of the Organiser were its portability and data storage capacity: on the other features there was fierce disagreement.

"Speedy data access" was a particularly tricky one. It is obviously a vital feature, but can't it be taken for granted? Surely this is what computers are supposed to be good at. And what about "rugged construction"? For most applications the device would not have to be very robust. But perhaps Psion should consider bringing out a range of outdoor models — the Safari Organiser or an

underwater version.

The panel's final choice was the following one:

1. Pocket-sized.
2. Permanent data storage.
3. Battery powered.
4. Re-usable datapacks.
5. Speedy data access.
6. Software library.
7. Own program language.
8. Rugged construction.

The three entries which matched or came closest to this list were from: Matthew Langham, Dhauner STR. 184, 6570 Kirn, West Germany; R Shaw, 3, Heathfield Cottage, Lodge Lane, Nailsea, Avon; M Gottlieb, 22 Gibbs Green, Edgware, Middlesex.

M Gottlieb's database suggestion — for

storing lecture notes — was a little dull. M Shaw was more original with a plan for keeping records of 100 cows.

We were not sure whether Matthew Langham was joking when he wrote: "I would store some Pretty Special information on Natterjacks in my Organiser". A natterjack, if you are wondering, is a small toad which runs instead of hopping.

Other database ideas ranged from the humorous to the highly practical. Dutch schoolboy Nouter Falk thought he would use the datapacks to cheat in exams, passing the machine off as a calculator. Good thinking, Nouter, you will be out of there in no time.

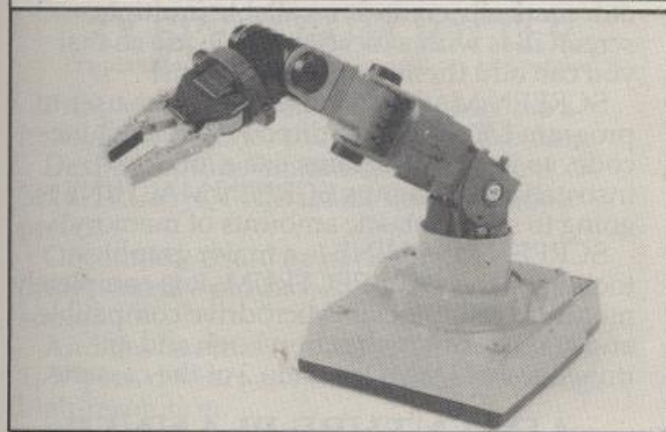
But watch out for schoolmaster J Davenport whose idea is to use the Organiser for "filling subjectively observed day to day behaviour characteristics of pupils at the moment of observation".

Daniel Langton refused to give anything away. "Private and confidential" he wrote coyly. Come off it Mr Langton, stamp collections are out in the open these days. Unless of course you are thinking along the same lines as D Oliver who suggested "Red-hot phone numbers".

On the practical level, anti-tank helicopter pilot Captain Husband thought to store daily changing battlefield codes and grid references, while fireman D Dempster argued the need for a computerised A to Z index. Even more sensible was P Metherall's idea of entering milk delivery details for his milk round.

Lastly, Russell Cooper seems to be in some confusion with his notion of using the Organiser to compose music.

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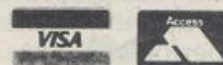
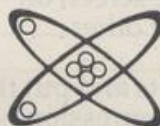
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HERE'S SIX WAYS TO



amounts of memory. Such items like compressing with or without attributes, saving thirds of the screen and multiple combinations of both are possible.

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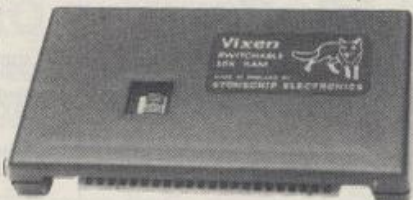
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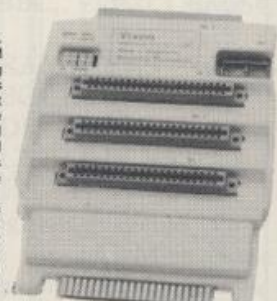


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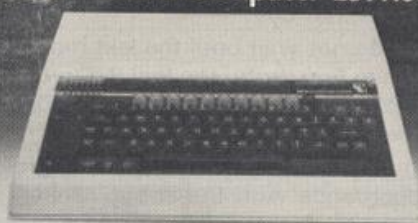
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MICRO MARKETS

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Sinclair Spectrum 48K £129.95

With FREE Software 6 pack (worth £56.70)

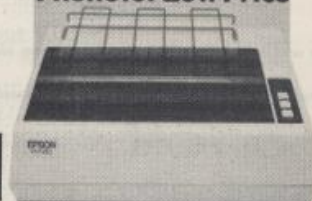
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COMMODORE COMPUTERS

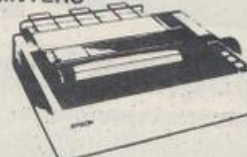
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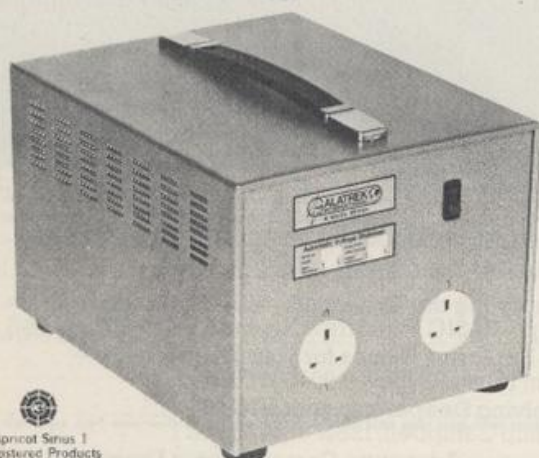


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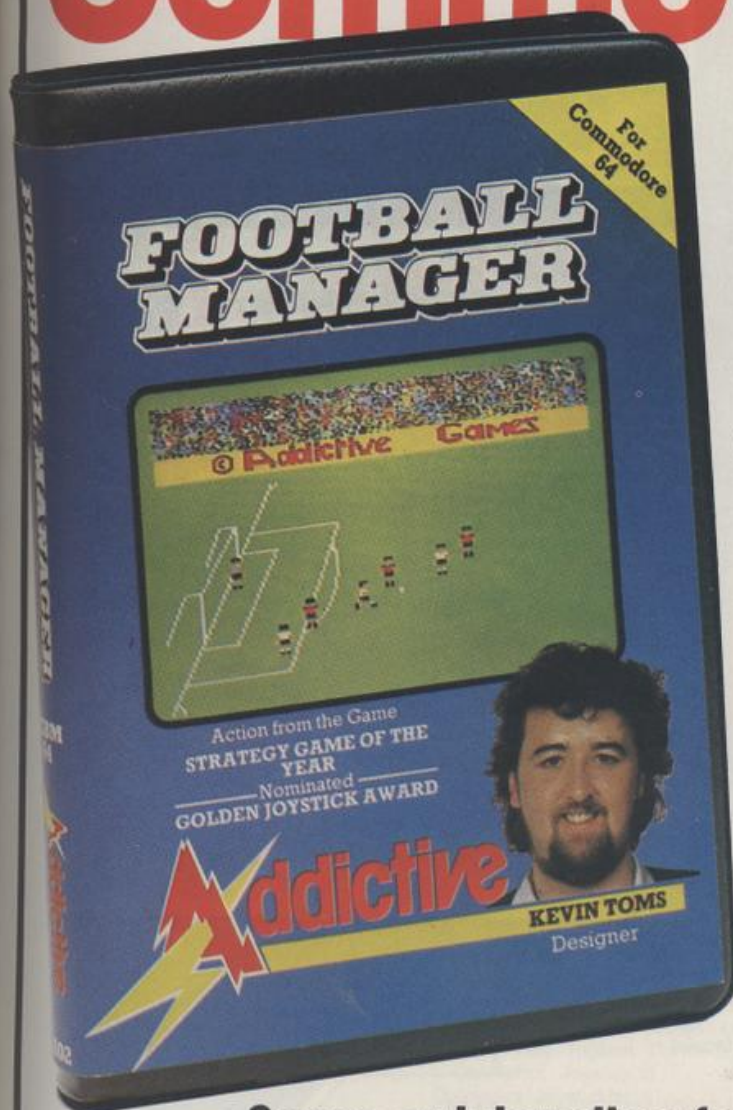
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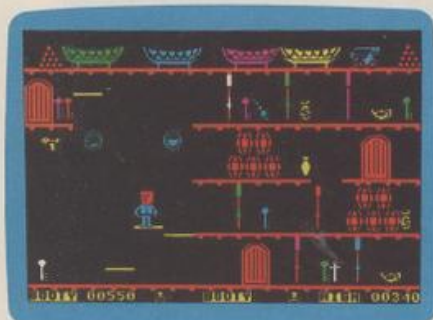
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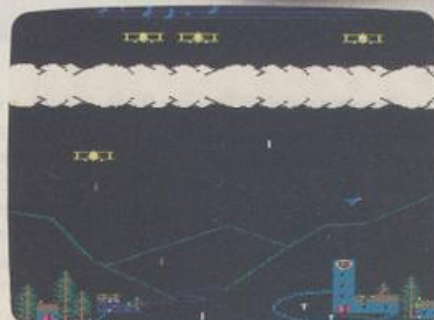
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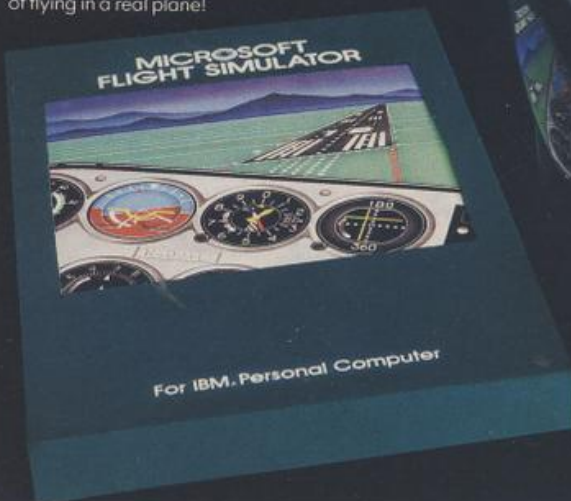
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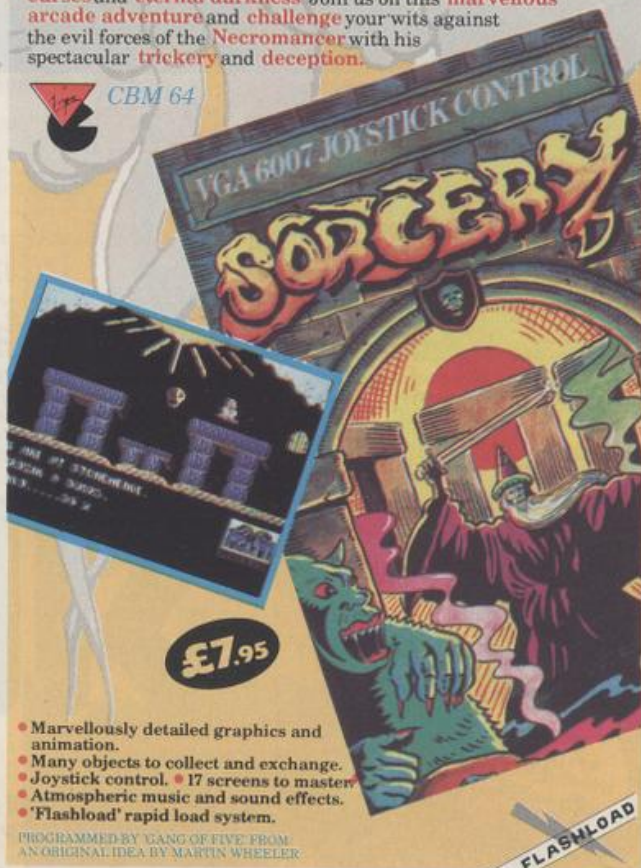


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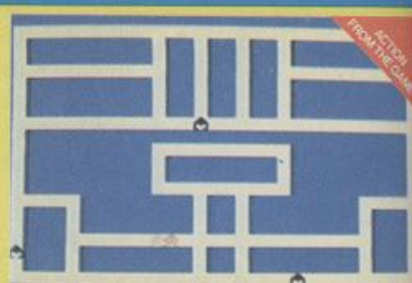
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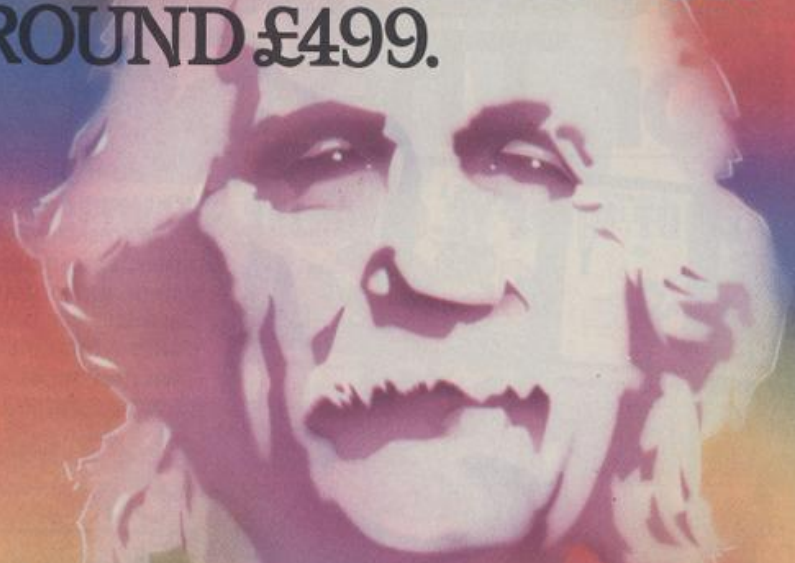
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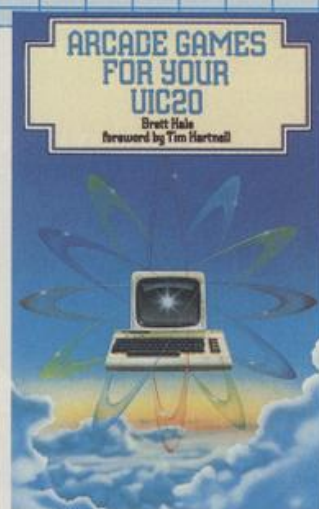
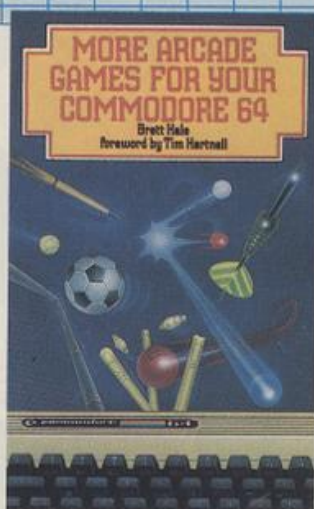
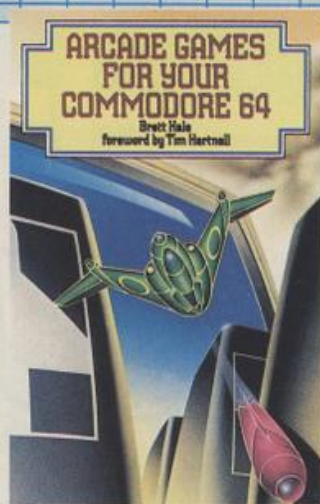
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DO-LOOP structure
DPOKE double poke
EST specified line
ELSE (used with IF...THEN)
EXIT leave DO-LOOP

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 list TO line
USED based with GOTO, GOSUB
ON ERROR trap errors
(with LINE, STAT and ERROR)
PLOT a string (may contain cursor
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POKE a string
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UNTIL used with DO or LOOP
USING used with PRINT
WHILE used with DO or LOOP
XOS, YOS move PLOT origin
XRG, YRG change PLOT scale

FUNCTIONS

AND (bit-by-bit)
BNE decimal to binary
CHARS number to 2 characters
CODE fast cosine
DEC hexadecimal to decimal
DPEEK double PEEK
FILLED filled area

NEXT decimal to hexadecimal
NEXTEND string search
MEM free memory
MEMORY# all of memory as a string
MOD modules
NUMBER 2 characters to number
OR (bit-by-bit)

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SINE fast sine
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XOR (bit-by-bit)

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Computing Today, August 84

✓ To me, all Level 9 adventures create a remarkable atmosphere because the descriptions sound so life-like. This is where so many other adventures fail.
Crash, July 84

✓ But it's not just the size of the game it's the quality as well that is astonishing ... scenes to fire the imagination.
PCG, April 84

✓ As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denizens.
Which Micro?, February 84

✓ (LORDS OF TIME). As we have come to expect from Level 9, the program is executed with wonderful style ... Highly recommended.
PCW, 1 February 84

✓ I thoroughly recommend these Adventures, they are excellent value for money. No self-respecting Adventure-addict should be without them. I believe Level 9 are producing a series of Adventures which should be regarded as classics.
Atari User, July 84

✓ These programs run very fast and there are no frustrating pauses. Level 9 Adventures are superbly designed and programmed, the contents first rate. The implementation of Colossal Adventure is nothing short of brilliant; rush out and buy it. While you're at buy their others too. Simply smashing!
Your 64, June 84

✓ Level 9 - arguably the producer of the best adventure games in the UK - has done it again. LORDS OF TIME is a sparkling addition to its stable of winners.
Acom User, July 84

✓ (SNOWBALL). This is another imaginative, massive-scaled immensely enjoyable adventure from those experts down at Level 9 Computing.
Your Computer, March 84

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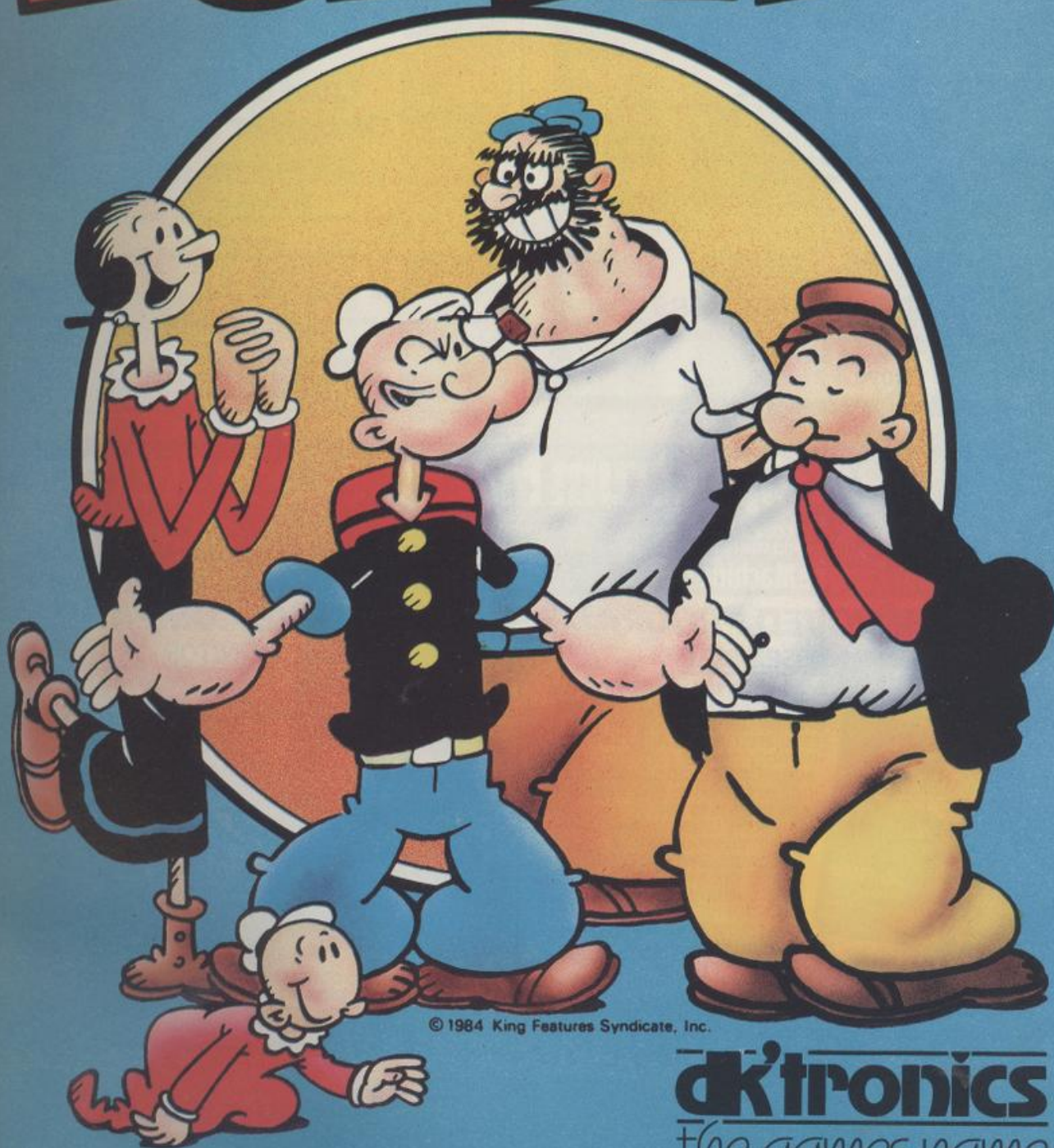
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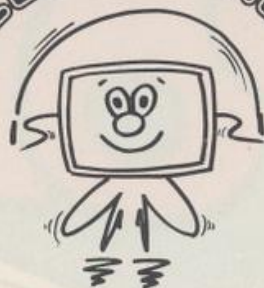
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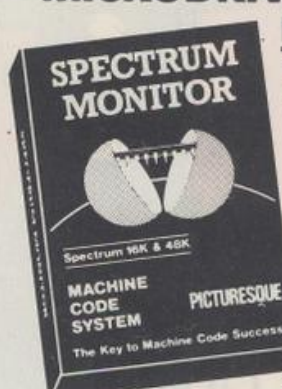
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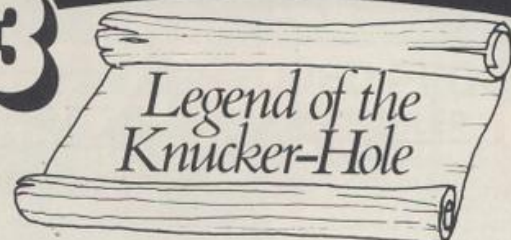
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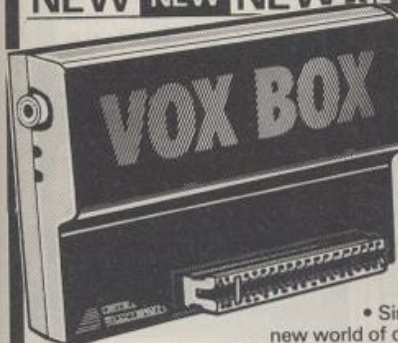


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INDEX OF ADVERTISERS

6809 Colour Show	50	E	English Software		210/211	Skywave	135	
A			Everyday Electronics	112	206	Softcentre	72	
A & F Software	200				216	Softsel	226	
Acorn Computers	198/199				26	Software Communications	IFC	
Activision	81/102	F	Ferguson	192/193	8/9	Software Farm	14	
Addictive Games	219		First London Micro Show	132	130/137/160/194	Software Library	146	
Advance Technology	121		Flexiwords	238	44	Southern Software	196	
Adventure International	20		Frel Ltd	241	155	Spectadraw	48	
Amstrad	126/127		Frontrunner (K-Tel)	21/23	113	Spectre	132/206	
Anirog	34/239				166	Spectrum	27-33	
Argus Press Software	54	G				Statesoft	140	
Axis	36-39		Galaset	7	N	Stonechip	234	
B			Galatrek	214		Swanley Computers	212	
Beebug	169		Gilsoft	231		Sybox	185	
Betasoft	233				35			
Beyond Software	82/83	H			209			
Blaby	44		Haulsterm	10	4	T		
British Telecom (Firefly)	224/225		Hewson Consultants	188		TEC	212	
Buffer Micro	46		Hisoft	215	142	Tatung	230/108	
Bugbyte	235	I			BC	Tektonic	155	
Bulldog Software	22		Ibico	233		Thoughts & Crosses	207	
C			Industrial Process	10	P	Toshiba	99	
CJE	238		Innelec	15	PAS	Touchmaster	136/167	
Cambridge Micro Electric	48		Interceptor Micro	164	PSS	Touchmaster	177	
Campbell Systems	72		Interface	213	PV Tubes	Tremiver	208	
Cases Computers Simulators	96				Phimag	Triptych	7	
Classic Software	227				Picturesque	Tritonic		
Cobalt Systems	145	K			Practical Computing			
Commodore	16-19/104/105		Kempston Micro	6	Praybourne	U		
Compusound	7		Kosmos	7	Print n' Plotter	US Gold	92/114/149/152/172/191/202	
Computer Games	118		Kuma	125	ProfiSoft	Ultimate Play the Game	111/138/139	
Computer Link	35				Protek	University Software	10	
Computer Mate	80	L			Q			
Corgi Books	232		LCL	227	Quicksilva	116/117/178/179	V	
Creative Sparks	86		LTS	215			Virgin Books	146
Cumana	52		Leasalink	154	R		Virgin Games	227/229/231/233
Currah Computers	IBC		Level 9	236	Ram Electronics	66	Visionstore	218
D			Llamosoft	24	Redhatch	46		
DACC	239				Richard Wilcox	5	W	
DK Tronics	151/220/221/237	M			Romac	84	WG Cox	89
Datatar	35		Melbourne House	170/171/222/223	Rose Software	229	WH Smiths	156
Datel	241		Memoco	203	Rotronics	168/174	Walker Computers	48
Dean Electronics	212		Memotech	56	S		Walters Computer Systems	162
Domark	90		Mail Order Protection Scheme	214	Saga Systems	159	Wizard	214
Downsway	206		Micro Answers	72	Sarasoft	209	Worldwide Computers	209
Durrell Software	12/13		Micro Fast	132	Sci (UK)	69		
					Selec Software	44	Z	
					Silicon Joy	228	ZX Microfair	217

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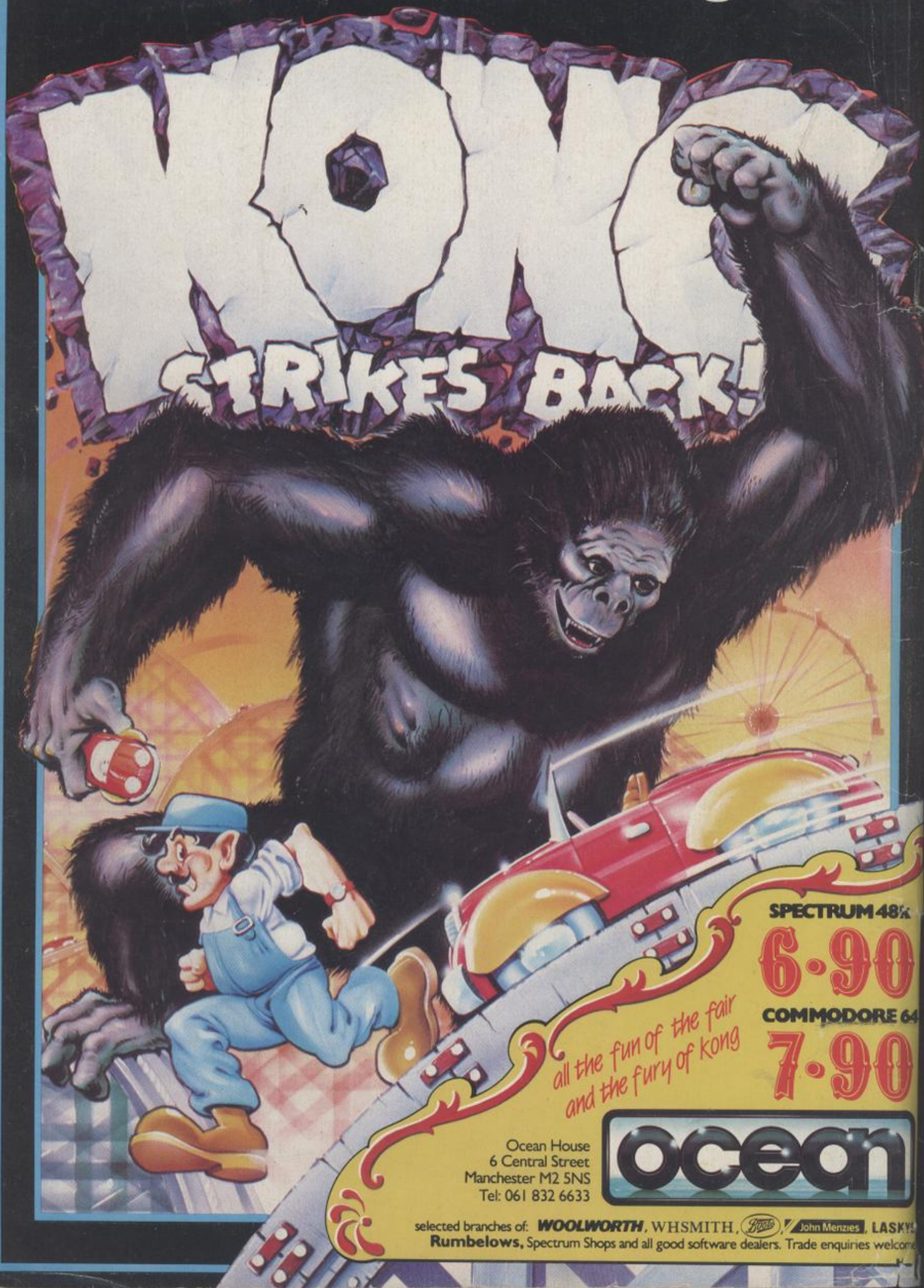
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