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# COMPUTER

MAY 1985

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Vol. 5 No. 5

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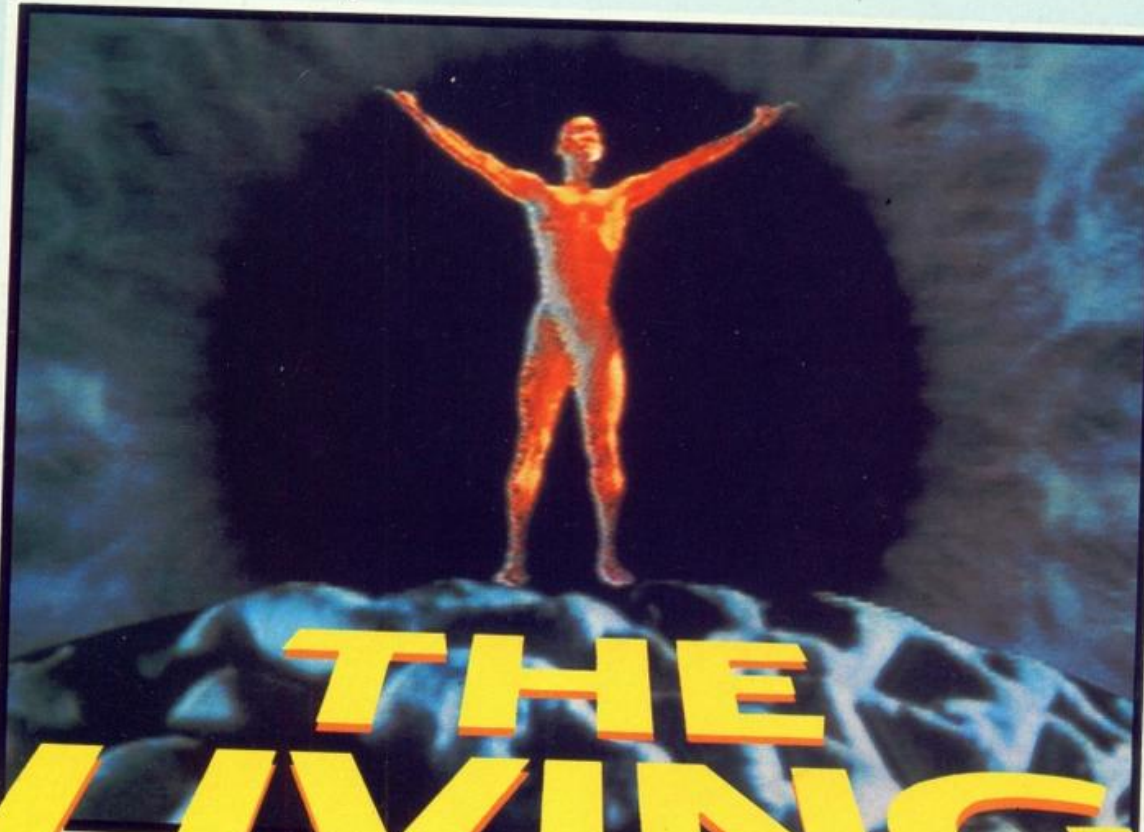
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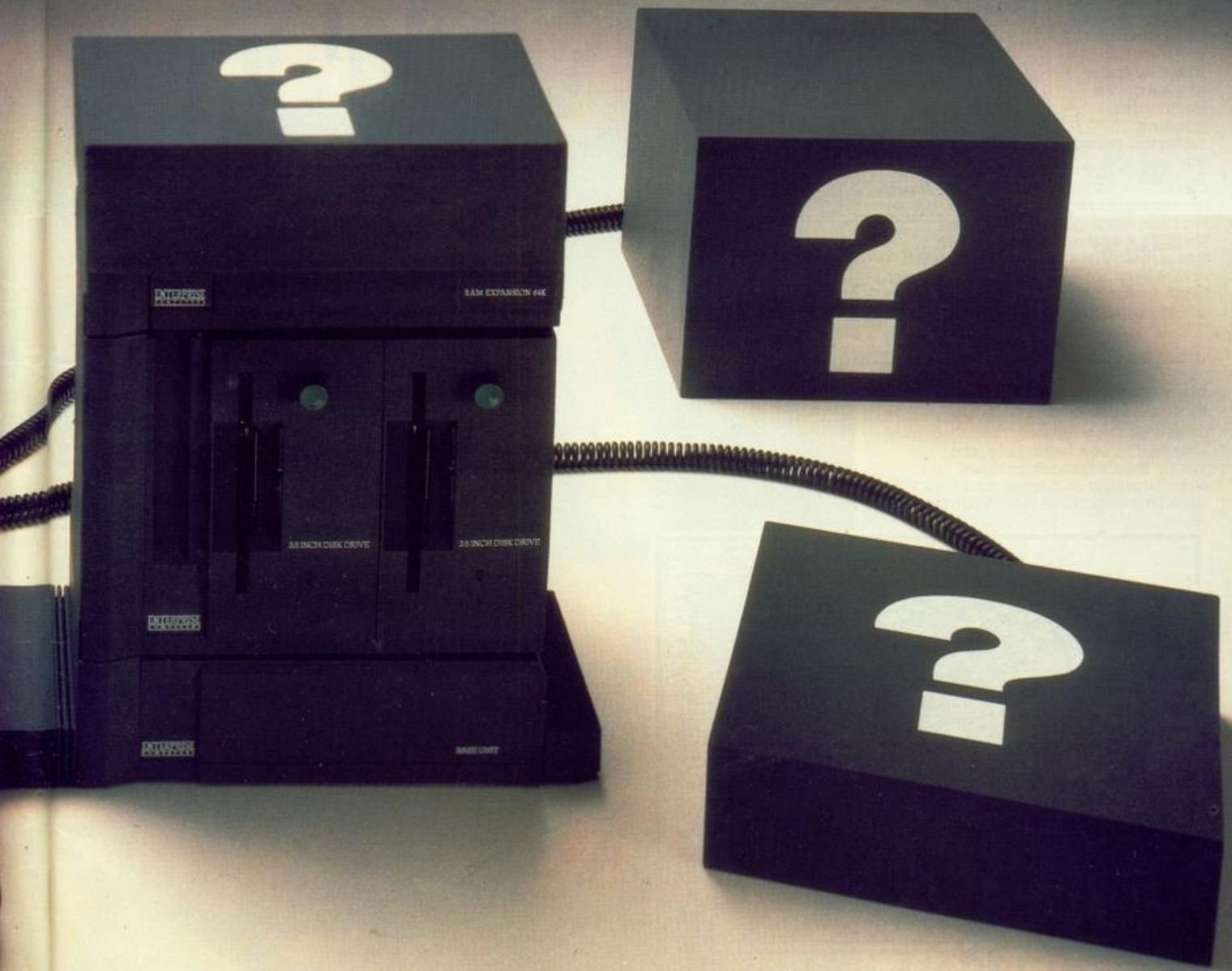
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The new Enterprise 64.

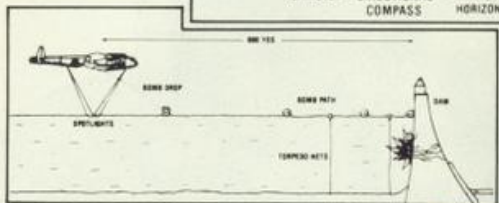
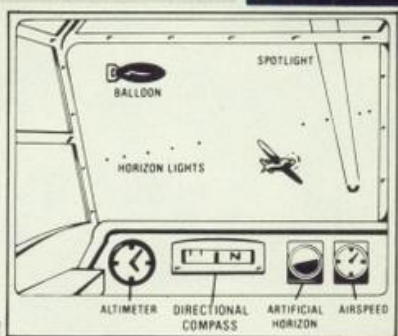
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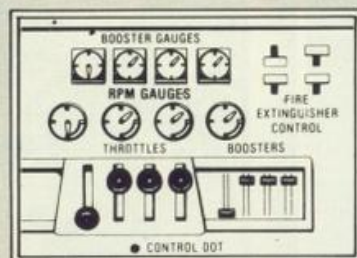


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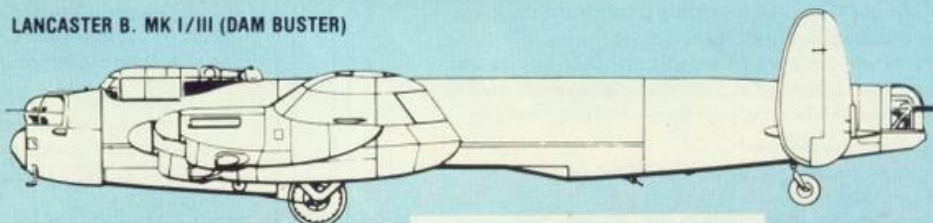
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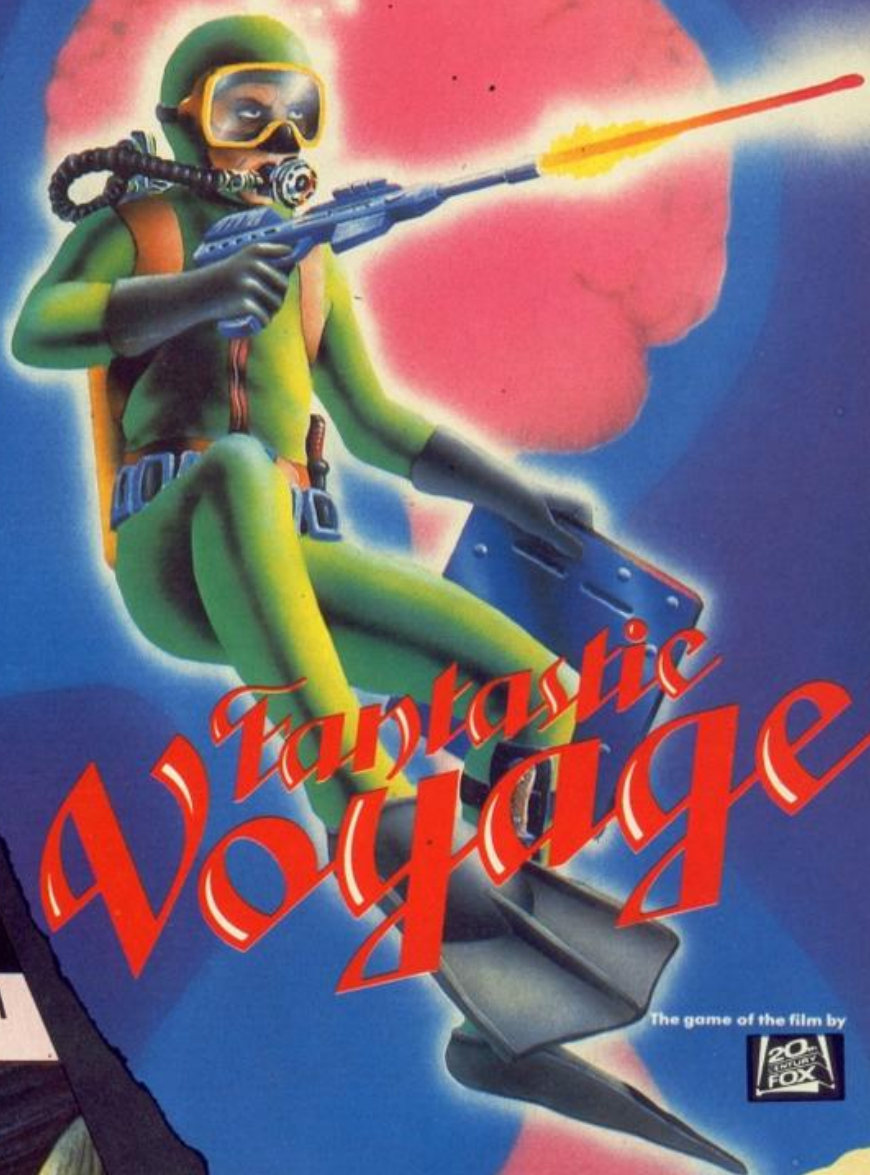
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Editors of Electronic Games

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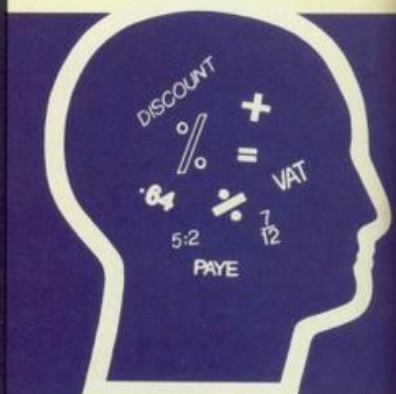
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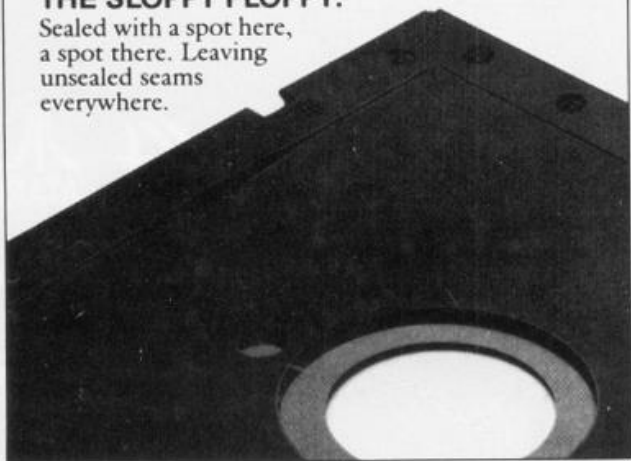
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Quasi knows a secret! Quasi knows where the jewels have been hidden in the castle and only Quasi can climb there.

They better leave Quasi alone, 'cause Quasi is getting mad. Quasi better hurry and find the jewels. Not much time. Quasi sees lots of soldiers. Quasi has lots of rocks.

Now the noise has stirred up the bats in the belfry. The bats are mean, they make Quasi fall down. Quasi better jump away from those bats.

Quasi thinks he got up on the wrong side of the bed today.

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YOUR COMPUTER, MAY 1985 19

# SILICON BOBBIES FLEX THEIR KNEES

AS TV SETS BLARE out the British Telecom "It's for you-hoo" ad slogan, hackers quite clearly only get interested when it isn't.

Breaking into unauthorised pages or parts of computers is their idea of having a good time. And although these electronic trespassers might agree that what they do is wrong, they would argue that it's really only good clean fun.

Comparisons with the early, illegal days of CB radio may seem inevitable — doing something you shouldn't — but with little risk of being caught. Yet whereas citizens' band eventually became legal, there is little chance of hacking becoming so. On the contrary, recent events show that the authorities are clamping down. The arrest of two hackers in London may be a taste of what is to come.

Armed with only a home computer, modem and telephone, hackers see their hobby as a test of ingenuity: the authorities see it as a challenge to security.

The current flood of hacking stories may be seen as bad publicity for the likes of Prestel but surely they could equally be welcomed for pointing out glaring deficiencies in system security.

After all, because networks like Prestel offer some subscribers a promise of confidentiality and are under obligation to make their system secure, it must be better that if security is to be breached it is done by people for fun rather than by vandals or criminals for financial gain.

Some claim that it is not unknown for a new network to release passwords to the hacking fraternity to test out its ability to react to breaches in safeguards. Hackers aren't interested in making use of information once they have gained access to it. They might occasionally leave a calling card by, for example, changing a letter in an unimportant word just to say they have visited.

Perhaps the recent spate of publicity surrounding hacking could actually help telecomms in general by encouraging home computer owners to buy modems. There are plenty of legitimate applications around such as *Your Computer's* Telsoft service, Prestel and Micronet 800. It seems sad that at a time when interest in modems is increasing, one of Britain's main home computer modem manufacturers, OEL, has gone into receivership. The good news is that you can still pick up one of its modems for around £40.

Editor: TOBY WOLFE; Assistant Editor: MEIRION JONES; Production Editor: IAN VALLEY; Software Editor: SIMON BEESLEY; Commercial Software Editor: PAUL BOND; Editorial Assistant: LEE PADDON; Editorial Secretary: LYNN DAWSON; Editorial: 01-661 3144. Advertisement Manager: NICK RATNIEKS 01-661 3127; Senior Sales Executive: JULIAN BIDLAK 01-661 8458; Advertisement Executives: NIGEL BORRELL 01-661 3660; KAY FILBIN 01-661 8484; Northern Office: GEOFF PARKER 061 872 8861; Advertisement Secretary: MAXINE GILL; Classified: SUSAN PLATTS 01-661 3036; Publishing Director: CHRIS HIPWELL; Group Advertisement Manager: SHOBHAN GAJJAR. Your Computer, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. © Business Press International Ltd 1985. Printed in Great Britain for the proprietors Business Press International Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500, Telex/grams: 892084 BIPRESG. ISSN 0263-0085. Printed by Riverside Press Ltd, Whitstable, Kent, and typeset by Instep Ltd, London EC1. Subscriptions: U.K. £12.50 for 12 issues. ABC 154,334 January-June, 1984.



Memotech negotiates in Moscow.

## KREMLIN 'N CHIPS

RUSSIA needs one million micros in its schools to fulfil the next Five Year Plan and British companies are queueing up to offer their products.

Surprise front runner at the moment is Memotech backed by the Spectrum Group USSR Consortium headed by Dudley Langmead. Memotech has already produced a full Cyrillic keyboard and Rom for its MTX range but since Gorbachev came to power the pace has quickened and last

month Langmead, together with Branton and Tupper from Memotech, met Soviet officials in Moscow.

The USSR might import the first 50,000 computers ready-built then switch to components and eventually self-production in a deal worth £100 million a year.

But Acorn and Sinclair are not out of the hunt — with Sinclair claiming that 100,000 Spectrums have already been unofficially exported to Eastern Europe.

## Wrist micro

SEIKO's new computer terminal in a wristwatch is the ultimate gimmick. Just plug it in to your Commodore 64 and it can receive 2K of data which can then be displayed over 80 "pages" of its two-line 24-character LCD display.

If you must use the £120, RC-1000 as a mere wristwatch you can still plug it in to your CBM-64 and use the big TV screen to set up messages which can be timed to appear at any time



Ultimate gimmick

over the next year on your watch to remind you of birthdays and anniversaries.

# TIME FOR 128K

## Commodore sorts chaos



Commodore going to any lengths to dispose of surplus stock.

AMSTRAD, Enterprise and Commodore are launching their new 128K computers into the middle of a price war caused by the low Christmas sales which have left half a million lower specification machines still clogging up the warehouses.

Amstrad's CPC-664 will

resemble the 464 except for the extra memory and built-in disc drive to replace the tape. Like the Commodore 128 it will be able to run CP/M programs although the CBM-128 "Shotgun" will also be CBM-64 compatible.

Its lack of compatibility with the C-16 and Plus-4 range prob-

ably means that the writing is on the wall for the two most recently introduced Commodores which are already being heavily discounted.

No wonder Commodore U.K. is recruiting an IBM executive as General Manager to try to sort things out.

## How to fast load hits on a Spectrum

ALL THAT tedious messing about with assemblers is a thing of the past with the Transformer, a utility from Soft Machine, guaranteed a farm welcome from FAST — or possibly a writ.

This utility contains specific routines for copying 30 of the most recent blockbusters, including the chart-topping *Alien 8* and *Cyclone*. Adding insult to injury, it even copies them to Microdrive, leaving out such space-wasters as loading screens. So legitimate back-ups can be made of your own software!!!

## Wafadrive speeds up CBM-64

THIRTY SECONDS to load any program on a Commodore sounds too good to be true, but that's the claim for the new £99.95 Quick Data Drive. That compares well with cassettes which take anything up to a quarter of an hour, and even the 1541 disc drive's take two minutes.

The drive, from Dean Electronics for the CBM-64 or Vic, plugs into the cassette port. Once the system is booted up by pressing Shift/Run, you have the usual Load, Save, and data storage commands. There is also a System file which gives directory, formatting and copying commands. The drive uses the same technology as the Rotronics Wafadrive.

## Clive C5 on screen

WHILE gearbox problems halt production of the real C5 tricycle, Scorpio Gamesworld has cashed in with a C5 Clive Spectrum arcade game.

You have to keep picking up batteries if you want to keep going through 50 screens of hazards between the shop and your home.

# BODY SYSTEMS AS ENTERTAINMENT

"THE THING about computers is that they lack intentionality. Essentially, they don't want to do anything — they're happy to follow orders." After two years' break from theatrical work, it is clear that Dr Miller is bubbling with ideas generated by study at the University of Surrey concerning artificial intelligence, and is almost more keen on discussing this than Bodyworks — the computerised follow-up to his pop-up book *The Human Body*.

Dr Miller first rose to prominence as part of the 60s revue *Beyond the Fringe* which spawned such stars as Peter Cooke, Dudley Moore and playwright Alan Bennett. Apart from his work directing opera and stage plays, he more recently conducted a guided tour of the human body in BBC TV's *The Body In Question*.



Miller's body works

Together with the directors of the production company, Genesis, Jonathan Miller

believes that there is a gap between serious business or educational software and games. Bodywork reviewed in this month's Software Shortlist is the first in a series of programs intended to fill this gap.

Genesis' future projects include a pop-up book and probably a computer game designed in co-operation with the Natural History Museum, London. And for Dr Miller? "I'd like to do a program devoted entirely to memory."

As a doctor how does he feel about the use of computers in hospitals? "Quite good in certain respects — diagnostic machines are less forgetful, but they have no intuition. Attempts to use them in psychoanalysis, as happened with Weizenbaum's Eliza program, are a reflection of the impoverishment of our lives."

Link to Giant Mainframes and network to thousands of Micro users via your 'phone with free Modems and Comms software in the British Telecom Modem competition.

British Telecom is offering 1000 free gift packs to plug direct into your home 'phone line.

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# MODEM COMPETITION

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150 for Commodore 64

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01-627 3000 or  
021-449 9944 or  
031-225 8999

To get the Tiebreaker Sentence 'phone

01-627 1199 or  
0532 455030 or  
0632 324444

Complete the entry form using your skill and judgement, and send it off in the next post.

#### RULES OF THE BRITISH TELECOM MODEM COMPETITION

- 1) The dial-in is available from 6pm Monday 22nd April to midnight Sunday 5th May 1985, when the competition closes.
- 2) Entries must be postmarked the next working day after the questions and tiebreaker were obtained.
- 3) Entries can only be made on the official entry forms and become the property of British Telecommunications plc.
- 4) The competition is open only to residents of the United Kingdom over the age of 18 years. Employees of the Network Marketing Unit of British Telecommunications plc and PARKER REDMILE LTD. and their dependants are excluded. Only one winning entry per household.
- 5) Entries not reaching the competition address before midnight on Thursday 9th May 1985 will not be considered.
- 6) A list of winners will be provided at the competition address. Please send an SAE if you wish to receive it.
- 7) The winners will be picked as follows from entries received on time and properly completed -  
The entries for each type of prize pack with all correct answers to the 5 questions and with the tiebreaker sentences judged most apt and humorous by the competition organisers will be chosen, subject to the stock of appropriate prize packs.
- 8) The decision of the competition organisers is final and no correspondence will be entered into. Winners will be notified automatically.
- 9) British Telecommunications plc offers winners requesting BT 'phone socket conversion on entry forms to waive the charge normally made for such work.
- 10) Details of how to get on Prestel/Micronet 800/Telecom Gold will be sent to winners. Subscriptions not included in prize.

### OFFICIAL ENTRY FORM

A. Your answers:

- Q 1 .....  
Q 2 .....  
Q 3 .....  
Q 4 .....  
Q 5 .....

B. Tiebreaker Sentence complete (25 words or less in total):

.....  
.....

C. If I win, I would like the prize pack for the

- ☒ SPECTRUM/SPECTRUM +  
☐ BBC MODEL B (Tick Choice)  
☐ COMMODORE 64

D. My home telephone line (\* Delete as appropriate)

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(b) would need converting to square-type BT 'phone socket \*

If (b), the person renting the line from British Telecom must fill in this declaration -  
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I understand British Telecom will not charge for doing the work.

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Telephone number .....

Signature .....

Date ..... 1985

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Date ..... 1985

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What's my line?

## Hacking charges against Mouse

STEVE GOLD, otherwise known as Micronet's Micromouse, and Robert Schifreen, a freelance journalist, were arrested on Wednesday night, 27th March.

The two men were taken to Holborn Police Station, where they were charged the following morning with offences under the Forgery and Counterfeiting Act 1981. A Scotland Yard spokesman said that this was "the first ever police operation in this country into the alleged use of computers to interfere with other computers". He said, "Officers from the Computer Crime Unit of the Metropolitan and City Fraud Squad in an operation in the Edgware area of London and the Crosspool area of Sheffield arrested the two men.

The raids were made in co-operation with the British Telecom officials and South Yorkshire Constabulary, under a warrant issued under section 7 of the Forgery and Counterfeit Act of 1981. They follow a three month operation into the alleged interference with the Prestel system and warnings from police that publications such as *The Hacker's Handbook* might incite people to break the law.

Century, the Handbook's publishers, has denied that either of the men charged is connected with the Handbook and the police admit that the arrests had no connection with the *Hacker's Handbook*, but they are still investigating it.

The charge the two men face is that they "forged an instrument, namely an electronic device, for recording information on the Prestel Gateway and the Kipling, Dickens and Keats Prestel computer, contrary to section 1 of the Counterfeit and Forgery Act 1981".

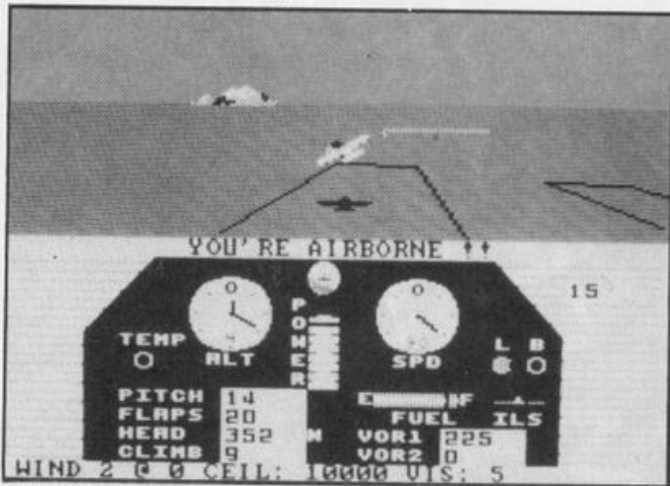
# RIGHT STUFF

## Pilot's Kennedy Approach

"I'M SELLING these games to men. If you haven't got the right stuff, I don't want to know." rasps Bill Stealey, president of MicroProse Software. Home of such hits as F-15 Strike Eagle, Nato Commander and Solo Flight, MicroProse programs are currently available in this country under the US Gold banner.

The next phase of ex-fighter pilot Bill's assault on the British software market via the US Gold beach-head has three main components: the Command series of Eastern Front style war games; a re-vamped version of Solo Flight and a remarkable air traffic control simulation called Kennedy Approach.

The Command series simulations allow you to play against the computer or against another player. The first two games available in the UK feature multiple scenarios ranging from single missions to in-depth campaigns. Crusade in Europe puts you in command of the Allied or German forces in Europe from D-Day to the Battle of the Bulge, and Decision in the Desert allows you to be either Monty or the Desert Fox in North Africa



Solo Flight needed a revamp.

from 1940 to 1942. Both games have a 10-screen scrolling map, strategic maps, game save and a flashback function.

Air traffic controllers are one of the sectors of the American public most prone to heart attacks. You can now expose yourself to this threat in the comfort of your own home with Kennedy Approach — students of American labour relations will be disappointed to know there is no strike option in the £14.95

game. But it features excellent synthesised speech — right down to the blast of static that you always hear in the movies when the pilot replies to the tower.

US Gold plans to market the Command series at £20 — a stiff price? "I'm not interested in the kind of guy who just wants a short thrill," says Bill Stealey. "If you want to spend £6 on an arcade game that you're going to play for an hour, I don't want you buying my software."

## PSION EYES MARKS CARD

PSION'S ORGANISER is now helping Marks and Spencer fight Chargecard frauds quickly and conveniently.

The Organiser enables assistants to validate a card on the spot without the usual time delay in getting telephone confirmation from the central office. The Eprom datapak is loaded with the latest list of invalid cards and distributed to the stores overnight, making stolen cards virtually worthless within 24 hours of being reported lost.

Other Organiser applications include the Wessex computerised on-site building estimates system, and a prescribed drug calculator, giving a dosage, precautions to be



Wessex hard hat

taken and side effects of 280 commonly used drugs. Entering the symptoms produces a list of recommended drugs.

## New Gen Jonah and the wail

CLOSE YOUR eyes and you could be playing squash at the highest level — although you might miss the ball. New Generation's talking squash for the Spectrum uses a synthesised version of Jonah Barrington's voice to read out the scores.

## Interface clocks on

IF YOU HAVE an Electron with a Plus 1, Cumana's new disc interface plugs straight into the cartridge port. The interface contains a battery-backed real-time clock for date stamping.

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# POP★ TOPS

## TOP 20

Game	Company	Machine
1 Booty	Firebird	Sp
2 Everyones a Wally	Microgen	Sp
3 Starstrike	Real Time	Sp
4 Match Day	Ocean	Sp
5 Alien 8	Ultimate	Sp
6 Ghostbusters	Activision	Sp
7 Wild Bunch	Firebird	Sp
8 Monkey Magic	Solar	16
9 Broad Street	Argus	64
10 Skool Daze	Microsphere	Sp
11 Airwolf	Elite	Sp
12 Blackbusters	Macsen	Sp
13 Overdrive	Superior	El
14 Technician Ted	Hewson	Sp
15 3D Time Trek	Anirog	16
16 Go Go Ghost	Firebird	64
17 Byte Bitten	Firebird	Sp
18 Dukes of Hazzard	Elite	Sp
19 Mini Office	CDS	Sp
20 Bumper Bundle	Alligator	El

Sp = Spectrum/Bc = BBC/16 = C16  
 El = Electron/Vc = Vic-20  
 Dr = Dragon/64 = CBM 64  
 Am = Amstrad/Or = Oric/At = Atari  
 \* = New release/— = Same position  
 Source: WH SMITH

## TOP 3 BY MACHINE

Game	Company	Machine
1 Vegas Jackpot	M. Tronic	Vc
2 Punchy	Mr Micro	Vc
3 Duck Shoot	M. Tronic	Vc
1 Mega Hits	Beau Jolly	64
2 Chiller	M. Tronic	64
3 BMX Racers	M. Tronic	64
1 Bruce Lee	US Gold	Sp
2 Raid over Moscow	US Gold	Sp
3 Wizards Lair	Bubble Bus	Sp
1 Hunchback	Ocean	Dr
2 Manic Miner	S. Projects	Dr
3 Dragon Chess	Oasis	Dr
1 Snooker	Visions	Bc
2 Mini Office	Database Pub.	Bc
3 Castle Quest	Micropower	Bc
1 Compilation Tape 1	English	At
2 Colossus Chess	English	At
3 F15/Strike Eagle	Centresoft	At
1 Williamsburg Adv.	Microdeal	16
2 Roller Kong	Melbourne House	16
3 Stellar War/ Blitz	CBM	16
1 Classis Adventure	Melbourne House	El
2 Mini Office Database	Database	El
3 Overdrive	Superior	El
1 Mutant Monty	Amsoft	Am
2 Sorcery	Virgin	Am
3 Mini Office Database	Database	Am

Source = Websters Software



## CONGRATULATIONS

IT IS ONLY on a very few occasions can I recall seeing in your columns letters from readers who have felt compelled to tell us of retailers who have performed a "service beyond the call of duty". We are so used to reading of late deliveries, damaged goods and exaggerated descriptions that we are flabbergasted when we encounter that almost extinct species, the "caring" supplier.

It is with real pride, therefore, that I bring to the notice of *Your Computer* readers Dr. Andrew Wright of Beta-soft whose software application for the 48K Spectrum, Beta Basic, adds 30 extra commands and a further 20 functions in just 11K of code.

I recently bought a Rotronics Wafadrive for my Spectrum and discovered that because of overwritten addresses the drive was not compatible with Beta Basic. I wrote to Beta-soft for assistance and, to my utter amazement, almost by return of post I received a reply from Dr. Wright advising me that the necessary modification was in hand and, upon satisfactory trials, I would be sent a copy.

Now, only a few weeks later, I have up and running a Wafa-based version of Beta Basic which, incidentally, has been upgraded to take better advantage of the drive and printer output facilities.

Peter Marles,  
Leeds,  
West Yorkshire.

## NUKE LEAR

DO YOU KNOW Nuke Lear from CCS? It's the best buy on the market! Why?

■ It costs only £2.99!  
 ■ It is the only game that can be enjoyed by beginners and experts alike! Levels 1 and 2 are for kids, levels 3-7 are hard enough for the best shoot-'em-up champions, levels 8 and 9 will never be finished every by the best!

■ You get a free compiler with it! Just load it by typing

CLEAR 39999: LOAD "W"  
 CODE 59900,5636

Then type in or load your Basic program. Type Randomise USR 60000 to compile it, Randomise USR 40000 (= start-address) to run the compiled version.

It will run 20-100 times faster than the Basic version.

H. Schneider,  
Hamburg,  
West Germany.

## GOOD HACKERS

I READ WITH interest your first bytes feature in the April 1985 issue of *Your Computer*. May I first make it quite clear that I am in agreement with everything you say about the

# YOUR Letters

Your Computer now has its own Prestel Mailbox. Our number is 01991800. If you have any program enquiries send us a message. We will try and give you an answer within a few days.

modern day hackers, people who seem to delight in attempting to sabotage the efforts of serious DP users.

What I do not agree with is your statement about the origin of a hacker — that is someone who spent hours locked away with a home computer. Long before the advent of home computers the hacker had risen to an almost legendary status. The hacker was the person you sent for when you needed some catastrophic software failure — usually on a PDP-11 mini — fixed yesterday.

A good hacker — and by definition there were no bad ones — had, and indeed still has, the ability to fix anything, corrupted file, application program, system software or whatever, and fix it quickly. Naturally, some of these fixes were a little crude but such was the nature of the hacker

that most tended to be rather elegant repairs that tended to become accepted as part of the software.

For such a fix the term "a neat hack" was coined.

John Harper,  
Roker,  
Sunderland.

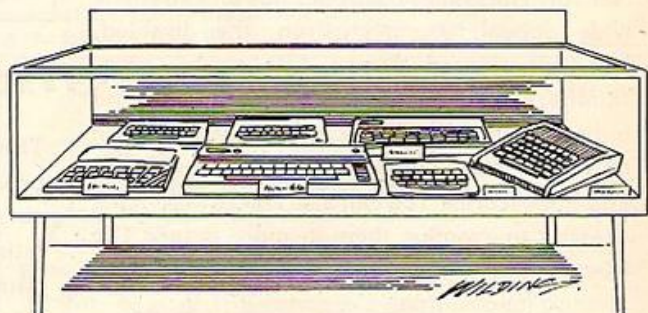
## PRESTEL WARNING

I WISH TO issue a warning to future modem owners who are interested in subscribing to Prestel, the British Telecom Viewdata Service. The warning is watch out, you may be in an area which cannot get Prestel at local call rate.

(continued on page 27)

## "SAVE YOUR OLD COMPUTERS"

### COMPUTER MUSEUM



I AM WRITING to ask your readers to think twice before throwing any old pieces of electrical equipment out, especially old calculators and computers.

The urge to collect in the human species is such that today's radios, calculators and especially computers will be tomorrow's collector's items — worth perhaps huge sums of money.

To prove my point, one only has to look at the prices old wire-leses fetch. In the days when such things were common, many people threw them away thinking that their ubiquity proved them worthless. And how wrong they were!

The reason I am making this appeal is so that posterity will be able to look at our present-day devices and marvel at their antiquity.

I am already beginning to build up a collection of old and obsolete microcomputers. They can be obtained for practically nothing, often in pristine condition.

So, think twice before you part with that old computer — it could be worth a fortune one day.

Robert Sedgwick,  
Grimsby,  
South Humberside.

# NEW!

## THE GAMES PLAYER

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Our latest Interface for the Spectrum is the ultimate in games playing accessories. Not only is it a joystick-interface but also a games speed controller. This interface will enable you to become the master of any computer game.

### Joystick Interface

When playing any game at normal speed the interface has all the features you would expect from a DK product. It is compatible with almost all games currently on the market and is fully Microdrive compatible. The port simulates in (31) command and will accept any joystick fitted with a 9 way D plug including the rapid fire types. (e.g. QuickshotII).

### Freeze Feature

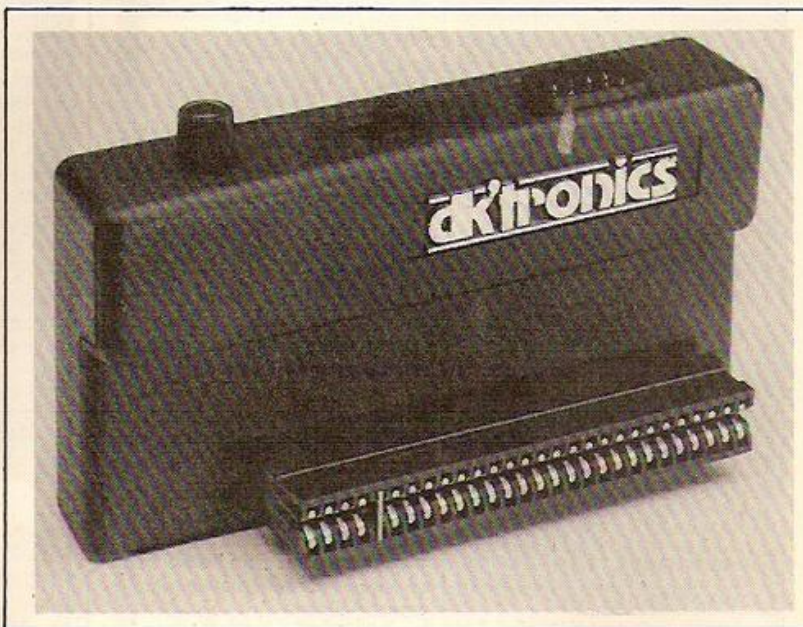
The secret of the interface is the "Freeze" control, after slotting the interface onto your Spectrum's expansion port you can adjust the speed of any game or program and even "freeze" frames simply by turning the speed control. The games controller has an extremely wide appeal; young children, the disabled, less experienced games enthusiasts, programmers and software developers will find individual benefits, you can slow games down to a complete stop and so improve your skills and high scores. You can also freeze individual screens to examine them in more detail. The freezer adds a new dimension to your games playing (or cheating).

### Quickshot II Joystick

The perfect companion for your games controller, the Quickshot II offers the following features: Super positive response. 2 fire buttons. Stabilising suction grips. 4ft lead. Improved control grip. Trigger fire button. Rapid fire option. At only £11.95, it represents superb value for money.

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# IN ★ TOUCH

## How to write for Your Computer

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

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

## Telsoft

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

## Message service

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

(continued from page 25)

It was only after I had subscribed that I found out that the whole country was not at Local Call Rate.

It looks as if I will have to sell my modem soon as our telephone bills are through the roof. If any other Prestel users who do not get the service at local call rate would like to contact me over Mailbox to exchange views on this, my Mailbox number is 082422531. I shall fight on.

Robert Evans,  
Ruthin,  
Clwyd.

## SCREEN ERROR

THANK YOU for publishing my program Screen. However several errors have occurred in the text which could lead to difficulty in using the program. The corrections are listed below Page 101, Column 2.

Line 16 "Pressing shift and graphics will alter the letter to an inverse G indicating that keys with graphic characters will have those as face value while the others are normal face value."

Line 28 "1 Indicates"

Line 31 "2 Will"

Line 34 "3 Then"

Line 38 "Editing of the screen may be carried out at any stage up to new-line on 3"

Page 102 Column 2.

Line 11 "PEEK x+1" (No brackets) Line 10 the flash character may be altered by Poking 16772 with the code of the character required.

Mark Stenlake,  
Whitwick,  
Leicestershire.

## CREEPY BUGS

IT HAS come to my notice that my program Creepy Castle — March — as it stands will not work on the Oric-1, only the Atmos. This is mainly due to bugs in the Oric-1's Rom but there is also a missing line from listing 1. There should be a line: 4525 POKE # 7800, # 4C:POKE # 7803, # 4C:POKE # 7806, # 4C

When the Oric-1 loads in a block of memory, it decides to adjust the Basic program pointers resulting usually in "out of memory" errors. To get around this problem, insert the following lines in listing 1: 25 DOKE1024, DEEK (# 9C): DOKE1026, DEEK (# 9A) 32 DOKE # 9C, DEEK(1024): DOKE # 9A, DEEK(1026): CLEAR

I believe that the Val function on the Oric-1 evaluates hex numbers — preceded by a hash — as zero resulting in the machine-code loader not working properly. This problem can be partially solved by making the following changes to listing 2:

10 INPUT "START ADDRESS (- 1 TO END)";A  
20 IF A = - 1 THEN END ELSE  
C=0  
35 INPUT B  
40 IF B = - 1 THEN 80  
50 POKE A,B  
60 A = A + 1; C = C + B

Now -1 is entered to terminate a block instead of "S" and each number entered must be prefixed by a hash character.

# YOUR Letters

Also, in the article the command for saving "castle3" should read, A6912 after "Castles" not ,A6192.

Myles Dunlop,  
Totnes,  
Devon.

## OPEN WINDOWS

THIS IS a modification to Ian Briscoe's Windos program which may be of interest to those without Microdrives — and maybe some, like me, with — who would like a VDU command to make the Windos system easier to operate. There is a bit of unused space between the program and the UDG area, and this is where this fits. Load Windos, then run the following program:

```
10 RESTORE: DATA 17, 118, 27,
225, 167, 237, 82, 32, 250, 213,
223, 254, 44, 192, 231, 205, 251,
36, 253, 203, 1, 118, 40, 6, 205,
213, 45, 215, 24, 236, 205, 54,
32, 24, 231
20 FOR n = 65282 TO 65316
30 READ a: POKE n,a
40 NEXT n
50 SAVE "WINDOS" CODE
60000,5317
```

Following the normal setting up for Windos — i.e., Rand USR 60000: Rand USR 60003 — insert the command Let VDU=65282. Now try the following Basic line:

LPRINT USR VDU, 31, 22, 10, 10, "HELLO", 5, 5, 6, 10, 5, 5

This is exactly the same as:

LPRINT CHR\$ 31; CHR\$ 22; CHR\$ 10; CHR\$ 10; "HELLO"; CHR\$ 5; CHR\$ 5; CHR\$ 6; CHR\$ 10; CHR\$ 5; CHR\$ 5;

Dave Spagno,  
London E2.

## CORRECTIONS

Statement 542 in April's QL Tutorial program was omitted. It is located at hex 458 and reads trap # 0. The hex code for this instruction is 4E40.

The hex loader for April's Amstrad Disassembler needs modifying before it can work. Change line 200 to read:

```
200 POKE address+y,a
and insert
165 y=0
205 y=y+1
```

The character which precedes the command for enabling the disassembler should be a bar character — shifted @ — and not an exclamation mark as suggested in the text.

The error messages printed in inverse video in lines 6000 to 6040 of April's Spectrum Singlestep program are not clearly visible.

They read, in order:  
Number out of range  
Not a decimal number  
Not a hex number  
Not a suitable flag value  
Interrupts disabled

Lines 595 and 610 in the listing for April's CBM Pikchachanja are not clearly printed. They should read:  
595 GOSUB 800  
610 X=X1:Y=Y1:etc

## EYEING UP A VDU PROBLEM



ONE FACTOR seldom mentioned in connection with VDU problems is that of viewing distance. A comfortable reading distance for a typical *Your Computer* article is about 40 cm. At this distance a capital A subtends an angle of 17 minutes at the eye. The equivalent distance for a ZX computer on a 12 inch screen is 90 cm, or about three feet, a far cry from the common practice of standing the monitor on top of the computer.

When the screen is too close flicker is exacerbated since more of the screen falls in the area of peripheral vision, and also the eye can only comprehend part of the screen at any time, leading to excessive eye movement. My suggestion to those suffering from eye strain is to move the screen further away if at all possible.

Phillip Bender,  
Sunderland.

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# I could do that...

If the few examples on page 31 stimulate you into giving some thought to making more imaginative use of loops, maybe you'd like to try your hand at this month's First Bytes competition and a chance to win our £15 prize. To enter, simply write a short routine to achieve anything you like — but make sure it incorporates no more than five loops — at least one of which should be nested.

Your program should also include a dynamic variable linked to the increasing or decreasing value of one loop, and a counter.

Send your entry to First Bytes, Your Computer, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

P Wilby, 34 Sheldon Close, Bransholme, Hull wins March's competition to write a program that modifies itself. His routine makes program lines which start with five colons invisible when listed.

By changing the first colon to a zero byte it fools the operating system into thinking it has reached the end of a line. To make the lines visible again change the 0 in line 10050 to 58. The program runs on the Vic-20, and the Commodores 16 and 64.

Anyone interested in the subject of self-modifying code might care to look at *Scientific American's* computer recreations feature. A recent issue introduced the fascinating idea of Core Wars — battles between two or more programs in memory at the same time. The aim of each program is to gain control of all available Ram space by replicating itself and attacking the others.

```
10 PRINT "THIS PROGRAM"
20 PRINT "PROTECTS LINES"
30 PRINT "8 TO 9999"
40 PRINT "FROM"
50 PRINT "PEEKING EYES"
10000 A=PEEK(43)+PEEK(44)+256
10010 ADDRESS=PEEK(A)+PEEK(A+1)+256
10020 LINE=PEEK(A+2)+PEEK(A+3)+256
10030 IF ADDRESS=0 THEN END
10040 IF LINE=10000 THEN END
10050 POKE A+4,0
10060 A=ADDRESS
10070 GOTO 10010
```

# 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.

## A bluffers' guide to micros

ADMIT IT. You're not really a computer expert. Okay, you know all about what's at the heart of every computer — a microprocessor, of course. You've probably figured out the oblique reply to the question "But what is a home computer for?" (The correct oblique reply is "What is a piece of paper for?").

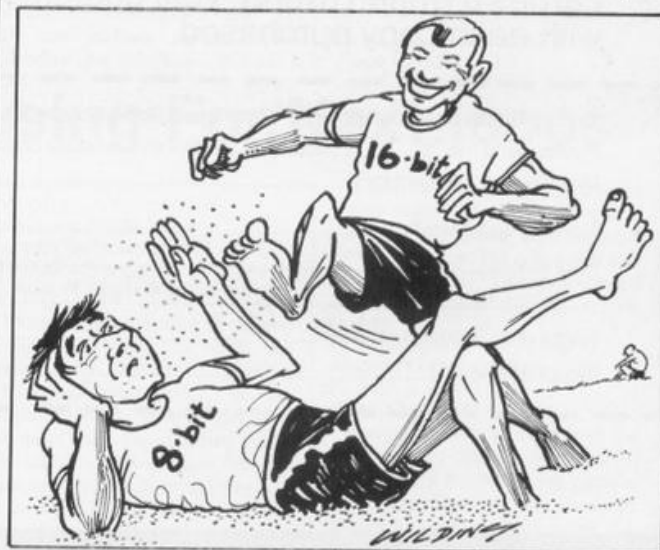
Maybe you even know enough not to get into a situation you can't handle — like trying to sing the praises of a CBM-64 to someone who owns an IBM PC. But at the end of the day there are still those bits of the conversation when names are dropped or antique machines referred to that make you feel like the man who hasn't been reading the FT. No comment.

Well, *Your Computer* is here to help you. Over the next few months we hope to develop, not just your knowledge, but more importantly, your techniques for defence. As with ju-jitsu, skilled micro-bluffing is all about turning aside remarks that threaten to expose your abysmal ignorance.

First, know your enemy. As with all social groups, there is a recognised pecking order among micro owners. A TI-99/4 owner, for example, is treated very often by the rest of the pack as a complete pariah. Why should this be? After all, as the distressed Texas owner often cries out whenever the pack starts circling him: "It is a 16-bit machine!"

Surely a 16-bit micro owner should be able to kick sand in the faces of mere eight-bit micro owners. But as we watch, we discover that for the Texas owner, at least, this is anything but the case.

The encounter is as horrifying in its way to the detached observer as watching a python swallow a lizard whole in a David Attenborough documentary. Nevertheless, it is instructive, since we are already deep in microbluff territory. What is the true meaning of the piteous cry of 16-bit, coming as it does in stark



contrast to the rhythmic tribal grunting of "Eight-bit, eight-bit"?

We all know what a bit is, of course. Defined elsewhere as "a boringly dichotomic entity which precludes rational discussion," the bit is more precisely a binary digit. Microbluffs and microbluffers alike all learned at mother's knee that each of the elements comprising the memory of any computer is a binary system — one state denotes 0, the other state denotes 1. But this cannot help our hapless Texas owner. He is the victim of two things: architecture, and history.

First, architecture. The term eight-bit normally refers to the width of the data bus as opposed to the address bus. The job of the address bus is to access addresses in Rom or Ram. The instruction that the address refers to is sent back to the CPU via the data bus. The address bus is one way. The data bus is two-way — for example the instruction the address bus got hold of might require the transference of further data from Rom or Ram, or even to the input/output ports (I/O in microjargon).

Most home computers like the Spectrum, BBC, Commodore 64 etc are referred to as eight-bit micros. This refers to the width of the two-way data bus. And the width of the data bus determines how much information is processed in the CPU

in a standard amount of time.

Obviously a true 16-bit micro ought to be able to shove twice as much through the CPU in the same standard amount of time. Just like a six-lane highway can carry twice as much traffic as a three-lane. But — and this is crucial to the TI-99/4 — big motorways can create parking problems in the city centre. For all its 16-bit architecture, only 32K of memory could be accessed by the 9900 chip deep in the heart of ever Texas.

And instead of having just an address bus, data bus and control bus, like the 6502, 6809 or Z-80 chips found in most home micros, it had a separate communications register unit I/O bus as well. So it needed an expensive 64K pin package to keep everything moving around. And instead of carrying on-chip registers like conventional processors, it had blocks of workspace registers in Ram memory.

All it had on the chip was a program counter flag register and the register pointing to the current workspace. So basically it's weird. It had its uses as a dedicated chip in military aircraft and so on, but proved to be too expensive and too strange to be bought by people in large volumes — which chips have to be if they are to be worth making. So much for architecture. Now for

(continued on page 31)

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(continued from page 29)

history.

When the Texas came out over here, you could only buy it with an NTSC colour monitor, so it could set you back £1,000. (Did you know, by the way, that NTSC stands for Not The Same Colour twice?) It spent a long time at £600 in the UK, went through a peculiar phase of being sold for £200, but you could get another £50 back if you sent off a voucher, and ended its days being sold for around £80. Finally, it was withdrawn from the market.

This is a vital piece of home computer mythology, symbolising the legendary price-cuts that reward the patient. It is also a severe lesson in bad marketing. As Commodore chronicler Mike Tomczyk says of TI in his gross book *The Home Computer Wars*, "I figured that if a giant semi-conductor company that

made its own chips charged that much money, they either didn't know how to control their manufacturing costs or were gouging profits at the consumer's expense."

So, to summarise, what the pack is conveying to its victim is basically this: "You are a sucker. You bought something that turned out to be slightly less successful step in evolution than Neanderthal man. Worse, you (a) paid a hell of a lot of money for it, (b) bought it for next to nothing off a scrapheap, (c) were given it for Christmas by a loveable but eccentric uncle who thinks that Prestel is a Jewish delicacy".

The pack is demonstrating its irrational but natural fear of the alien. Nearly all of them are 6502 or Z-80 based. There may be a few Dragon owners who are glad it is not their turn to be picked on. There is little the victim can do to defend

# BEGINNERS

*first bytes*

himself. "To the initiated, the 9900 chip is powerful and flexible," he may call out — this is a strange mantra he has gleaned from an old copy of *Practical Computing*.

He can point out that the mutant communications register unit I/O bus can address up to 4,096 individual bit I/O lines. But he is

clutching at straws — the unique TI speech synthesiser add-on has addressed him more often than he has used the computer to address anything else.

He must divert the attention of the pack. As the baying raises to its peak, he plays his trump card. He yells, "Well, I know for a fact that George over there has got a COMX-35 at home!" and runs like hell.

Paul Bond

## Elegant programming: using For/Next loops

ELEGANT PROGRAMMING doesn't necessarily mean sitting at your micro wearing a pink carnation and spats — especially if you're female. It's more a question of rethinking those bad old hacking habits you've picked up, so that your self-written Basic routines don't look to others as though you found them at the bottom of a cardboard box.

Take as an example the ubiquitous For/Next loop. It's one of the most powerful Basic commands there is — and probably also the most abused. Check through your own uses of it and you'll doubtless find that you have in all innocence introduced a couple of classic chip-charring catastrophes.

For/Next loops are versatile; use one as a counter set to the number of times you want a particular operation to be executed, to mimic a clock, or

to stuff your arrays full of data. They'll always work much better, though, if you observe a couple of golden rules.

First, don't skimp on labelling, especially if you're nesting — that is, introducing one loop or more inside another loop. This is sloppy:

```
10 FOR L=1 TO 10
20 PRINT L
30 FOR D=1 TO 350
40 NEXT: NEXT
```

Now the proper order of execution might be clear in this simple example — but such routines aren't always so easy to decipher when you're checking over a listing of a program you wrote months before. So why not make the last line

```
40 NEXT D: NEXT L
```

and remove all risk of confusion?

Next, it's wise always to close down a loop when you're finished

with it, like this:

```
10 FOR L=1 TO 10
20 IF L=7 THEN PRINT
   "SEVEN": L=10: GOTO 40
30 NEXT L
40 REM PROGRAM CONTINUES
```

There is an exception. You may sometimes want to use the "exhausted" value of L in a subsequent statement. If so, remember that it will usually total one more than the specified value. For example, if you Run the first demo again and then enter Print L in direct mode, you'll find the number printed in response is 11.

Of course, you can also weave in the changing loop value as a dynamic variable in a routine:

```
10 FOR L=1 TO 10
20 PRINT "":
30 FOR D=1 TO (500*L)
40 NEXT D: NEXT L
```

A loop can also be used to create a simple timer. Most micros have a real-time clock held in a reserved string — such as TIS — but you may want to keep this by for another part of your program. So use a loop instead:

```
10 FOR CD=10 TO 1 STEP -1
20 PRINT "COUNTDOWN" CD
30 FOR D=1 TO 350
40 NEXT D: NEXT CD
```

You're probably familiar with the technique for filling one array or more using a For/Next loop equal to the total number of elements involved. However, don't forget that you can nearly always bypass an array provided there are 10 elements or less. Try this:

```
10 FOR L=1 TO 5
20 READ D$
30 PRINT D$
40 IF D$="ORANGES" THEN GO
50 NEXT L
60 PRINT "YOU'RE OUT OF
FRUIT!"
70 END
80 DATA GRAPES, BANANAS,
LEMONS, PINEAPPLES,
ORANGES
```

Finally, don't overlook the power that a For/Next loop can bring to all kinds of string-sorting chores. For example, some Basics — such as Commodore's — don't have an equivalent to the INSTR function available on the BBC which searches a string for a specified group of characters and returns its location. But this very useful facility can be emulated:

```
10 A$="YOUR COMPUTER"
20 B$="PUT"
30 FOR L=1 TO LEN(A$)
40 IF MID$(A$,L,LEN(B$))=
   B$ THEN GOTO 70
50 IF L>LEN(A$) THEN PRINT
   "NO MATCH FOUND": GOTO 90
60 NEXT L
70 PRINT "POSITIVE MATCH
FOUND"
80 PRINT "BEGINNING AT
CHARACTER" L
90 END
```

After trying this version change B\$ to "OUR" and Run the program again; next, make B\$="NIL".

John Ransley

## The flexible floppy disc system

ALTHOUGH CASSETTE tape is a perfectly adequate medium for those people who just want to dabble with computers, most serious users find it too hampering for real computing. It is awkward for handling program files and downright obstructive for manipulating data files of more than a handful of records. The remedy most sufferers of data headaches turn to is the floppy disc.

Discs — Americans call them disks or diskettes — are flat, round platters of magnetic material encased in a plastic shell. They come in a variety of sizes; eight inch, five and a quarter inch, three and a half inch, and three inch. There are also a number of different formats, densities and single or double sidedness.

In order to use discs with a micro you need three elements; a disc drive, an interface and some controlling software. Normally, a disc drive will be sold with all three components included in the asking price, however that is not always the case. Most manufacturers market a disc package

designed to work with their computer.

The notable exception to this rule is Sinclair Research, who has decided to plough a lonely furrow with the Microdrive. Yet Sinclair owners who desire the flexibility and convenience of floppy discs can turn to the third party disc manufacturers who also market units for other ranges of micros.

When buying a disc unit, it is worth taking a look at the "official" unit for your system first. This is usually the same as the most popular drive and is important because any disc-based software produced for your system is likely to be available in this format. Before purchasing, check that the drive you intend to buy is supported by the software houses.

You will almost certainly want to transfer your library of software to your disc drive. This should be a trivial task as far as converting your own Basic programs is concerned but may be much more difficult for

commercial software.

Depending on a number of factors, you should expect to part with around £200 for a single disc drive. A twin drive unit will often cost less than the sum of two singles as the power supply, controller and interface will be shared.

Remember that eight inch discs are a dying breed. Five and a quarter inch discs are still popular, though the drives can be more expensive to buy. Microfloppies — that is the Japanese three and three and a quarter inch discs — are becoming more and more popular all the time; however the discs are expensive to buy costing around £5 each.

Apart from the hardware, you will also be faced with a choice of operating systems. If there is a system specific to your micro, such as Commodore Dos or AMSDOS, you will have little choice. CP/M is a standardised operating system which will open your machine up to a wide range of software.

Bill Bennett

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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

### Memotech

Memotech owners now have a magazine devoted just to them. It has articles on the machine, programs to type in and offers on commercial software. Contact the Memotech Owners Club, 23 Denmead Road, Harefield, Southampton..

### Christian

A club has been formed "to promote the use of microcomputers in Church related activities". Christian computer users should contact the Secretary, P.A. Clark at the Christian Micro Users Association, 6 Wakely Street, Sheffield, S6 3RG.

### Atari

Atari owners in the Watford area might like to join this likely bunch of WAG's (Watford Atari Group). Yet another offshoot of the ever prolific Infomania group, they plan to cover a wide range of Atari related activities. WAG promise a software library and newsletter as well as regular meetings at Infomania HQ. Membership is £15 per year. Interested Atariists should contact Chris Bone (Garston 672235), or write to him for more details at 10 Garston Drive, Garston, Watford Herts WD2 6LB.

### Elbug

The publishers of BEEBUG for the BBC have produced a cut-down offshoot for a cut down computer, the Electron. For £9.90 you get 10 issues of ELBUG, and the club provides other facilities such as local user groups, a discount scheme with a number of retailers and a software library. It's available from ELBUG, PO Box 109, High Wycombe, Bucks HP11 2TD.

# COMPUTER

Patrick McDermott takes the high road to Glasgow and discovers omnibuses as well as databuses at the S.P.T.E. club.

*club*

THERE ARE five, perhaps six, computer clubs around Glasgow. There might be over 100. The difficulty in knowing arises from the fact that they do not make themselves known, particularly to each other. By far the largest and best known is the S.P.T.E. Club organised by John Reid.

When I visited the club for one of the Sunday evening sessions, John was putting on a performance like one of the stall-holders at the famous Glasgow "Barras" market. With a CBM-64, disc drive and monitor, he enthusiastically demonstrated the wonders of computer programming to a gathering of 30 or 40. Not that it seemed necessary to sell them the idea, most listened attentively and stopped him in full flow if he had gone on too quickly.

Elsewhere in the large room, four or five small groups were working on their own, maybe they were playing games; but if they were, then they were silent ones, for games playing is not encouraged until the final hour of each meeting.

The tutorial that was taking place was the easy part of what is a very impressive programming course that forms the main part of the club's activity. This was the second of 12 fortnightly meetings that begin by assuming that the participants have no previous knowledge and end 24 weeks, three test papers and a programming project later.

On completion each member will have a full working knowledge of Basic and a complete set of detailed course notes and exercises for future reference. The course is not as stern as it may sound; the test papers indicate to John and his assistants where extra emphasis is required or

if any private tuition is necessary. Just now courses in Sinclair and Commodore Basics are run with an Amstrad course a possibility for the future.

If the whole business seems more like hard work than fun, then that is far from the truth. The membership of 192 is made up mostly from Strathclyde Passenger Transport Executive — S.P.T.E. bus crews and their families, although anyone can join, children with their parents approval only. The meetings take place in the staff function suite at one of the depots, a venue that comfortably provides all the necessary facilities and allows the nightly fee to be kept to 20p for adults and 10p for children.

As with most public computer clubs, there is a span of age groups and while I saw no-one under ten or over fifty, there was a variety of all inbetween working together. Unlike a lot of clubs there was a reasonable representation of female members.

I was surprised to see that there were relatively few computers at the club. Not, I found out, because members didn't have one; but that the organisers preferred people to work together. The theory seemed to work. Spread around the room there were people working on databases, music programs, writing adventure games, helping each other come to terms with machine code as well as Basic. A variety of machines were in use; Commodore 64s, 16s, Vic-20s, BBCs, Amstrads and Spectrums. There were also a variety of monitors, VVS, disc drives and cassettes that seemed freely available.

When younger members found

that their joysticks were going down faster than Mary Decker when they played Daley Thomson's Decathlon, John Reid designed and built a more durable customised joystick from the broken one and some extra parts. For more serious breakdowns of computers or peripherals, members can have repairs made via the club which has an arrangement with a local workshop.

Arrangements with other businesses provide discount discettes, discounted software and Activision, and has enabled the club to form its own library. A local book distributor allows the club to review books and then to purchase their choices at a discount. Businesses benefit from greater trade and the club by being able to offer more facilities to its members. Other businesses seeking similar benefits would be made most welcome.

Travelling has never presented any problem to the S.P.T.E. computer club. Free busses are one of the perks of the job and there is no shortage of drivers, a facility that the club intend to make the most of. A full list of outings to computer shows, commercial installations, and some of the computer manufacturers that abound in the area is planned. It is a facility that the club is willing to share with any other local club who dares make themselves known. Other clubs could benefit from both the visits and opportunity to witness an active, well organised and resourceful club at close hand.

The S.P.T.E. Club will welcome any inquiries from business or prospective members and details can be had from the organiser: John Reid, 3 Meadow Road, Partick, Glasgow.



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# ADD-ON EXTRA

## XK Spectrum

Spectrum 48K  
Television Services  
£20.95

The XK is available as a kit add-on or fitted to your Spectrum for £5 extra.

What it does is hack the Spectrum's memory up into two 32K pages. It also allows you to add up to 128 external pages, each up to 32K, onto your machine.

Each page of Ram can have a program running in it, and have a separate screen window dedicated to messages generated by that program.

One major problem is that most of the more complex games such as Alien 8 and Lords of Midnight won't run on an XK Spectrum, and being a soldered-in modification, you can't quickly change back.

## Maxam

Amstrad CPC-464  
Arnor Ltd.  
£59.90

Arnor have come to the serious CPC-464 owner's aid with a comprehensive piece of hardware containing an assembler/disassembler/editor.

The small board plugs into the Amstrad so that most of the circuit board disappears inside the computer under the existing PCB. It provides an expansion bus extension and a slot for further Rom boards. You also get a 50-page manual which explains the use of the Rom-based assembler and the commands available.

Calling the assembler is done from Basic using extended commands.

Arithmetic operators and labels are supported and parameters can be passed from Basic to the code and back.

The RST command is mentioned only rather briefly in the provisional manual provided. As this controls breakpoints. This could have done with more explanation and examples. Aside from this rather minor quibble, this looks like a product no serious Amstrad user can afford to be without.

# HARDWARE

## Quick Disk

- Various
- Disc drive
- Triton
- £129

THE QUICK Disk is designed as a cheap alternative to floppy disc drives, with only a slight reduction in performance.

There are three versions, Spectrum, Commodore 64 and MSX available, each priced at £129 with 100K 3in discs available at £1.99. The hardware consists of the disc drive and an interface box which plugs into the rear expansion socket of the computer. The performance of the drives is only marginally slower than normal disc drives.

A file takes a minimum of one sector and there are 20 by 2558 byte sectors per side, providing a maximum of 20 files/programs per side. Data files may be transferred between the three types of computers using the discs.

The drive repositions itself at its start position after every operation; this adds a further three to four seconds before the next disc access can be made, but does leave the head out of harms way and the data safe.

The quick disks overall are slightly quicker than the Spectrum Microdrives and appear to be reliable. Command format is simpler than Microdrive, but only just. As the quick disk built in software does not take up any additional space in memory, most software can be converted to run on the quick disk very easily using the conversion program provided in the manual.

There are a few problems with the Spectrum version — the only printer that can plug in directly is the obsolete ZX Printer, the Alphacom 32 does not work from the rear of interface. Interface 1 cannot be connected which loses the RS-232 port and modem facilities although a standard Centronics adaptor does work.

The MSX and Commodore versions do not have to sell against competitively priced products and appear to be good value for money, the Spectrum version needs tidying up to produce a viable alternative to Microdrives and stringy floppies.

## QCOM

- QL
- Communications
- OEL
- £200

BLOODIED BUT unbowed by the demise of Prism and Oric, OEL once again sally forth into the world of microcommunications. Once again they have teamed up with Scicon to produce a formidable product for a Sinclair machine. The hardware



Triton Quick Disk.

consists of three units: QCON, QCALL and QMOD. All three units come in QL livery and styling and stack one upon the other.

The unfortunately named QCON is the guts of the system. It plugs into serial Interface 2. It uses the TI 7000 single chip micro and controls protocols, baud rates, receiving and sending data. This can be plugged into a standard modem with an RS-232 interface, or another QCON on another QL to provide short-distance communications.

This, bought separately, would cost you £75.95 and comes with all the Scicon software. QMOD is an autodial, autoanswer unit which, at £79.95, might seem an expensive luxury to the hobbyist, but will make a big impact with the business user.

QCALL is a standard OEL V21 modem at a standard OEL price of £49.95. The hardware is only half the story. What makes this product worth a second look is the software. You get some idea when they tell you they only have room for one Prestel frame at a time in memory, the rest is filled up by the software!

The computer can be used as either a Viewdata terminal or as a VT100 terminal emulator, even down to simulating the numeric keypad. These models can either be accessed via a series of menus or the confident can just use command words.

Using Prestel is simple in as far as using Prestel is ever simple. The # and \* commands use the Enter and / keys. While on line, frames can be saved, loaded, printed either in text only — i.e., fast — or a full graphics screendump with shading is available

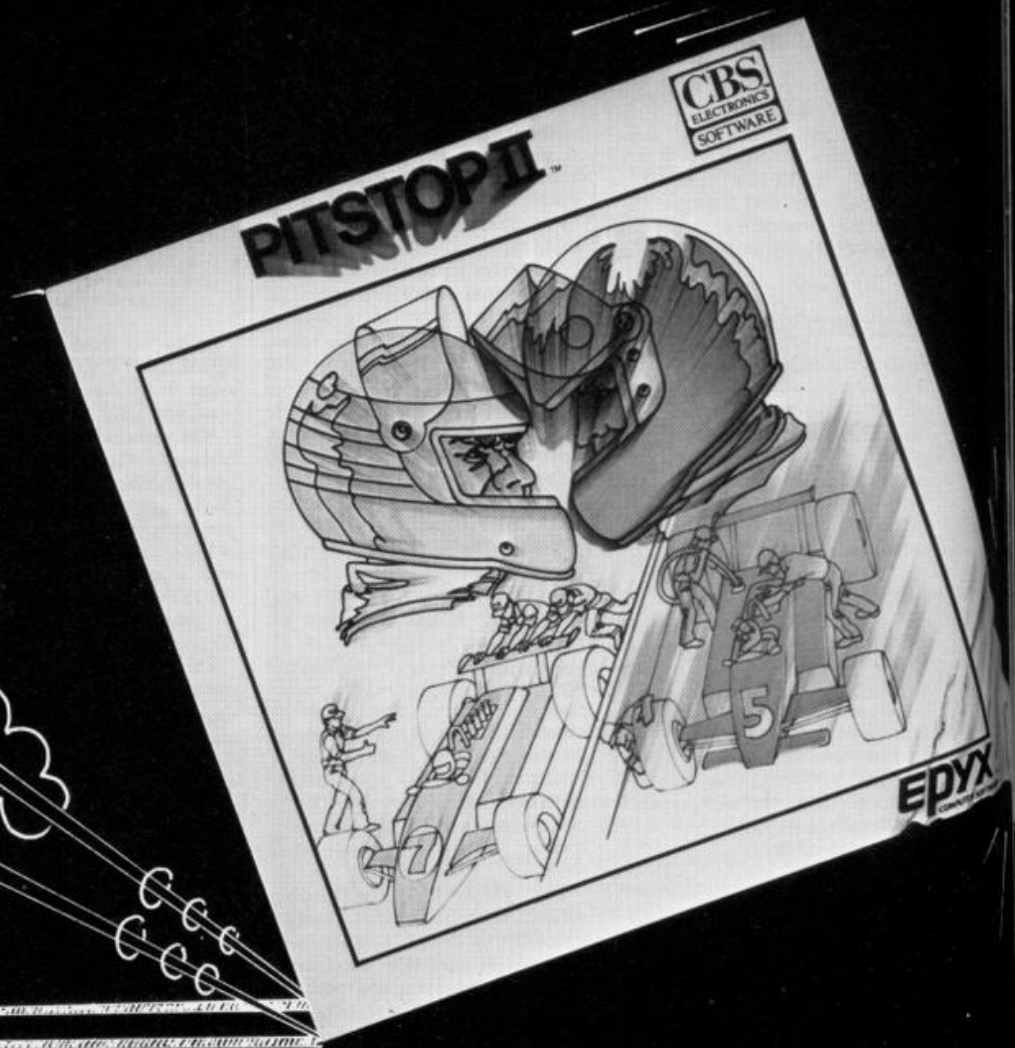
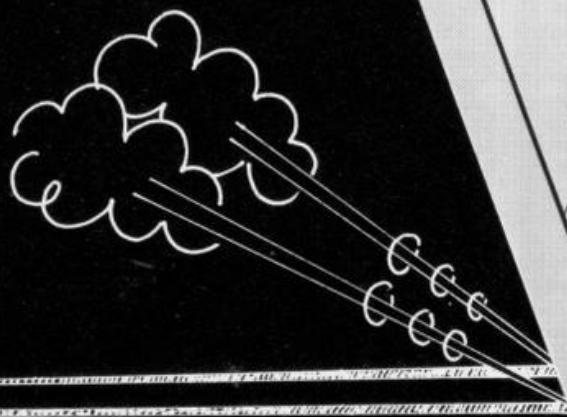
which takes a few minutes. The phone book you load on booting the software can contain up to 50 named pages. Each entry on a page is given its own number and prompt string, so once you're through, logging-on is automatic.

The filing commands, again available when on line are very comprehensive, indeed they represent a major improvement on QDOS, with the sort of facilities you would associate with a proper DFS. Data on Microdrive can be encrypted and, if necessary, this encrypted version can be transmitted, with the encryption code sent by some other means.

A command sequence can also be saved on Microdrive. This allows the user to, for instance, write a message for a Telecom Gold mailbox, run his mailbox program and then walk away and let the computer get on with it, even using delayed send to send it while he's asleep!

User-to-User comms works very smoothly. Although 1200 half duplex, time sharing between both ends means it appears full duplex. Both message and file transfer is possible, with checksums sent and echoed in the latter case. Of course, this unique protocol means a QCOM user won't be able to talk to anyone else, even should they wish to converse with such mere mortals in the Spectrum and BBC world.

For the business user, the simple menus and the ruggedness of the software won't leave him with a crashed program and a big phone bill. The hobbyist will revel in the numerous clever facilities, and it might even find a market as a cheap alternative to buying a VT100 terminal for mainframe users.



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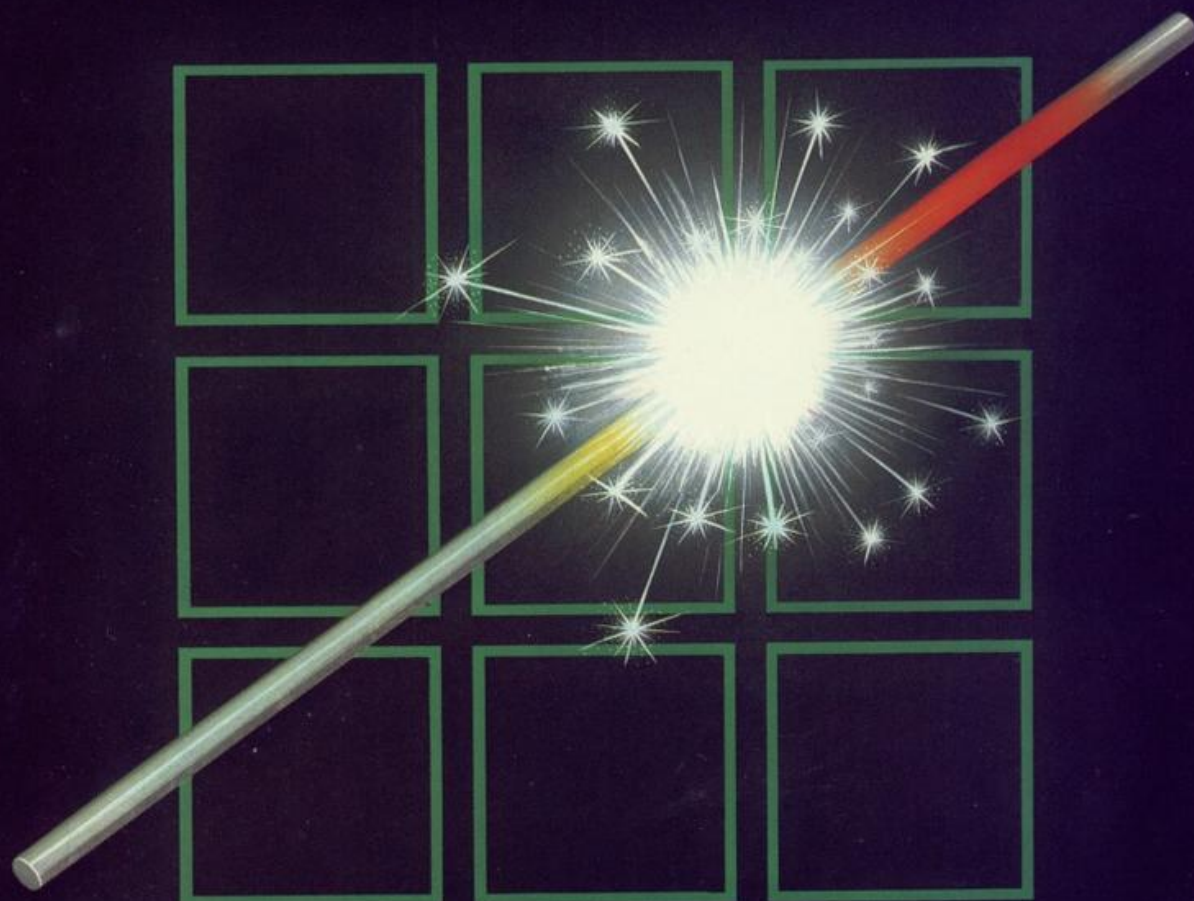


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# Star★ chart

## KEY

- ★★★★★ Best of its type
- ★★★★ Very good
- ★★★ Good
- ★★ Average
- ★ Below par

## Moon Cresta

ZX Spectrum

£6.95

Shoot'em-up  
Incentive

★ ★ ★

The Nichibitsu arcade classic, with an opportunity to win your own dedicated Moon Cresta machine. You blast away and score bonus points by docking successfully with the mother ship.

## Stay Kool

ZX Spectrum

£6.95

Arcade adventure  
Bug-Byte

★ ★

Everyone raved about Manic Miner but what Bug-Byte seem to have forgotten is you must put some oomph into the graphics if you want to get away with this sort of thing. Silly jokes about police boxes and doctors are not enough.

## Caveman Capers

BBC Micro

£7.95

Moon buggy derivative  
Icon

★ ★

Nice to see some games for the BBC Micro after all this time. Your caveman rides on the back of a perambulating platypus. You must jump holes in the ground but avoid doing this when a low-flying bird is around.

## Pole Position

CBM 64

£9.95

Road Race  
US Gold

★ ★ ★ ★

The archetypal road-race game for your 64. It's all here, practice round, qualifying round, racing against other vehicles. Only carp is the under-use of CBM-64 sound facilities.

# SOFTWARE

## Formula One

- ZX Spectrum
- Management game
- CRL
- £7.95

★ ★ ★ ★

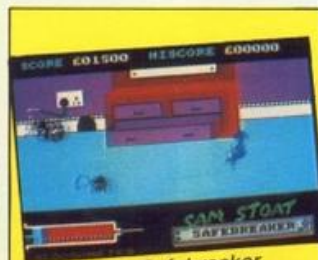
FOOTBALL MANAGER with racing cars. Fabri, De Angelis, De Cesaris, Piquet — you can hire them all provided they haven't already been bought up by your Spectrum. You can load up previous games, enabling you to continue a tournament over a long period of time, you can use a Kempston joystick and from one to six people can play at a time. There are five levels of play depending on whether you are a novice, junior, average, good or expert manager.

The six teams the players can manage include Brabham, Ferrari, Lotus, Williams, McLaren and Renault. You can also choose to be a driver — the ability to add new games in is a good one: stops the game getting out of date. After this you can select a sponsor, Saudia or Denim or whatever.

Now down to the nitty gritty — choosing your driver and then outfitting the car. Allotted a sum — depending on your sponsors — usually around £630,000, you can improve the driver, chassis, engine and pit crew. The more money you spend on your pit crew the faster they move in the pits. This is crucial, because although the race itself is randomly generated by the micro in the style of Addictive Games' Football Manager, you control tyre changes and adjustments by steering your man around the screen.

The graphics are functional rather than brilliant — but the heads of the crowd turn to watch the cars and the Goodyear airship moves majestically across the screen. After the race you are shown who won and how they're doing in the championship stakes. Other interactive elements of the game include deciding what sort of tyres to use, dependent on weather conditions, and when to go into the pits. Simple, enjoyable, no doubt socially divisive with six people fighting to get at the controls of one Spectrum.

Paul Bond



Sam Stoat Safebreaker

# Shortcut



Formula One

## Sam Stoat Safebreaker

- Spectrum 48K
- Arcade adventure
- Gremlin Graphics
- £6.95

★ ★ ★

THE LATEST character to emerge from the warren of the Gremlin Gang, Sam Stoat would appear to be as guilty as Monty was innocent. Intent on stealing a very valuable diamond he braves bouncing bed-springs, runaway pool balls, nasty green bottles, pogo gnomes and deadly gnomemobiles in his quest.

Rather like Statesoft's Icicle Works, you get four main scenarios to choose from. Sam prowls about in the dark below four houses ranging from easy to hard. Press the fire button and pop goes the stoat — you're in the house of your choice.

The basic scheme of the game is to locate the explosive bomb and match — then you can blow the safe. Having grabbed the diamond and whatever other jewellery may be lying around in the house, you can then move on. Each house contains 20 screens including the vital bottle of stoat elixir that boosts Sam's blood level — shown graphically in the form of a syringe at the bottom left hand side of the screen. At the top is shown high-score and how much money you personally have gained ill-gottenly.

The maximum score attainable is, we are assured, £64,384. This is not a game that I personally would go wild over. When all's said and done, it has to be remembered that the four houses with 20 screens are just the

same house with different levels of difficulty. Some nice graphical possibilities are hinted at, but Gremlin have a little way to go yet if they want to mutate into something bigger and meaner. Keep trying though, lads.

Paul Bond



Icicle Works

## Icicle Works

- Spectrum 48K
- Boulderdash clone
- Statesoft
- £6.95

★ ★ ★

DID THE ELECTRO-WIMP band name themselves after the game or vice versa? We may never know. Nevertheless, Icicle Works is a taxing and exciting game which bears many hereditary traits of Statesoft's earlier big hit, Boulderdash, for the Commodore 64.

The similarity lies in the snowballs. You dash around the screen, clearing paths and collecting parts of objects. If a bunch of snowballs falls on your head, you lose a life.

There are four main screens apart from the entry screen. This last is quite simple. You just saunter down from the top of the screen, grab a two-part key and decide which set of stairs you are going to go down.

In the first set you assemble a jet fighter and release a stream of water.

(continued on page 41)

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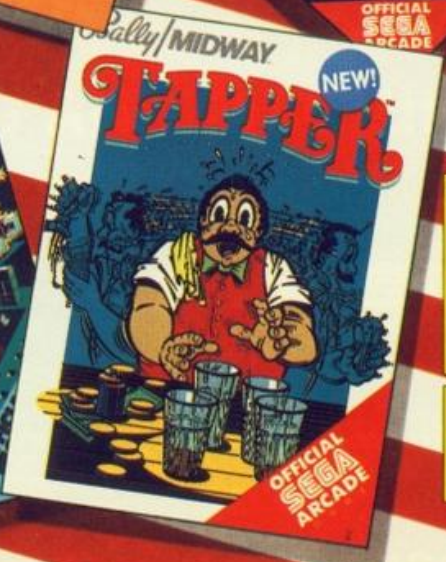
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# Star★ chart

## Mama Llama

CBM 64

£7.50

Arcade adventure  
Llamasoft

★ ★

Ingenious 10 by 10 rotating grid enables you to select from five scenarios in which you protect Mama Llama and her two babes voyaging through the cosmos. You can place retrogenesis and antigenesis devices into areas of the game to block attacks for you. This is an irritating game to play — games for purists are all very well but we at YC feel Jeff's getting too involved in his own head.

## Frankie 2000

BBC Micro

£7.95

Fantastic voyage  
Icon

★ ★ ★

Right-hand side shows X-ray view of human body, indicating where your minisub is in the bloodstream. Left-hand side is the arcade action as you journey through the trachea, etc., shooting germs. In the left lung you encounter cigarette ends!

## Berks

Commodore C-16 and  
Plus 4

£6.95

Robotronesque  
CRL

★ ★ ★

More genocide. Tool around shooting at pathetic robot Berks edging their way round a total of 32 randomly generated maze screens. Paralyse the flashing diamonds that threaten to crush you. And serve you right.

## Major Blink

Commodore 16 & Plus 4

£6.95

Painter

CRL

★ ★

Major Blink is the creator of the Berks. He is harassed by "bears" and drones who try to stop him painting the blocks on the screen. A competent implementation of this old favourite.

(continued from page 39)

On the second set you build a railway engine while moving around a maze; in the third you attempt to destroy volatile puffins by dropping snowballs on them; on the fourth you assemble a ghetto blaster.

The modus operandi on the last screen is the most ingenious of all. The screen displays a central line of mystery boxes. You knock snowballs down on to them. When you clear a path underneath segments of the ghetto blaster fall from the boxes. You then sweep back and collect the parts. As with the engine and the jet what you are building is gradually displayed on the right-hand side of the screen. Once you have built the radio you start collecting bonus points — but only if you collect the individual letters B-O-N-U-S in the correct order.

Each of the four main screens has exit doors which you use to pass through into ever more mind-boggling levels. You have to get through each part of the game in a certain time — too little time! — this one should appeal to the Chinese puzzle mentality.

Paul Bond

## Bug-eyes

Icon

Arcade adventure

Spectrum 48K

£6.95

★ ★ ★

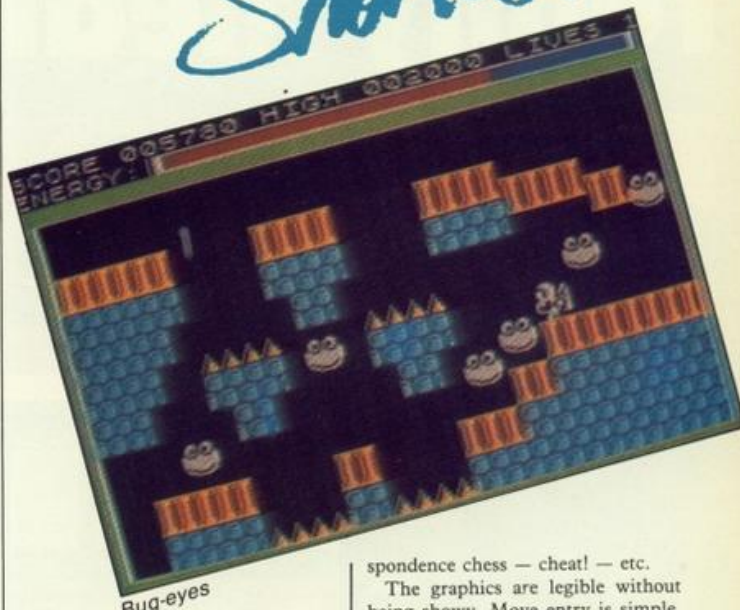
XXABANEANS RULE OK. Well, of course it's not OK since they intend to wipe out all intelligent life and have the universe to themselves. The dummies have invaded earth in a giant starship disguised as a meteorite. Your job is to penetrate down through the 10 levels of the ship and destroy its power generator.

Well-implemented graphics and a sense of humour make this game worthy of comparison with games in the style of Manic Miner. The big-nosed gliding ogre, the terrible twisting thingies, the wigglers and Big Jake all combine to despatch you with a despairing little squeak — all the more pathetic because of the Spectrum's not-wonderful sound capacity.

On the first screen you encounter the stamping stompers, a fiendish arrangement of ascending and descending plungers which make it a little like trying to walk through an internal combustion engine. Your little spaceman can only walk forwards or back, no jetpacking. Timing is of the essence. On most screens it is worth finding a place to ponder on how to scramble through the next set of obstacles.

When you fall through into the second screen you face the blinking bouncers. You also have a problem with disappearing bridges. The combinations of problems seem to grow increasingly more complex as you approach the base of each screen. You might miss the bouncers just to find yourself plummeting onto

# SOFTWARE Shortlist



Bug-eyes

needle sharp rocks from a non-existent bridge.

Lazer phazer blazers, the third screen, is really two screens in one. There are three layers of ray guns then you have to work through a cavern of spiders casually reeling and unreeling from the roof on their grisly gossamer threads.

Icon may not be a prominent name now, but with quality like this they soon will be.

Paul Bond

## Colossus Chess 3.0

Atari

Chess game

English Software

£9.95

★ ★ ★

Is THIS the greatest chess program on a micro? According to the handbook, Martin Bryant's Atari conversion of his Commodore 2.0 original thrashed 21 other programs mostly by 16-0. That includes Odesta's Chess 7.0 — Apple/Atari — based on a former World Champion program. White Knight II — BBC — it beat 13-3, Sargon III 10-6, and the excellent Parker Bros Chess — Atari, IBM PC — written by David Levy's Intelligent Software (Cyrus IS) — by 12-4. The list does not, however, include Psion's 3-D Chess on the Sinclair QL.

I tested it against the Parker cartridge and it confirmed its form. When it plays in Tournament mode — one of the six available — it claims an ELO rating of 1800 and gives moderate club players like me a challenging game. There are easier modes for beginners, plus Infinite and Problem modes for corre-

spondence chess — cheat! — etc.

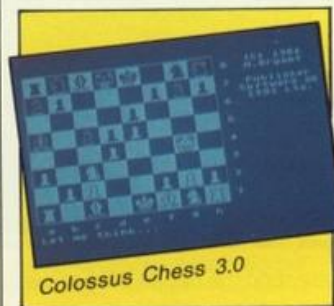
The graphics are legible without being showy. Move entry is simple, by either typing them in (e2-e4) or using the cursor keys. Pressing the space-bar toggles between the game board and a separate screen which lists the moves, shows the time on each player's clock, position and material rating and the program's latest thoughts.

Colossus also offers most of the other features you might want, including back-step, save and load game, and replay. You can even adjust the weight according to which positions are assessed, as like most programs Colossus will swap a small amount of material for a large positional inferiority.

The only major flaw is the handbook, which is almost illegible — black dot-matrix type on red paper — and has a cover of almost unsurpassed embarrassingness.

Atari chess enthusiasts have a number of options — Sargon, Chess 7.0, David Kittinger's 3-D Mychess, Parker Bros Chess — but except for the awful Atari Chess cartridge, they are all at American prices, i.e., very expensive. The fact that this is British, probably better and third to a fifth of the price makes it a best buy on either tape or disc. Highly recommended.

Jack Schofield



Colossus Chess 3.0

(continued on page 43)

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Another leap forward  
**QUEST**

# Star★ chart

## Android 1

CPC 464

Vortex

Shoot-em-up

£7.95

★ ★

Vortex made a name for themselves with TLL and Cyclone. They might have done better to bring out conversions of those games rather than this rather tedious game. Primitive graphics combined with naff sound effects and unoriginal material make this possibly their worst release to date. You have to get to the reactor core before it blows up. To do this, you shoot your way through walls, go through mazes, sideways scrolling and plan views. Naturally there are mutants to blast out of the way.

## Don Juan

Oric/Atmos

No Man's Land

Adventure

£8.50

★ ★

Perhaps it was inevitable that sooner or later this French software house would turn to the national obsession — l'amour. Given a choice of a number of young ladies to attempt to seduce, of varying coyness, you must seek to entice them into your little love nest by entering the right keyword at the right time. Some nice humorous touches; might provide some entertainment when inebriated.

## Rocketball

C64

IJK

Sport Simulation

£6.95

★ ★ ★

"This was never meant to be a game" in case you hadn't guessed this is Rollerball, hailed at the time as a grotesquely violent film IJK have removed all the blood and gore, and discover underneath a pretty trivial sort of game. Not bad as sport simulation goes, but I don't think International Football will be knocked off its perch by this one.

(continued from page 41)

## Banjax

■ BBC

■ Robico Software

■ Arcade Adventure

■ £9.95

★ ★ ★

BANJAX is one of those games that is enjoyable to play even though you do not get very far with it. Despite having been given some tips by Robico this reviewer was only able to explore less than a quarter of the game's 240 locations, but liked what he saw: pleasant landscapes, smooth animation, and just enough threats from spiders, blobs and suchlike to keep you on your toes.

It also boasts some of the best graphics in a BBC game since Frak. Like Frak it uses Mode 1 but varies the palette to give a different four colours in each screen.

Although challenging enough for those who seek challenge, the game has a pleasingly relaxed quality. As the character you control — a bear wearing a baseball cap — is unarmed you must avoid hostile creatures in your path. But if you do not feel up to dodging them you can leave the room. And when you return they are usually gone.

Some rooms, however, are blocked by gargoyles and guards. To gain access more energetic adventures will need to collect an assortment of objects. They will also have to map the territory thoroughly if they are to achieve the goal of the game and reach the Inner Sanctum of the Golden Temple.

Simon Beesley



Tempest

## Tempest

■ BBC

■ Superior Software

■ Arcade Classic

■ £9.95

★ ★ ★

IN HIS excellent survey of the arcades, *Invasion of the Space Invaders* Martin Amis calls Tempest the most abstract of all arcade games. The player is in charge of a claw which patrols the rim of a grid, a cobweb-like shape with lanes converging on a hub.

Out of the hub come a variety of what can only be described as animated geometrical figures — spikes, diamonds, stars, and so on. The player's task is to contain them — with the aid of a blaster or, as a last resort, a super zapper.

This version, translated to the

# SOFTWARE Shortlist



Banjax

BBC with Atari's approval, is the first to appear on a home computer. In its arcade form the use of sharp vector graphics creates a spectacular display as the various shapes cartwheel outwards and then flip along the rim. But much of the game's impact is lost with pixel graphics: lines look too jagged at this resolution.

Nonetheless Tempest is a sufficiently original game to be worth playing however it is implemented. As far as possible Superior Software have recreated its features faithfully, with nine different grids, 255 levels, and, although rather fuzzy, fast-moving graphics.

Simon Beesley

## Flyer Fox

■ Commodore 64

■ Flight emulator

■ Tymac

■ £9.95

★ ★ ★

A NICE SIMPLE stick and string air combat emulator, spoils somewhat by the premise that Mig fighters feel the need to shoot down civilian airliners in international airspace. They only do it in Soviet airspace. You are piloting a fighter in escort of a passenger jet. The screen display gives you radar on the left, compass on the right, artificial horizon in the centre plus showing altitude, fuel and score. Messages are also flashed up on the altitude reading to inform you when you are at the same altitude as the jetliner and also to



Flyer Fox

warn you of imminent contact with hostile aircraft.

The view from the cockpit shows a flat plain criss-crossed by straight lines to form a geometrical grid. This stretches away convincingly to mountains in the distance. When the game starts you are automatically elevated to the same height as the airliner you are defending.

You can't get any higher than the airliner. It always flies at your service ceiling.

Just before the attack the computer speaks — no add-ons required — and says "Mayday". It says other things at other times, all of them unintelligible.

All in all, good graphics, gripping combat action, garbled speech synthesis, all combine to make a tense and enthralling game.

Paul Bond



Dragon Torc

## Dragon Torc

■ Spectrum 48K

■ Arcade adventure

■ Hewson Consultants

■ £7.95

★ ★ ★

MAROC IS back. So what? Well, this is the entity who vanquished the Lord of Chaos and banished him from his earthly realm — a neat thing to mention in job applications. Afficionados of Hewson's Avalon will remember him; more importantly, they will have experienced the lateral thinking necessary to get things done in this program. Hardly anyone does anything for themselves; Maroc kicks off by projecting his soul — not one of the more manoeuvrable souls I may

(continued on page 45)

# The Dawn of a new beginning for your Spectrum

Introducing Discovery 1 – quite simply the most advanced and comprehensive disc drive unit yet developed for the Spectrum and Spectrum + computers.

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# Star★ chart

## A Day in the Life

Micromega  
Spectrum  
£6.95

★  
One of those twee games featuring you-know-who (snigger, snigger) a bloke with bald head and glasses who is (tee-hee) quite important in the (ha-ha) U.K. computer industry.

Oh no, oh no it's no good I can't hold back, it's Sir Clive and the game has really primitive graphics.

## Dukes of Hazzard

Elite  
Spectrum  
£6.95

★ ★ ★  
Them good ol' boys can now just roll along your Spectrum. The screen display is excellent and the game is rather more playable than some of Elite's previous offerings.

Up to now the company's main achievement has been the holographic label on the outside of the cassette.

The Duke boys have to make it to the start line of the road race but helicopters, Hell's Angels, and of course, Boss Hog, all conspire against them.

They drive along the motorway changing lanes and chucking bombs at on-coming vehicles. More fun than a traffic jam.

## Pacmania

C-16  
Pacmanesque  
Mr Chips Software  
£5.99

★ ★ ★  
The old arcade classic revisited on the Commodore 16. Afficianados of Acorn Snapper or other more traditional implementations of the Atari original will probably find themselves shocked and stunned by this version.

The ghosts are completely anarchic, they hold to no known norm of civilised behaviour, recovering almost instantaneously.

(continued from page 43)

say — but quite a lot of Maroc's soul's work is done for him by a servant creature.

To move, you get the arrow pointing to move. Press the fire button once and the scroll changes to show the move you have selected and how many more uses of it you have left. "Project they soul" hints the scroll. In the style of Gargoyle's Tir Na Nog, you have to move around on pathways.

To access the servant, you scroll as before and press the fire button twice. A small will-o'-the-wisp appears which you control with the joystick instead of Maroc.

The graphics are rough — scrolling, sacrificing smoothness for colour, so sometimes irritating to the eyes. But I am sure that the actual mechanics of the game will prove an irresistible addictive factor to adventure fanatics.

Paul Bond

## Body Works

■ Spectrum  
■ Genesis Productions  
■ Educational  
■ £14.95

★ ★ ★ ★

IS THERE a doctor in the software house? Yes, there is, and it's Dr Jonathan Miller, star of stage, screen and operating theatre. If you don't remember Beyond the Fringe you may remember the mammoth documentary called The Body in Question.

The program in question is based on the pop-up book *The Human Body*, also published by Genesis Productions, a new company specialising in books and computer software. Consultant physician David Jefferys also worked on the project and one suspects a lot of the real slog was done by Five Ways Software's Andrew Rutherford (graphics), and Roger Moffat (code).

The program takes you on a trip round your body, dealing with cells, digestion, respiration, circulation, nerves, and muscles culminating in a marathon run simulation.

Interaction is the name of the game. Apart from pushing the space bar to animate each function, you can key in your own data. So you can choose between fats, proteins and carbohydrates in the digestion program.

It's not a biology revision program — it doesn't claim to be.

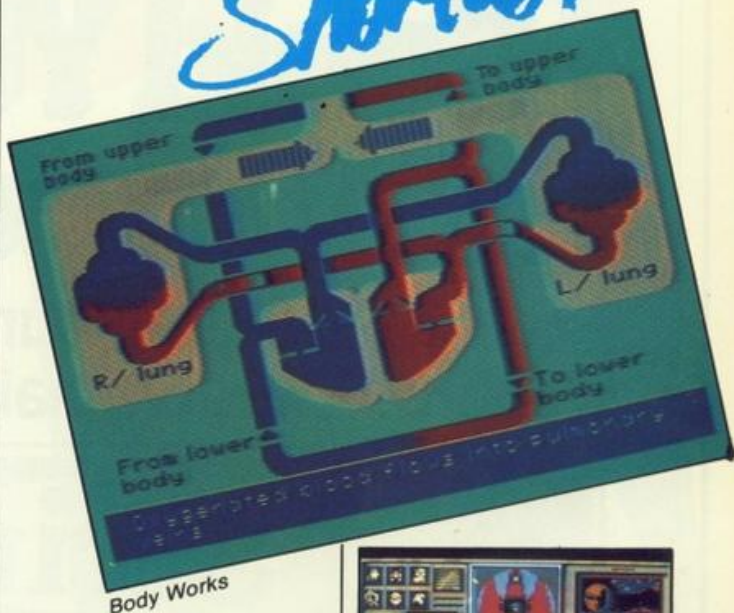
What it is, is an informative and interesting way of putting ideas together for yourself.

The final program in the suite, Marathon, is like a flight simulator for the human body. Running eight times faster than real time, the simulation allows you to enter a course from 5-26 miles.

The body monitors displayed on the screen in the form of black graphs include heart rate and output, stroke volume, temperature and lactate.

Paul Bond

# SOFTWARE Shortlist



## Shadowfire

■ CBM/Spectrum  
■ Beyond  
■ Adventure  
■ £9.95

★ ★ ★ ★

IN THIS ADVENTURE your quest is to transport your crack and deadly — why can't they be bungling and harmless for a change — team onto the enemy spaceship. Once there, you have to fight your way through the corridors to rescue Ambassador Kryxix.

All this in 100 minutes of real time before the Ambassador cracks under interrogation and tells the bad guys Prince Phillip's Prestel mailbox number. There are six members of your party, each of which have particular strengths and weaknesses. There are various characters around to fight off, doors to open and things like the self destruction mechanism of the ship left lying around.

Lee Paddon

## Super Huey

■ Spectrum  
■ Cosmi/U.S. Gold  
■ Simulator  
■ £11.95

★ ★ ★ ★

THE GAME goes out of its way to take you gradually through each learning stage till you gain mastery of your "flying gearbox". There's plenty of clear instruction in the manual, including a step-by-step guide on how to get into the air, no mean feat! Once up there your friendly computer will provide you with handy hints on how to stay there.

Once you think you've got the controls sussed, you're ready to proceed onward.

Lee Paddon



Shadowfire



Super Huey



Spitfire 40

## Spitfire 40

■ Commodore 64  
■ Mirrorsoft  
■ Simulator  
■ £9.95

★ ★ ★ ★ ★

THERE ARE three display's — the traditional out-of-cockpit, the obligatory map, and a superb reproduction of the Spitfire instrument panel which takes Commodore graphics to new heights. Not combining the instruments with the forward view has two advantages, better instruments and a better view from the cockpit.

Three game modes are included: practice, combat practice and combat.

Lee Paddon

# Could YOU get a Newspaper Scoop?

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Reporter Extraordinaire in 'The Hotel Caper'



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jazz up yacht,  
but to  
surprise

**Room 372**

**Press PASS**

**Stringer**  
Addictive

**STRINGER** is an arcade adventure game in which you are a press photographer for the "Daily Blurb" set the task of snatching a shot of a Film Star, Polly Platinum in an hotel. To hinder your attempts your camera, flashbulb, press pass and the key to the lady's room have been hidden in the hotel and these items have to be recovered before the all important shot can be taken. To add to your troubles the hotel staff are bent on catching you before you reach your goal and your Editor has set you a strict deadline for the completion of the task.

The game has 5 skill levels and 10 screens of increasing difficulty. It is tantalisingly playable, graphically excellent and, of course — Addictive! Available . . . Commodore 64 £6.95

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**Software Star**  
It carries the Kevin Toms hallmarks of attention to detail and carefully tuned difficulty. Popular Computing Weekly, February 1985.  
"The game can be incredibly subtle." Pick of the Week, Popular Computing Weekly, February 1985.  
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**NEWS**  
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## The crystal ball

There's some exciting news from those adventure writing geniuses at Level 9. Later this year, they plan to release the first in a series of mega-adventures which they say will be as large, complex and detailed as those published by Infocom. And don't worry if you haven't got a disc drive — they'll also be available on cassette. Cost is likely to be around £15.00.

Enterprise owners have not been overlooked — Level 9 adventures can now be obtained for this machine.

Other imminent new releases from Level 9 include Red Moon — £6.95 — and The Worm In Paradise — £9.95.

Amstrad and MSX owners can now try Melbourne House's famous Hobbit adventure — £14.95 — for themselves. In addition, a reworked version of The Hobbit, on disc only and for Commodore 64, Apple and IBM PC owners, is available in the UK. The new version includes extra problems, additional text, larger vocabulary, enhanced graphics and, for the Commodore 64, complex music throughout the game.

## A helping hand

Here's a trio of tips for Spider-Man devotees: Sandman proving a gritty problem?

ROGN EHT G NILI ECOG  
Not getting far up the elevator shaft?  
PU OG NEHT UP HS UP  
Madam Web a mystery to you?

OTRE HKSA UOYF IUOY  
ROFS GNIH TNAC SLLI  
WEHS

Yours in adversity and adventure,  
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.

## Heroes of Karn

■ Spectrum 48K

■ £6.50

■ Interceptor Micros

HEROES OF KARN is a text and graphics adventure that first appeared for the Commodore 64. It proved to be very popular and has now been translated for the Spectrum.

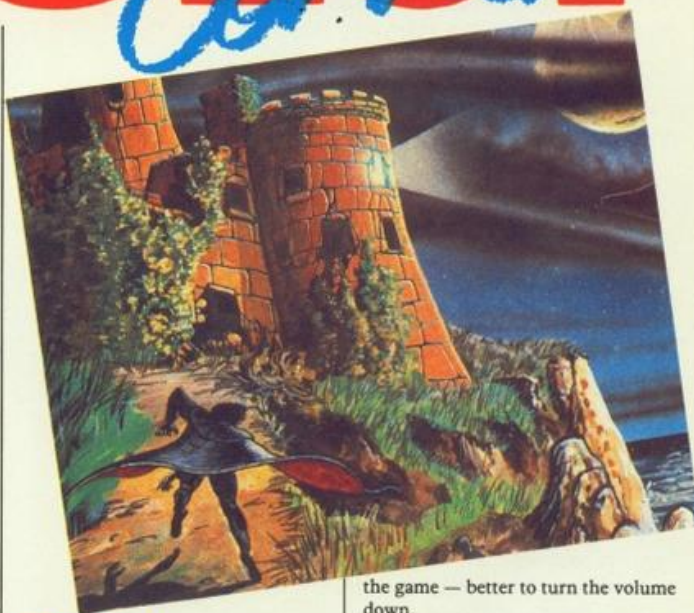
Although the plot and puzzles are identical to the 64 version, the Spectrum program wins hands down in the graphics department, has a small edge in the text input contest but, naturally enough, loses by a mile in the music stakes.

Unlike the 64 version, not every location is depicted graphically but those that are included are magnificent. Credit for the superb computer artwork goes to Terry Greer, as credited by the cassette inlay. The pictures appear instantaneously and are beautifully drawn using colourful high-resolution graphics.

The Spectrum's lack of sound capability means that the impressive music of the 64 version has had to be foresworn. However, the input parser has been tidied up making the acceptance of more complex commands much easier to use.

The plot involves you searching a fantasy land for not one but four lost heroes. The adventure has a host of puzzles, most of which involve hitting on what object to use with what item. The heroes themselves have different capabilities and in certain situations can do things that you could not do by yourself. It is therefore essential that you locate at least one of the lost heroes quite quickly. Finding the first lost hero, Beren, turns out to be quite easy, fortunately.

A thoroughly enjoyable adventure with some of the best graphics on the market.



## Grand Larceny

■ Commodore 64

■ £7.95

■ Melbourne House

THIS IS THE second of what Melbourne House call their "joystick adventures". If you've played Zim Sala Bim, their first one of the series, then you'll know precisely what they mean. The adventure is a combination of traditional text and scrolling graphics.

The plot involves your recovering some secret plans which are about to be smuggled out of the country. If the enemy agents believe you are on to them, they will stop at nothing to escape.

You start the adventure outside a large hotel, your first problem being to get inside. The rest of the action takes place inside the hotel which you can explore by riding in the lift or nipping up the fire escape.

The cassette inlay describes the game as having "smooth, arcade style graphics" and "every location brilliantly displayed in 3-D". What you actually get is a minimally animated figure walking in front of some quite uninspiring and very two-dimensional backdrops.

The figure ambles to the left or right in response to the movement of your joystick — or by pressing the "less than" and "greater than" signs on your keyboard. The background scrolls in the appropriate direction.

The graphics mostly consist of hotel rooms and are simplistic stylised representations. Some fairly nondescript music plays throughout

the game — better to turn the volume down.

The bottom part of the display is reserved for text input and output. When your character is stationary, you can type in the usual sort of two word command e.g., get knife. The program only recognises the first two letters of each word so abbreviated commands are acceptable. Response to your input is instantaneous but terse.

There seems to be a non-fatal bug in the program. When you move to the extreme left of a floor above ground level and type Look, the description given is not of that location but relates to a location on the floor above.

I found Grand Larceny to be quite tedious, lacking in interesting puzzles and totally devoid of atmosphere. However, if you enjoyed Zim Sala Bim, chances are you might like this one.

## Quest for the Holy Joystick

■ Spectrum 48K

■ £4.95

■ Delta 4 Software

THIS QUILED text adventure is a zany spoof set around the ZX Micro-fair. You'll encounter many well known characters and companies who bear more than just a passing resemblance to famous names from the world of computer games and adventures.

There is also a sequel — Return of The Joystick — which has graphics and includes some extremely funny pastiche title screens.

The games are available by mail order (04893 5800) and are sure to provide you with many a belly laugh.

# COMPUTER C

Meirion Jones investigates a potentially explosive new crime wave instigated by that master of the keyboards — the hacker.

COMPUTER CRIMINALS will steal at least £1 billion in Britain this year — that's a Great Train Robbery every day in 1985. But unlike the train robbers, most of the electronic thieves will get away with it and even if they are caught, financial institutions are unwilling to prosecute because public confidence in them might collapse if people knew how easy it had been to breach their security.

In America the problem is worse still. Computer fraudsters range from high-ranking company officials who have invented whole communities on magnetic tape to make business look as if it's booming — as in the multi-million dollar Equity Life insurance scandal — to individuals who have resuscitated thousands of dead clients in order to pay the pensions into their own accounts.

Interfering with delivery and accounts programs has also produced spectacular results, in one case the disappearance of 200 rerouted freight wagons, in another the collection of a million dollar's worth of components without payment.

And in the unlikely event of the fraudster ending up in jail, white collar criminals don't need to dirty their shirts digging tunnels to escape, they can always follow the example of the Ohio prisoner, who having access as a trustee to a terminal in the library simply used it to bring forward his release date on the computer.

These are just some of the cases that have been discovered and as Brandt Allen, an American researcher who helped to publicise the problem of computer crime in the early 1970s writes, "the first time I assembled a set of computer fraud cases, I was struck by the incompetence of most of the embezzlers who had been discovered. Since the computer



*"You never know who's on the end of a hacked line. Watch out, there's a computer cop about."*

provided such a high degree of fraud potential, I wrote at the time, "I can't help wondering what the really clever people are doing" with the computer. I think the biggest computer frauds are still to be revealed."

All this pales into insignificance with the fears of Mr X, a British computer consultant who does not wish to be named. So far, most computer crime has been the work of professional criminals or employees who have taken advantage of their privileged use of a computer.

The amateur hackers — equipped with nothing more than a home computer, modem and a quick brain have been more of a nuisance than a threat to the big companies. Despite the fantasies of films like War Games where global thermonuclear war is almost

initiated by a teenage hacker, the real-life exploits have been more usually of the order of the diversions of Pepsi-Cola shipments across Canada, which the pupils of Dalton School, Manhattan, reportedly perpetrated, or again in New York crashing a TV network.

But Mr X believes that all this will change in the next couple of years as modems become as common as data recorders and 16 and 32 bit chips give home micros the capabilities of the minicomputers that run companies today. Six years ago a powerful VAX 750 mini cost £80,000 for a machine with 500K Ram and a 15 Megabyte hard disc drive. Atari plans to offer similar kit for less than £2,000 this year and companies like Commodore and Sinclair will not be far behind.

Armed with that power, the hackers may take some stopping. Mr X believes that if something like the mining dispute was to happen again organised team of hackers could cause power cuts, "you don't need pickets,

## HOW IT ALL BEGAN

Early computer crimes were unsophisticated but effective. One simple trick, first used in New York was to remove the blank deposit slips on the counters of banks and replace them with apparently blank slips encoded with the fraudster's account number.

When customers filled in the slips as they

deposited money the fraudster's account was credited — and with a carefully timed withdrawal from the account the fraudster could be away before anyone noticed that their accounts were awry. Programmers with criminal tendencies who found themselves writing financial software opted for more subtle tricks —

the so-called Trojan Horse, a fragment of code buried in a program which looked secure from the outside but which could trigger an unscheduled diversion of funds.

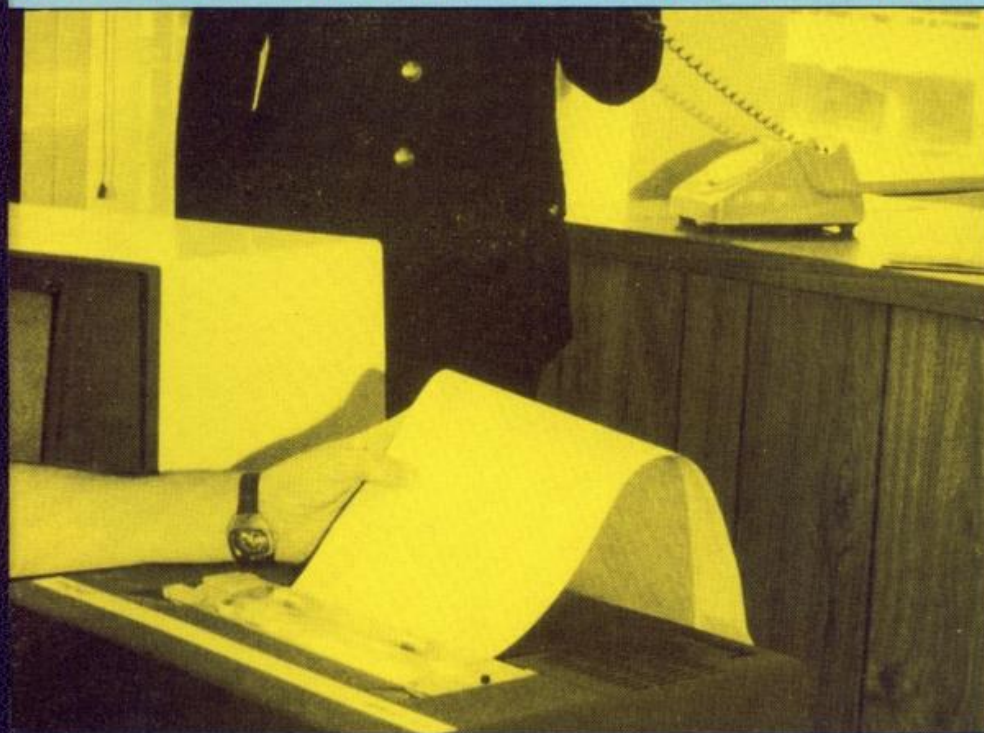
These became known as Time Bombs if they were triggered by the central processor clock and Logic Bombs if they were set off by a par-

ticular event which might be triggered to suit the programmer. Rather than these one-off raids some villains incorporated subtle routines which stole almost imperceptibly small amounts of money at a time — rounding up cheques by a penny or a cent for instance and sending the difference to their accounts — but on a

large number of transactions.

This Salami technique can be very effective in large organisations — one service transfers £27,000,000,000 a day across the Atlantic. You would only need to divert one part in a million to make yourself a millionaire in a matter of weeks.

# CRIME REPORT



you could damage our grid capability — they could have brought the country down". He also suggests that groups that are opposed to deploying nuclear weapons, like the Greenham women, might be able to disrupt Ministry of Defence Systems — although Sabine Kurjo, who organises anti-war computer users in a Peace Network, has never heard of any such attempts, "none of us would dream of hacking into military computers".

Government cuts which affect scientists' jobs could also be dangerous says Mr X. "Ministry of Defence people are working on systems which can break any computer on earth. The government is paying them to do it — put a few of them out of work..."

Government spying agencies not only break their way into private computers, they sometimes deliberately make the job easier by reducing the security of commercial codes.

In America the National Security Agency which runs most of the spy satellites and surveillance interfered with the choice of the National Bureau of Standards Data Encryption Standard to make sure it was set at a level, 56-bit key with 64-bit cryptogram, that the NSA could break. Mr X thinks that the threat posed to major companies by hackers is not just the loss of few percent of turnover as with shoplifting but the complete destruction of their whole organisations. "It's

not the petty pilfering, or even the major pilfering that worries them now. If you want to bring down a major company, even IBM, all you have to do is modify profit margins."

Mr X sees a total and unavoidable collapse of companies as the hackers are let loose.

Faced with such apocalyptic predictions it is no wonder that Scotland Yard's computer crime chief Detective Inspector John Austen is calling for a ban on books like the recently published *Hacker's Handbook* which tells you how to set about breaking and entering other people's mainframes down your phone line.

But the book's author, who goes by the name Hugo Cornwall on the title page, believes that hacking is harmless so long as the participants follow a sort of countryside code: "Don't manipulate files unless you are sure a back-up exists; don't crash operating systems; don't lock legitimate users out from access; watch who you give information to; if you really discover something confidential, keep it to yourself." Cornwall also believes that "most hackers are not interested in perpetrating massive frauds. Modifying their personal banking, taxation and employee records, or inducing one world super power into inadvertently commencing Armageddon in the mistaken belief that another super power is about to attack it."

Cornwall prefers to think of hackers as the pranksters who raided Prince Philip's Prestel mailbox and bedevilled every public demonstration of Telecom Gold. Despite assurance from Telecom that the system was secure, Radio @'s Chip Shop presenter Barry Norman found his Gold mailbox raided on a number of occasions and the first demonstration of Telecom Gold on live TV was also disrupted by the appearance of a hacker's message.

## WATCH OUT-HACKERS

Police fear that the current publicity will give away the "secrets" of hacking and so open up the possibility of computer crime. But once a hacker has the necessary equipment — micro, phone line and modems capable of transmitting and receiving at any baud rate in any protocol and data format which the target computer might use — much of the necessary information such as passwords for breaking into systems is easily available.

Bulletin boards — the electronic noticeboards accessible with a

modem, or their more prosaic counterparts, the tatty pieces of paper passed around at computer clubs, often carry a few interesting numbers for enthusiasts to try. For a professional criminal many passwords are easy to find. At exhibitions an access number may be taped to the side of a machine in full view of the public, or typed in while people are watching. A single repeated symbol from the keyboard may trigger a test number and many people use their initials or birthdays as passwords.

Increasing the number of passwords needed to access a system can also cause problems. Clive Blatchford — in charge of ICL's computer security — told a computer crime conference last month that almost no-one who has to remember more than two Personal Identification Numbers trusts their own memories enough not to carry them around in a diary or on a slip of paper. Blatchford told his audience — mainly people in charge of computer security that if he picked their pockets he would expect to find out

the PIN numbers for at least one in three of them.

If the hacker has most of the digits of a number, an autodialler can run through the remaining possibilities — although most systems now cut off a modem after two or three false attempts. The professional criminal might buy specialist equipment which can analyse a stream of data and tell you what protocols and formats are being used. Even closed computer networks can be cracked if you can get close enough. £200 would buy

a would-be villain a device which could measure the variations in electromagnetic pulse put out by a computer. According to Blatchford an unscreened terminal puts out 150 microvolts 30 feet away — while the device can pick up fluctuations as low as one microvolt. By listening in to the beginning of each transmission the bug could capture the passwords and identification codes. No wonder that some companies now spend up to £500,000 to screen a room which is going to take a £50,000 computer.

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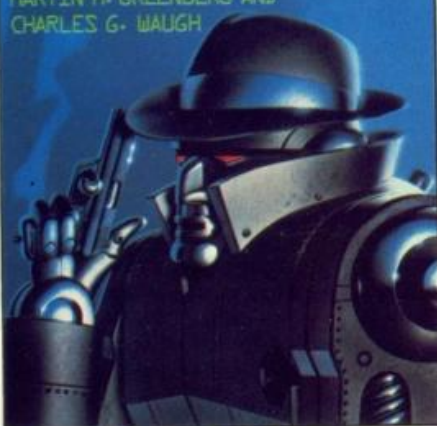


...The Hacker's Handbook by Hugo Cornwall released by Century which might help you break into the computers that store examination records.

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EDITED BY ISAAC ASIMOV, MARTIN H. GREENBERG AND CHARLES G. WAUGH



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- The winner of the competition will be the person who, in the view of the editor, comes up with the most amusing or clever idea for a computer cheat or scam.
- The name of the winner will be printed in the August issue of *Your Computer*.
- All entries must arrive at the *Your Computer* offices by the last working day in May 1985.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
- No employees of Business Press International or their relatives may enter the competition.
- The decision of the editor is final.
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# REVISION SOF

EVERY YEAR the nation is swept by an epidemic of exam fever. It begins around Easter and reaches its climax in May and June. Most of the victims suffer no lasting damage, although some do have a relapse known as "retakes". Usually, the trouble passes as quickly and strangely as it has started.

There is no known cure for the complaint; time is the great healer. The only thing the victim can do to alleviate the condition is to take large preventive doses of revision, beginning in mid-winter. In the right doses, revision lessens mental tension and ensures that there will be no need for the misery of retakes.

Many potential sufferers from exam fever will be owners of home computers. Many of the large publishing companies are now producing revision software for a wide range of subjects and machines. Can they help?

In some cases, almost certainly. Penguin Study Software has come up with a series of programs on Shakespeare's plays which shows just how much good educational software can achieve.

The programs run on a database containing three sections: people, themes and acts. So the student can search through each act, or the whole play, searching for references to particular characters or themes. But much more interesting, and useful, is the ability to combine a particular character with a theme in the search.

In Julius Caesar, for instance, the program lists 17 themes ranging from Alchemy to Weeping. Let's say you choose Ambition, combining it with the character of Caesar, and search through the whole play. The screen will display line references — to the Penguin edition, of course — and a comment, e.g.

## Pete Connor studies revision programs.

"Look at Act 1 Scene 1 Line 72. Flavius expresses fear, later developed by Cassius, that Caesar's ambition might plunge Rome into dictatorship." Sometimes another reference will be given, or a question for the user or a suggestion that another theme will be worth exploring.

Thus the program constantly makes the user think for himself as well as providing information. It's the kind of service a good teacher would like to give, but never has the time — or perhaps the database — for.

English Literature lends itself readily to this kind of stylish treatment. Other subjects are more traditionally presented and are much heavier going. French, for instance. You're obviously not going to get much guidance on your accent from a computer. And, sadly you won't get an awful lot of guidance on anything else of great value.

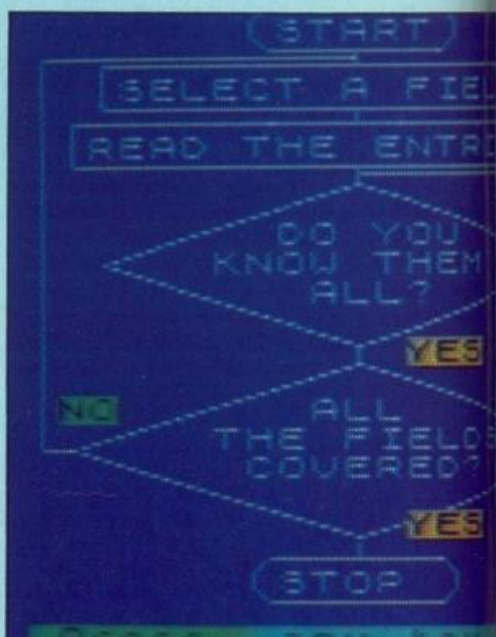
In the Hill MacGibbon/Pan Study Aids Software series you get two tapes and the Pan Study Aid book in a hefty £14.95 package. The program starts off with Diagnostic Test in which you have to choose the answers from an accompanying booklet. On completion you get a report showing how you've done.

The rest of the program is taken up with sections on grammar and areas of vocabulary. It's pretty simply presented, and will certainly ram home all those rules about the agreement of past participles etc., but it doesn't really seem to provide anything to merit the time taken to load it up.

With the Longman French program on the Spectrum you get only one tape. It contains five programs. Two of these — Lexis 1 and 2 — are pretty dull vocabulary tests. The others



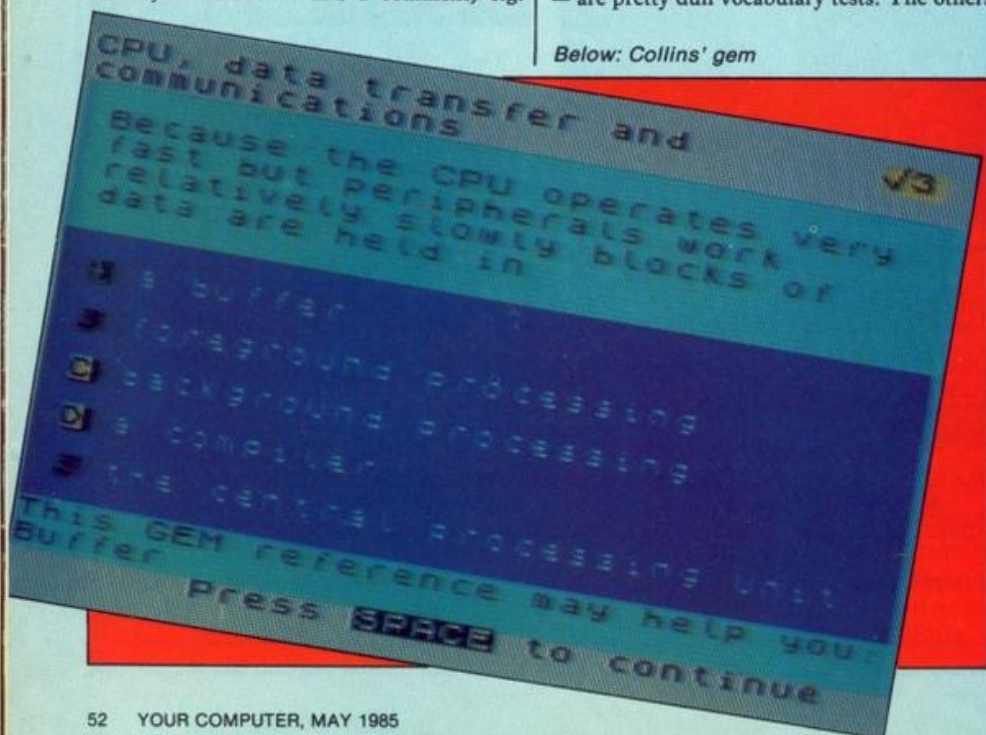
Above: Pan biology



Above: Longman's biology

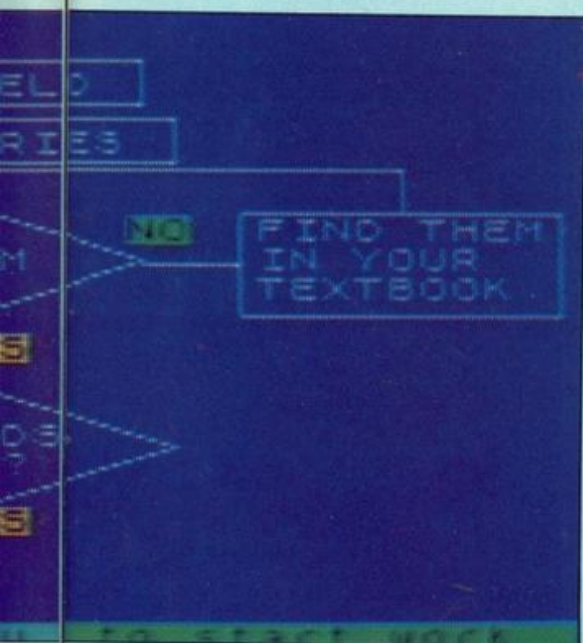
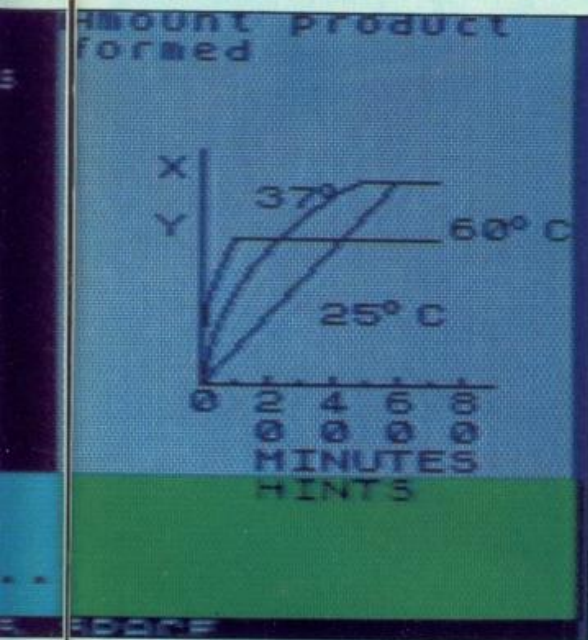
test knowledge of verbs and of the geography of France.

The most interesting seemed to be a Comprehension program. Here you get a choice of six passages which you are then asked questions on. But, in fact, this was little more than a memory test like those games where you must remember the objects on a tray. Instead of asking questions and expecting grammatical answers, the student is merely required to reproduce exactly each sentence in the passage. All this is accompanied by atrocious "drawings" designed to jog the memory.



Below: Collins' gem

# SOFTWARE REVIEW



The trouble with language programs is that computers just don't understand what they're talking about and so can only give a very limited number of mechanical and not very useful tests. French is one subject where you're better off with a book, your notes and a teacher.

Biology at least allows you to use diagrams and Longman, Hill MacGibbon, Collins and Scisoft programs all rely heavily on them. Word games are the other favoured means of learning. The Longman package has five programs on the one tape. Of these, Skeleton is the most fun. It's a word game based on

hangman in which each correct answer adds another bone with its name.

It's not a terribly original idea, and it hasn't really got much to do with the scientific method, as the blurb claims. But it is quite enjoyable, reinforces the knowledge and covers seven topics. The other programs cover heredity, food and kingdoms.

The Pan/Hill MacGibbon offering is similar to the French package, beginning with "diagnostic tests" and then going on to learning modules covering most of the topics on an 'O' Level syllabus. Since it has two tapes it covers rather more ground than the Longman program. The diagrams are all very clear and the program will be useful to the student — but not that much more useful than his or her own notes. If he or she has got any.

Collins Revision Software is another tape/book package: one tape and the Collins Basic Facts on Biology. The first of the four programs, Tester, asks you to give the answer to definitions from a mixture of topics. Get it wrong once and you're given the first letter, twice and you're referred to the Basic Facts, a third time and you're given the answer.

The other three programs are all diagram-based. The first one, for example, offers the structure of the flower, structure of the eye, kidney tubule, section through a leaf and the human digestive system. The exercises consist of labelling the parts, with plenty of help available if you need it. Again, most of the syllabus is covered and the program will be useful to the student. A pity, though, that the diagrams weren't just a little clearer or quicker on the draw.

Scisoft's Biology is the weakest package under review, even though it does proclaim on the cover "Approved by teachers". Which ones? Where?

Most of it is multiple choice questions on

*Below: Collins' gem*

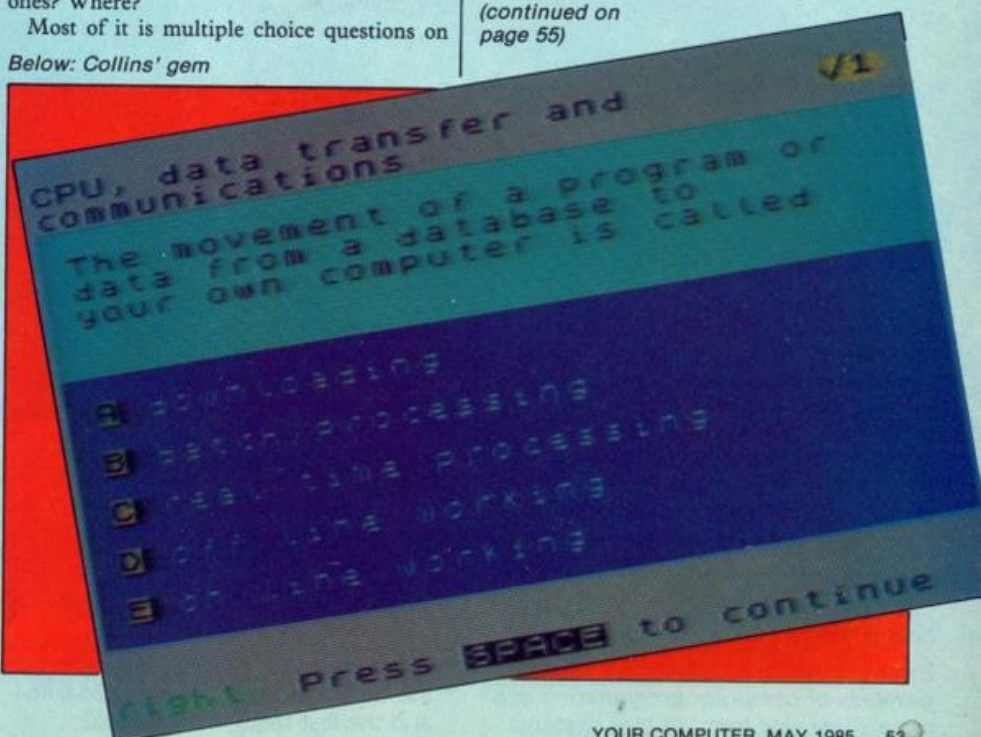
various topics. But each section contains only 20-32 questions, which doesn't really seem enough. There is also a diagram program. The package doesn't really have enough to offer the student in terms of variety or fun. Both Longman and Collins offer Computer Studies revision software, the Collins once more coming in a pack with a Gem Basic Facts.

Longman's tape contains four programs covering most of the syllabus. Topics include Basic routines, file-handling, logic and low-level language. This latter is dealt with in the program Visicode, which gives you 15 commands in a low level language and allows you to write your own programs. This is a particularly useful section; explanation is clear, graphics are good and it's easy to get any help you might need.

Collins's Computer Studies has the same format as their Biology; three programs in which you must label diagrams and two with multiple choice questions. The program covers much the same ground as Longman's, but is less well organised and therefore not quite so useful. It also contains a truly awful "game", based around darts. It's supposed to be fun, but it isn't.

Longman's do a Physics program as well, and it's pretty good. The four main programs are Formulae, Circuits, Light and Machine. Circuits contains two sections on Ohm's Law, the first of which is a graphic demonstration of the way that diodes and transistors work. It's very clear in its explanations, although the diagrams are constructed rather slowly. The rest of the package is of a similarly high standard.

But it's put in its place by the Physics program in the Penguin Study Software *(continued on page 55)*



An Introduction to Computer Programming

# Realise the Potential of your Computer



## THE BBC & ACORN ELECTRON First Steps in BASIC

The user guides which are supplied with the BBC Computer and the Acorn Electron are excellent reference books.

There are also lots of very worthy books on sale which attempt to teach people how to program in BBC BASIC.

However learning a complex subject from books alone can be a very boring and daunting process.

There is a need to present the essential elements of computer programming in a more interesting form, so that students

can gain the basic knowledge they require in order to further their studies, using the many books which are available.

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(continued from page 53)

series. This really is a very superior product, almost meriting the blurb's claim that it's "the next best thing to having your own private teacher."

There are two tapes with four programs: Mechanics and Units; Heat and Sound; Electricity and Magnetism; Light, Atomic and Nuclear Physics. Each is presented in a multiple-choice format with a help facility. So, if you're stuck on a question, you can first get a hint, then a detailed explanation with the answer.

The program has a very sophisticated randomising facility. If you want another question on a topic just covered you'll get something similar, but definitely not the same. And the questions are not easy — the

program will be useless unless you really have done the work. Which is as it should be in a revision program. Not only is this program more academically useful than others considered here, it is also much classier. It just looks better, with more colour and clearer and faster diagrams.

Perhaps this is because the Penguin software has more machine code routines — it's certainly more attractive and much quicker than any of the others. Indeed, too little thought has been given to visual impact in nearly all the programs mentioned here. If someone has a computer the chances are that he or she will have seen countless games of one kind or another, games whose graphics, speed and general presentation put most educational software to shame. The

experienced games player is not going to stand for the sort of pathetic "game" presented on Collins's Computer Studies program.

Educationally, none of the programs is without merit. But too many of them do not give the student enough to do and are just not hard enough. And too many of them do not provide anything substantially different from what you would get from a decent set of notes — and if you haven't got those it's unlikely you're going to pass your exams, computer revision or not.

Top of the class, then, comes Penguin for both presentation and content. The other publishers need to pull their fingers out, pull their socks up and get their noses to the grindstone if they want to pass any future exams.

An inclined plane may be treated as a lifting machine whose Mechanical Advantage depends on its slope i.e. on  $h/l$ , where  $h$  is the height gained in moving a distance  $l$  along the slope. If  $h/l = 1/20$ , then what effort (in N) is required to raise a load  $L$  of 300 N?

(a) 7.5 (b) 30 (c) 300 (d) 15

(a) is wrong. Here is a hint. The Mechanical Advantage  $A$  is  $l/h$  and the effort  $E$  required is the load  $L$  divided by  $A$ . Here is further help. Here  $h/l = 1/20$  so the Mechanical Advantage  $A = l/h = 20$  and the effort  $E$  is  $E = L/A = 300/20 = 15$ . This assumes a 100% efficiency (no friction or other losses). The correct answer is (d).

Press  $\rightarrow$  to repeat,  $\rightarrow$  to finish, or  $\rightarrow$  for next.

Above and below: Penguin's Study Physics

Tell me your field of interest and I will list all of my references for that field.

- A PLANTS
- B ANIMALS
- C GENERAL
- D THEORY & EXPERIMENT
- E END OF PROGRAM

PRESS A B C D OR E

A body of mass  $M$  kg has a velocity  $v$  m/s. Its kinetic energy is  $E$  Joules. If  $M = 2$  and  $v = 1$ , which value of  $E$  is correct?

(a) 5 (b) 7 (c) 1 (d) 8

(c) is the CORRECT answer.

Press  $\rightarrow$  to repeat,  $\rightarrow$  to finish, or  $\rightarrow$  for next.

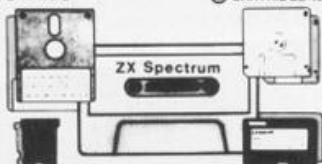
Left: Longman's biology

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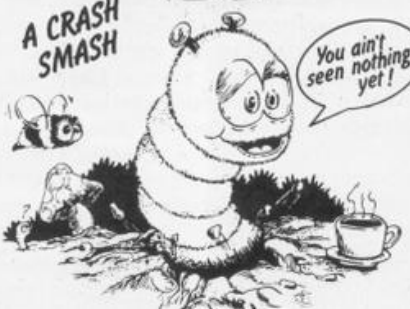


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# MATIS MASTER

Colin Carruthers and a Spectrum teach you a thing or two about quadratic equations.

ARE YOU BORED solving systems of equations with five unknowns? Want a hand to invert a couple of matrices? Shouldn't you check that difficult integration problem you've just spent four hours doing?

Well, the computer's ability to plough through tedious calculations at high speed is used in this program to provide a useful maths package.

The program will run on both the 16K and 48K Spectrums, but since it is written entirely in Basic it should be quite a simple task to implement the package on other micros.

As far as possible, each part of the program has been made self-contained enabling the individual to just type in the routines he or she requires. However, the Matrix Operations section demands that the System of Equations routines be present — this is due to the fact

that matrix inversion and solving systems of equations can be done by similar techniques and therefore have common program blocks. In any case, the program must have the menu, input a number and hit any key routines — see

## Figure 1 Program breakdown.

- 500- 580 : Input a number routine. Extensive use is made of this routine, so it is placed near the beginning to speed execution.
- 1000-1180 : Menu.
- 2000-2970 : System of Equations.
- 3000-3500 : Quadratic Equation.
- 4000-4500 : Equation of third degree.
- 6000-6650 : Matrix Determinant and Inverse.
- 7000-7500 : Simpson's Rule.
- 9000-9030 : Hit any Key to Return.

figure 1.

There now follows a brief description of each part of the program and examples of the kind of mathematical problem they solve. These examples can be used to check that the routines have been typed in correctly.

**System of Equations:** Solved using Gaussian Elimination, each problem can have a maximum of five equations and five unknowns. The coefficients are held within a two-dimensional array — called "a". The user is prompted for each coefficient of x in turn, with the whole array of values shown on the screen at all times to enable checking.

$$\begin{aligned} \text{Ex (n=3)} \quad & x_1 + 3x_2 - 4x_3 = -11 \\ & 2x_1 - x_2 + 3x_3 = 10 \\ & 4x_1 + x_2 - 2x_3 = 3 \end{aligned}$$

(continued on next page)

```

1000 GO TO 1000
500 LET a$="": LET d$=""
505 IF integer THEN LET d$="1"
510 PRINT AT 1,3;"Enter a key to continue"
515 IF INKEY$="" THEN GO TO 510
520 LET a$=INKEY$: IF a$="" THEN GO TO 520
525 BEEP .02,54.4: IF LEN a$>length THEN GO TO 500
530 IF a$="." AND NOT d$ THEN LET a$=a$+d$: LET d$=""
535 GO TO 510
540 IF a$="+" AND a$="" THEN LET a$="0": GO TO 510
550 IF a$="0" AND a$="" THEN LET a$="0": GO TO 510
560 IF CODE a$=13 AND a$="" AND a$="" THEN PRINT AT 1,3;"Enter a key to continue"
565 IF CODE a$=12 AND LEN a$=1 THEN IF a$(LEN a$)="" THEN LET d$=""
570 IF CODE a$=12 AND LEN a$=1 THEN LET a$=a$+d$: LET d$=""
575 IF CODE a$=12 AND LEN a$=1 THEN LET a$=a$+d$: LET d$=""
580 BEEP .5,10: GO TO 510
1000 REM menu
1010 BORDER 0: INK 7: PAPER 0
1020 CLS : POKE 23649,30
1030 PRINT AT 3,3;"System of Equations"
1040 PRINT AT 3,3;"Quadratic Equation"
1050 PRINT AT 3,3;"Equation of 3rd Degree"
1060 PRINT AT 3,3;"Matrix Operations"
1070 PRINT AT 3,3;"Simpson's Method"
1080 PRINT AT 3,3;"Quit"
1090 PRINT AT 3,3;"Enter Number"
1100 LET a$="1: System of Equations"
1110 LET a$="2: Quadratic Equation"
1120 LET a$="3: Equation of 3rd Degree"
1130 LET a$="4: Matrix Operations"
1140 LET a$="5: Simpson's Method"
1150 LET a$="6: Quit"
1160 PRINT AT 3,3;"Enter Number"
1170 LET a$="1: System of Equations"
1180 LET a$="2: Quadratic Equation"
1190 LET a$="3: Equation of 3rd Degree"
1200 LET a$="4: Matrix Operations"
1210 LET a$="5: Simpson's Method"
1220 LET a$="6: Quit"
1230 PRINT AT 3,3;"Enter Number"
1240 LET a$="1: System of Equations"
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1590 LET a$="1: System of Equations"
1600 LET a$="2: Quadratic Equation"
1610 LET a$="3: Equation of 3rd Degree"
1620 LET a$="4: Matrix Operations"
1630 LET a$="5: Simpson's Method"
1640 LET a$="6: Quit"
1650 PRINT AT 3,3;"Enter Number"
1660 LET a$="1: System of Equations"
1670 LET a$="2: Quadratic Equation"
1680 LET a$="3: Equation of 3rd Degree"
1690 LET a$="4: Matrix Operations"
1700 LET a$="5: Simpson's Method"
1710 LET a$="6: Quit"
1720 PRINT AT 3,3;"Enter Number"
1730 LET a$="1: System of Equations"
1740 LET a$="2: Quadratic Equation"
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1910 LET a$="5: Simpson's Method"
1920 LET a$="6: Quit"
1930 PRINT AT 3,3;"Enter Number"
1940 LET a$="1: System of Equations"
1950 LET a$="2: Quadratic Equation"
1960 LET a$="3: Equation of 3rd Degree"
1970 LET a$="4: Matrix Operations"
1980 LET a$="5: Simpson's Method"
1990 LET a$="6: Quit"
1999 GO TO 1000

```

(continued from previous page)

This has the solution  $x_1 = 2$ ,  $x_2 = -3$  and  $x_3 = 1$ .

**Quadratic equation:** The roots are found using the classic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

This routine allows for both real and imaginary roots.

Ex 1  $x^2 - 3x + 2 = 0$  gives  $x = 2$  or  $1$

Ex 2  $x^2 - 6x + 10 = 0$  gives  $x = 3 \pm i$

Ex 3  $x^2 - 6x + 9 = 0$  gives  $x = 3$

(double root?)

### Roots of a polynomial

**Equation of third degree:** This routine gives the roots of a polynomial with a term in  $x^3$ . Again, imaginary roots are catered for, giving four types of possible solution.

Ex1  $x^3 - 6x^2 + 11x - 6 = 0$

gives  $x = 1, 2, 3$

Ex2  $x^3 - 3x^2 - 3x - 1 = 0$

gives  $x = 1, 1, 1$

Ex3  $-x^3 - 9x^2 + 81x + 729 = 0$

gives  $x = 9, -9, -9$

Ex4  $x^3 - 5x^2 + 7x + 13 = 0$

gives  $x = -1, 3 \pm 2i$

**Matrix Operations:** The determinant of the given square matrix is calculated and displayed. Assuming that this is non-zero, the inverse is computed using Gaussian Elimination. A matrix with zero determinant has no inverse. The main "invert" routine is the same as that for the System of Equations.

Ex  
(n=3)

3 1 2  
2 1 0  
2 1 1

has determinant 1  
and inverse

1 1 -2

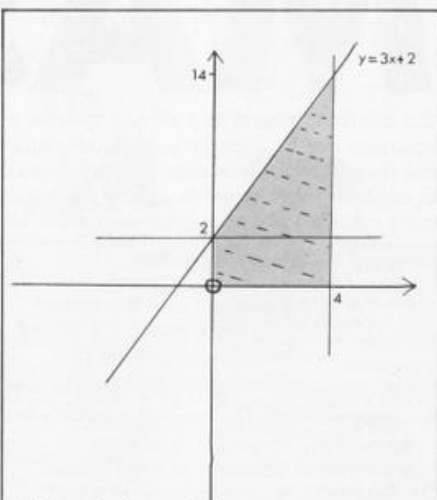


Figure 2. Area of triangle + rectangle.  
=  $\frac{1}{2} \times 4 \times 10 + 2 \times 4$   
=  $20 + 12$   
=  $32$

-2 -1 4  
0 -1 1

Note that only real matrix elements are allowed.

**Simpson's Rule:** The function entered must be a valid expression in 'x', for example 'y =  $3x + 2$ ' must be entered as:

$$y = 3 * x + 2$$

Also, functions such as Sin, Tan or Ln must be entered as single-stroke key words. Any invalid expression typed in response to the prompt will result in an error at line 7100, statement 3. If this should happen, simply type:

GO TO 7000

and re-type the expression correctly.

Ex

$$y = 3 * x + 2$$

lower x = 0

upper x = 4

samples = 10

### Value of the integral

As can be seen by looking at figure 2, the value of the integral — or shaded part of the graph — should be 32.

Type in the program as it is listed and check the operation of each segment using the given examples. They have been chosen to test all parts of the program and should make any typing errors apparent. When all is well, save the package by typing:

CLEAR: SAVE "Maths" LINE 100

This prevents any variables being dumped along with the program.

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## Wizard's Lair

Arcade Adventure

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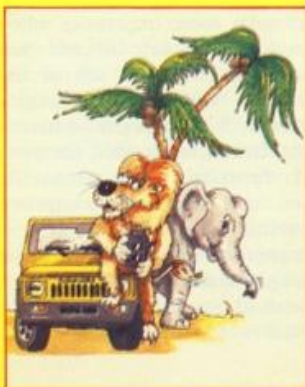
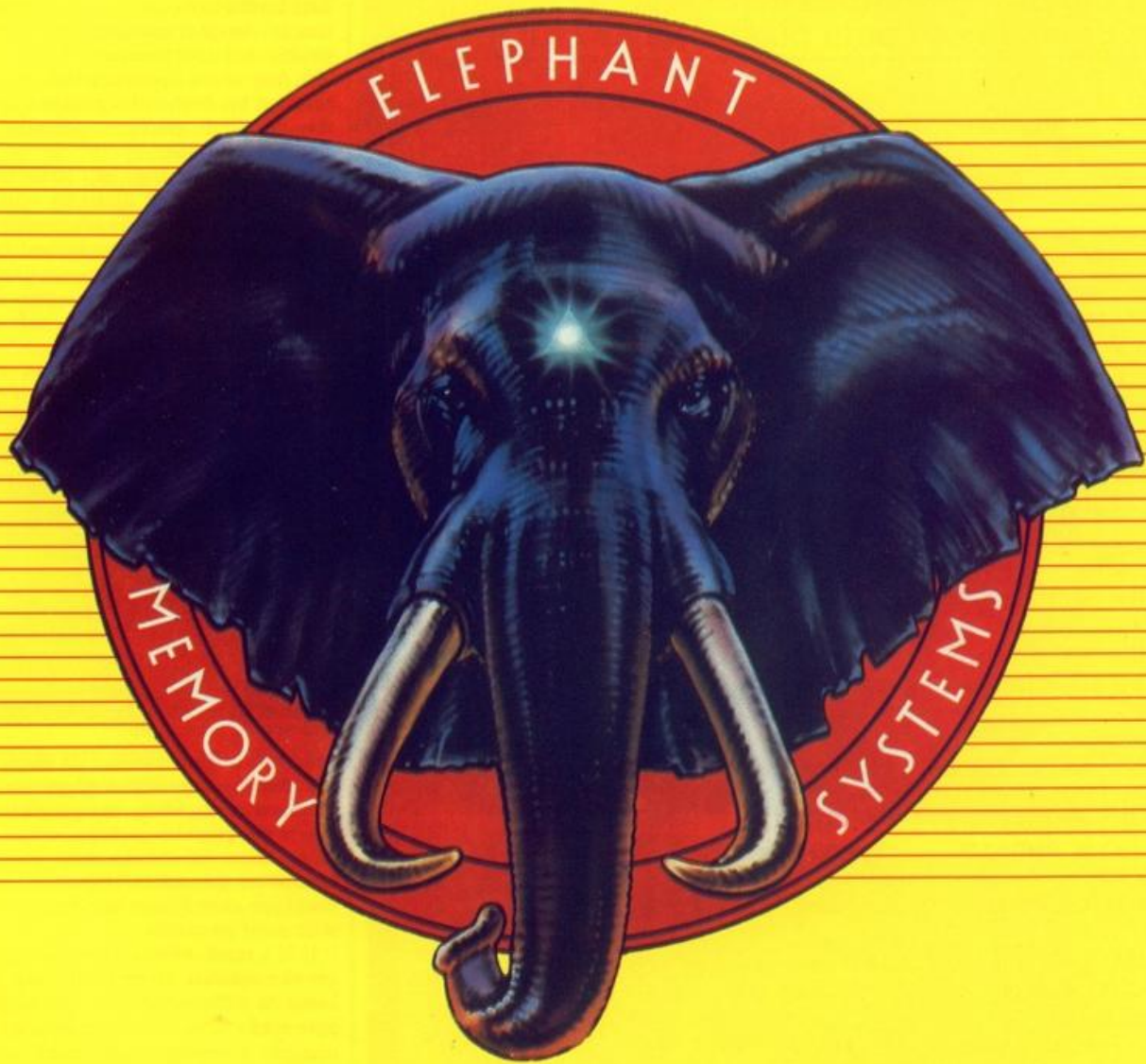
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# AMSTRAD AND SPEC LANDSCAPE

Fill in the background to that text-only adventure.  
Artist Brian James puts pixel to phosphor.

Program 1.

```

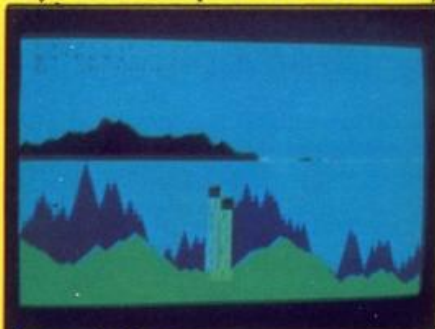
10 '      Fourier Synthesis
20 '
30 '      AMSTRAD BASIC
40 '
50 '      Brian James ,   March 1985
60 '
70 c$=CHR$(13)
90 KEY 135,"mode 1:ink 0,1:ink 1,24"+c$+" list "
100 KEY 137," edit ": KEY 128," goto "
120 SPEED KEY 12,2
130 SPEED WRITE 1
170 '
180 DIM a(250),b(250),c(250)
185 '
190 MODE 0      ' for 16 colours
200 nn=6        ' number of terms
210 am=30       ' maximum amplitude
220 INK 0,11    ' blue sky
230 '
240 FOR i= 1 TO 15
250 INK i,RND*26 ' set colours
260 NEXT
270 '
280 FOR n= 1 TO nn ' Each wavelength
290 a(n)=RND*80/n  ' amplitudes
300 b(n)=RND*2*PI  ' phases
310 c(n)= RND*15   ' colours
320 NEXT
325 PRINT: PRINT" Fourier Synthesis"
330 '
340 FOR x=0 TO 639 STEP 4
350 PLOT x,0,0    ' at bottom
360 y=10
370 k=2*PI*x/640
380 '
390 FOR n= 1 TO nn 'incr. frequencies
400 y=y+a(n)*(1+SIN(n*k+b(n))) 'add waves
410 DRAW x,y,c(n) ' draw upwards
420 NEXT n
430 '
440 NEXT x        ' go right
450 '
460 FOR i= 1 TO 3000:NEXT 'pause
470 RUN
500 '
6000 WHILE 1:SAVE "":WEND

```

THE LANDSCAPE Creator is a program which creates detailed coloured landscape views, quickly and spontaneously. I developed this idea first on the Spectrum 48K, and now the program has been redesigned to fully exploit the beautiful graphics capability of the Amstrad CPC-464.

It is a simulation of "creativity": the computer makes all decisions relating to a wide range of parameters concerning the hills, trees, flowers, lakes, islands, and buildings. The number of variable parameters is such that the resulting scene gives endless, unexpected surprises with a wide range of possible colour schemes.

I developed this idea because, generally, very little "computer art" is actually



The scenic Spectrum.

generated by the computer. In nearly all cases the computer merely displays the picture, which is arranged by the programmer. We now have graphics packages which make it much easier for the operator to control the results on the screen. However, the result could just as well — or even better — be done with paint on canvas.

It is a much more interesting challenge to get the machine to create its own pictures, based on a "knowledge" of the subject to be portrayed. This involves intricate mathematical modelling, and really begins to unleash the power and the intelligence of the microchip and do things in a way only the computer can.

We have all seen some impressive colour graphics in computer games. In most cases these graphics make extensive use of user defined characters, which are rectangular elements — usually 8 by 8 pixels — used as building bricks. In contrast to this, the use of mathematical functions and probability theory allows us enormously improved flexibility, enabling the spontaneous creation of different scenes, giving endless surprises, even to the programmer!

It is easy enough to write a program to rearrange a number of graphic shapes — say to

# ELECTRUM APES

select a building from a choice of five, choose a mountain from a choice of five, etc. etc. and put them together. But to simulate the idea of "creativity", we need to use a whole hierarchy of routines, building up the picture from the smallest elements, with freedom of choice at every stage in the process. User-defined characters are of limited use in this kind of exercise.

My objective in the Landscape Creator was to have the minimum of fixed quantities: to allow the greatest freedom for variations, without departing from some basic properties of landscapes. This same idea I used in Country Cottages, a fun game for two players where you buy cottages and try your skill in managing the awful tenants.

The cottages, the landscapes and the tenants are different every time you play the game. However, the Landscape Creator was designed from scratch, to produce greater variations, better colour schemes, better appearance of water and vegetation.

The number of calculations involved is quite horrendous. Just doing a single pixel involves over 50 machine-code instructions. Though Amstrad Basic is very comprehensive and quite fast, the Landscape Creator has so many calculations to do that machine code was essential.

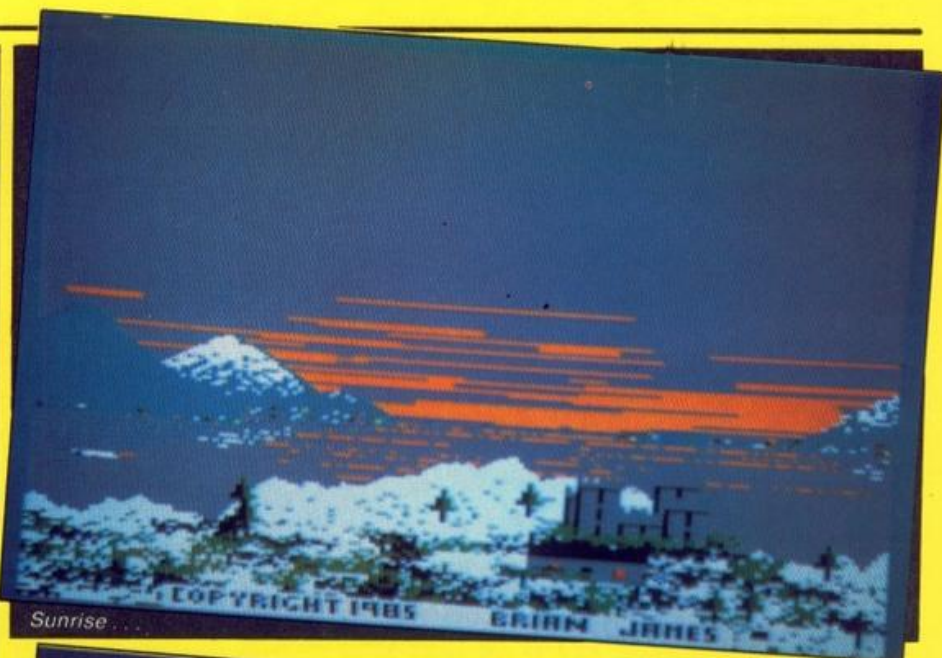
## Routines for plotting

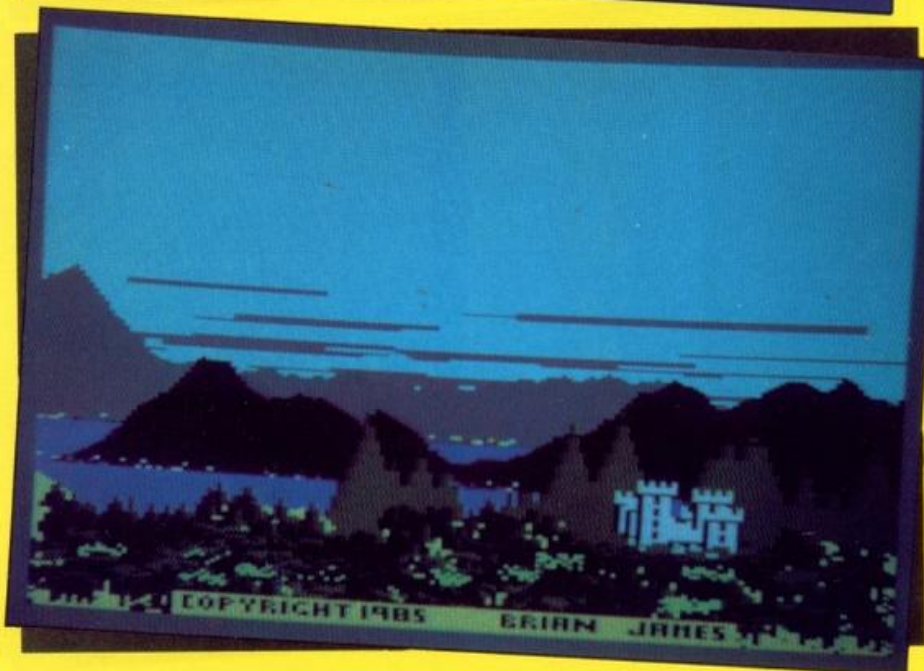
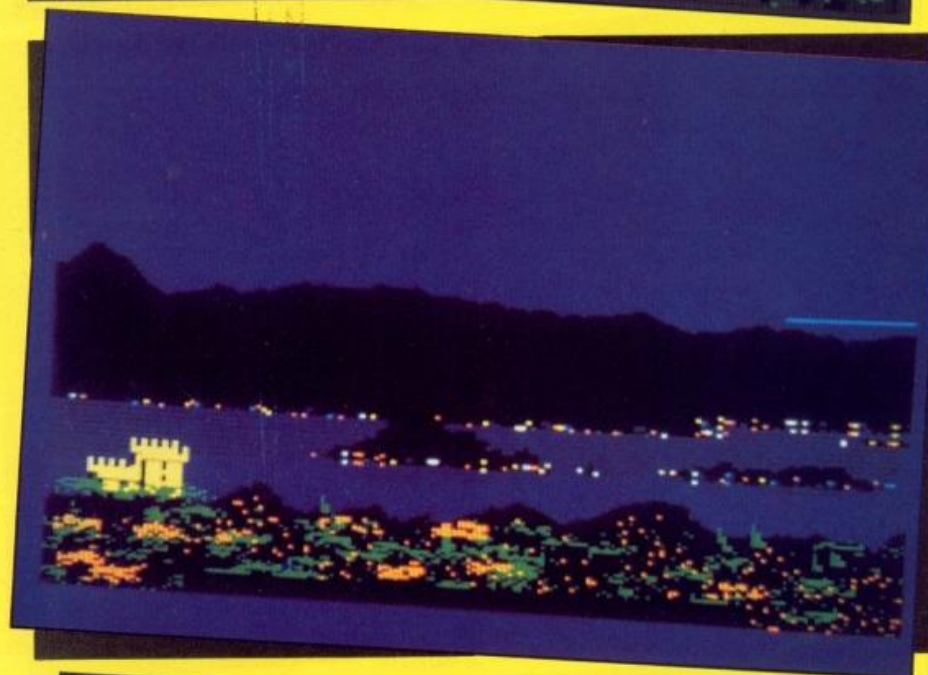
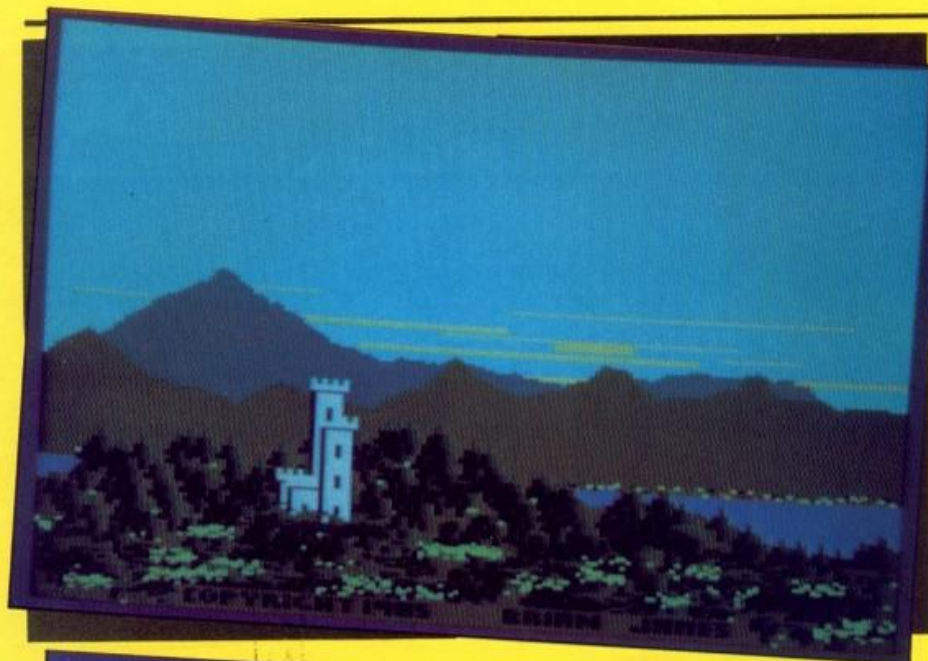
The Amstrad Firmware manual gives the addresses of inbuilt machine-code routines for plotting. These are easy to use and nicely crashproofed — but are therefore not as fast as would be desired. The Landscape Creator utilises its own extremely fast, compact plotting routines. Also the basic arithmetic routines were designed for the job.

In the Landscape Creator, the object was to have the maximum variety of pictures. Whether it is creating a rugged skyline, an island, a patch of buttercups, or a castle, a flexible routine is used which combines probability functions with appropriate mathematics.

The program needs some "knowledge" about the structure of landscapes, so that the different features will have reasonable shapes and fit sensibly together. Trees and buildings must not hang in mid-air; hills must not have enormous holes through them; land must not be drawn when it is below water! Foreground objects may hide more distant objects — not the reverse — and so on. Distant hills could have a grey or bluish colour; whereas the foreground can have much brighter colours.

Lakes and sea can use a mixture of colours  
(continued on next page)





(continued from previous page)

reflecting the hills and sky beyond. The precise formulation of the fundamental properties of a landscape is a subjective process — and this is where the art comes in — and the inspiration for this task came from the Highlands of Scotland and also Cumbria.

The Amstrad version of the program displays several advances compared to the Spectrum version. A tremendous advantage of Amstrad graphics is that any pixel can be any colour. You can have 16 colours in Mode 0, with a resolution of 160 pixels horizontally by 200 vertically. For better resolution, Mode 1 gives you 320 horizontally, but only four colours. I chose Mode 0 with its much greater range of colours. If you want better resolution horizontally than vertically, then you could turn the monitor on its side, and swap your x and y axes.

### Pixels can be any colour

Whatever mode you select, any pixel can be any of the available colours. This gives enormous freedom compared to most home computers. Foreground features can be drawn with no effect at all on the background colours. The colours actually used on the screen can be chosen from a selection of 27.

Machine code is notoriously difficult to experiment with and so I am providing a simple program in Amstrad Basic for you to try out. It uses the RND function to generate



a recipe for a mixture of sine waves with different wavelengths and phrases. The sum of all the different waves is a complex curve which can have enormous variability. It is a well-known method called Fourier Synthesis.

Each waveform here is drawn with a different colour and — Hey Presto! — the Fourier Series we learned in stuffy lecture theatres comes to life in brilliant colours.

The number of sine waves used is nn. You can try putting in a larger number, say nn = 20 or nn = 50. The curve becomes more and more complex — but very much slower. This method is very good for smooth curves, but becomes too cumbersome and slow for very rough crinkly lines.

Next month we will explore more possibilities with the RND function, and also peer into the fascinating world of "fractals", functions which are particularly suitable for describing the very rough mountain skylines we like to gaze upon.

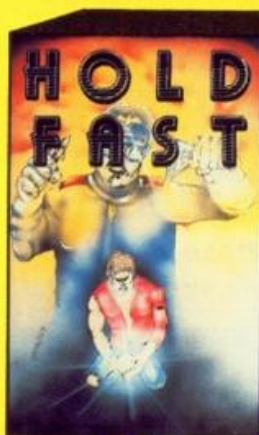
I can supply the Landscape Creator doubly recorded on cassette, for the Amstrad or the Spectrum 48K. Send £5 for the Amstrad version, or £3 for the Spectrum version, to — Brian James, 21 Lamond Place, Aberdeen AB2 3UT.

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## AMSTRAD CPC464

software



Holdfast



Gems of Stradus



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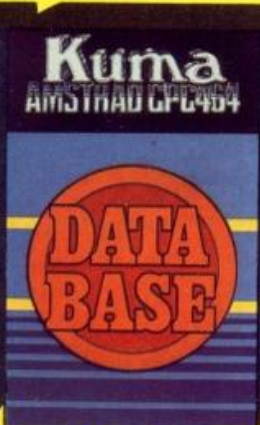
Galaxia



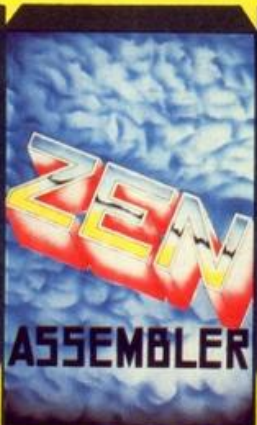
Music Composer



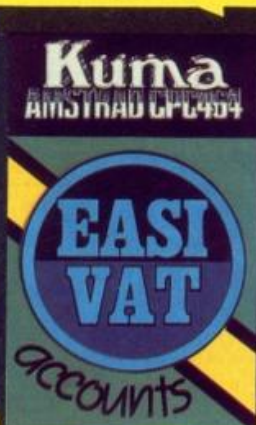
Logo



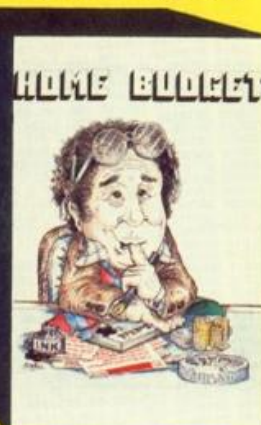
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# JOE AND THE ALLIGATORS

F G Tout  
and his  
CBM-64  
are on the  
run.



YOU ARE Joe, out for a quiet boat ride at your favourite beauty spot when you suddenly realise that someone with a warped sense of humour has sent loose a shoal of dangerous and ferocious alligators, intent on making you their snack of the day.

Guide Joe through four waves trying to steer clear of floating logs, other boats, rafts, floating weed and most of all *watch those gators*.

When you reach the narrow exit you have to

guide Joe through the locks without hitting the walls or overhanging rocks.

There is also a hole in the boat and you must use the fire/button to bale out or the boat will sink.

Time limit and water level are shown at the bottom of the screen:

Time — WHITE

Water level — BLUE

On the locks screen you can control Joe by:

Left — reduce speed of boat

Right — increase speed of boat

Up — increase level of water

## Variables.

V — 53248 sprites  
Q — sp locations  
CO — colour of water  
level and time limit  
TL — time limit  
WL — water level  
L — joystick port  
S1, S2, S3 — sound  
SYS 36864 = sound on  
SYS 37120 = sound off  
LI — lives  
LE — lake number  
SC — score

## Listing 1.

```
10 PRINT "FOR=0T02 FORK=0T0255 READ: IFA=1THEN40
20 POKE36864+T0256+X,R NEXTX
40 NEXTT
50 DTR169,146,141,21,3,169,0,141,20,3,96,-1
60 DTR169,204,141,21,3,169,0,141,20,3,96,-1
70 DTR172,0,147,192,16,240,57,206,1,147,173,1,147,201,0,200,44,230,0,147,169
80 DTR185,0,140,141,1,212,105,0,149,141,0,212,169,17,141,4,212,105,0,147
100 DTR169,0,141,0,147,141,4,212,24,144,242,-1
110 POKE37632,0 POKE37633,0 FOR=0T02 READ: REND: L,F,D
120 POKE38144+T,22 POKE38155+T,227 POKE38400+T,180 POKE37380,T+1
140 DTR169,177,30,25,177,30,32,94,30,20,214,30,25,177,30,22,227,30,22,227,30
150 DTR169,214,30,25,177,30,32,94,30,20,214,30,25,177,30,22,227,30,22,227,30
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270 DTR172,177,30,22,227,30,25,177,30,20,214,30,25,177,30,22,227,30,22,227,30
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700 DTR172,177,30,22,227,30,25,177,30,20,214,30,25,177,30,22,227,30,22,227,30
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1010 DTR172,177,30,22,227,30,25,177,30,20,214,30,25,177,30,22,227,30,22,227,30
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1510 DTR172,177,30,22,227,30,25,177,30,20,214,30,25,177,30,22,227,30,22,227,30
1520 DTR172,177,30,22,227,30,25,177,30,20,214,30,25,177,30,22,227,30,22,227,30
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1550 DTR172,177,30,22,227,30,25,177,30,20,214,30,25,177,30,22,227,30,22,227,30
1560 DTR172,177,30,22,227,30,25,177,30,20,214,30,25,177,30
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```

10 - 200 Music interrupt & data
29999-61000 Sprite data
62000-62030 Download W.D.Gs
62155-62235 Sprites for Title
62300-62570 Move sprites.
Gator: Listing 2.
0 - 50 Set variables
100 - 135 Set sprites pos.
600 - 999 Set time and water level
1000- 1099 Main routine
10000-10199 Screen 1
11000-11099 Screen 2
11100-11199 Screen 3
11200-11288 Screen 4
22000-22040 Lives left
23000-23155 Game over
30000-30199 Locks screen
60000-60998 Title page
60999-61199 Music for title page

```

[illegible]

1

# Listing 1.

```
10 *LOAD "TANKS-DATA" 4000
20 CHAIN "TANKS-3"
```

# Listing 2.

```
10 REM TANKS-2 BY N.SHEARD
20 MODE 4
30 VDU 29,652;524;
40 MOVE 0,0:LOC%=54000
50 FOR ZX=0 TO 2
60 CLS
70 PROCdatachasvert
80 X%=340
90 RESTORE X%
100 PROCdrawvert
110 NEXT ZX
120 PROCdatachasdiag
130 X%=390
140 PROCdrawdiag
150 CLS
160 PROCdataturretvert
170 X%=440
180 PROCdrawvert
190 PROCdataturretdiag
200 X%=480
210 PROCdrawdiag
220 CLS
230 PROCdataenturvert
240 X%=520
250 PROCdrawvert
260 PROCdataenturdiag
270 X%=560
280 PROCdrawdiag
290 FOR CIRC%=0 TO 360 STEP 30: X%=CIRC%*PI/90: A%=44*
COS X%: B%=44*SIN X%: MOVE 0,0: DRAW A%,B%: NEXT
300 PROCstore
310 *SAVE "TANKS-DATA" 4000 4948
320 END
330 DEFPROCdatachasvert
340 DATA -1004,8,-4,-7,-5,-8,-6,-8,-7,-7,-7,8,-6,9,-
5,9,-3,7,5,7,5,8,5,-7,6,-8,7,-8,8,-7,8,8,7,9,6,9,5,8,5
,5,-4,5,-4,-4,5,-4,5,-5,-4,-5,-4,-6,5,-6,5,Z%-7,8,Z%-7
,8,Z%-4,5,Z%-4,5,Z%-1,8,Z%-1,8,Z%+2,5,Z%+2,5,Z%+5,8,Z%
+5
350 DATA -1007,Z%-7,-4,Z%-7,-4,Z%-4,-7,Z%-4,-7,Z%-1,
-4,Z%-1,-4,Z%+2,-7,Z%+2,-7,Z%+5,-4,Z%+5,1500,1500
360 ENDPROC
370
380 DEFPROCdatachasdiag
390 DATA 1003,9,3,10,2,10,2,11,1,11,-10,0,-10,-1,-9,
-2,-8,-2,3,9,2,8,8,2,10,2,11,1,11,0,1,-10,0,-10,-1,-9,
-1,-8,9,2,7,0,1,6,0,6,-6,0,-6,-1,0,-7,-1,-7,-1,-1,-
7,-2,-7,-7,-2,-7,-1,-9,1,-7,3,-5,1,-3,3,-5,5,-3,7,-1,5
,1,7,-1,9,1008,1,10,-1
400 DATA 8,-3,6,-1,4,-3,6,-5,4,-7,2,-5,0,-7,2,-9,150
0,1500
410 ENDPROC
420
430 DEFPROCdataturretvert
440 DATA -1001,-4,2,-4,2,-3,-1,-3,-2,-2,3,-2,3,-1,-2
,-1,-3,0,4,0,4,1,-3,1,-3,2,4,2,3,3,-2,3,-1,4,2,4,1,4,1
,11,0,11,0,4,1500,1500
450 ENDPROC
460
470 DEFPROCdataturretdiag
480 DATA -1002,-4,-4,-2,-4,-1,-1,-4,-1,-3,-3,-1,-3,0
,0,-3,1,-3,-3,1,-3,2,2,-3,2,-2,-2,2,-2,3,3,-2,3,-1,-1,
3,0,3,3,0,3,1,1,3,2,3,3,2,9,0,8,9,3,3,4,7,8,1500,150
0
490 ENDPROC
500
510 DEFPROCdataenturvert
520 DATA -1001,-4,2,-4,2,-3,-1,-3,-1,-1,-2,-1,-2,-2,
-2,-1,-3,0,-3,2,-1,2,-2,3,-1,3,-1,4,0,4,0,11,1,11,1,4,
2,4,2,2,3,3,3,2,4,2,4,0,2,-2,2,-1,3,-2,1500,1500
530 ENDPROC
540
550 DEFPROCdataenturdiag
560 DATA -1002,-4,-4,-2,-4,-1,-1,-4,-1,-3,0,-2,0,-3,
2,-3,2,-2,3,-2,3,0,2,0,3,1,3,2,9,8,8,9,3,3,4,7,8,2,3
,0,3,0,2,-1,3,-2,3,-2,2,-3,2,-3,0,-2,0,-3,-1,1500,1500
570 ENDPROC
580
590 DEFPROCdrawvert
600 REPEAT: READ A%,B%: IF A%=1500 THEN GOTO 620
610 PROCdraw
620 UNTIL A%=1500: PROCstore: RESTORE X%: CLS: MOVE 0,0
630 REPEAT: READ A%,B%: IF A%=1500 THEN GOTO 670
640 IF A%>1000 THEN A%=A%-1000: C%=A%: A%=B%: B%=C%: A%=
A%+1000: PROCdraw: UNTIL FALSE
650 IF A%<-1000 THEN A%=A%+1000: C%=A%: A%=B%: B%=C%: A%=
A%-1000: PROCdraw: UNTIL FALSE
660 C%=A%: A%=B%: B%=C%: PROCdraw
670 UNTIL A%=1500: PROCstore: RESTORE X%: CLS: MOVE 0,0
680 REPEAT: READ A%,B%: IF A%=1500 THEN GOTO 700
690 A%=A%-1: B%=B%-1: PROCdraw
700 UNTIL A%=1500: PROCstore: RESTORE X%: CLS: MOVE 0,0
710 REPEAT: READ A%,B%: IF A%=1500 THEN GOTO 750
720 IF A%>1000 THEN A%=A%-1000: C%=A%: A%=B%: B%=C%: A%=
```



BBC

TANK



TANKS is an arcade-style game for the BBC Micro with operating system OS 1.2. The program features machine-code, flicker-free, high-resolution graphics, with independent rotation of the tanks' turrets and chassis, music, animated lives and a high-resolution title page.

To get the program Saved on tape, first type in listing 1 and Save it as Tanks-1, then type in listing 2 and Save it as Tanks-2 on a different tape. Run Tanks-2 and a series of rotations of tank's chassis, turrets and trees will appear on the screen followed by the message "Record then return".

Start your tape recording straight after Tanks-1 and press Return. Finally, type in listing 3 and Save it as Tanks-3 after Tanks Data. To load the game

#### CHAIN "TANKS-1"

which will draw the title page and automatically load the other sections.

When the whole program has loaded, the instructions will be displayed. The object of the game is to destroy all enemy tanks — those with crosses on their turrets — by cleverly chasing and ambushing them. You score 100 points for each tank destroyed and 1,000 points for each screen completed.

After losing a life or on starting a new game your tank automatically drives from the barracks, at the top right of the screen, to the

centre of the screen ready for action, during which the music plays. At the end of the game the last score and the highest score are displayed.

In writing the game the first problem was that, to obtain the necessary independence of rotation of a tank's chassis and turret, a total of 128 3-by-3 character matrices had to be defined, or 1,152 characters, or 9,216 numbers would have had to be typed in. This is obviously a massive waste of memory and would be very prone to error.

The alternative was to separate the turret and chassis into different characters and overlay one of the eight different rotations of each on to the other. This can be done using the Basic function Or, which affects the bits of two numbers when written in binary such that:

01010100 OR 00110101 = 01110101

It can be seen from this that if there is a 1 in any or both of the corresponding positions of the numbers then a 1 will appear in the corresponding position in the answer. Only where there is an 0 in both of the corresponding positions of the numbers does an 0 appear in a corresponding position in the answer. Thus:

8 OR 53 = 117

Unfortunately, using Or is too slow to produce flicker-free graphics and so I wrote a machine-code subroutine which appears at

line 1940 in listing 3. ORA is the equivalent function to Or in assembly language and takes the form:

LDA (first number):  
ORA (second number):  
STA (on screen)

As you can see I have directly accessed the screen for ease and speed and so second processors must be disconnected before running the program.

With the program altered to accept this only 24 3-by-3 character matrices are required, that is 1,728 numbers to be typed in, which is still too prone to error. The solution was simple, use the BBC's processing power to rotate the shapes — from just two of the most important rotations of each shape entered from the keyboard — to create the remaining rotations and store them in the memory before the game begins. Listing 2 does this by reflecting the shapes in varying lines.

With this entered and working correctly only six of the 128 3-by-3 character matrices that will appear on the screen have to be defined.

If you wish to have a copy of the game, but do not have the time to type it in, it is available from N Sheard, 2 Ashbrook Drive, Prestbury, Cheshire SK10 4BY, on cassette for £4 including P&P.

(continued on next page)

# ATTACK



#### Listing 2 continued.

```

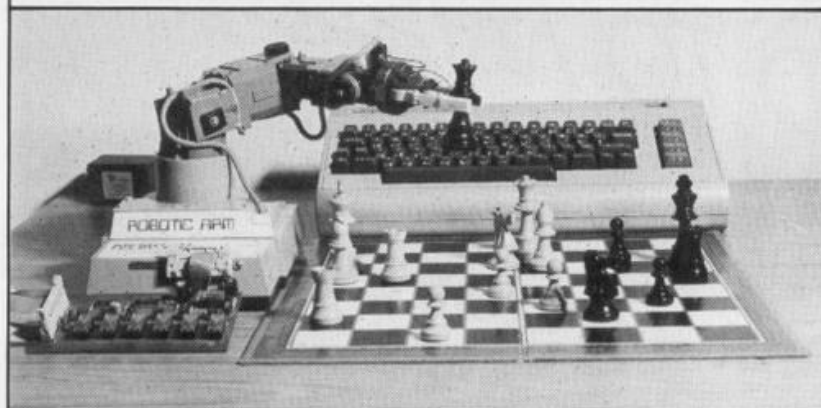
AX=1:BX=BX-1:AX=AX+1000:PROCdraw:UNTIL FALSE
730 IF AX<1000 THEN AX=AX+1000:CL=AX:AX=BX:BX=CL:AX
=AX-1:BX=BX-1:AX=AX-1000:PROCdraw:UNTIL FALSE
740 CL=AX:AX=BX:BX=CL:AX=AX-1:BX=BX-1:PROCdraw
750 UNTIL AX=1000:PROCdraw:CL:ENDPROC
760
770 DEFPROCdrawdiag
780 CL:MOVE 0,0
790 REPEAT:READ AX,BX:IF AX=1000 THEN GOTO 810
800 PROCdraw
810 UNTIL AX=1000:PROCdraw:RESTORE X:CL:MOVE 0,0
820 REPEAT:READ AX,BX:IF AX=1000 THEN GOTO 840
830 AX=AX-1:PROCdraw
840 UNTIL AX=1000:PROCdraw:RESTORE X:CL:MOVE 0,0
850 REPEAT:READ AX,BX:IF AX=1000 THEN GOTO 870
860 AX=AX-1:BX=BX-1:PROCdraw
870 UNTIL AX=1000:PROCdraw:RESTORE X:CL:MOVE 0,0
880 REPEAT:READ AX,BX:IF AX=1000 THEN GOTO 900
890 BX=BX-1:PROCdraw
900 UNTIL AX=1000:PROCdraw:CL:ENDPROC
910
920 DEFPROCdraw
930 IF AX<000 THEN AX=AX+1000:MOVE AX+4,BX+4:AX=AX-
1000:ENDPROC
940 IF AX>000 THEN AX=AX-1000:MOVE AX+4,BX+4:AX=AX+1
000:ENDPROC
950 DRAW AX+4,BX+4:ENDPROC
960
970 DEFPROCstore
980 FOR PX=00A10 TO 00AF:7LOCK=7PX:LOCK=LOCK+1:NEXT
990 FOR PX=00B00 TO 00BF:7LOCK=7PX:LOCK=LOCK+1:NEXT
1000 FOR PX=00C00 TO 00CF:7LOCK=7PX:LOCK=LOCK+1:NEXT
1010 ENDPROC

```

*Listing 3.*

68 YOUR COMPUTER, MAY 1985

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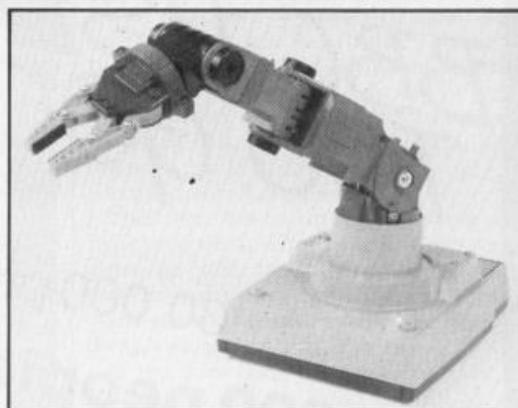


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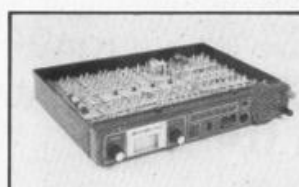


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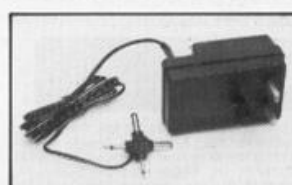
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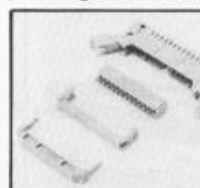
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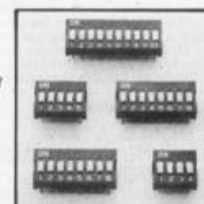
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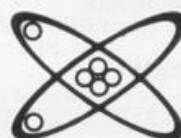
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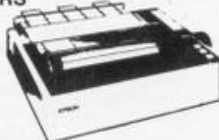
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# Interface

# TANK

Serge Simon with a very fast Basic game for the unexpanded Vic-20.

# BATTLE

## Program 1.

```
0 POKE$2,28:POKE$6,28:POKE$6879
152
1 REM ***** * TA
NK BATTLE * * SERGE SIMON
* *****
5 PRINT"VIC-20 TANK BATTLE"
6
8 PRINT"MADE BY SERGE SIMON"
9
10 PRINT"UDG'S...PLEASE WAIT..."
11
20 C=0:FOR I=7168 TO 7679
30 READ IFA=-1 THEN 51
40 POKE I, A: C=C+A
50 NEXT I
51 IF C<>12528 THEN PRINT"ERROR IN DATA"
55 FOR T=7168+256 TO 7168+256+8:POKE T, 0: NEXT T
60 POKE 198,0:POKE 198,1:POKE 631,1
61 NEW
90 DATA 0,0,0,0,0,0,0
99 REM TANKS *****
100 DATA 16,16,214,254,254,254,19
3,199
```

```
110 DATA 25,50,124,253,191,30,12,
24
120 DATA 0,252,252,36,63,56,252,2
52
130 DATA 24,12,30,191,253,124,50,
25
140 DATA 198,198,254,254,254,214,
16,16
150 DATA 24,40,120,253,191,62,76,
152
160 DATA 63,63,28,252,28,63,63,0
170 DATA 152,76,62,191,253,120,40,
124
171 REM END OF TANKS ***
180 DATA 54,126,62,60,126,124,2
0
190 DATA 0,109,255,255,255,255,76,
0
191 DATA 60,126,255,255,255,255,1
20,60
192 DATA 0,0,24,24,0,0,0
193 DATA 129,90,36,90,90,36,90,12
9
194 DATA 124,60,126,120,60,124,12
4,60
300 DATA -1
```

```
0 PRINT"VIC-20 TANK BATTLE"
1 FOR T=7168 TO 7679:POKE T,0: NEXT T
2,21,1,23,22,21,-1,-23
3 PRINTCHR$(0):CHR$(142)
10 REM TANKGEVECHT * * DOOR SE
RGE SIMON * * VLAANDEREN, BELGIE
*
40 PRINT"VIC-20 TANK BATTLE"
50
41 PRINT"MADE BY SERGE SIMON"
45 PRINT"PLAYER 1:CBM/SHIFT/C
TR/PLAYER 2:FUNCTION KEYS"
46 PRINT"GIVE NAME OF"
50 INPUT"PLAYER 1:"B$:IF LEN(B$)
>5 THEN B$=LEFT$(B$,5)
50 INPUT"PLAYER 2:"A$:IF LEN(A$)
>5 THEN A$=LEFT$(A$,5)
65 PRINT"
69 REM SETUP SCREEN ***
70 POKE$6869,255
71 FOR T=440 TO 484:POKE$38400+T,0: NEXT T
75 PRINT"KJJKJJJJJJJJJJJJJJJJJJ
JK"
76 FOR T=1020:PRINT"NSPC(20)"N":
NEXT T
77 PRINT"KJJKJJJJJJJJJJJJJJJJJJ
JJ"
PRINTCHR$(157):CHR$(148)"JJ"
80 FOR T=0 TO 20:R=INT(1)*484+22:PO
KE$38400+R,5:POKE$6869+R,11: NEXT T
95 PRINT"NSPC(4)"JK"
100 INPUT"NAME 1:"B$:IF LEN(B$)
>5 THEN B$=LEFT$(B$,5)
106 PRINT"NSPC(15)"KJ"
106 INPUT"NAME 2:"A$:IF LEN(A$)
>5 THEN A$=LEFT$(A$,5)
107 PRINT"NSPC(15)"A$:A$
89 REM END SCREEN *****
90 PB=7680+3+242:PA=7680+17+242:
POKE PB,3:POKE PA,7:RA=7:RB=3:POKE
```

```
PB+30720,0
91 POKE PA+30720,6
95 KL=152:POKEV,10:TI$="000000"
96 MS=30:REM NUMBER OF BULLETS F
OR EACH PLAYER
99 REM TANK 1 *****
100 A=PEEK(197)
101 IFA=63 THEN 90 TO 110
102 IFA=55 THEN 120
103 IFA=47 AND A$CM$ THEN 130
104 POKEV=3,0:GOTO 199
110 RA=RA+1:IF RA=9 THEN RA=1
111 POKE PA,RA:POKE$30720+PA,6:GOT
O 199
120 POKEV=3,255:POKE PA,32:PA=PA+
R(RA):IF PEEK(PA)<32 THEN PA=PA-R
(RA)
122 POKE PA,RA:POKE$30720+PA,6:GOT
O 199
130 AS=AS+1:C=0:S=220:PK=PA:R=RA
130 RB=60505:GOTO 200
199 REM TANK 2 *****
199 FOR T=0 TO 25: NEXT T
200 B=PEEK(199)
201 IF B=1 THEN 210
202 IF B=4 THEN 220
203 IF B=2 AND B$CM$ THEN 230
204 POKEV=4,0:GOTO 299
210 RB=RB+1:IF RB=9 THEN RB=1
211 POKE PB,RB:POKE$30720+PB,0:GOT
O 299
220 POKEV=4,255:POKE PB,32:PB=PB+
R(RB):IF PEEK(PB)<32 THEN PB=PB-R
(RB)
222 POKE PB,RB:POKE$30720+PB,0:GOT
O 299
230 BS=BS+1:C=6:S=200:PK=PB:R=RB
```

AS REGULAR readers of *Your Computer* can see, machine code is used more and more for writing games. Such programs are much faster and more sophisticated than Basic programs, but are they better? Typing in those programs, mostly consisting of endless data lines is not a pleasant task, and for beginning computer enthusiasts it may be very discouraging. Also it seems as if people have forgotten that in Basic too, one can write good and reasonable fast games.

Therefore I have written this 100 per cent Basic program. It is Tank Battle, a two-player game for the unexpanded Vic-20. The program starts with displaying a title page, where you will be asked to enter the names of the two players.

If you have done this, and you have hit Return, you can see a sort of map on the screen, and two tanks.

The two players can move around the tanks and they can fire in the direction they move. The aim is — naturally — to destroy the other's tank and to score points. The keys to be used are:

For player one (black tank)  
forward, Ctrl; turn, Shift; and fire, CBM  
For player two (blue tank)  
forward, £5; turn, £7; and fire, £3

The game itself is divided into two parts because of the limited memory of the standard Vic-20. First type in the program with the data statements for the user defined graphics. Then save it and type in the second part. Save this immediately after the first one. If you later load in the first program, the main program will be loaded automatically.

One last note: player one, who sits at the left side, may accidentally hit the Run-Stop key and thus break into the program. To prevent this add line:

2 POKE 45, 240: POKE 46, 26: POKE 788, 194

```
10=RA:GOSUB 500:GOTO 300
299 FOR T=0 TO 25: NEXT T
300 IF TI$<"000140" THEN 100
310 KL=-(KL=152)*160-(KL=160)*15
2:POKE$6879,KL
315 IF TI$<"000150" THEN 100
316 PRINT"POKE$36869,240:POKEV
+1,152
319 POKEV=1,0:POKEV=4,0:POKEV=3,
0
320 PRINT"POKE$6869,255 SCORE
"
321 PRINT"NSPC(1)"B$:B$
322 PRINT"NSPC(2)"A$:A$
323 PRINT"PRESS KEY 2"
330 GETA$:IFA$<"2" THEN 330
340 RUN
350 REM FIRE *****
500 POKEV=1,200:POKEV=4,100
510 FOR T=1 TO 15
520 P=PK+T*(R:IF PEEK(P)<32 THE
N 550
530 POKEV=12:POKEV=1,5-T*4+10:PO
KEV=4,5-T*4:POKEV,32
540 NEXT T
545 POKEV=1,0:POKEV=4,0:POKEV,10
:RETURN
550 IF PEEK(P)>32 THEN 545
560 POKEV=13:POKEV=1,140:POKEV=4,
0:FOR T=15 TO 0 STEP -1:POKEV,T:POKE
$30720+P,2-(INT(1)*.5)*2
565 NEXT T
570 IF PA=0 THEN BS=BS+1:RA=RA+3:RA
=RA+(RA>8)*8:POKE PA,RA
580 IF PB=0 THEN AB=AB+1:RB=RB+3:RB
=RB+(RB>8)*8:POKE PB,RB
590 PRINT"NSPC(15)"B$:B$:A$:A$:PO
KE$30720+P,C:GOTO 545
```

```

Loader.
1 POKE 23693,7: BORDER 0: CLE
AR 23999: LOAD "CODE": LOAD "C"
ODE PRINT "HIT ANY KEY...":USR
30059

```

The hex loader.

```

10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9")+CODE h$(2)
-48-(7 AND h$(2)>"9")+CODE h$(3)
20 INPUT "Start":s
30 INPUT "Finish":f
40 FOR n=s TO f STEP 3
50 LET tot=0:PRINT n:
60 INPUT h$:PRINT h$
70 LET x=0
80 FOR b=1 TO LEN h$ STEP 2
90 LET z=FN h(h$):LET tot=tot
+z
100 POKE n+x,z
110 LET h=h$(3 TO ):LET x=x+1
120 NEXT b
130 PRINT " "
140 IF tot<>t THEN PRINT "input
error - try again":GO TO 50
150 NEXT n
160 REM enter STOP to stop

```

Listing 1.

```

23296: 2A15012404012509 = 151
23304: 0325111C1D0C1E00 = 156

```

SNAKES ALIVE is a 100 per cent machine-code game for any Spectrum which just fills all the memory available to the 16K machine. It features:

- 48 locations, which you are free to move between and around, and each of which is named.
- Choice of control by Kempston-type joystick, cursor type, Interface II or redefinable keyboard.
- Title screen with music, scrolling instructions and display of
- High-score table.
- Annoying addictiveness that makes you unable to stop playing!

The object of the game is to guide Kahn the snake around a house and its grounds to find and collect nine eggs which he has lost. It is

totally non-violent — your poor snake is absolutely defenceless — which doesn't matter as there is nothing else about. The worst thing that can happen to Kahn is either bumping into an object, which results, in a nasty headache, or tying himself in knots. Despite Kahn being the only character that moves, the game is still frustratingly difficult.

On a blank cassette, save the loader program. This will load in the final code:

SAVE "SNAKES II"LINE 1

Type in the hex loader carefully. Save this on the other cassette, in case you don't type in all the hex in one go, or need to check it later.

Now Run the hexloader, type in the code from listing 1, and save the resultant code on the cassette with the loader, using:

SAVE "PRBF" CODE 23296,256  
Run the hex loader again, and this time enter data from listing 2. Once finished, type: SAVE "CODE II" CODE 28384,4384  
This code should not be saved on the final cassette.

Repeat this exactly, except type in code from listing 3. It may be saved temporarily with the same save instruction as before. When you have typed in this code, type:

CLEAR 23833: NEW and then  
CLEAR 23999: LOAD "CODE 2400

Load in the code from listing 2. Save the whole code on the finished cassette of the game, after the PRBF file, with:

SAVE "TOTAL" CODE 24000,8768

Summon up enough courage to try out the game — type Load " and cross your fingers. If the game does not work perfectly first time, the most likely mistake that could have been made is that of entering one or more lines of hex data twice, or missing out others. The checksum is likely to stop other possible errors, but may not have. The only solution, short of starting again from scratch, is to list the program from the hexloader, by loading in relevant sections of code. As a guideline — if the program when tested crashes straight away, the error is likely to be within the code typed in from listing 2.

# SNIA

Listing 2.

```

00000000: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000001: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000002: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000003: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000004: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000005: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000006: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000007: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000008: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000009: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000000A: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000000B: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000000C: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000000D: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000000E: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000000F: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000010: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000011: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000012: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000013: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000014: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000015: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000016: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000017: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000018: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000019: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000001A: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000001B: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000001C: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000001D: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000001E: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000001F: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000020: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000021: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000022: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000023: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000024: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000025: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000026: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000027: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000028: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000029: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000002A: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000002B: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000002C: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000002D: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000002E: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
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00000030: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
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0000005A: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
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0000006A: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
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0000006C: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000006D: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
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00000079: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000007A: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000007B: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000007C: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000007D: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000007E: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
0000007F: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000080: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000081: 00000000 00000000 00000000 00000000 00000000 000000
```

If it is during the game that an error becomes apparent, then look at the hex from listing 3. If, however, it is some mistake with the sound effects, or egg positioning, then check the code from listing 1.

Once the game has loaded, and works successfully, after pressing a key you will be shown the title screen to the game and some quite lengthy, but good, music will play. If this ends or is interrupted by a key press, the scrolling instructions will move slowly along the bottom line. Pressing S or O now will start or take you to the control options screen, respectively. On the control option screen, scrolling instructions again tell you which keys to press: 1 is keyboard, 2 — cursor joystick, 3 — Interface II joystick and 4 — Kempston-type joystick. The current choice is highlighted in white — the others in cyan.

I can supply tapes of the game, with both a turbo load — yes, in 16K! — and a normal load version of the game on, for only £2.75 inc. from: Snakes Alive, 16 Viking Way, Pilgrims Hatch, Brentwood, Essex, CM15 9HX. If you would also like a copy of my other game, Aliquid Simplex, published in *Your Computer* in November of last year, which includes sprites, two-channel music, etc., then I will put this on the same tape for you for another £1. Europe please add £1, overseas an extra £2.



David Aspinall presents a totally non-violent but, nevertheless exciting, game for the Spectrum featuring Kahn the snake.

# SNAKES ALIVE

30416	2045474753205745	30928	CD10677CEE10E610	961	31440	202020200004504C	31952	47C50046454E43C5	749
30424	494348204841484E	30936	F60357E61020022C	676	31448	4841534555548550	31960	02444F4F52535445	546
30432	00484133204C4F753	30944	2C22A958E101C110	981	31456	4520594F5552204E	31968	000148414C4C5741	650
30440	542E205745454E20	30952	D9210975A7030079	1080	31464	4140453A0047A0E1	31976	D903555441495203	318
30448	414C402045474753	30960	4F3E35913205B5C0	904	31472	06085C5CDA17537	31984	0153584152452052	434
30456	20484158645204245	30968	A175C034978C095A	1135	31480	CD18783C28F630FE	31992	4F4FC0014D41494E	857
30464	454E204046F554E44	30976	3E00C01CC8105721	631	31488	00280EFC0D1067F1	32000	20424544524F4FCD	600
30472	0C2052455455524E4	30984	0502197EC922DC58	704	31496	C1E1772310E4C3A1	32008	014C4956494E4720	490
30480	20E4472054434520	30992	1728815CEBAF08C0	917	31504	75C1E135682310FE	32016	524F47C03504154	877
30488	3544158344404E47	30000	187805C0D70014F	1226	31512	C9A17803CDA17528	32024	485741D9D1424143	640
30496	0C204F433154494F	31008	3A815C1F79300CFE	745	31520	F8C09E6A20F61C28	32032	4820424544524F4F	550
30504	4E2E2022E041584F	31016	53CA3375FE4FC33E	1050	31528	F81D186C2D105806	32040	CD034C414E44494E	646
30512	4944455459454E47	31024	F81813FE52AC27E	668	31536	04C5E5C5C0A175C0	32048	C70142415448524F	648
30520	2048414842044E47	31032	F800CA9278FE3138	1091	31544	AD65510802CDD750	32056	4FC0004741524147	630
30528	0C204E44F4463204F	31040	05FE350AF0751A66	1146	31552	0048506245E35320	32064	C501535452454504	737
30536	2020454154414C20	31048	7F8F260029292901	400	31560	5245515549524544	32072	024852454E524044	435
30544	434F4C14C4953494F	31056	007D09034F080608	843	31568	2048455920454F52	32080	4F4FD020504F4E44	873
30552	4E2E2022E041584F	31064	5EB31FF590C793C	1154	31576	3A8CC1245E9A22A9	32088	202020200A00043	387
30560	414E58594448434E47	31072	471A0710FDE60186	786	31584	S11E8504C4A90C0	32096	4F4C504F53524048	866
30568	2045445345524520	31080	772413C110EF0108	839	31592	3066A7CD1878E1C1	32104	4541D00048454447	622
30576	202D202020202270	31088	3CE60720A1001A13	843	31600	73545D40003E0590	32112	45524FD700465255	692
30584	58455353204F4204	31096	87F2692EADCC5B16	902	31608	471A0550028B5E20	32120	49542054524545D3	704
30592	4F5052047414D4520	31104	3CDD0552100702A	818	31616	F8E81110ACDC5C50	32128	0857414CC025354	601
30600	4F5052047414D4520	31112	68650E0632A75B11	601	31624	CD1067C141E12010	32136	5245455420434F50	740
30608	204F52205320544C	31120	C17BAF32FB792100	946	31632	AC0DA175C33E7808	32144	4E45D0205047415244	646
30616	2055544152542020	31128	0022A958C0F4793E	926	31640	2050521600197E21	32152	454E20504154C800	608
30624	20202038C03D4020	31136	0232F8793E0532A7	708	31648	557B06044E280423	32160	6699885651996500	909
30632	2020202000000647	31144	581134721060222	359	31656	10FAC90104000500	32168	F9989E5E5989F900	1285
30640	2041204020452020	31152	A958C0F4791E000E	887	31664	3001097FC9E33005	32176	6699885651996500	753
30648	204F205020520409	31160	0521C050E5218B75	889	31672	20141515177F0DFF	32184	4E99894E28A4600	742
30656	204F2040200C320D	31168	3E4732A758060816	477	31680	2027222320272225	32192	2ACDFFC217B619AC	1098
30664	2020202020202020	31176	0AE33069C0E57910	1079	31688	2027222320262025	32200	1A821C991E901F53	710
30672	2020202020202020	31184	14E33069C0E57910	830	31696	20272223202722A3	32208	215027925722868	615
30680	20202020A0484559	31192	FB1C1C3E4432A75B	745	31704	2225022022259220	32216	2A852C5CF2F593254	592
30688	424F4152442C2041	31200	0020E2F4C97EEB05	1267	31712	2230E2220222A220	32224	354F38483B463F42	531
30696	5320424544FD743	31208	C52A9958C0D067E8	1063	31720	2225022022A805D2	32232	423E463048374F34	537
30704	5852534F5280494F	31216	C1E1230C0C33651A	1030	31728	2225022022A805D2	32240	3430592E5E287042	595
30712	59535544943CB494E	31224	3CC026082C2A95B8	843	31736	2225022022A805D2	32248	3F080A730C34FF00	959
30720	5445552464134520	31232	10F211B8750E05D5	819	31744	23205022A805D2F2	32256	0000000000000000	0
30728	49C9454540505354	31240	0605210C651A8E23	616	31752	2022202220222922	32264	1818181818001800	144
30736	4F4E2044F7F959584	31248	13200710F3F10D20	686	31760	2022202220222E20	32272	FF00FF00FF00FF00	1020
30744	494348204841484E	31256	EEC9013007210000	780	31768	2428242024204A50	32280	FF00FF00FF00FF00	696
30752	202EFFFACB162010	31264	195B18F0D05050C5	942	31776	2428242024204A50	32288	FF00FF00FF00FF00	316
30760	F8240D20F2FB76F3	31272	00281E0C21027511	472	31784	2428242024204A50	32296	1F007F007F007F00	696
30768	C1E15911E259001	31280	00281E0C21027511	1051	31792	2522DEFF72722280	32304	3C007E00FF00FF00	316
30776	1C0307E0C00CCDA1	31288	00281E0C21027511	1177	31800	2522DEFF72722280	32312	70007E00FF00FF00	452
30784	75CDA0653E1FC031	31296	00281E0C21027511	1006	31808	2522DEFF72722280	32320	E000FF00FF00FF00	985
30792	7811A07721000422	31304	00281E0C21027511	918	31816	2522DEFF72722280	32328	FF00C0001008100	708
30800	A958C033662C2604	31312	00281E0C21027511	607	31824	2522DEFF72722280	32336	00005100C300C300	519
30808	22A958C033662C2604	31320	00281E0C21027511	507	31832	2522DEFF72722280	32344	FC00FF00C02C27C0	660
30816	3A0858B83E052002	31328	00281E0C21027511	507	31840	2522DEFF72722280	32352	0000000013386000	128
30824	3E0732A758F64008	31336	00281E0C21027511	507	31848	2522DEFF72722280	32360	0000000000000000	96
30832	5E052C2C22A958B8	31344	00281E0C21027511	511	31856	2522DEFF72722280	32368	0000000000000000	116
30840	5E052C2C22A958B8	31352	00281E0C21027511	511	31864	2522DEFF72722280	32376	3F00000007001F00	1022
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30856	D7110E0C0D76A00	31368	00281E0C21027511	511	31880	2522DEFF72722280	32392	7CC2021C0C27C0C	668
30864	044B4559424F4152	31376	00281E0C21027511	511	31888	2522DEFF72722280	32400	08182848FE050800	414
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30880	4420434F4E54524F	31392	00281E0C21027511	511	31904	2522DEFF72722280	32416	3C0080FC02C27C0	855
30888	4420434F4E54524F	31400	00281E0C21027511	511	31912	2522DEFF72722280	32424	FE02043E05101000	362
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30904	A958C033662C2604	31416	00281E0C21027511	511	31928	2522DEFF72722280	32440		
30912	E8502C5E0C3366E1	31424	00281E0C21027511	511	31936	2522DEFF72722280			
30920	05E2359A7CD977B	31432	00281E0C21027511	511	31944	2522DEFF72722280			

(continued on page 76)

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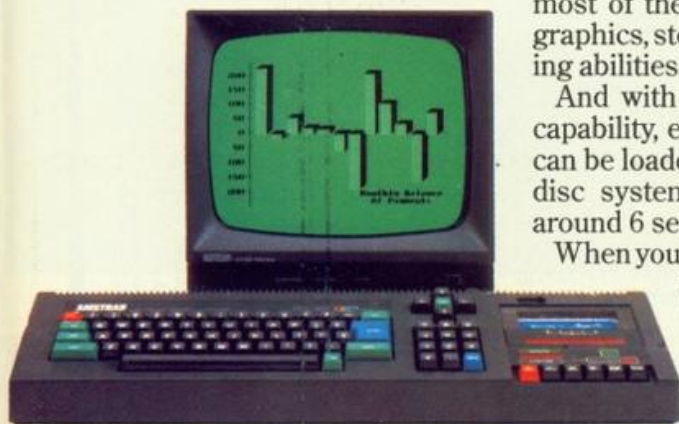
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*[The page contains several columns of extremely faint, illegible text, likely bleed-through from the reverse side or very low quality scan artifacts.]*

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so you cannot hang from anything. You are, however, possessed of a pretty good pair of legs — good that is for running and jumping. Unfortunately, the standard ZX-81 graphics set is somewhat limited and most little blue people end up looking suspiciously like a capital A, and on most televisions, worse still a black and white capital A.

You have absolutely no defences or protection. Almost anything in your environment is hostile. In fact, about the only thing that will

## SURV

## Adrian Spriddell survives.





The image shows a document page with extremely faint, illegible text. The text appears to be organized into columns or sections, but the characters are too light to be transcribed accurately. There are some darker spots and marks scattered across the page, possibly due to scanning artifacts or ink bleed-through from the reverse side.

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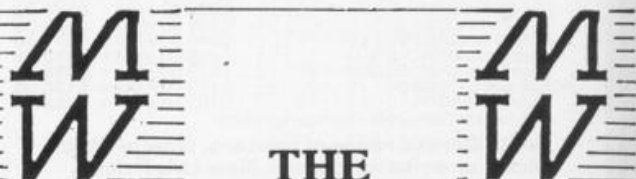
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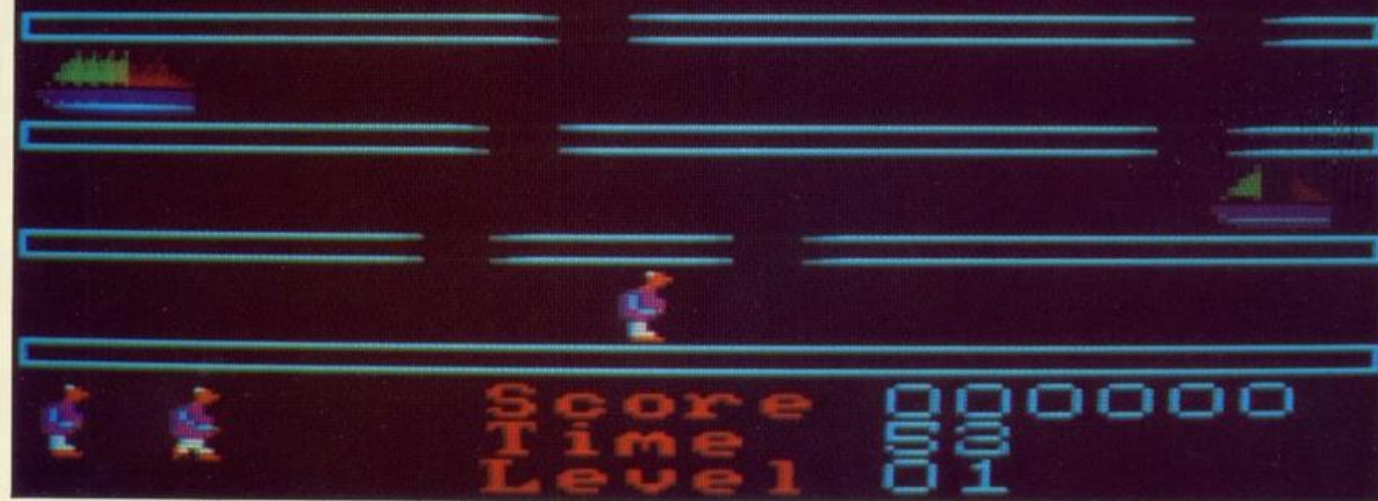
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# AMSTRAD JUMPER

Jason Charlesworth leaps into Amstrad action.



JUMPER is an arcade-quality game for the Amstrad CPC-464 computer in which you must guide a little man called Jumper to the top of the screen.

To get to the top of the screen, Jumper must jump through the moving holes in the platforms but if he falls through a hole he will be stunned and so will be unable to move for a while. However, all the time the nasties are advancing and Jumper, being a nice sort of chap, does not want to kill them so he must run away from them. To help him do this, the screen is wrap round i.e. if he runs off the left-

hand side of the screen he will appear on the right-hand side and vice versa.

The scoring in the game is based on how many times you jump up. The more times you jump up, the more points you get and the amount of points you get per jump increases every other round. If your score is high enough at the end of the game, the program will ask for your name.

The game has 15 screens featuring different combinations of the nasties — yachts, teapots, telephones and tanks — and on each screen continuous music plays — translated by

Robert Rhodes.

The game also features a joystick option and a hard or easy game option. To set up the game type in listing 1 and save it with **SAVE "JUMPER"**

Next type in listing 2 and run it. If it finds an error in the code, correct it then rerun the program and when it gives the "Finished, no errors" message, save the code with **SAVE "CODE",b,35900,3700**

The game may now be played by rewinding the cassette and typing Run"". *Listing 2 is on the next page.*

## Listing 1.

```
100 e=0:j=1:DEF FN x(n)=10*INT(PEEK(n)/16)+PEEK(n)-16*
INT(PEEK(n)/16)
110 INK 1,24:INK 14,26,0:INK 15,0,26:INK 5,0:INK 8,15:
INK 9,3:INK 13,4:INK 10,3
120 GOSUB 130:GOTO 360
130 REM SETUP
140 MEMORY 32767:BORDER 0:INK 0,0:MODE 0:PRINT"Please
wait":LOAD "":e=0:j=1
150 ENV 1,5,2,1,5,1,1,1,0,8,5,-1,1,5,-2,3
160 DIM a$(5),a(5):FOR a=1 TO 5:READ a$(a),a(a):NEXT a
170 DATA Super Ted,50,Shaggy the Yak,40,Black Adder,30
,Doomdark,20,Mangled Cassette,10
180 RETURN
190 REM demo
200 BORDER 1:INK 0,1:MODE 0:CALL 35900
210 FOR a=0 TO 999:z$=INKEY$:NEXT a:BORDER 0:INK 1,0:R
ETURN
220 REM game
230 BORDER 1:INK 0,1:CALL 35946
240 FOR a=0 TO 1999:z$=INKEY$:NEXT a:BORDER 0:INK 0,0
250 sc=10000*FN x(37856)+100*FN x(37855)+FN x(37854)
260 FOR a=1 TO 5:IF sc<a(a) THEN NEXT a:GOTO 290
270 IF a<>5 THEN FOR b=5 TO a+1 STEP -1:a$(b)=a$(b-1):
a(b)=a(b-1):NEXT b
280 CLS:PEN 1:INK 1,24:INPUT "Name ",a$(a):a(a)=sc
290 RETURN
300 REM High score table
310 BORDER 0:INK 0,0:MODE 0
320 PEN 2:PRINT " High Score Table":FOR a=1 TO 5:PEN a
+5
330 LOCATE 1,2*a+3:PRINT a$(a):LOCATE 16,2*a+3:PRINT a
(a):NEXT a
```

```
340 LOCATE 3,24:PEN 2:PRINT"Press a key"
350 IF INKEY$="" THEN 350 ELSE RETURN
360 REM instructions
370 BORDER 0:INK 0,0:MODE 0:PRINT " Instructions"
380 RESTORE 360:FOR a=5 TO 11:READ z$:LOCATE 1,2*a-3:P
EN a+1:PRINT z$:NEXT a
390 LOCATE 1,24:PEN 1:PRINT " Press a key"
400 IF INKEY$="" THEN 400
410 DATA Z Left,\ Right,SHIFT Jump,0 Abort
,H Halt,S Start,SPACE Music on/off
420 DATA 1 Game,2 Demo,3 Easy game,4 Hard
game,5 Joystick,6 Keys
430 MODE 0:PRINT " OPTIONS"
440 FOR a=2 TO 7:READ z$:LOCATE 4,2*a+2:PEN a+4:PRINT
z$:NEXT a
450 IF j=1 THEN LOCATE 4,14:PEN 14:PRINT"5":PEN 1:PRIN
T:PRINT " 6" ELSE LOCATE 4,14:PRINT"5":PRINT:PEN 14:P
RINT " 6":PEN 1
460 IF e=1 THEN LOCATE 4,10:PEN 14:PRINT"3":PEN 1:PRIN
T:PRINT " 4" ELSE LOCATE 4,10:PRINT"3":PRINT:PEN 14:P
RINT " 4":PEN 1
470 z$=INKEY$:IF z$="5" THEN j=1 ELSE IF z$="6" THEN j
=0
480 IF z$="3" THEN e=1 ELSE IF z$="4" THEN e=0
490 IF z$<>"1" AND z$<>"2" THEN 450
500 PEN 1:IF z$="2" THEN GOSUB 190:GOSUB 300:PEN 1:INK
1,24:GOTO 360
510 IF z$<>"1" THEN 490
520 POKE 37853,e:IF j=1 THEN POKE 37562,74:POKE 37570,
75:POKE 36659,72 ELSE POKE 37562,71:POKE 37570,22:POKE
36659,21
530 GOSUB 220:PEN 1:GOSUB 300:PEN 1
540 GOTO 360
```



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# CBM-64

The Telsoft service now extends to include the CBM-64.

THIS MONTH we are pleased to be able to announce the extension of the Telsoft service to Commodore 64 owners. It will be available initially to users who have the OEL Comms pack coupled with the Telemod 2 or similar modem.

Both the downloading program — which is listed with this article — and the full user-to-user communications program for the C-64 have slightly different menus to those produced for the BBC and Spectrum computers — see page 88.

The main difference is the addition of a machine-code Save routine which was considered essential since this is absent from the Commodore operating system. The full C-64

menu is: (1) Receive; (2) Transmit; (3) Chat; (4) Set Baud Rate; (5) Return to Basic; (6) Save Bytes — ie machine code sections. Brief details of the functions of these menu options are as follows:

**Chat mode:** This mode allows a real time conversation between the users with automatic changeover from one end to the other. Each time characters are entered from a different end a carriage return is generated automatically which ensures that the text sent by the two ends is not mixed up on the same line.

**Transmit and Receive modes:** These modes are used to transfer data between computers and if both users start off in the Chat mode

the procedure is semi automatic, as follows:

The user who is going to send the program presses his Stop key which reverts the computers at both ends to the menu. Menu option 2 is called to go to Transmit mode and the user will then be asked to enter details of the data that is to be transmitted to the distant end.

Both the transmitting and receiving ends get a visual display of the progress of the data or program transfer. The data is sent in 256 character blocks, each block being numbered in hex and finishing with an OK if the receiving end calculates that it has received the block without any errors.

If the block contains errors, the OK is

Figure 1.

```

5 REM  HEX LOADER FOR CBM 64  FIG.1
6 REM
10 FOR I=680 TO 727:READA:POKEI,A:T=T+A
20 NEXT:IF T=6716 THEN GOTO 100
30 PRINT"ERROR IN DATA ":T=6716:END
40 DATA 169,1,133,186,169,1,133,184
50 DATA 133,185,169,8,133,183,169,208
60 DATA 133,187,169,2,133,188,169,56
70 DATA 133,251,169,199,133,252,169,251
80 DATA 162,231,160,206,32,216,255,96
90 DATA 68,79,87,78,76,79,65,68
100 SA=51000:LA=52855
110 INPUT"START ADDRESS":A
120 IF (A<SA) OR (A>LA) THEN GOTO 140
130 IF A/8=INT(A/8) THEN GOTO 150
140 PRINT:PRINT"ADDRESS ERROR":GOTO 110
150 T=(A-32768)AND255:PRINTA:INPUTD$
160 IF D$="END" THEN GOTO 900
170 IF LEN(D$)=20 THEN GOTO 190
180 PRINT"WRONG LENGTH":GOTO 150
190 FOR B=0 TO 7:B$=MID$(D$,2*B+1,2)
200 GOSUB 300:IF E=1 THEN GOTO 280
210 POKE A+B,D:T=T+D:NEXT
220 B$=MID$(D$,18,3):GOSUB 300
230 IF E=1 THEN GOTO 280
240 IF T=D THEN GOTO 260
250 PRINT"CHECKSUM ERROR":GOTO 150
260 A = A+B:IF A<LA THEN GOTO 150
270 GOTO 800
280 PRINT TAB(8+2*B+D)C$"??"
290 B=8:NEXT:GOTO 150
300 E=0:D=0:FOR N=1 TO LEN(B$)
310 C$=MID$(B$,N,1):GOSUB 400
320 IF E=1 THEN D=N:N=4:NEXT:RETURN
330 D=D*16+X:NEXT:RETURN
400 X=ASC(C$)-48:IF X<0 THEN E=1:RETURN
410 IF X<10 THEN RETURN
420 X=X-7:IF X<10 THEN E=1:RETURN
430 IF X>15 THEN E=1
440 RETURN
500 H$="0123456789ABCDEF"
510 FOR A=SA TO LA STEP 8
520 PRINT A:"? ":T=(A-32768)AND255
530 FOR B=0 TO 7:X=PEEK(A+B):GOSUB 600
540 T=T+X:NEXT:PRINT"=";

```

```

560 Y=INT(T/256):PRINT MID$(H$,Y+1,1);
570 X=255 AND T:GOSUB 600:PRINT
580 NEXT:GOTO 900
600 PRINT MID$(H$,INT(X/16)+1,1);
610 PRINT MID$(H$,1+(XAND15),1):RETURN
800 SYS 680:C$=CHR$(34)
810 PRINT:PRINT" TO RELOAD CODE : "
815 PRINT:PRINT"  LOAD"C$"DOWNLOAD";
820 PRINTC$,1,1 (RETURN)"
825 PRINT:PRINT" THEN TYPE NEW";
830 PRINT" (RETURN)"
835 PRINT:PRINT"TO RUN THE PROGRAM";
840 PRINT"  SYS 51000 (RETURN)"
900 PRINT:PRINT:PRINT"1 ENTER DATA"
910 PRINT:PRINT"2 PRINT DATA"
920 PRINT:PRINT"3 SAVE DATA"
930 INPUT Z:ON Z GOTO 100,500,800

```

Figure 2.

51000 ? A9068D21D08D20D0=3E2	51304 ? CE8C7DCE202ECCAD=4D4
51008 ? A90F8D0602A90E20=2E4	51312 ? 72CE29F0C980D0E4=506
51016 ? D2FFA908D15D0A9=4DD	51320 ? 20D2CB80DA9973CE=599
51024 ? FF8D8A02BA8E92CE=510	51328 ? 08202ECC0009D0F0=4EB
51032 ? 20CAC920C7CB20F8=4D5	51336 ? A000AD75CE298D0=492
51040 ? CADD80CEC931F823=532	51344 ? 8FA52B85F818A52C=3D8
51048 ? C935F014C936D086=43F	51352 ? 6D75CE85F4C4AC8=587
51056 ? 208EC74C5BC7A914=410	51360 ? AD78CE85F8AD79CE=687
51064 ? 20D2FF202FCB0D08=52E	51368 ? 85FC20D2CB80A820=55E
51072 ? 203FC8A92020D2FF=461	51376 ? D9CC20D2FFC820D9=607
51080 ? 4C93C94C4AC82063=411	51384 ? CC202ECC0010D0EA=528
51088 ? CC2022CD9A5B85FD=4F1	51392 ? A92020D2FFAD75CE=56A
51096 ? A9CE85FE2028CD80=547	51400 ? 202ECD20D2CB8087=4D7
51104 ? 002095CC202FCBC9=404	51408 ? CD7CFE00B8A95820=503
51112 ? 44F00BC954D0ED20=4E1	51416 ? D2FF2030C84C57C8=52C
51120 ? D2FFA901D007A944=4EF	51424 ? 20D2CB80F8CD7DCE=65D
51128 ? 20D2FFA90885BA20=4B9	51432 ? D0E8AD75CEA8B993=687
51136 ? 25CD9A0820A8BCCA=4A3	51440 ? CED00E2030C8A991=4EE
51144 ? 8D85FDA9CD85FEA0=6A0	51448 ? 20D2FF47C7CE94C57=51F
51152 ? 002095CC2025CD20=383	51456 ? C8A0008C77CE8C7D=447
51160 ? 95CC9848A0048C83=4CC	51464 ? CE20D2CB80F091FB=58F
51168 ? CE20D8C968A82025=4C4	51472 ? 202ECC8C077CED0=4D3
51176 ? CD2095CC9848A906=4C5	51480 ? FB20D2CB80E0CD7C=59E
51184 ? 8D83CE20D8C9ADA7=5E3	51488 ? CEF008A95820D2FF=4D8
51192 ? CE85FBAD80CE85FC=6EA	51496 ? 4C57C820D2CB80CE=4CE
51200 ? 68A82060CB8A0185=39A	51504 ? CD7DCEFA0034C23C9=473
51208 ? B885B998A293A0CE=539	51512 ? 20ACCB2030C8AD75=409
51216 ? 20D2FFA909CEACAA=567	51520 ? CE8A9009993CEAD=506
51224 ? CEE8D001C82025CD=479	51528 ? 84CEC98D0825208C=436
51232 ? A9FB20D8FF20F1CB=597	51536 ? CBA9C820F3CB8A955=568
51240 ? 6020D9CC90D008=3FE	51544 ? 2016CD9A95020F3CB=432
51248 ? A90085C7A92020D2=3E0	51552 ? 20C7CBAC73CEC888=54F
51256 ? FFA90D20D2FF60A9=4E7	51560 ? B993CED02398D0F7=5D4
51264 ? 0D2029C8A90D20D2=306	51568 ? 4C5BC7A9552016CD=3D0
51272 ? FF602063CC8000A9=43F	51576 ? 20F1CB4C63C9AC77=4EF
51280 ? FF9993CEC8D0FA20=5FB	51584 ? CE20D2CB80D0FA20=57D
51288 ? D2CB9FB20D2CB80=5ED	51592 ? D2CB20D2CB4C47C9=53E
51296 ? FB8D72CEA0008C7C=4D0	51600 ? 4C5CC8A52B85F8A5=4F5

# 1 TELSOFT

omitted and the block is retransmitted by the sending end until it is received without error.

When data transfer is successfully completed Program loaded OK is printed at both ends and they then revert back to Chat mode.

**Set baud rate:** This gives the user the option to change baud rates to try out different methods of working; e.g., the Telemod 3 has the facilities for full duplex working at 1200/75 and 75/1200. However, the program was specifically written for 1200/1200 bit/s half duplex working — selection 4 from the baud rate menu.

**Save bytes:** As mentioned earlier this facility is built in to enable users to save any number of machine code sections to tape or disc after downloading. The start and finish memory addresses of the machine code can be entered using either decimal or hex numbering. Naturally, any Basic program located in its usual position in memory — i.e., 2048 upwards — should be saved using the machine's built-in Save to tape or disc facility.

Only the Download section of the machine code is given in this listing, not the Transmit and Chat routines.

When you have been returned to the menu, exit to Basic and list the first few lines of the program where we will give the instructions needed to Save the program to tape or disc.

The download program is approximately 1800 bytes in length and consists of a Basic hex loader program and a list of machine code. Type in the hex loader program listed in figure 1 and then Save to tape or disc before

you Run it. When the hex loader program is run the computer will give the prompt "Start address (hex)?" and you should enter 51000 and press Return.

The computer will print the start address of the line and a question mark — e.g., 51000? — you then have to enter all the characters after the question mark from the relevant line in figure 2 and press Return at the end of the line. If all is well you will be prompted with the next address and so on. Each line comes with its own checksum so that you can correct any errors as you go.

If you want to enter the machine code in several sessions you can save part of the code — but to tape only — by entering End instead of the next line of data when you are prompted with a line number and question mark. When you want to continue typing in the machine code program it is reloaded with the Command.

When you have entered all the machine-code lines the hex loader program will automatically save this machine-code section with the title Download, so make sure that you have your tape recorder or disc ready to record, before starting to type in the machine-code section.

If you want to enter the machine code in several sessions you can save part of the code (but to tape only) by entering End instead of the next line of data when you are prompted with a line number and question mark. When you want to continue typing in the machine code program it is reloaded with the command.

LOAD "DOWNLOAD",1,1  
then enter New and Load and Run the hex loader program.

When you have completed and saved the Download program it is reloaded with the command

LOAD "DOWNLOAD",1,1  
or 8,1 for disc — followed by the New command. To Run the program, enter  
SYS 51000 (Return)

## Modem transmit speeds

Provided the machine code is correct you will be asked to select the modem transmit and receive speeds. For the OEL Telemod 2 modem simply select Option 4.

To receive software from Telsoft, the *Your Computer* downloading service, first dial up Colchester (0206) 8068 and check when software for your machine is being downloaded. This audio recorded information service will also advise you which telephone numbers to ring for the 300 and 1200 bit/s downloading services.

When a program you want to download is available, make sure your modem is correctly set up and dial up the telephone number appropriate to your modem's speed. When you hear the modem tones switch the modem to line and replace the receiver.

Select Option 1 from the menu — Receive. As each block of data is received the block number and the program title will be displayed, followed by "OK" if there were no errors. Note that the "OK" will be missing from any blocks in which errors are detected and that the downloading program will wait for these blocks to come round again in order to make a second attempt to load.

When all blocks have been loaded, the Program loaded OK message will appear and you will be returned to the menu or Chat mode after which select Option 5 to leave the Telsoft Menu and list the first few lines of the Basic program you have received to get the necessary Saving instructions.

51608 ? 2C85FCA000B1F899=52A	51920 ? CEADCFCE8DD1CEAD=6C1	52232 ? D0FDAA2069CC6020=454	52544 ? FF68290F0930C93A=31B
51616 ? 2200C8B1F88523F0=4CE	51928 ? D0CE8DD2CE18ADD1=639	52240 ? 25CD9A0220ABCC20=364	52552 ? 300318690720D2FF=2F4
51624 ? 08A52285FB852385=447	51936 ? CE6DCFCE8DDCFCEAD=68F	52248 ? 95CCAD8CE20D2FF=573	52560 ? 60444F574E4C4F41=2C4
51632 ? FC4C9BC918A5F869=57D	51944 ? D2CE6DD0CE8DD0CE=68E	52256 ? A92020D2FFA90320=3A6	52568 ? 44204D454E552131=243
51640 ? 02852D852F8531A5=37B	51952 ? 8005CECECE8D0E66=625	52264 ? ABCC20D8C6904D7D=48A	52576 ? 2020205245434549=228
51648 ? FC6900852E853085=412	51960 ? 2063CC9A9F8D0602=414	52272 ? CE8D7DCEA208AD7D=4AA	52584 ? 5645213520202045=1FE
51656 ? 32602063CC90920D=3E1	51968 ? A95185FDA9CD85FE=575	52280 ? CE2A9018AD7DCE49=411	52592 ? 58495420544F2042=28A
51664 ? 84CEA908D02DE60=4A3	51976 ? A000209DCC2025CD=343	52288 ? 088D7DCEAD7CCE49=460	52600 ? 4153494321362020=22F
51672 ? 8E01CE8C82CEA200=533	51984 ? 209DCC209DCC209D=30F	52296 ? 108D7CCE2E7CCE2E=3D5	52608 ? 2053415645204259=28A
51680 ? A9098DCE202FCB=4D4	51992 ? CC2022CD20A9CC20=3A8	52304 ? 7DCEAD0E160A000=516	52616 ? 5445532128205553=285
51688 ? C914F016C90DF051=4E2	52000 ? 95CC2022CD2095CC=411	52312 ? A9090900D4C8C018=40E	52624 ? 4520122053544F50=26D
51696 ? C32A01920D2FF0D=544	52008 ? 202FCB20D2FF608E=421	52320 ? D0F660A99320D2FF=5B3	52632 ? 205220544F205245=2C4
51704 ? C3CE84CE5C9E000=64B	52016 ? 81CE8C82CE2069CC=4B0	52328 ? 6048A9A2290FD01F=37E	52640 ? 5455524E20544F20=20C
51712 ? D0E3E000F0DF20D2=554	52024 ? 20ECCC20CACC9000=48F	52336 ? A5D448A5A22910F0=4A1	52648 ? 4E54455220292145=28C
51720 ? FFCAC4CE5C9C3090=554	52032 ? D00D20FDC9C931F0=4F0	52344 ? 059A9A4C80CC9A20=42B	52656 ? 4D544552204E554D=2F9
51728 ? D4C9A901548ADC3=444	52040 ? 062001CC4C35CB0D=314	52352 ? 20D2FFA90085D4A9=51C	52664 ? 4245522021494620=281
51736 ? CEC924F004694CE5=460	52048 ? 80CEAE81CEAC82CE=597	52360 ? 9D20D2FF6885D468=53F	52672 ? 4144455245535320=2E6
51744 ? C968C941908FC947=48A	52056 ? 60AE92CE9A4C5B7=4CE	52368 ? 6020D2FFC8B1FDC9=620	52680 ? 495320494E204845=2C8
51752 ? 80B820D2FF3E8930=405	52064 ? 2022CDA92285FDA9=465	52376 ? 21D0F6C8602025CD=48D	52688 ? 582C119D9D9D9D9D=476
51760 ? C90A9002FE907E005=3A6	52072 ? CE85FEA0002095CC=4D4	52384 ? A90C20ABCC2095CC=4B9	52696 ? 9D9D9D9D9D9D9D9D=500
51768 ? F0A9B9DC3CEE84CE5=61A	52080 ? 2025CD800FA92099=39A	52392 ? 60A9058E81CEA9A9=4E6	52704 ? 9D9D9D9D9D9D9D9D=500
51776 ? C9E000F0A0E001D0=52A	52088 ? 93CE88D0F8AD93CE=619	52400 ? 2020D2FFC8B0FAFE=603	52712 ? 4958205749544820=305
51784 ? 07ADC3CE924F895=4FF	52096 ? 202FCB914D018C0=417	52408 ? 81CE60C914F008C9=505	52720 ? 2421535441525420=2E3
51792 ? A92020D2FFA9FF9D=54F	52104 ? 00F0F520D2FF80A9=58F	52416 ? 7FF00160A91460A9=456	52728 ? 4144455245535320=31E
51800 ? C3CEA2008ECFCE8E=544	52112 ? 209993CE4C00CB9C=50A	52424 ? 7F6020E4FFC9C190=50C	52736 ? 464F522041524541=1D3
51808 ? D0CE8ED1CE8ED2CE=659	52120 ? 0DF00B20D2FF9993=4BD	52432 ? 07C9DBB00338E960=4AF	52744 ? 202145494E414C20=1D0
51816 ? ADC3CE924D006A9=512	52128 ? CEC8C10D0DAA920=579	52440 ? 60C941900EC95B90=494	52752 ? 4144455245535320=236
51824 ? 0F8DCDCE88DC3CE=5DD	52136 ? 20D2FF60A92020D2=4B4	52448 ? 08C9619006C97B80=49C	52760 ? 464F522041524541=238
51832 ? C9FF01D20CB0A80=5B2	52144 ? FFA94F20D2FFA94B=58C	52456 ? 02492060480A4808=2D5	52768 ? 202150524F475241=22C
51840 ? 3418BDC3CE5DCFE=524	52152 ? 20D2FF60A9138D00=452	52464 ? 20E1FFD0034C59CB=533	52776 ? 4D2054495544C4520=237
51848 ? 8D0CEA9006DDDCCE=566	52160 ? DEA9128D00DE60A9=4CD	52472 ? 2068A9A6608D00D0=485	52784 ? 204D415820313620=1E5
51856 ? 8D0CEA9020804C75=534	52168 ? 538D00DEA9528D00=40E	52480 ? A9016A9003A90060=250	52792 ? 4348415227532920=219
51864 ? 8ADCFCEAC83CE99=642	52176 ? DE60A996188D87CE=457	52488 ? AD01DE6048AD00D0=307	52800 ? 21124E4F54205641=21B
51872 ? ACCE8ADD0CE99A3=660	52184 ? 8C82CEAC82CE2004=4D4	52496 ? 49026A6A608D200C=223	52808 ? 4C944922C205452=2A5
51880 ? CEC8188C83CEAC82=561	52192 ? CC20ECCCCE87CED0=677	52504 ? C8D0FB8D01DE20EC=508	52816 ? 5920414741494E20=289
51888 ? CEAE81CE602025CD=4ED	52200 ? 02386020FDC80EE=509	52512 ? CC602025CD2028CD=373	52824 ? 3A28214449534320=216
51896 ? A200BD41CE921F0=500	52208 ? 60A9FA8C82CEA820=597	52520 ? A90D20D2FF604829=3A0	52832 ? 4F52205441504520=26B
51904 ? 0720D2FFE84BCA=570	52216 ? 04CC88D0FAAC82CE=616	52528 ? F06A6A6A6A0930C9=3CA	52840 ? 2820442F54202920=1E0
51912 ? 4CDE9ADCCE8DCE=65E	52224 ? 602004CC8A2A8CA=3EE	52536 ? 3A300318690720D2=21F	52848 ? 3F21800000000000=0D0

# TELNET



A reminder of how to use the Telsoft service.

THE PROGRAMS given here will enable Spectrum and BBC owners to download via Your Computer's Telsoft service. First type the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. On the BBC you call the service by entering

CALL 86A00

while Spectrum owners must type

RANDOMIZE USR 60000

So far OE Ltd's Telemod 2 and VTX 5000

modems have been tested with the service, but it also works with a number of other makes.

To find out what is available on Telsoft and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is available, make sure your modem is set up and dial the number appropriate to your modem's

speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received, you will see "OK" printed if there were no errors, otherwise the program will wait for the blocks to come round again.

When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HINEM=659FF
20 CLS:PRINT
30 INPUT "Start Address (Hex):"A$
40 A=VAL("0"+A$)
50 IF A=659FF THEN 200
60 IF A<6A00 OR A>6FE7 THEN 20
```

Figure 2. BBC.

```
6A00 :A9CBA0FEA20120F4,4C6
6A00 :FF20616C204B6DC9,38A
6A10 :31F00BC934FBE9C9,4C0
6A10 :35F00BCA20C6A4C47,20B
6A20 :6AA98C20C6A4C47,20B
6A20 :A000A2FF20FFAFA9,4B2
6A30 :03A20820F4FFAFA9,4B2
6A30 :A20820F4FFAFA9,4B2
6A40 :FEA20820F4FFAFA9,4B2
6A40 :0C20C3FF20FFAFA9,4B2
6A50 :15A20820F4FFAFA9,4B2
6A50 :A9FFB89955F0DFA,507
6A60 :A915A20120F4FF20,394
6A60 :0C6A90F8200C6A90,346
6A70 :FBA0000477847B04,416
6A70 :79B47A047B057820,300
6A80 :D5A0A57829F8C980,499
6A80 :D0E2208C6C80099,468
6A90 :7180C820D56C809,364
6A90 :D0F8A000A57A2908,422
6AA0 :D0B95A1C05761BA5,354
6AA0 :1D0A5730577200C6,209
6AB0 :D0B95A1C05761BA5,354
6AB0 :160C01800F8A5730,523
6AC0 :B2A0200C6A900A5,30C
6AC0 :F7A000A95820C3FF,440
6AD0 :20C7FFA6C67A200C,34F
6AD0 :B0C6C57F8000A9,40C
6AE0 :5020C3FF20FFAFA9,4B2
6AE0 :67A0A5730577200C,209
6AF0 :D0B95A1C05761BA5,354
6AF0 :E3FFA6C67A200C,34F
6B00 :A000A2FF20FFAFA9,4B2
```

```
70 PRINT "A"
80 INPUT "B,C"
90 IF LEN(B$)<16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X=MID$(B$,2*N+1,1):GOSUB 300
130 IF E=1 THEN 260
140 X=MID$(B$,2*N+2,1):GOSUB 300
150 IF E=1 THEN 260
```

```
160 B=VAL("0"+MID$(B$,2*N+1,2))
170 A=A+B*16:GOTO 110
180 NEXT N
190 FOR M=1 TO LEN(C$)
200 X=MID$(C$,M,1):GOSUB 300
210 IF E=1 THEN A=A+1:GOTO 260
220 NEXT M
230 IF T=VAL("0"+C$) THEN 50
240 PRINT "CHECKSUM ERROR!"
```

```
250 A=A-B:GOTO 50
260 PRINT "TYPING ERROR!"
270 A=B*(A DIV 8):GOTO 50
280 *SAVE "DOWNLOAD" 6A00 6B07
290 END
300 E=0:IF ASC(X)<48 THEN E=1:RETURN
310 IF ASC(X)<58 THEN RETURN
320 IF ASC(X)<65 THEN E=1:RETURN
330 IF ASC(X)>71 THEN E=1:RETURN
340 RETURN
```

Figure 1. Spectrum.

```
5 REM SPECTRUM 48k
10 REM Hex Code Loader
15 CLEAR 59000
20 POKE 23456,0:CLS:PRINT
30 INPUT "Start Address"JA
50 IF A<1135 THEN GO TO 200
60 IF A=60000 THEN GO TO 20
70 PRINT A
```

```
80 INPUT "J"JB$
90 IF B$="END" THEN GO TO 200
90 IF LEN(B$)>20 THEN GO TO 260
100 LET T=A-256*INT(A/256)
110 FOR N=0 TO 7
120 LET X=MID$(B$,2*N+1,2)
130 IF E=1 THEN GO TO 260
140 LET X=MID$(B$,2*N+2,2)
150 GO SUB 300:LET Y=Y+16*X
```

```
150 IF E=1 THEN GO TO 260
170 POKE A,Y:LET A=A+1
180 LET T=T+Y:NEXT N:LET Y=0
190 FOR M=1 TO 3
200 GO SUB 300:LET Y=Y+16*X
210 IF E=1 THEN LET A=A+1:GO TO 260
220 NEXT M
230 IF T THEN PRINT "J"JB$:GO TO 50
```

```
240 PRINT "Checksum Error"
250 LET A=A-B:GO TO 50
260 PRINT "Typing Error"
270 LET A=B*INT(A/8):GO TO 50
280 *SAVE "download"CODE 60000,1136
290 POKE 23456,0:STOP
300 LET E=0:LET X=CODE X-48-7*(X/9)
310 IF X<0 OR X>15 THEN LET E=1
320 RETURN
```

Figure 2. Spectrum.

```
60000 :CD15EDC307ECCD15,4C7
60000 :EDC307ECCD154C7,4C7
60010 :50EDC307ECCD154C7,4C7
60010 :B0EDC307ECCD154C7,4C7
60020 :35CAB7EAC366ACD,500
60020 :15ED3EACD84ECCD,5FD
60040 :15ED3EACD84ECCD,5FD
60040 :EACD6AED11E5EE06,58C
60060 :B03E6F121310FCCD,45B
60070 :15E11CDEE06173A,3D2
60080 :20B121310FCCD1FED,30A
60080 :30F8C5D0ECCD1FED,30A
60090 :30F8C5D0ECCD1FED,30A
60100 :6CE326F0F327BEF,544
60110 :3A6E5F0EBC6A65,5A7
60120 :EFA6F0F0EBC6A65,5A7
60120 :07116E5F0EBC6A65,5A7
60130 :AAEAI312CDEBCD,552
60140 :20F23A69FE60820,51A
60150 :802145EED4B6A6FE,36C
60160 :00477922A6F000A,1DA
60160 :11CDEECCD1FED300,47F
60170 :12130CDEBC679FE,45C
60180 :1020F8C30DEBCD1,447
60190 :ECCD1FED0AAAE21,574
60200 :6FEF8E28133E0811,326
```

```
60200 :E0EE12133E0812CD,340
60210 :D7ECCDA6ECC3AAEA,6B1
60220 :CD1FED0AAAE2178,510
60230 :E0EE20E121E5EE3A,324
60240 :A0F85A6F3E000C6F,3CC
60240 :3E000E2000CDD7EC,46F
60250 :3E213200CC3FFEB,40F
60260 :3E0032A6FE327BEF,3C7
60270 :E05B6A6FE000CD1F,40C
60280 :ED0AAAE2178FECD,634
60290 :E05B6A6FE000CD1F,40C
60290 :E05B6A6FE000CD1F,40C
60290 :E05B6A6FE000CD1F,40C
60300 :E12130C3A6A6F9F,3FC
60310 :120CDD1FED0AAAE2,50B
60320 :21A6FEBC22DEBCD,54F
60330 :1FED0AAAE2178FE,5A2
60340 :10EC22DEBC22DEBCD,54F
60350 :EE3E683E3E3E3E00,498
60360 :32E4EE3A000CFE21,583
60370 :2003CD15ECCD1FED,583
60380 :CD0A6ECC21E5EE3A6,5C5
60390 :E05B6A6FE000CD1F,40C
60400 :E05B6A6FE000CD1F,40C
60410 :E05B6A6FE000CD1F,40C
60420 :E05B6A6FE000CD1F,40C
60430 :E05B6A6FE000CD1F,40C
```

```
60440 :31D3FF3E0F320F5C,505
60440 :320D5C32405C3E01,250
60450 :3F0E21915CC9FEF8,560
60460 :CD0E0C3A6EACD15,52F
60470 :ECCDA6ED3E0B13FE,556
60480 :21A5EE3E00C00EFC,442
60490 :CD0A6ECCD4ECCDA6,654
60500 :ECC23C077ECCD77EC,5BF
60510 :CD0A6ECCD4ECCDA6,654
60520 :ECC23C077ECCD77EC,5BF
60530 :A3E3CE07C00EFC,561
60540 :84E23C97FE000C,520
60550 :C0B0E23C97FE000C,520
60560 :C0B0E23C97FE000C,520
60570 :C0B0E23C97FE000C,520
60580 :C0B0E23C97FE000C,520
60590 :C0B0E23C97FE000C,520
60600 :C0B0E23C97FE000C,520
60610 :C0B0E23C97FE000C,520
60620 :C0B0E23C97FE000C,520
60630 :C0B0E23C97FE000C,520
60640 :C0B0E23C97FE000C,520
60650 :C0B0E23C97FE000C,520
60660 :C0B0E23C97FE000C,520
```

```
60670 :E0EE10326FEF3721,305
60680 :E0EE10326FEF3721,305
60690 :20E2C1E1C910001,394
60700 :21A00CDB0503C93E,32F
60710 :963277EFCDD7EDA,529
60720 :2EEDF1C36A6ACD,508
60730 :ED7E681F602D3FE,540
60740 :AF2177E35200237,2FC
60750 :C9CD77E35200237,2FC
60760 :47EEDF08C8B37C9,50F
60770 :F5D0FF3A81E0000,5C7
60780 :200A3E3610023E37,107
60790 :D3FDB77F1C9F53A,675
60800 :81E0FE00000A3E36,376
60810 :D3FDB77F1C9F53A,675
60820 :000D0F60837C0B,594
60830 :FFE68237C0B8FFCE,626
60840 :30200A007F7A7C3A,3E0
60850 :81E0FE00000A3E36,376
60860 :10023E3603F7D07F,452
60870 :C9CD77E35200237,2FC
60880 :F1C36A6ACD53ED3D,5EE
60890 :20FDF1C9CD0003D,62A
60900 :20FAC9C5D05E5FE,780
60910 :7F2B1307F0E0FEBC,557
60920 :200C6E0D0003E20,28A
60930 :D73E0D0710103E20,38A
60940 :D73E0D0710103E20,38A
60950 :2120033E0D073E3F,2E6
```

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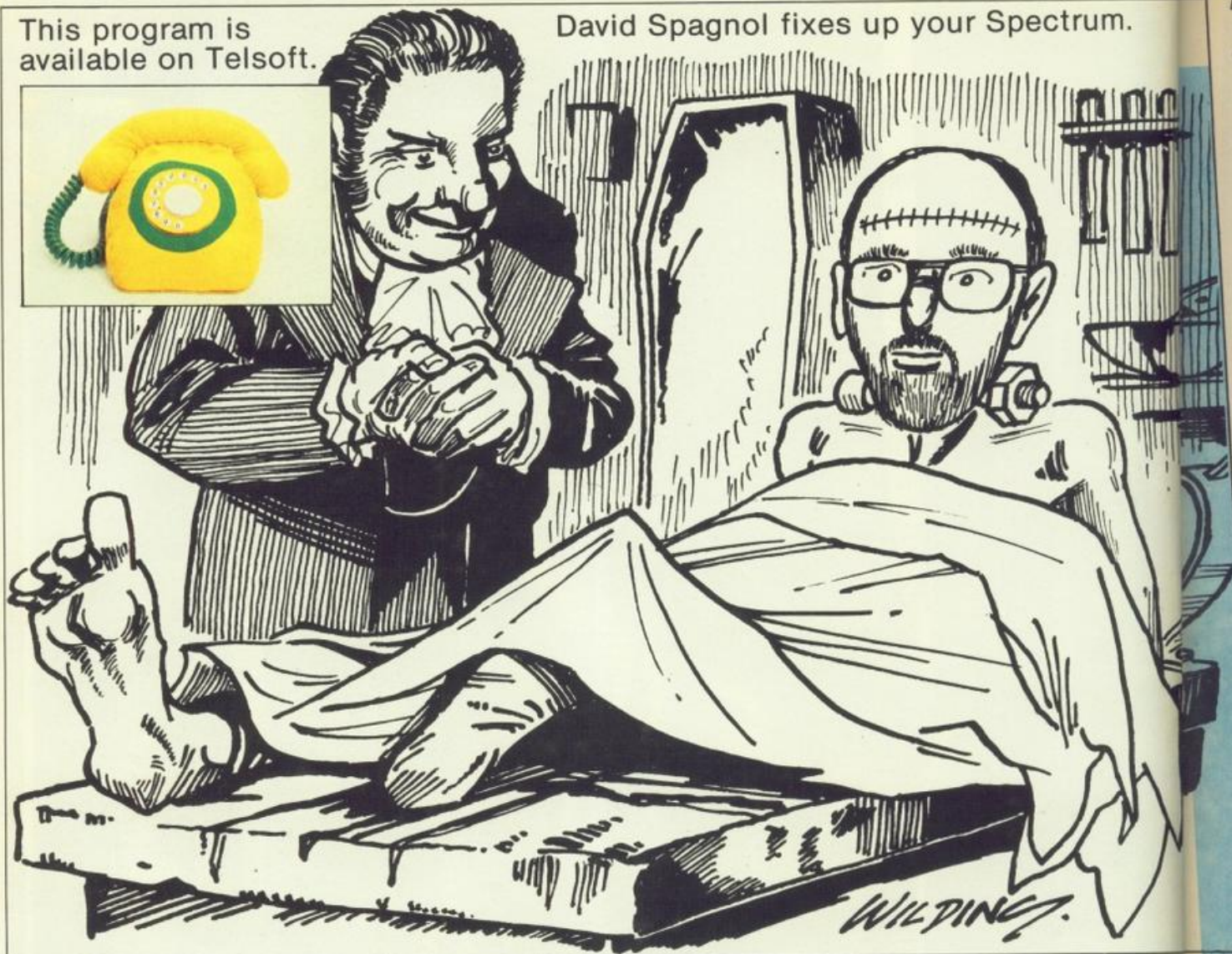
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This program is available on Telsoft.



David Spagnol fixes up your Spectrum.



THERE ARE a number of Basic Programmer's Toolkits on the market for the ZX Spectrum. They all seem to have one or two absolutely brilliant functions, which are only used because they are there. Meanwhile, the normal toolkit functions are pretty ordinary and often not at all user-friendly. I have tried to compile a number of Toolkit functions which operate the way I want them to. I also decided to write a user-friendly System to link them all up. A tidy Menu Page is included as is a method of returning to the menu any time Input is requested.

Single-key entry and default values have been avoided. It is too easy to make a mistake and ruin a program. Every parameter is prompted for on screen. Most errors that can occur are trapped. There are a number of error messages.

A feature that will please many people is that if Open #2, p or t is entered before calling the machine-code, the menu and prompts are still printed to the screen, but any Output — say, in Search and List, or List Variables — is sent to the selected channel.

*The Editor:* After much searching through Logan & O'Hara's book on the Spectrum Rom disassembly, I worked out how to call the internal Editor from machine-code. All

# TOOLKIT

Input is treated like Input Line — i.e. Caps 6 will return to Basic and no syntax check is made. Two added features are that the calling routine has to specify a length limit for any string, and that the empty string causes a return to the Menu. If the length limit is exceeded then the input is rejected and the editor is called again.

*The Collect Number Routine:* This uses the Editor to allow input up to five bytes. If any non-numeric characters are included, or the number is over 65535, then input is rejected and the Editor called again. Only positive whole numbers are allowed. If the first character is a "#", then characters A-F or a-f are also allowed, and a hex number is evaluated.

*The Parameter subroutine:* This is a bit of code that when called, uses the bytes following the call as instructions. Compare the Spectrum Rom's floating-point calculator. It calls the editor for input, prints strings and

numbers on screen, as well as ordinary letters and messages from a table. It places input into buffers, and when all the prompts have been answered, tests to see if the values are valid. If all is well, it then asks if the routine should be executed. If you answer Y or y then the work is done. Some individual routines have further tests and error traps inside them.

*The Renumber functions:* Because of the way these programs correct Goto line numbers, they should not be used with programs that contain machine-code in Rem lines.

*R — Renumber block of program:* Renumbers a specified block — Start and first unaffected line numbers — with a new base — Destination — and Increment as specified by the user. It makes sure that line numbers will not overlap. It corrects purely integer, simple and up to four-figure numbers after Goto, Gosub, Llist, Run, Restore, and Line — as in Save a\$ Line 100 — throughout the entire program. It also removes leading zeros in

# Listing 1.

```

100 REM PUT MACHINE CODE
110 CLEAR 50000
120 LET A=100: LET B=110: LET C=120: LET D=130: LET E=140
130 LET F=150
140 LET G=160: LET H=170: LET I=180: LET J=190: LET K=200
150 LET L=210: LET M=220: LET N=230: LET O=240: LET P=250
160 LET Q=260: LET R=270: LET S=280: LET T=290: LET U=300
170 LET V=310: LET W=320: LET X=330: LET Y=340: LET Z=350
180 LET AA=360: LET AB=370: LET AC=380: LET AD=390: LET AE=400
190 LET AF=410: LET AG=420: LET AH=430: LET AI=440: LET AJ=450
200 LET AK=460: LET AL=470: LET AM=480: LET AN=490: LET AO=500
210 LET AP=510: LET AQ=520: LET AR=530: LET AS=540: LET AT=550
220 LET AU=560: LET AV=570: LET AW=580: LET AX=590: LET AY=600
230 LET AZ=610: LET BA=620: LET BB=630: LET BC=640: LET BD=650
240 LET BE=660: LET BF=670: LET BG=680: LET BH=690: LET BI=700
250 LET BJ=710: LET BK=720: LET BL=730: LET BM=740: LET BN=750
260 LET BO=760: LET BP=770: LET BQ=780: LET BR=790: LET BS=800
270 LET BT=810: LET BU=820: LET BV=830: LET BW=840: LET BX=850
280 LET BY=860: LET BZ=870: LET CA=880: LET CB=890: LET CC=900
290 LET CD=910: LET CE=920: LET CF=930: LET CG=940: LET CH=950
300 LET CI=960: LET CJ=970: LET CK=980: LET CL=990: LET CM=1000
310 LET CN=1010: LET CO=1020: LET CP=1030: LET CQ=1040: LET CR=1050
320 LET CS=1060: LET CT=1070: LET CU=1080: LET CV=1090: LET CW=1100
330 LET CX=1110: LET CY=1120: LET CZ=1130: LET DA=1140: LET DB=1150
340 LET DC=1160: LET DD=1170: LET DE=1180: LET DF=1190: LET DG=1200
350 LET DH=1210: LET DI=1220: LET DJ=1230: LET DK=1240: LET DL=1250
360 LET DM=1260: LET DN=1270: LET DO=1280: LET DP=1290: LET DQ=1300
370 LET DR=1310: LET DS=1320: LET DT=1330: LET DU=1340: LET DV=1350
380 LET DW=1360: LET DX=1370: LET DY=1380: LET DZ=1390: LET EA=1400
390 LET EB=1410: LET EC=1420: LET ED=1430: LET EE=1440: LET EF=1450
400 LET EG=1460: LET EH=1470: LET EI=1480: LET EJ=1490: LET EK=1500
410 LET EL=1510: LET EM=1520: LET EN=1530: LET EO=1540: LET EP=1550
420 LET EQ=1560: LET ER=1570: LET ES=1580: LET ET=1590: LET EU=1600
430 LET EV=1610: LET EW=1620: LET EX=1630: LET EY=1640: LET EZ=1650
440 LET FA=1660: LET FB=1670: LET FC=1680: LET FD=1690: LET FE=1700
450 LET FG=1710: LET FH=1720: LET FI=1730: LET FJ=1740: LET FK=1750
460 LET FL=1760: LET FM=1770: LET FN=1780: LET FO=1790: LET FP=1800
470 LET FQ=1810: LET FR=1820: LET FS=1830: LET FT=1840: LET FU=1850
480 LET FV=1860: LET FW=1870: LET FX=1880: LET FY=1890: LET FZ=1900
490 LET GA=1910: LET GB=1920: LET GC=1930: LET GD=1940: LET GE=1950
500 LET GF=1960: LET GH=1970: LET GI=1980: LET GJ=1990: LET GK=2000
510 LET GL=2010: LET GM=2020: LET GN=2030: LET GO=2040: LET GP=2050
520 LET GQ=2060: LET GR=2070: LET GS=2080: LET GT=2090: LET GU=2100
530 LET GV=2110: LET GW=2120: LET GX=2130: LET GY=2140: LET GZ=2150
540 LET HA=2160: LET HB=2170: LET HC=2180: LET HD=2190: LET HE=2200
550 LET HF=2210: LET HG=2220: LET HH=2230: LET HI=2240: LET HJ=2250
560 LET HK=2260: LET HL=2270: LET HM=2280: LET HN=2290: LET HO=2300
570 LET HP=2310: LET HQ=2320: LET HR=2330: LET HS=2340: LET HT=2350
580 LET HU=2360: LET HV=2370: LET HW=2380: LET HX=2390: LET HY=2400
590 LET HZ=2410: LET IA=2420: LET IB=2430: LET IC=2440: LET ID=2450
600 LET IE=2460: LET IF=2470: LET IG=2480: LET IH=2490: LET II=2500
610 LET IJ=2510: LET IK=2520: LET IL=2530: LET IM=2540: LET IN=2550
620 LET IO=2560: LET IP=2570: LET IQ=2580: LET IR=2590: LET IS=2600
630 LET IT=2610: LET IU=2620: LET IV=2630: LET IW=2640: LET IX=2650
640 LET IY=2660: LET IZ=2670: LET JA=2680: LET JB=2690: LET JC=2700
650 LET JD=2710: LET JE=2720: LET JF=2730: LET JG=2740: LET JH=2750
660 LET JI=2760: LET JJ=2770: LET JK=2780: LET JL=2790: LET JM=2800
670 LET JN=2810: LET JO=2820: LET JP=2830: LET JQ=2840: LET JR=2850
680 LET JS=2860: LET JT=2870: LET JU=2880: LET JV=2890: LET JW=2900
690 LET JX=2910: LET JY=2920: LET JZ=2930: LET KA=2940: LET KB=2950
700 LET KC=2960: LET KD=2970: LET KE=2980: LET KF=2990: LET KG=3000
710 LET KH=3010: LET KI=3020: LET KJ=3030: LET KK=3040: LET KL=3050
720 LET KM=3060: LET KN=3070: LET KO=3080: LET KP=3090: LET KQ=3100
730 LET KR=3110: LET KS=3120: LET KT=3130: LET KU=3140: LET KV=3150
740 LET KW=3160: LET KX=3170: LET KY=3180: LET KZ=3190: LET LA=3200
750 LET LB=3210: LET LC=3220: LET LD=3230: LET LE=3240: LET LF=3250
760 LET LG=3260: LET LH=3270: LET LI=3280: LET LJ=3290: LET LK=3300
770 LET LL=3310: LET LM=3320: LET LN=3330: LET LO=3340: LET LP=3350
780 LET LQ=3360: LET LR=3370: LET LS=3380: LET LT=3390: LET LU=3400
790 LET LV=3410: LET LW=3420: LET LX=3430: LET LY=3440: LET LZ=3450
800 LET MA=3460: LET MB=3470: LET MC=3480: LET MD=3490: LET ME=3500
810 LET MF=3510: LET MG=3520: LET MH=3530: LET MI=3540: LET MJ=3550
820 LET MK=3560: LET ML=3570: LET MN=3580: LET MO=3590: LET MP=3600
830 LET MQ=3610: LET MR=3620: LET MS=3630: LET MT=3640: LET MU=3650
840 LET MV=3660: LET MW=3670: LET MX=3680: LET MY=3690: LET MZ=3700
850 LET NA=3710: LET NB=3720: LET NC=3730: LET ND=3740: LET NE=3750
860 LET NF=3760: LET NG=3770: LET NH=3780: LET NI=3790: LET NJ=3800
870 LET NK=3810: LET NL=3820: LET NM=3830: LET NO=3840: LET NP=3850
880 LET NQ=3860: LET NR=3870: LET NS=3880: LET NT=3890: LET NU=3900
890 LET NV=3910: LET NW=3920: LET NX=3930: LET NY=3940: LET NZ=3950
900 LET OA=3960: LET OB=3970: LET OC=3980: LET OD=3990: LET OE=4000
910 LET OF=4010: LET OG=4020: LET OH=4030: LET OI=4040: LET OJ=4050
920 LET OK=4060: LET OL=4070: LET OM=4080: LET ON=4090: LET OO=4100
930 LET OP=4110: LET OQ=4120: LET OR=4130: LET OS=4140: LET OT=4150
940 LET OU=4160: LET OV=4170: LET OW=4180: LET OX=4190: LET OY=4200
950 LET PA=4210: LET PB=4220: LET PC=4230: LET PD=4240: LET PE=4250
960 LET PF=4260: LET PG=4270: LET PH=4280: LET PI=4290: LET PJ=4300
970 LET PK=4310: LET PL=4320: LET PM=4330: LET PN=4340: LET PO=4350
980 LET PQ=4360: LET PR=4370: LET PS=4380: LET PT=4390: LET PU=4400
990 LET PV=4410: LET PW=4420: LET PX=4430: LET PY=4440: LET PZ=4450
1000 LET QA=4460: LET QB=4470: LET QC=4480: LET QD=4490: LET QE=4500
1010 LET QF=4510: LET QG=4520: LET QH=4530: LET QI=4540: LET QJ=4550
1020 LET QK=4560: LET QL=4570: LET QM=4580: LET QN=4590: LET QO=4600
1030 LET QQ=4610: LET QR=4620: LET QS=4630: LET QT=4640: LET QU=4650
1040 LET QV=4660: LET QW=4670: LET QX=4680: LET QY=4690: LET QZ=4700
1050 LET RA=4710: LET RB=4720: LET RC=4730: LET RD=4740: LET RE=4750
1060 LET RF=4760: LET RG=4770: LET RH=4780: LET RI=4790: LET RJ=4800
1070 LET RK=4810: LET RL=4820: LET RM=4830: LET RN=4840: LET RO=4850
1080 LET RP=4860: LET RQ=4870: LET RS=4880: LET RT=4890: LET RU=4900
1090 LET RV=4910: LET RW=4920: LET RX=4930: LET RY=4940: LET RZ=4950
1100 LET SA=4960: LET SB=4970: LET SC=4980: LET SD=4990: LET SE=5000
1110 LET SF=5010: LET SG=5020: LET SH=5030: LET SI=5040: LET SJ=5050
1120 LET SK=5060: LET SL=5070: LET SM=5080: LET SN=5090: LET SO=5100
1130 LET SP=5110: LET SQ=5120: LET SR=5130: LET SS=5140: LET ST=5150
1140 LET SU=5160: LET SV=5170: LET SW=5180: LET SX=5190: LET SY=5200
1150 LET SZ=5210: LET TA=5220: LET TB=5230: LET TC=5240: LET TD=5250
1160 LET TE=5260: LET TF=5270: LET TG=5280: LET TH=5290: LET TI=5300
1170 LET TJ=5310: LET TK=5320: LET TL=5330: LET TM=5340: LET TN=5350
1180 LET TO=5360: LET TP=5370: LET TQ=5380: LET TR=5390: LET TS=5400
1190 LET TU=5410: LET TV=5420: LET TW=5430: LET TX=5440: LET TY=5450
1200 LET TZ=5460: LET UA=5470: LET UB=5480: LET UC=5490: LET UD=5500
1210 LET UE=5510: LET UF=5520: LET UG=5530: LET UH=5540: LET UI=5550
1220 LET UJ=5560: LET UK=5570: LET UL=5580: LET UM=5590: LET UN=5600
1230 LET UO=5610: LET UP=5620: LET UQ=5630: LET UR=5640: LET US=5650
1240 LET UT=5660: LET UV=5670: LET UW=5680: LET UX=5690: LET UY=5700
1250 LET VZ=5710: LET WA=5720: LET WB=5730: LET WC=5740: LET WD=5750
1260 LET WE=5760: LET WF=5770: LET WG=5780: LET WH=5790: LET WI=5800
1270 LET WJ=5810: LET WK=5820: LET WL=5830: LET WM=5840: LET WN=5850
1280 LET WO=5860: LET WP=5870: LET WQ=5880: LET WR=5890: LET WS=5900
1290 LET WT=5910: LET WU=5920: LET WV=5930: LET WX=5940: LET WY=5950
1300 LET WZ=5960: LET XA=5970: LET XB=5980: LET XC=5990: LET XD=6000
1310 LET XE=6010: LET XF=6020: LET XG=6030: LET XH=6040: LET XI=6050
1320 LET XJ=6060: LET XK=6070: LET XL=6080: LET XM=6090: LET XN=6100
1330 LET XO=6110: LET XP=6120: LET XQ=6130: LET XR=6140: LET XS=6150
1340 LET XT=6160: LET XU=6170: LET XV=6180: LET XW=6190: LET XY=6200
1350 LET XZ=6210: LET YA=6220: LET YB=6230: LET YC=6240: LET YD=6250
1360 LET YE=6260: LET YF=6270: LET YG=6280: LET YH=6290: LET YI=6300
1370 LET YJ=6310: LET YK=6320: LET YL=6330: LET YM=6340: LET YN=6350
1380 LET YO=6360: LET YP=6370: LET YQ=6380: LET YR=6390: LET YS=6400
1390 LET YT=6410: LET YU=6420: LET YV=6430: LET YW=6440: LET YX=6450
1400 LET YZ=6460: LET ZA=6470: LET ZB=6480: LET ZC=6490: LET ZD=6500
1410 LET ZE=6510: LET ZF=6520: LET ZG=6530: LET ZH=6540: LET ZI=6550
1420 LET ZJ=6560: LET ZK=6570: LET ZL=6580: LET ZM=6590: LET ZN=6600
1430 LET ZO=6610: LET ZP=6620: LET ZQ=6630: LET ZR=6640: LET ZS=6650
1440 LET ZT=6660: LET ZU=6670: LET ZV=6680: LET ZX=6690: LET ZY=6700
1450 LET ZZ=6710: LET AA=6720: LET AB=6730: LET AC=6740: LET AD=6750
1460 LET AE=6760: LET AF=6770: LET AG=6780: LET AH=6790: LET AI=6800
1470 LET AJ=6810: LET AK=6820: LET AL=6830: LET AM=6840: LET AN=6850
1480 LET AO=6860: LET AP=6870: LET AQ=6880: LET AR=6890: LET AS=6900
1490 LET AT=6910: LET AU=6920: LET AV=6930: LET AW=6940: LET AX=6950
1500 LET AY=6960: LET AZ=6970: LET BA=6980: LET BB=6990: LET BC=7000
1510 LET BD=7010: LET BE=7020: LET BF=7030: LET BG=7040: LET BH=7050
1520 LET BI=7060: LET BJ=7070: LET BK=7080: LET BL=7090: LET BM=7100
1530 LET BN=7110: LET BO=7120: LET BP=7130: LET BQ=7140: LET BR=7150
1540 LET BS=7160: LET BT=7170: LET BU=7180: LET BV=7190: LET BW=7200
1550 LET BX=7210: LET BY=7220: LET BZ=7230: LET CA=7240: LET CB=7250
1560 LET CC=7260: LET CD=7270: LET CE=7280: LET CF=7290: LET CG=7300
1570 LET CH=7310: LET CI=7320: LET CJ=7330: LET CK=7340: LET CL=7350
1580 LET CM=7360: LET CN=7370: LET CO=7380: LET CP=7390: LET CQ=7400
1590 LET CR=7410: LET CS=7420: LET CT=7430: LET CU=7440: LET CV=7450
1600 LET CW=7460: LET CX=7470: LET CY=7480: LET CZ=7490: LET DA=7500
1610 LET DB=7510: LET DC=7520: LET DD=7530: LET DE=7540: LET DF=7550
1620 LET DG=7560: LET DH=7570: LET DI=7580: LET DJ=7590: LET DK=7600
1630 LET DL=7610: LET DM=7620: LET DN=7630: LET DO=7640: LET DP=7650
1640 LET DQ=7660: LET DR=7670: LET DS=7680: LET DT=7690: LET DU=7700
1650 LET DV=7710: LET DW=7720: LET DX=7730: LET DY=7740: LET DZ=7750
1660 LET EA=7760: LET EB=7770: LET EC=7780: LET ED=7790: LET EE=7800
1670 LET EF=7810: LET EG=7820: LET EH=7830: LET EI=7840: LET EJ=7850
1680 LET EK=7860: LET EL=7870: LET EM=7880: LET EN=7890: LET EO=7900
1690 LET EP=7910: LET EQ=7920: LET ER=7930: LET ES=7940: LET ET=7950
1700 LET EU=7960: LET EV=7970: LET EW=7980: LET EX=7990: LET EY=8000
1710 LET EZ=8010: LET FA=8020: LET FB=8030: LET FC=8040: LET FD=8050
1720 LET FE=8060: LET FG=8070: LET FH=8080: LET FI=8090: LET FJ=8100
1730 LET FK=8110: LET FL=8120: LET FM=8130: LET FN=8140: LET FO=8150
1740 LET FP=8160: LET FQ=8170: LET FR=8180: LET FS=8190: LET FT=8200
1750 LET FU=8210: LET FV=8220: LET FW=8230: LET FX=8240: LET FY=8250
1760 LET FZ=8260: LET GA=8270: LET GB=8280: LET GC=8290: LET GD=8300
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1780 LET GK=8360: LET GL=8370: LET GM=8380: LET GN=8390: LET GO=8400
1790 LET GP=8410: LET GQ=8420: LET GR=8430: LET GS=8440: LET GT=8450
1800 LET GU=8460: LET GV=8470: LET GW=8480: LET GX=8490: LET GY=8500
1810 LET GZ=8510: LET HA=8520: LET HB=8530: LET HC=8540: LET HD=8550
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1870 LET IE=8810: LET IF=8820: LET IG=8830: LET IH=8840: LET II=8850
1880 LET IJ=8860: LET IK=8870: LET IL=8880: LET IM=8890: LET IN=8900
1890 LET IO=8910: LET IP=8920: LET IQ=8930: LET IR=8940: LET IS=8950
1900 LET IT=8960: LET IU=8970: LET IV=8980: LET IW=8990: LET IX=9000
1910 LET IY=9010: LET IZ=9020: LET JA=9030: LET JB=9040: LET JC=9050
1920 LET JD=9060: LET JE=9070: LET JF=9080: LET JG=9090: LET JH=9100
1930 LET JI=9110: LET JJ=9120: LET JK=9130: LET JL=9140: LET JM=9150
1940 LET JN=9160: LET JO=9170: LET JP=9180: LET JQ=9190: LET JR=9200
1950 LET JS=9210: LET JT=9220: LET JU=9230: LET JV=9240: LET JW=9250
1960 LET JX=9260: LET JY=9270: LET JZ=9280: LET KA=9290: LET KB=9300
1970 LET KC=9310: LET KD=9320: LET KE=9330: LET KF=9340: LET KG=9350
1980 LET KH=9360: LET KI=9370: LET KJ=9380: LET KK=9390: LET KL=9400
1990 LET KM=9410: LET KN=9420: LET KO=9430: LET KP=9440: LET KQ=9450
2000 LET KR=9460: LET KS=9470: LET KT=9480: LET KU=9490: LET KV=9500
2010 LET KW=9510: LET KX=9520: LET KY=9530: LET KZ=9540: LET LA=9550
2020 LET LB=9560: LET LC=9570: LET LD=9580: LET LE=9590: LET LF=9600
2030 LET LG=9610: LET LH=9620: LET LI=9630: LET LJ=9640: LET LK=9650
2040 LET LM=9660: LET LN=9670: LET LO=9680: LET LP=9690: LET LQ=9700
2050 LET LR=9710: LET LS=9720: LET LT=9730: LET LU=9740: LET LV=9750
2060 LET LW=9760: LET LX=9770: LET LY=9780: LET LZ=9790: LET MA=9800
2070 LET MB=9810: LET MC=9820: LET MD=9830: LET ME=9840: LET MF=9850
2080 LET MG=9860: LET MH=9870: LET MI=9880: LET MJ=9890: LET MK=9900
2090 LET ML=9910: LET MN=9920: LET MO=9930: LET MP=9940: LET MQ=9950
2100 LET MR=9960: LET MS=9970: LET MT=9980: LET MU=9990: LET MV=10000
2110 LET MW=10010: LET MX=10020: LET MY=10030: LET MZ=10040
2120 LET NA=10050: LET NB=10060: LET NC=10070: LET ND=10080
2130 LET NE=10090: LET NF=10100: LET NG=10110: LET NH=10120: LET NI=10130
2140 LET NJ=10140: LET NK=10150: LET NL=10160: LET NM=10170: LET NO=10180
2150 LET NP=10190: LET NQ=10200: LET NR=10210: LET NS=10220: LET NT=10230
2160 LET NU=10240: LET NV=10250: LET NW=10260: LET NX=10270: LET NY=10280
2170 LET NZ=10290: LET OA=10300: LET OB=10310: LET OC=10320: LET OD=10330
2180 LET OE=10340: LET OF=10350: LET OG=10360: LET OH=10370: LET OI=10380
2190 LET OJ=10390: LET OK=10400: LET OL=10410: LET OM=10420: LET ON=10430
2200 LET OO=10440: LET OP=10450: LET OQ=10460: LET OR=10470: LET OS=10480
2210 LET OT=10490: LET OU=10500: LET OV=10510: LET OW=10520: LET OX=10530
2220 LET OY=10540: LET OZ=10550: LET PA=10560: LET PB=10570: LET PC=10580
2230 LET PD=10590: LET PE=10600: LET PF=10610: LET PG=10620: LET PH=10630
2240 LET PI=10640: LET PJ=10650: LET PK=10660: LET PL=10670: LET PM=10680
2250 LET PN=10690: LET PO=10700: LET PP=10710: LET PQ=10720: LET PR=10730
2260 LET PS=10740: LET PT=10750: LET PU=10760: LET PV=10770: LET PW=10780
2270 LET PX=10790: LET PY=10800: LET PZ=10810: LET QA=10820: LET QB=10830
2280 LET QC=10840: LET QD=10850: LET QE=10860: LET QF=10870: LET QG=10880
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2300 LET QM=10940: LET QN=10950: LET QO=10960: LET PQ=10970: LET QR=10980
2310 LET QS=10990: LET QT=11000: LET QU=11010: LET QV=11020: LET QW=11030
2320 LET QX=11040: LET QY=11050: LET QZ=11060: LET RA=11070: LET RB=11080
2330 LET RC=11090: LET RD=11100: LET RE=11110: LET RF=11120: LET RG=11130
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2350 LET RM=11190: LET RN=11200: LET RO=11210: LET RP=11220: LET RQ=11230
2360 LET RS=11240: LET RT=11250: LET RU=11260: LET RV=11270: LET RW=11280
2370 LET RX=11290: LET RY=11300: LET RZ=11310: LET SA=11320: LET SB=11330
2380 LET SC=11340: LET SD=11350: LET SE=11360: LET SF=11370: LET SG=11380
2390 LET SH=11390: LET SI=11400: LET SJ=11410: LET SK=11420: LET SL=11430
2400 LET SM=11440: LET SN=11450: LET SO=11460: LET SP=11470: LET SQ=11480
2410 LET SR=11490: LET SS=11500: LET ST=11510: LET SU=11520: LET SV=11530
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2480 LET UB=11840: LET UC=11850: LET UD=11860: LET UE=11870: LET UF=11880
2490 LET UG=11890: LET UH=11900: LET UI=11910: LET UJ=11920: LET UK=11930
2500 LET UL=11940: LET UM=11950: LET UN=11960: LET UO=11970: LET UP=11980
2510 LET UQ=11990: LET UR=12000: LET US=12010: LET UT=12020: LET UV=12030
2520 LET UW=12040: LET UX=12050: LET UY=12060: LET UZ=12070: LET VA=12080
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2540 LET VG=12140: LET VH=12150: LET VI=12160: LET VJ=12170: LET VK=12180
2550 LET VL=12190: LET VM=12200: LET VN=12210: LET VO=12220: LET VP=12230
2560 LET VQ=12240: LET VR=12250: LET VS=12260: LET VT=12270: LET VU=12280
2570 LET VV=12290: LET VW=12300: LET VX=12310: LET VY=12320: LET VZ=12330
2580 LET WA=12340: LET WB=12350: LET WC=12360: LET WD=12370: LET WE=12380
2590 LET WF=12390: LET WG=12400: LET WH=12410: LET WI=12420: LET WJ=12430
2600 LET WK=12440: LET WL=12450: LET WM=12460: LET WN=12470: LET WO=12480
2610 LET WP=12490: LET WQ=12500: LET WR=12510: LET WS=12520: LET WT=12530
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2640 LET XF=12640: LET XG=12650: LET XH=12660: LET XI=12670: LET XJ=12680
2650 LET XK=12690: LET XL=12700: LET XM=12710: LET XN=12720: LET XO=12730
2660 LET XP=12740: LET XQ=12750: LET XR=12760: LET XS=12770: LET XT=12780
2670 LET XU=12790: LET XV=12800: LET XW=12810: LET XZ=12820: LET YA=12830
2680 LET YB=12840: LET YC=12850: LET YD=12860: LET YE=12870: LET YF=12880
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2700 LET YL=12940: LET YM=12950: LET YN=12960: LET YO=12970: LET YP=12980
2710 LET YQ=12990: LET YR=13000: LET YS=13010: LET YT=13020: LET YU=13030
2720 LET YV=13040: LET YW=13050: LET YX=13060: LET YZ=13070: LET ZA=13080
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2770 LET ZV=13290: LET ZW=13300: LET ZX=13310: LET ZY=13320: LET ZZ=13330
2780 LET AA=13340: LET AB=13350: LET AC=13360: LET AD=13370: LET AE=13380
2790 LET AF=13390: LET AG=13400: LET AH=13410: LET AI=13420: LET AJ=13430
2800 LET AK=13440: LET AL=13450: LET AM=13460: LET AN=13470: LET AO=13480
2810 LET AP=13490: LET AQ=13500: LET AR=13510: LET AS=13520: LET AT=13530
2820 LET AU=13540: LET AV=13550: LET AW=13560: LET AX=
```

(continued from previous page)

depression will be taken as K mode. Symbol Shift A followed by just A will give Stop. This is useful in functions A and S, avoiding having to do Then keyword backspace Delete forwardspace.

**N — Autoline Number:** Prompts for Increment. When awaiting a Basic line to be entered, adds the Increment value to the existing current line and inserts that number in the Edit line. It only works if the last key pressed was Enter. It will very rarely append to a line after a syntax error — you'll just have to delete. Note that Q, T, W and X all turn this utility off.

**Q — Constant memory:** Gives a constant display of memory left. Is turned off by N, T, W and X.

**T — Trace — Continuous display of current program line:** This function prompts for speed. 100 is close to normal running speed. As the number is reduced, the program runs considerably slower. So if there is something wrong with your program you can get a rough idea why. When this function is in operation, you can skip through part of your program at normal speed by holding down Enter and K together. You can freeze the program by holding Enter and L together. Trace is turned off by N, Q, W and X.

**X — Return interrupts to normal:** Switches off N, Q, T and W. You can now New if you wish!

**A — Search and replace:** This prompts for Start and Finish line numbers. It then asks for Old and New strings. String in this sense means a string of characters from the program. They do not have to be the same length. There is also a List option (not advisable when there will be a large number of alterations). If the string to be altered contains floating point numbers, tell the program by preceding and following the number with three "&" signs. For example:

OLD STRING: "m";&&&1&&& NEW STRING:

would allow you to change Microdrive commands for tape. If "&&&" is part of a non-numeric string, this feature would not work further down the line. It also works in the New String. There is a maximum string length, including &'s, of 32 characters. To use the Bin character, place &&& before the Bin and after the bits. If the number is too large, a return to Basic is made with error 6. Error 4 is also possible but no damage will have been done.

**B — Machine code to data:** This prompts for start and finish addresses, a destination and number of bytes per line. Lines are formed incrementing by one. It gives the option of hex in the same form as line 1000 onwards in listing 1 or Decimal numbers. Only the hex form gives a checksum. A memory check is made before each line is started to ensure that the program is not corrupted by unfinished lines.

#### Listing 3.

```
9997 STOP : SAVE "Toolkit" LINE 9998: SAVE "Toolbytes"
CODE 60000,5368: VERIFY "Toolkit": VERIFY "Toolbytes"
CODE : STOP
9998 CLEAR 59999: LOAD "Toolbytes"CODE 60000: STOP
9999 RANDOMIZE USR 60000
```

#### Error Reports.

Error message	May occur in
Task completed	Most routines: it means it's done as told
Range error	B, C, M, N, R, T, U. Increment > 100
Numbers reversed	A B C D J K L M P R
Invalid line number	S. Start > Finish
Zero not allowed	Line > 9996. Non-existent line in O.
Lines would overlap	C M N R T U. Speaks for itself.
No room at destination	R. Check what you are trying to do.
Zero block!	B C E M. Not enough unused line numbers.
	C D. No actual lines from start to finish

A check is also made to ensure that there are enough unused line numbers at the destination. Of course, machine code occupying the same space as the Toolkit will have to be moved before the Toolkit is loaded but that is simple enough.

**U — UDGs to data:** This is the same as function "B" but is an easier way of working if you want to put any UDGs — perhaps produced by function G — into Data lines. It asks for the number of UDGs required — starting from A — so 4 gives graphic A, B, C and D — and the number of the first Data line. It puts eight bytes on each line.

**D — Delete block of program:** This is obvious. Enter first line and finish line as prompted. It is very quick indeed.

**E — Create a Rem line:** This can create a Rem line of 35,000 characters in less than a second. Useful for those without Interface 1 who enter their machine code that way. Prompts for Line Number, Length, and Symbol.

**F — Delete Rem lines:** Prompts for Start and Finish line numbers. Deletes Rem lines in specified range only, including :Rem further down a line. Does not deal with If a Then Rem but who is that daft?

**G — UDG Designer:** Prompts for a character to be used as a starting point. This is then amended by entering the co-ordinates of a point on an 8 by 8 grid — number first — followed by i for fill in and o for rub out. Mirror images, inversions and rotations can also be made. Finally, the UDG is entered into a specified letter.

**H — Hex/Decimal conversions:** Will print any number input in both hex and decimal. As all numbers 0-65535 can be entered in either hex or decimal — see above under Collect Number routine — this is useful. It

#### Listing 2.

```
1 REM Lines 9997-9999 are referred to as L1
2 String 2 in the text. Listing 3 is, of course,
3 the first program on this tape!
9997 STOP : ERASE "m";"Toolkit": ERASE "m";"Toolby
tes": SAVE "m";"Toolkit": VERIFY "m";"Toolkit":
SAVE "m";"Toolbytes":CODE 60000,5368: VERIFY "m";
"Toolbytes":CODE : STOP
9998 CLEAR 59999: LOAD "m";"Toolbytes":CODE 60000: S
TOP
9999 RANDOMIZE USR 60000
```

keeps prompting for more numbers. Return to menu using Empty String.

**I — Status report:** Gives a report of memory left, whether interrupts are normal or diverted, printout of UDGs provided channel s or p is in use, plus a few other bits. A command can be entered without returning to the menu.

**J — Merge block of lines:** Will merge together a specified block of lines as one line. Watch out for Goto destinations, Rem lines, and the fact that the Spectrum only allows 127 commands on a line.

**K — Lower to upper case and L — upper to lower case:** Will convert letters inside a program between two specified lines. Note that there is an option to include or exclude characters inside string quotes.

**O — Token locate:** This gives the address in both decimal and hex of the first symbol after the Line Number and Length Pointer in a specified line. Gives an error if the line does not exist.

**P — Compact program:** Does usual prompts for specified program block. Then deletes any unnecessary characters — i.e., spaces and colour controls outside quotes. It ignores lines that start with Rem but does affect messages after Rems if it is not the very first symbol on the line.

**S — Search and List:** This is the opposite to function A in how it deals with floating-point forms. It searches the lines and prints them in accordance with how they look when listed so you don't have to worry about hidden characters. It prompts for Start and Finish line numbers, and the string of characters to be searched for — maximum length 32.

**V — List variables:** Does what it says. All simple variables are given with their values, except that CHR\$ 0-31 in string variables are printed as "?". For-Next variables are printed in capitals with their values, and Dimensioned variables are printed with their dimensions but no values.

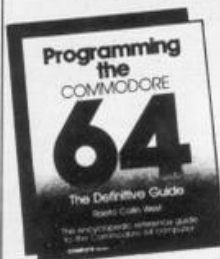
**Warning — Line 9999:** If at any time there is an attempt to append to the existing program — i.e., creating lines after the last one present — using functions B, C, E, M or U, then although the functions will appear to work, the new lines will be formed in the variables area, and the computer will not work properly until you Clear it. Also Renumber relies on the fact that Line 9999 is present to ensure that if doesn't form invalid line numbers. So always ensure that at least Line 9999 is present in a program before using the Toolkit.

All prompts requiring line numbers actually reject anything above 9996. I append two suggested ideas for lines 9997 to 9999 depending on whether you are a Microdrive owner or not. Note that it is unwise to use Autorun on the Microdrive version as you would be unable to Merge the control lines with your existing program.

Lines 1000 upwards of listing 1 were produced by the toolkit. Type in listing 1. Save it by Run 500. Run the program. If all is well you will end up with Report E. Once okay, save it by Run 490 and save the Code also — Run 600. Rand USR 60000 should give you a nice title page. Use Caps 6 to return to Basic, then do a New then enter listing 2 or 3 as appropriate. Now Run 9997, then continue.

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0000 LB HL, (20004)	PC 0000	0000 FF 00 FF 00 FF 00 FF 00
0005 LB DE, (20004)	SP 0004	0000 FF 00 FF 00 FF 00 FF 00
000A OR A	IX 0000	0000 FF 00 FF 00 FF 00 FF 00
000F SRC HL, DE	IX 0000	0000 FF 00 FF 00 FF 00 FF 00
0014 LB SP, HL	0000 HL 0000	0000 2A 04 00 11 00 18 07 ED
001A PUSH HL	0000 DE 0000	0000 32 FF 03 3A 04 00 5F 16
001B LB A, (20004)	0000 BC 0000	0000 00 00 00 00 00 00 00
001E LB E, A	0000 AF 00FF	0000 00 00 00 00 00 00 00
002F LB B, E	0000 0000	0000 19 21 00 01 7E 87 20 08
0033 CALL 0000	18 0078	0000 5F 0E 02 E3 03 05 00 E1
003A LB DE, C	18 0078	0000 5F 0E 02 E3 03 05 00 E1
003F LB C, E	SP 17 1E HL DE BC AF	0000 0000 0000 0000 0000 0000
0044 CALL 0000	0004 0000 0000 0000 0000 0000	
004E INC A	DOPE C3 C3 C3 C3 C3 C3 C3 C3	
005F JR NZ, 001A	0020 03 03 03 03 03 03 28	
0065 LB A, HL	2021 01 01 01 01 01 01 01	
006A LB A, HL	0019 00 00 00 00 00 00 00	
006F OR A	0020 00 00 00 00 00 00 00	
0074 JR NZ, 001A	0020 C3 C3 C3 C3 C3 C3 C3 C3	
007A LB E, A	0020 00 00 00 00 00 00 00	
007F LB E, A	0020 00 00 00 00 00 00 00	
0084 LB C, E	0020 00 00 00 00 00 00 00	

a brilliant front panel debugger

## HISOFT

180 High Street North,  
Dunstable, Beds. LU6 1AT  
Telephone (0582) 696421

THE AIM OF this and the next article is to describe the construction of a compiler system for BBC Basic that is suitable for use on the BBC and Electron computers. The limitations on the amount of memory available on these machines mean that it is not possible for the program to compile all of BBC Basic — instead only a subset is treated but this is more extensive than that handled by some commercially available compilers. This subset is shown in figure 1. I shall refer to it as TC — Tiny Compiled — Basic.

TC Basic consists of two programs; the compiler which is a large Basic program and the run time system — RTS — which is a hybrid machine code — Basic program. This article will describe the compiler while the subsequent one will contain a description of the assembly language program that generates the RTS: this is called the run time system generator — RTSG.

The aim of a compiler, is to convert a program written in a high-level language like BBC Basic into a much simpler one like machine code which will therefore run faster. A program compiled by the TC Basic compiler will run as fast as a Forth program — ie., four to five times faster than the usual interpreted BBC Basic.

The code version of a program is rather more compact than the original Basic program and, typically, at least 10K of code can be generated on a BBC micro — for the Electron 4K would be a reasonable estimate.

The compilers usually implemented on mainframe and minicomputers take the high-level program and convert it into machine code. However, for the BBC computer this approach has the disadvantage that the 6502 CPU chip does not have instructions to do many of the things one would like it to.

For instance, there are no instructions to add two 16 bit numbers or for multiplication. To get round this I have invented a "virtual machine". This is an idealised CPU which has instructions to do all the things required. It is implemented as a 6502 machine-code program. The compiler produces machine-code for this virtual machine; such code is usually called pseudo-code or more briefly, p-code.

The machine-code to interpret the p-code, is contained in the RTS and this is, of course, the main purpose of this program. The use of p-code has some advantages and some disadvantages. The chief advantage is that it makes the compiler and run time system a bit less complex. A further advantage is that compiled programs are very compact. The

chief disadvantage is that p-code executes about three times slower than machine code.

An alternative to p-code would be to compile the Basic program into 6502 machine-code statements. Every time some feature not in the 6502 instruction set was required we could jump to a subroutine in a run time support system. Simple functions like addition could be implemented as in line code. The major advantage of this approach is that programs run faster. However, there is the disadvantage that programs are very long; perhaps three to four times the length of an equivalent p-code program.

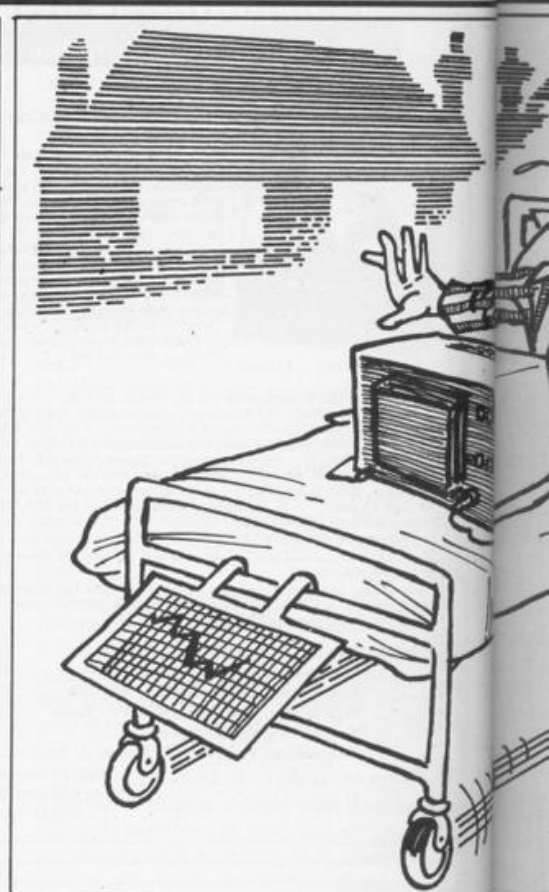
All the components of a p-code system are used by a true machine-code compiler. It is therefore worth starting with such a system if you want to learn how to make a compiler work.

The TC Basic compiler is shown in the listing. Obviously, if you want a TC Basic system, begin by typing in this listing. It should be Saved before you try Running it. In addition, before you can declare the compiler finished, it is necessary to enter in line 120 the value of the address in memory of the top of the RTS. This number, is provided by the RTSG program to be described in part 2.

The following is a description of the major components of the compiler. The main program runs between lines 150 and 300. Line 150 calls Procsetup — line 560. This initialises the values of various variables; in particular, it gives a large number of them the values of the Basic tokens which correspond to the keywords the compiler needs to know about. Procsetup also calls Proctok — lines 380 to 540 — which assembles a small machine-code program which is used to print out keywords from their tokens in the listings of programs. In addition, Procsetup prompts the user to specify the sizes of various things and reserves the appropriate quantities of memory.

Line 160 is a call of Procopen — lines 940 to 1020 — which opens the file containing the program to be compiled. Once the file is open, characters are always read from it by using FNCH — line 1020. Line 170 set things up so that compilation can start and in line 180, the call of Procprog actually initiates the compilation process. After the program has been compiled, execution of the main program continues at line 190. Lines 190 to 210 check if the storage allocations have been exceeded and print error messages if this is the case.

At line 220, a check is made to see if there have been any errors so far. If there have, the program branches to line 290: this is where



# COMP

the compiler ends if there are errors; a message is printed out giving the number of errors.

At this point, the compiler has constructed a p-code version of the Basic program. However, there are no actual addresses in this for either variables or for Goto — or in p-code jump — statements to branch to. To complete the p-code program it must be "fixed up". This is done by Procfix — lines 4050 to 4230 — and its associated routines in lines 3950 to 4280. This procedure allocates memory to variables and finds out the addresses in code to which Gotos, procedures and functions correspond. While the code is being fixed up, it is also relocated so that it will run at the address corresponding to the top of the RTS. Hence the reason why the value of this must

Figure 1. TC Basic Specification

#### Variables:

2 byte signed integers.

Variable names may contain up to 255 characters and may end with a %. The variables A% to Z%, use the same memory locations as the usual Basic system variables thus allowing programs to pass information, and enabling parameter passing to the Call statement.

#### Arrays:

Multiple dimension arrays of 2 byte signed integers.

Arithmetic Operators: +, -, \*, /, DIV, MOD

Logical Operators: AND, OR, EOR, NOT

Relational Operators: =, <, >, >=, <=, <>  
Indirection Operator: ? (right hand side operand only)

#### Statements:

FOR TO STEP NEXT (no variable allowed after NEXT)

REPEAT UNTIL

PRINT "string" ' variable / expression, TAB(X,Y) ;

IF THEN ELSE

VDU ; ;

\* string (send string to OSCLI)

GOTO line number

SOUND ENVELOPE

MODE GCOL COLOUR CLS CLG MOVE

DRAW PLOT

CALL END

#### DIM array / variable

#### System variables / functions:

INKEY GET TRUE FALSE

ADVAL TIME ABS SGN

POS VPOS POINT SQR RND()

#### Procedures / functions:

DEFPROC PROC ENDPROC

DEFFN FN =

procedure and function arguments are not supported but procedures and functions can be used recursively.

In addition, the following are supported: REM, () (brackets), = (assignment), : (for multi-statement lines), integer constants, + and - (unary sign operators), & (for hex constants).



*WILDING*

D J Piling with a compiler for the BBC.

# COMPILER

be known.

Finally, if no errors occur in the fix up process the compiler ends at line 260; this calls Procdump — lines 1040 to 1180 — to save the code produced.

Some other features of the compiler are worth describing. The procedures in lines 1230 to 1900 compose the lexical analyser.

Every time Proclx — lines 1230 to 1360 — is called, it reads the text token from the program and puts its type in the variable T%. Here "token" does not refer to the usual BBC Basic keyword token. Instead, it means the next significant piece of the program. Therefore, tokens can be variables and strings.

As was stated earlier, in a p-code system one constructs a virtual machine. In TC Basic the virtual machine is stack-based. This means that all operations take place either to or from the stack. For instance, there is an operation Add which takes a variable and adds it to the top element of the stack the result of the addition becoming the new top of stack element.

When the syntax analysis requires that a variable be added to the stack it calls Procadd. This writes the opcode for Add (2) into the code space and follows it with the address of the variable. In fact, until fix up instead of the variables address its number in the symbol table is used.

Other code generating subroutines, are supplied for all the operations the virtual machine is required to perform.

A typical scenario for the use of the compiler would be as follows: First, the program is developed as usual using the TC Basic subset to BBC Basic with the BBC Basic interpreter and Saved. Next, the compiler is Loaded and Run. It then asks for three pieces of information; the number of variables, the number of line numbers and the code space in bytes for the program to be compiled. Typically, answers of 100, 100 and 2000 would suffice for a small program. It is important to note that the number after a Goto counts as a variable as do the names of functions and procedures. Thus you must be careful when calculating how many variables to reserve space for.

Next, the compiler will ask you for the name of the program to be compiled. This will then be read in off the tape. This can in fact lead to a slight problem since, the compiler, is treating a program file as a data file. On a cassette-based system they are written to tape with different inter-block gaps.



This article is available on the Telsoft service.

With some cassette recorders having the wrong gap will lead to filing system errors when the program is being read in. The solution to this problem; if it happens to you, is to define one of the function keys as follows: \*KEY0 \*OPT,1 IIM INPUT " "FILE NAME "AS:X% = OPENOUTA\$:FORI% = PAGE TO TOP-1: BPUT #X%, ?I%: NEXT: CLOSE #X%: \*OPT IIM f0 is then used for saving programs to be compiled.

As the program is compiled, it will be listed out on the screen. If any errors are found there will be a break in the listing and an appropriate error message. If enough room has not been reserved for variables code or lines you will be informed of the amount of space needed for the.

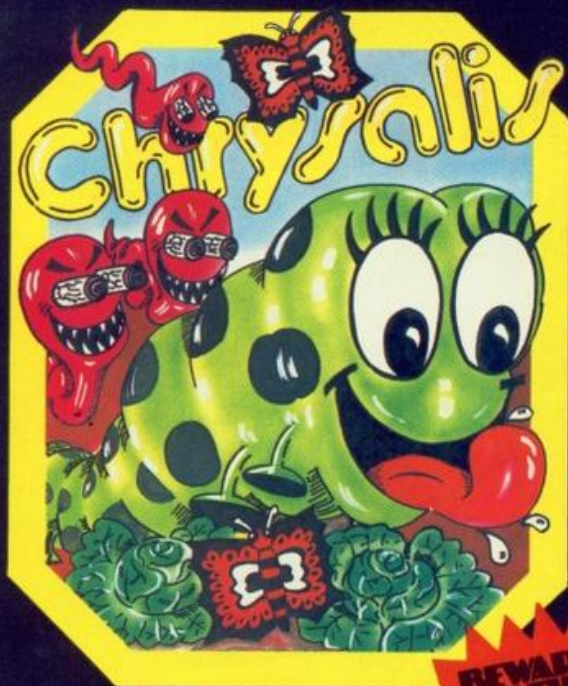
Finally, if there are no errors in compilation, a copy of the code equivalent of the Basic program can be saved. This will automatically be given the name C.name-of-compiled-program.

To execute the program, this new code file must be loaded into the RTS. The construction of this will be described in part 2. A C30 containing the listings from both articles, TC Basic systems set up for both tape and disc based computers and example programs and code files is available from D. J. Piling, 12 Cherrywood Avenue, Anchorsholme, Blackpool. FY5 1SU. in return for a cheque for £2.99.

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(listing continued from previous page)

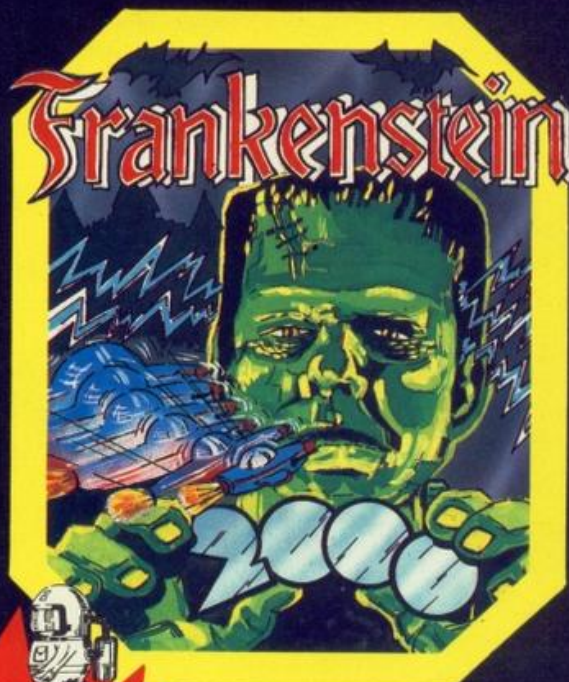
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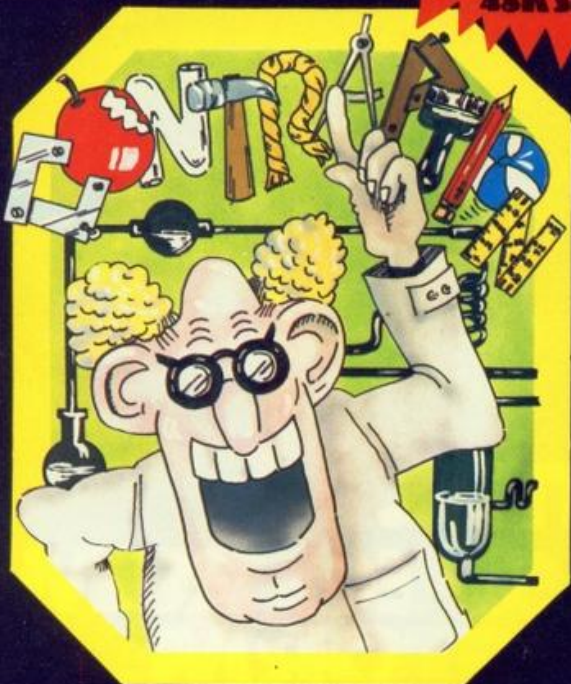
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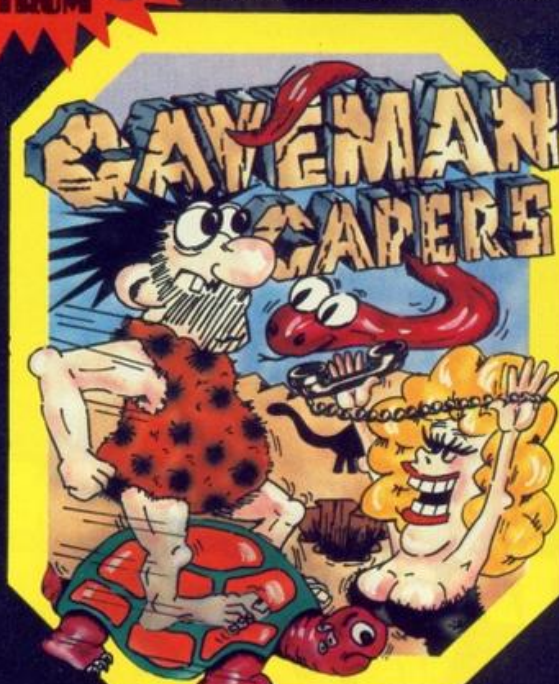
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# Hex loader.

```

100 MODE 4
110 BORDER 5,0,6:CLS
120 PRINT "Type in starting address (followed
    by an 'h' if in hex)"
130 INPUT a$
140 IF a$(LEN(a$)-1) = "h" THEN
150   a$ = a$(1 TO LEN(a$)-1)
160   hex_dec a$
170 ELSE
180   t=a$
190 END IF
200 add=t
210 REPEAT loader
220   CLS
230   FOR col=0 TO 18
240     AT col,0
250     dec_hex add,5
260     PRINT d$;" ";
270     FOR q=0 TO 1
280       dec_hex PEEK(add+q),2

```

```

290     PRINT d$;
300   END FOR q
310   AT col,18
320   INPUT "?:";b$
330   IF b$="" THEN GO TO 390
340   hex_dec b$
350   POKE_W add,t
360   AT col,18
370   dec_hex t,4
380   UNDER 1:PRINT d$;:UNDER 0:PRINT " ";
390   add=add+2
400   END FOR col
410 END REPEAT loader
420 DEFINE PROCEDURE hex_dec(h$)
430   LOCAL l,a$,v
440   v=0:t=0
450   FOR l=0 TO LEN(h$)-1
460     a$=h$(LEN(h$)-1 TO LEN(h$)-1)
470     IF CODE(a$)>57 THEN
480       v=CODE(a$)-87
490     ELSE
500       v=a$

```

```

510   END IF
520   t=t+v*16
530   END FOR l
540 END DEFINE
550 DEFINE PROCEDURE dec_hex(v,1)
560   LOCAL c,a$,b
570   b=ABS(v)
580   a$=b/16:a$=(1 TO 1)
590   b=ABS(b)
600   REPEAT work
610     c=(b/16-INT(b/16))*16
620     IF c<=9 THEN
630       d$=CHR$(c+48)&d$
640     ELSE
650       d$=CHR$(c+55)&d$
660     END IF
670     b=INT(b/16)
680     IF b=0 THEN EXIT work
690   END REPEAT work
700   d$=FILL$("0",1-LEN(d$))&d$
710   IF a$="" THEN d$=a&d$
720 END DEFINE

```

# ZOOM

ZOOM is a graphics utility for the QL which enlarges part of the screen in Mode 4 or Mode 8. It allows you to double one of the four screen quadrants simply by pressing a key. Once you have zoomed you can zoom again, and again . . . until the screen either fills up or becomes empty.

If you have an assembler you can enter the assembler code directly. You must remember that it has to produce an executive code — that is a position independent code.

If you have not got an assembler you can use the Basic hex-loader listed elsewhere or use your own program to enter the assembled code — this is much faster than using an

assembler but errors arise more often.

If you use the Basic hex-loader type the program in and save it for later use. Make room in memory for the machine code by typing

OP = RESPR (512)

See what starting address you have got for the code by typing

PRINT OP

Run the hex-loader and type in the address. Remember that you must type in the code as words, so if the listing says:

```

0000' 223C 0000 2000 23
MOVE.L #HEAP_ROOM,D1

```

(continued on page 101)

Carsten Greve makes the QL screen bigger.

## Explaining Zoom.

- 8-15 QDOS Trap routines.
- 18-24 Take 8192 bytes from the common heaproom. If not succeeded kill Zoom and return to Superbasic.
- 26-37 Open a console and set the cursor. If not succeeded kill Zoom and return to Superbasic.
- 38-44 Find out display mode and store it for later use.
- 46-62 Get a number from keyboard and jump to an Area.
- 64-101 Fill Heap\_Room with the right area of screen.
- 103-140 Take Heap\_Room and enlarge to the whole screen.
- 142-146 Kill Zoom and return to Superbasic.
- 148-182 Data definition for console and Bit\_Data.

## Assembly listing.

LOC	OBJECT	STMT	SOURCE STATEMENT				
		1 *	ZOOM	0014'	72FF	25	
		2 *	A procedure to enlarge part of the screen	0016'	7602	26	MOVEQ #1,D1
		3 *	By Carsten Greve	0018'	41FA 015A	27	MOVEQ #2,D3
		4 *	Started on the 14th of December 1984	001C'	7001	28	LEA.L DEUNAME,A0
		5 *	Finished on the 22nd of December 1984	001E'	4E42	29	MOVEQ #10_OPEN,DO
		6 *	For the SINCLAIR QL version JM	0020'	4A80	30	TRAP #2
		7		0022'	6600 0144	31	TST.L D0
		8	HEAP_ROOM EQU 8192	0026'	76FF	32	BNE JOB_END
		9	MT_ALCHP EQU 24	0028'	700E	33	MOVEQ #1,D3
		10	IO_OPEN EQU 1	002A'	4E43	34	MOVEQ #SD_CURE,DO
		11	SD_CURE EQU 14	002C'	4A80	35	TRAP #3
		12	IO_FBYTE EQU 1	002E'	6600 0138	36	TST.L D0
		13	UT_ERRO EQU 202	0032'	72FF	37	BNE JOB_END
		14	MT_FRJOB EQU 5	0034'	74FF	38	
		15	MT_DMODE EQU 16	0036'	7010	39	MOVEQ #1,D1
		16		0038'	4E41	40	MOVEQ #1,D2
		17	START	003A'	E309	41	MOVEQ #MT_DMODE,DO
0000'		18	MOVE.L #HEAP_ROOM,D1	003C'	1801	42	TRAP #1
0006'	74FF	19	MOVEQ #1,D2	003E'	284D	43	LSL.B #1,D1
0008'	7018	20	MOVEQ #MT_ALCHP,DO	0040'	76FF	44	MOVE.B D1,D4
000A'	4E41	21	TRAP #1	0042'	7001	45	
000C'	4A80	22	TST.L D0	0044'	4E43	46	LOOP_0 MOVE.L A5,A4
000E'	6600 0158	23	BNE JOB_END	0046'	4A80	47	MOVEQ #1,D3
0012'	2A48	24	MOVE.L A0,A5			48	MOVEQ #IO_FBYTE,DO
						49	TRAP #3
						50	TST.L D0

(listing continued on page 101)

```

* Program to dump a screen
* Using <ESC>"*"+5+n1+n2
* By Carsten Greve
* Started on the 29th of Dec

```

```

MOVEQ #1,D1
MOVEQ #1,D3
LEA.L DEUNAME
MOVEQ #1,D0
TRAP #2
TST.L D0
BNE.S END_JOI

MOVE.W #3,D2
MOVE.W #1,D3
LEA.L SETUP,;

```

```

* Program to
* Using <ESC>
* By Carsten
* Started on

```

```

MOV
MOV
LEA

```

```

mp a sc
"+5+n1+n2
eve
e 29th

```

# Experience the thrill of Formula One Motor Racing

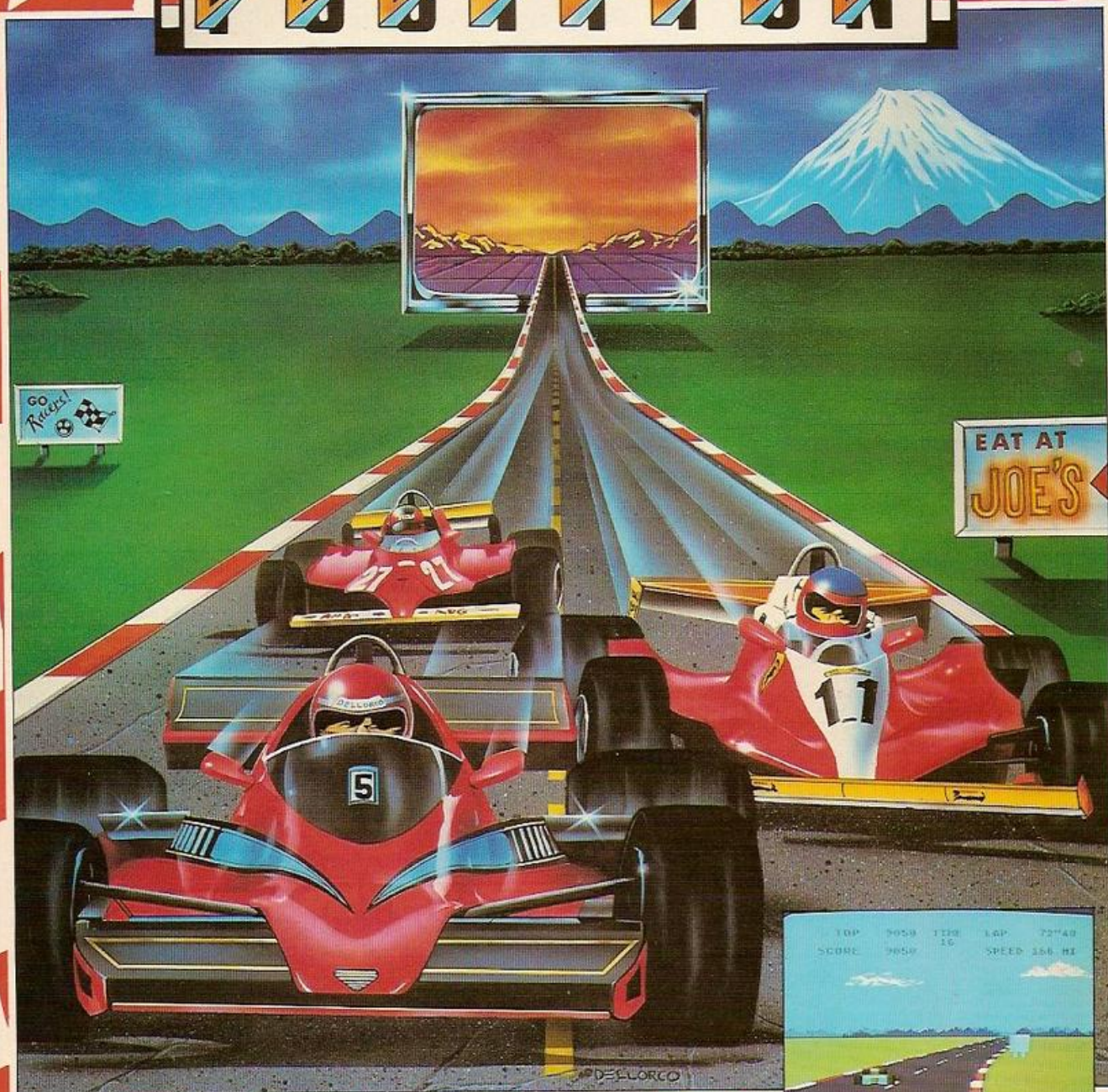


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(listing continued from page 99)

0048	6600	011E	51	BNE	JOB_END	011C	1342	0001	118	MOVE-B	D2,1(A1)	
004C	B23C	0031	52	CMP-B	##31,D1	0120	1214		119	MOVE-B	(A4),D1	
0050	671C		53	REQ-S	AREA_1	0122	E809		120	LSR-B	#4,D1	
0052	B23C	0032	54	CMP-B	##32,D1	0124	C27C	000F	121	AND-W	##F,D1	
0056	6736		55	REQ-S	AREA_2	0128	D204		122	ADD-B	D4,D1	
0058	B23C	0033	56	CMP-B	##33,D1	012E	45FA	004E	123	LEA-L	BIT_DATA,A2	
005C	6750		57	REQ-S	AREA_3	0132	1432	1000	124	MOVE-B	0(A2,D1-W),D2	
005E	B23C	0034	58	CMP-B	##34,D1	0136	1282		125	MOVE-B	D2,\$80(A1)	
0062	676A		59	REQ-S	AREA_4	0138	121C		126	MOVE-B	D2,(A1)	
0064	B23C	000A	60	CMP-B	##0A,D1	013A	C27C	000F	127	MOVE-B	(A4)+,D1	
0068	6700	0104	61	REQ-S	END_JOB	013E	D204		128	AND-W	##F,D1	
006C	60D0		62	BRA-S	LOOP_0	0140	1432	1000	129	ADD-B	D4,D1	
			63			0144	1342	0082	130	MOVE-B	0(A2,D1-W),D2	
006E	227C	0002	64	AREA_1	MOVE-L	##20000,A1	0148	1342	0002	131	MOVE-B	D2,\$82(A1)
0074	28D9		65	LOOP_1	MOVE-L	(A1)+,(A4)+	014C	5689		132	MOVE-B	D2,2(A1)
0076	2209		66	MOVE-L	A1,D1	014E	3209		133	ADDQ-L	#3,A1	
0078	0801	0006	67	BTST	#6,D1	0150	0801	0007	134	MOVE-W	A1,D1	
007C	67F6		68	REQ-S	LOOP_1	0154	679E		135	BTST	#7,D1	
007E	D3FC	0000	69	ADDQ-L	##40,A1	0156	D3FC	0000	0080	136	REQ-S	LOOP_FS
0084	B3FC	0002	70	CMPL-L	##24000,A1	015C	B3FC	0002	8000	137	ADDQ-L	##80,A1
0088	66E8		71	BNE-S	LOOP_1	0162	6690		138	CMPL-L	##28000,A1	
008C	605E		72	BRA-S	FILL_SCR	0164	6000	FED8	139	BNE-S	LOOP_FS	
			73						140	BRA	LOOP_0	
008E	227C	0002	74	AREA_2	MOVE-L	##20040,A1	0168	3478	00CA	141		
0094	28D9		75	LOOP_2	MOVE-L	(A1)+,(A4)+	016C	4E92		142	JOB_END	MOVE-W
0096	2209		76	MOVE-L	A1,D1	016E	7005		143	JSR	UT_ERR0,A2	
0098	0801	0006	77	BTST	#6,D1	0170	72FF		144	END_JOB	MOVEQ	
009C	66F6		78	BNE-S	LOOP_2	0172	4E41		145	MOVEQ	##-1,D1	
009E	D3FC	0000	79	ADDQ-L	##40,A1				146	TRAP	#1	
00A4	B3FC	0002	80	CMPL-L	##24040,A1	0174	0004		147			
00AA	66E8		81	BNE-S	LOOP_2	0176	424F	4E5F	148	DEVNAME	DC-W	
00AC	603E		82	BRA-S	FILL_SCR				149	DC-B	4	
			83						150	DC-B	'CON '	
00AE	227C	0002	84	AREA_3	MOVE-L	##24000,A1	017A	00	151	BIT_DATA	DC-B	
00B4	28D9		85	LOOP_3	MOVE-L	(A1)+,(A4)+	017B	0C	152	DC-B	##00000000	
00B6	2209		86	MOVE-L	A1,D1	017C	0C		153	DC-B	##00000011	
00B8	0801	0006	87	BTST	#6,D1	017D	0F		154	DC-B	##00001100	
00BC	67F6		88	REQ-S	LOOP_3	017E	30		155	DC-B	##00001111	
00BE	D3FC	0000	89	ADDQ-L	##40,A1	017F	33		156	DC-B	##00100000	
00C4	B3FC	0002	90	CMPL-L	##28000,A1	0180	3C		157	DC-B	##00100011	
00CA	66E8		91	BNE-S	LOOP_3	0181	3F		158	DC-B	##00111111	
00CC	601E		92	BRA-S	FILL_SCR	0182	C0		159	DC-B	##10000000	
			93			0183	C3		160	DC-B	##10000011	
00CE	227C	0002	94	AREA_4	MOVE-L	##24040,A1	0184	CC	161	DC-B	##10001100	
00D4	28D9		95	LOOP_4	MOVE-L	(A1)+,(A4)+	0185	CF	162	DC-B	##10001111	
00D6	2209		96	MOVE-L	A1,D1	0186	F0		163	DC-B	##11100000	
00D8	0801	0006	97	BTST	#6,D1	0187	F3		164	DC-B	##11100011	
00DC	66F6		98	BNE-S	LOOP_4	0188	FC		165	DC-B	##11111100	
00DE	D3FC	0000	99	ADDQ-L	##40,A1							
00E4	B3FC	0002	100	CMPL-L	##28040,A1	0189	FF		166	DC-B	##11111111	
00EA	66E8		101	BNE-S	LOOP_4	018A	00		167	DC-B	##00000000	
			102			018B	05		168	DC-B	##00000101	
00EC	284D		103	FILL_SCR	MOVE-L	A5,A4	018C	0A	169	DC-B	##00001010	
00EE	227C	0002	104	MOVE-L	##20000,A1	018D	0F		170	DC-B	##00001111	
00F4	1214		105	LOOP_FS	MOVE-B	(A4),D1	018E	50	171	DC-B	##01010000	
00F6	E809		106	LSR-B	#4,D1	018F	55		172	DC-B	##01010101	
00F8	C27C	000F	107	AND-W	##F,D1	0190	5A		173	DC-B	##01010110	
00FC	D204		108	ADD-B	D4,D1	0191	5F		174	DC-B	##01011111	
00FE	45FA	007A	109	LEA-L	BIT_DATA,A2	0192	A0		175	DC-B	##01010000	
0102	1432	1000	110	MOVE-B	0(A2,D1-W),D2	0193	A5		176	DC-B	##01010101	
0106	1342	0080	111	MOVE-B	D2,\$80(A1)	0194	AA		177	DC-B	##01010110	
010A	12C2		112	MOVE-B	D2,(A1)+	0195	AF		178	DC-B	##01011111	
010C	121C		113	MOVE-B	(A4)+,D1	0196	F0		179	DC-B	##11100000	
010E	C27C	000F	114	AND-W	##F,D1	0197	F5		180	DC-B	##11110101	
0112	D204		115	ADD-B	D4,D1	0198	FA		181	DC-B	##11111010	
0114	1432	1000	116	MOVE-B	0(A2,D1-W),D2	0199	FF		182	DC-B	##11111111	
0118	1342	0081	117	MOVE-B	D2,\$81(A1)				183			
									184	END		

(continued from page 99)

you must type 223C and Enter, 0000 and Enter, 2000 and Enter.

If the listing says:

0190' 5A 173 DC.B %01011010

0191' 5F 174 DC.B %01011111

you must type 5A5F and Enter.

When you have finished typing in press Ctrl-space. To check the code you must Run the hex-loader again with the same starting address. If the code is correct just type Enter, and if the code is incorrect type the correct code in and continue.

If you have used an assembler, the

assembler should have produced an Executable code. If you have used the hex-loader you must type:

SEXEC mdv1\_ZOOM,OP,412,64

There are two different ways of running the Zoom-code and I will describe both here.

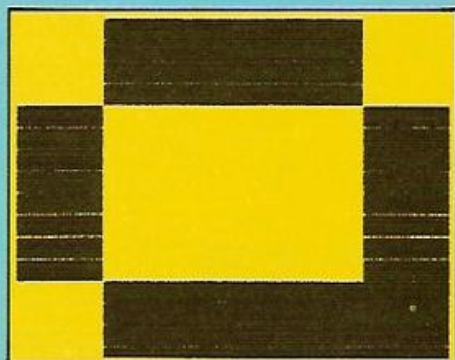
EXEC\_W MDV1\_ZOOM=With this command you run the code and you can make as many Zoom's as you like, and when you have finished you type Enter to return to Superbasic.

EXECMDV1\_ZOOM=With this command you also run the code, but you stay in Superbasic. To make a Zoom you must

type Ctrl C to transfer control to the Zoom-procedure. Now you can again make as many Zoom's as you like, but to go back to Superbasic you just have to type Ctrl C. In this way you can use the Zoom-procedure on many screens.

The screen is organised in the following way and you just have to type one of the numbers to obtain a Zooming.

1	2
3	4



# PLOTLINE

THE FOLLOWING machine-code routines for the QL were written as an exercise in 68008 programming. They demonstrate the difficulties involved in manipulating the screen memory and also show the ease with which data can be passed to machine code from Basic using the Call command.

To set up the code, run the Basic code creator program. Whenever you reset the computer you will need to reserve some memory for the routines by typing

BOX = RESPR (250)

Now load the code with

LBYTES MDV1—CODE,BOX

The variable Box contains the address at which the code is stored. To plot a point Call ST, x co-ordinate, y co-ordinate, colour. To draw a box Call ST+2, x co-ordinate of bottom left corner, y co-ordinate of bottom left corner, width of box, depth, thickness of box.

For example, to draw a box at 100,000, width=10, depth=10, thickness 3, colour red — in mode 4:

CALL BOX + 2, 100,100,2,10,10,3

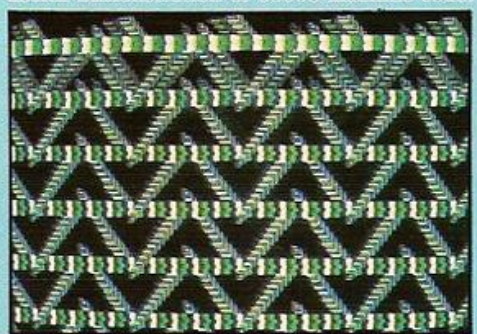
For further information see under Call in the QL manual.

The x and y co-ordinates are independent of channels and scale where x=0, y=0 is the top left corner of the screen, x=512 (26 if mode

Mark Jones with a set of programs which show how difficult it is to manipulate screen memory and the ease of using the Call command.

8), y=256 is the bottom right corner. Colour codes for the routine are explained in the assembler listing.

Speeds achieved for the plot routine are faster than the QL's own plot routine and this speed advantage is particularly effective in machine code. Using a plot routine is not the fastest way to draw a box but again serves as a useful demonstration of 68008 machine code.



## Demo program.

```
1 REMARK **** BASIC DEMONSTRATION PROGRAM ****
3 OPEN #4,scr,512x256a0:CLS #4
4 FOR n=0 TO 250 STEP 40
5   g=1:j=1
6   FOR m=1 TO 11
7     FOR f=1 TO 50
8       IF g&f=0 THEN
9         CALL box+2,j,k+h,f,10-f/10,10-f/10,1
10      j=j+1
11    NEXT f
12  NEXT m
13  FOR f=1 TO 512 STEP 5:CALL box+2,f,h,f,10,10,4
14  NEXT h
15  FOR f=1 TO 32:PAN #4,16
16  GO TO 4
17  DATA 10,25,103,69,01,117,96,42,62,64,255,4,01,5,97,
18  258,126,66,182,1,126,8,2,65,226,7,2,3,226,65,182,65,62
19  258,28,3,34,0,1,7,227,29,283,41,0,1,12
20  REMARK
21  DATA 10,25,12,183,286,66,4,01,5,97,258,63,287,96,6,
22  78,0,0,34,52,0,65,182,76,58,7,2,14,8,74,8,65,198,3,2
23  28,124,218,254,144,11,01,41,8,1,76,8
24  REMARK
25  DATA 97,66,181,6,255,135,82,287,96,38,62,65,255,4,0
26  1,117,68,255,8,124,12,0,1,8,2,66,0,3,96,255,226,3,26,0
27  0,2,14,0,194,218,1,227,288,8,0,141,159,70
28  DATA 117
29  REMARK
30  RESTORE
31  tot=0
32  FOR g=0 TO 4
33    FOR f=0 TO 46
34      READ d:POKE strg+f*5,d
35      tot=tot+d
36    NEXT f
37  NEXT g
38  READ d:POKE strg+235,d
39  tot=tot+d
40  IF tot<18982 THEN PRINT "error"
41  PRINT "code stored ok from 'strg' length 236 bytes"
42  STOP
```

## Code loader.

```
1 st=RESPR(250)
2 REMARK
3 DATA 10,22,82,18,181,236,62,65,255,4,01,4,97,258,62
4 287,72,188,134,8,41,183,255,0,65,8,3,0,34,184,76,22
5 7,68,8,3,239,2,2,196,96,14,235,0,283,41,0
6 REMARK
7 DATA 78,62,68,63,4,78,4,97,258,63,287,96,18,62,66,2
8 25,167,2,66,56,2,0,34,184,188,8,254,28,1,2,65,2,73,0,1
9 5,0,74,8,68,112,6,227,246,135,41,0,1,126
10 REMARK
11 DATA 96,65,183,69,01,117,96,42,62,64,255,4,01,5,97,
12 258,126,66,182,1,126,8,2,65,226,7,2,3,226,65,182,65,62
13 258,28,3,34,0,1,7,227,29,283,41,0,1,12
14 REMARK
15 DATA 10,25,12,183,286,66,4,01,5,97,258,63,287,96,6,
16 78,0,0,34,52,0,65,182,76,58,7,2,14,8,74,8,65,198,3,2
17 28,124,218,254,144,11,01,41,8,1,76,8
18 REMARK
19 DATA 97,66,181,6,255,135,82,287,96,38,62,65,255,4,0
20 1,117,68,255,8,124,12,0,1,8,2,66,0,3,96,255,226,3,26,0
21 0,2,14,0,194,218,1,227,288,8,0,141,159,70
22 DATA 117
23 REMARK
24 RESTORE
25 tot=0
26 FOR g=0 TO 4
27   FOR f=0 TO 46
28     READ d:POKE strg+f*5,d
29     tot=tot+d
30   NEXT f
31 NEXT g
32 READ d:POKE strg+235,d
33 tot=tot+d
34 IF tot<18982 THEN PRINT "error"
35 PRINT "code stored ok from 'strg' length 236 bytes"
36 STOP
```

## Assembly listing.

```
MODE EQU 163892
SCREEN EQU 131072
*
* PLIN BRA,S PLOT ENTER HERE FROM BASIC TO PLOT ONLY
* BXIN BRA,S MULTI ENTER HERE FROM BASIC TO DRAW BOX (PLIN +2)
*
* MULTI THICKNESS BOX ROUTINE
* D6=THICKNESS OF BOX, WIDTH AND DEPTH ARE EXTERNAL MEASUREMENTS
* OTHER ENTRY PARAMETERS AS FOR BOX ROUTINE
*
*
* LOOP BSR,S BOX
* ADDD #1,D1 NEXT BOX LH CORNER IS X=X+1
* SUBQ #1,D2 Y=Y-1
* SUBQ #2,D4 WIDTH=WIDTH-2
* BEQ,S EXIT EXIT LOOP IF WIDTH=0
* BCS,S EXIT EXIT LOOP IF WIDTH<0
* SUBQ #2,D5 DEPTH=DEPTH-2
* BEQ,S EXIT EXIT LOOP IF DEPTH=0
* BCS,S EXIT EXIT LOOP IF DEPTH<0
* MULTI DBRA D6,LOOP DRAW (D6) BOXED. ENTER ROUTINE HERE FROM BOX_ENT
* EXIT RTS
*
* BOX ROUTINE D1=X, D2=Y, D3=COL, D4=WIDTH, D5=DEPTH
*
* ALL REGISTERS UNCHANGED EXCEPT A1=ADDRESS OF LH CORNER, D7=-1
*
* MODE 4 COLS 0=BLACK,1=GREEN,2=RED,3=WHITE
* MODE 8 COLS 0=BLACK,2=GREEN,4=BLUE,6=CYAN,8=RED,10=YELLOW,12=MAGENTA
* 14=WHITE,ADD 1 TO MODE 8 COLOUR FOR FLASH
*
* BOX CLR,L D7
* MOVE,W D4,D7
* BRA,S BOXA TOP OF BOX
* BOXAA ADDQ #1,D1
* BSR,S PLOT
* DBRA D7,BOXAA
*
* MOVE,W D5,D7
* BRA,S BOXB
* BOXBB SUBQ #1,D2 RIGHTHAND SIDE
* BSR,S PLOT
* DBRA D7,BOXBB
*
* MOVE,W D4,D7
* BRA,S BOXC
* BOXCC SUBQ #1,D1 BOTTOM OF BOX
* BSR,S PLOT
* DBRA D7,BOXCC
*
* MOVE,W D5,D7
* BRA,S BOXD
* BOXDD ADDQ #1,D2 LEFTHAND SIDE
* BSR,S PLOT
* DBRA D7,BOXDD X1 AND X2 ARE NOW BACK TO ORIGINAL VALUES
* RTS
*
* PLOT ROUTINE D1=X D2=Y D3=COLOUR(0-15)
* SPEED=110 PLOTS/SEC FROM BASIC - 3000 PLOTS/SEC FROM M/C
* QL POINT ROUTINE=40 PLOTS/SEC
* ALL REGISTERS UNCHANGED EXCEPT D0=0,A1(LEFT WITH SCREEN ADDRESS)
*
* PLOT MOVEM,W D1-D6,-(A7) SAVE REGISTERS
```

```
MOVE,W D2,D6
ANDI,W #255,D2
CMP,W D2,D6
BNE,RANGX
MOVE,W D1,D4
MOVE,L #MODE,A1
CMPI,B #8,(A1)
BEQ,S MODE8
*
* EITHER MODE 8 OR MODE 4 ROUTINE USED HERE
*
* MODE4
* ANDI,W #511,D1
* CMP,W D1,D4
* BNE,RANGX
* LSR,W #2,D4
* ANDI,W #7,D1
* MOVE,W #254,D5
* ANDI,B #3,D3
* MOVE,B D3,D6
* ANDI,B #1,D3
* LSR,B #1,D6
* BRA,S ALLOK
*
* MODE8
* ANDI,W #255,D1
* CMP,W D1,D4
* BNE,S
* LSR,W #1,D4
* ANDI,W #3,D1
* LSL,W #1,D1
* ADDQ #1,D1
* MOVE,B #252,D5
* AND,B #15,D3
* MOVE,B D3,D6
* ANDI,B #3,D3
* LSR,B #2,D6
*
* SCREEN ADDRESS= Y*120 + (IF MODE X/4 AND 510,IF MODE4 X/2 AND 510)
* MODE 4 AND MODE 8 ROUTINES BOTH END UP HERE
*
* ALLOK LSL,W #7,D2 Y2=Y*128
* MOVE,L #SCREEN,A1 GET START OF SCREEN
* ADDA,W D2,A1 ADDR=ADDR+Y2
* ANDI,W #510,D4 LOSE ANY ODD 1
* ADDA,W D4,A1 ADDR=ADDR+X2
*
* A1 NOW CONTAINS CORRECT SCREEN ADDRESS
*
* MOVEQ #7,D0
* SUB,B D1,D0 7-X3 FIND WHICH BITS TO ALTER
* BRA,S LPA
* LPA1 LSL,B #1,D3 ROTATE 1ST COLOUR BYTE
* LSL,B #1,D6 ROTATE 2ND COLOUR BYTE
* ROL,B #1,D5 ROTATE MASK OVER E.G 11110011
* DBRA D0,LPA1
*
* ACTUAL PLOT IS DONE HERE
*
* AND,B D5,(A1) MASK OF SCREEN (SET PLOT POS TO 00)
* OR,B D3,(A1) OR 1ST BYTE WITH GREEN
* AND,B D5,(A1) MASK OF SCREEN
* OR,B D6,(A1) OR 2ND BYTE WITH SCREEN
* MOVEM,W (A7)+,D1-D6 RETRIEVE REGISTERS
* MOVEM #0,D0 ENSURE NO ERROR ON RETURN TO BASIC
* RTS
* END
```

# CONNECT PROTECT

Peripherals make using your computer more interesting and easier. But you may have more items of equipment than power outlets. The best way of tidying up the trailing wires and obtaining a 'clean' power supply is to use STRIPBLOC. It has five CEE 22 outlets, probably more than enough for connecting your add-ons to your power source. It's rugged, made from



tough black plastic, and safe, meeting British and European safety requirements.

**The Stripbloc** is RFI filtered

against spikes, 'dirty' mains and 'unclean' power.

Once you've bought it you don't need any extras, it's supplied with five standard right-angled rewirable plugs, a 2m fully-approved cable and moulded 13A plug. Forget about risky connections. Be safe with STRIPBLOC.

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Have you ever noticed interference when you are using your computer?



It could be caused by any number of things: a light switch, a fridge, a central heating motor starting, or even a thunderstorm. The power lines of your computer can pick up many forms of natural and man-made interference, which can be damaging to computers and peripherals. Rendar's SPIKEBLOC has been developed to give protection against transient over voltages and continuous high frequency interference on the mains supply. The unit is housed in a rugged metal case and gives good electrical screening from high frequency sources. This high level of protection was only possible previously using elaborate and expensive filter units. Now it isn't too expensive for you to protect your equipment.

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Spikebloc		£49.99	
		<b>TOTAL</b>	

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Address \_\_\_\_\_  
Post Code \_\_\_\_\_

I enclose cheque/postal order  
made payable to **Rendar Ltd.,**

for £ \_\_\_\_\_ or debit my

Access/  
Visa Credit Card



No \_\_\_\_\_  
(Prices includes VAT, Postage & Packing)

Rendar Ltd, Durban Road,



Bognor Regis, PO22 9RL.

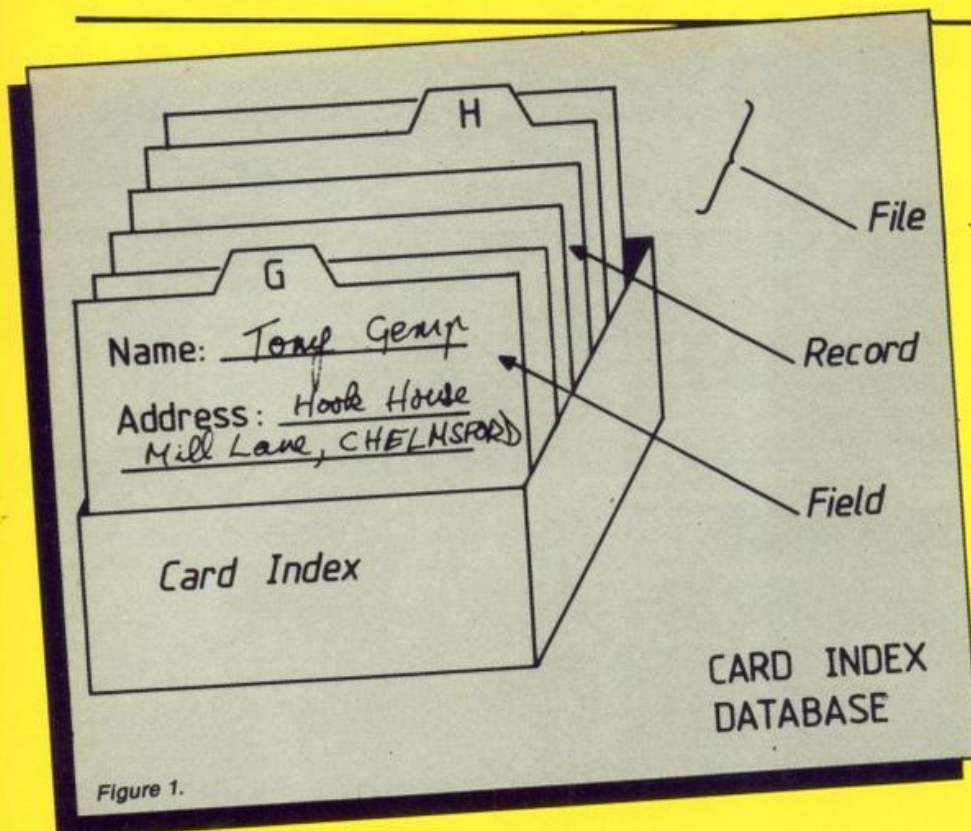


Figure 1.

THIS SERIES of articles is about four database programs for the BBC microcomputer. It is impossible to review these sophisticated programs adequately in a single article and I hope that some of the ideas and the solutions to problems will help you if you are thinking of buying a database program for *any* microcomputer, not just the BBC machine.

A microcomputer is a general-purpose machine that can be made to look like any other machine by programming it to simulate the actions of the machine. In other words, a microcomputer can simulate a numerically controlled machine tool, model a central heating system or act as a central heating system controller, edit and format text or work as a complex pocket calculator.

A microcomputer can be used to store, manipulate and retrieve information and a spreadsheet program like Viewsheets or Ultracalc 2, for example, establishes a sort of database except that it is dedicated to displaying information in a particular way. General-purpose programs for database manipulation make fewer assumptions about the type of data

that will be held in the system and the ways in which it will be used for calculation and displayed.

The best known, and most widely sold, database for microcomputers is dBase II which is marketed by Ashton Tate, California. dBase II is written in machine code for the Z-80 central processor unit and will not run directly on the BBC microcomputer's 6502 CPU. However, the program has been installed on the Z-80 second processor for the BBC machine and is now available.

### A difference with dBase II

dBase II is entirely different from all the other database programs that are on sale for the BBC micro because it is not a dedicated database program but a high level programming language. There are about 84 commands and functions in the dBase II language and these can be combined into command files that are interpreted by the central dBase II core.

A dBase II program can set up a database of information and can then sort, search, calculate

# DATA

results and output the results in a huge variety of different ways.

The four databases that are included are:

Datagem	Gemini Marketing Ltd., Exmouth. 0395 265165.
Scribe Database	Merlin Computer Products, Swansea. 0792 467980.
Stardatabase	GCC (Cambridge) Ltd., Cambridge. 0223 835330.
Database	Acornsoft Ltd., Cambridge. 0223 316039.

All of these programs are dedicated in the sense that the structure of the information in the database is largely preordained. That seems to contradict some of the advertising claims made for Datagem and Stardatabase so let's see what's going on in more detail.

Figure 1 shows the card index architecture that is used by all four programs. A single file of information is held on a floppy disc and this can be accessed by the program to give you the results that you want. In these programs a *file* looks like a box holding a number of cards. You may have a number of boxes holding cards on different subjects; a stamp collection, a name and address list, recipes for your kitchen and so on.

Each file consists of a number of *records* which you can think of as the individual cards in the card-index box. Each card has information written on it. If the information is organised in a regular way then each piece of information is a *field* in the record.

So, there are several fields in each record and a number of records make up a file. Figure 2 shows the record format for a hypothetical wine cellar file. There are eight fields in each record and the information recorded about each wine is of various types. The date the wine was brought into the cellar is structured information in the form DD/MM/YYYY — Day/Month/Year — while the name of the wine is a string of alphanumeric characters of indeterminate length.

Note particularly that the tasting notes field is longer than the width of the paper or the VDU screen; long fields create special problems for printing out information in three of the databases when you try to use them in conjunction with *View* or *Wordwise*.

Figure 3 shows the record format of a real name and address file. This record layout and the fields it contains are more complex than the usual, trivial examples shown in the instruction manuals because "real" life is both complex and messy.

However, in both figure 2 and figure 3 you can see at once that the same information is recorded in the same place on each card. In other words, the program can look in the same place on each record and expect to find a name, or the date you bought a stamp, or how much you paid for a consignment of wine, or simply the town in which someone lives.

Figure 2.

NAME: Corton-Charlemagne	MERCHANT: S H Jones
	TELEPHONE: 0295 11798
VINTAGE: 1980	
DATE BOUGHT: 25/05/1983	QUANTITY: 8 bottles
TASTING NOTES:	CURRENT STOCK: 3

# DATABASES

In the first in a series of articles, John Dawson looks at databases in general and how they operate.

Figure 3.

PEOPLE 04/03/1985

FILE LENGTH 625 records  
FILE USED 34 records  
RECORD LENGTH 601 characters

### \*\*\* FIELD NAME LIST \*\*\*

ONAME S  
ACTIVE S  
ADD1 S  
ADD2 S  
ADD3 S  
CODE S  
FAMILY S  
FNAME S  
KEY1 S  
NOTES S  
ORGN S  
P1 S  
P2 S  
P3 S  
P4 S  
PINDEX S  
TITLE S  
UPDATE N  
XMAS S  
XREF S  
XREF1 S

### \*\*\* INPUT CARD \*\*\*

SURNAME

Firstname Title

ORGANISATION

TELEPHONE

ADDRESS

KEYWORDS

A> Update Christmas

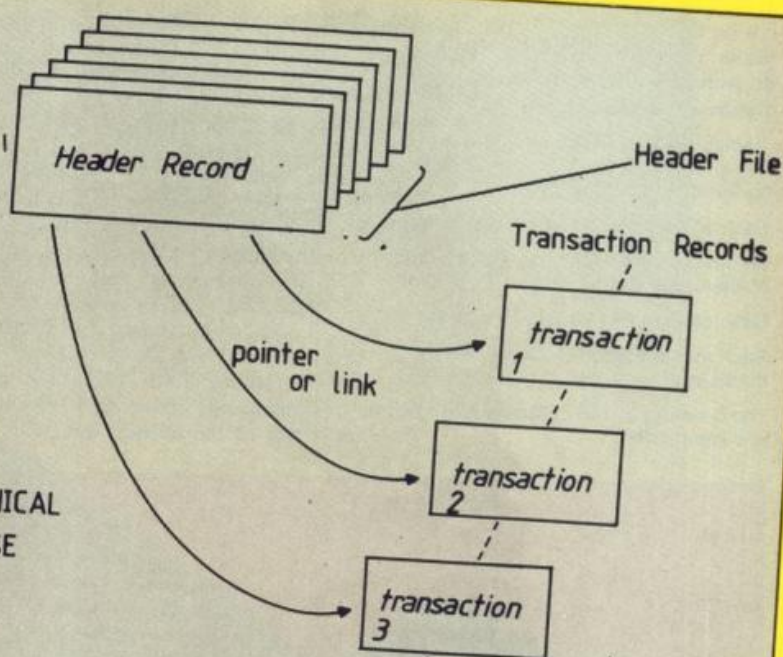
Phone Index Family

References

NOTES

## SIMPLE HIERARCHICAL DATABASE

Figure 4.



A card index architecture is simple, straightforward and can be very useful for many purposes. For example, all other factors being equal, you could use any of the four programs for the following purposes:

- Software catalogue
- Photograph and slide indexing
- Christmas card lists
- Name and address files
- Mailshot personalised mailings
- Price lists
- Estate agents' housing lists

There are, however, other ways of structuring information that are better suited to many common tasks that you may want to carry out.

Figure 4 illustrates the architecture of a very simple hierarchical database. Suppose that you want to set up an invoicing system for sales of mugs, plates, casserole dishes, parsley pots and other items from your craft pottery. If none of your customers ever buys from you more than once then the card index architecture is quite adequate.

Presumably, though, you would like some of your customers to come back again for more of your goods. When this happens you have to re-enter all the same details about the customer's name, invoice address, delivery address, telephone number each time you make a sale.

Apart from being very time consuming, the chances of errors occurring are large and if you make a mistake in entering the customer's name it becomes more and more difficult to relate one sale in June to another in October and two in the previous March. You can't run any sort of a credit system with the card index approach.

The database in figure 4 is different. When a customer first makes contact with your operation the name, addresses, telephone numbers and other information that you will need for the first, and subsequent orders, are typed into the database to form a header record. The goods that you supply, the cost per item, total price, Value Added Tax, discount and so on are entered into a separate transaction record

which is linked to the header record by a pointer.

The information in the transaction record is different to that in the header record — the second field, for example, may contain a telephone number in the header record and a description of a piece of furniture in the transaction record; so you need two files, but the files are linked automatically by the database program.

When the customer, impressed by your efficiency, returns for the third time you can search through the header file to find the original entry and immediately enter information into a new transaction record for the next sale. In a well designed system it should be possible to merge information from the header record with the transaction record to print an invoice and label for the envelope. The transaction should point to the header, just as the header must point to all the transactions.

dBase II has an exceptionally advanced feature that permits you to work in two separate active areas at the same time: Primary and Secondary. You can switch between the two areas by typing Select Secondary followed by Use 'newfilename'. Return to the primary database is achieved by typing Select Primary.

### Prefix the name of variable

Information can be transferred from one area to another by prefixing the name of a variable with either P. or S. This facility means that records in a second file can be found or manipulated by reference to records in the first file.

dBase II is an example of the third type of database which has been talked about greatly in the last few years. dBase II is a relational database. E.F. Codd published a fundamental paper titled 'A Relational Model of Data for Large Shared Databases' in Communications ACM in June 1970.

Although the theory of relational databases (continued on next page)

(continued from previous page)

can be taken into quite high powered mathematics, the ideas underlying it all are simply to do with tables. As Kenneth Robinson says in Database Analysis and Design:

"tables are a very simple and natural way of regarding data ... The tables conform to a set of rules ...

Each box in a table contains one value

Within a column the box values are all of the same kind

Each column has a distinct name

Each row is unique — there are no duplicates

The ordering of the columns and rows is not significant"

Figure 5 illustrates part of a simple medical relational database. The information in the database is arranged in tables and each part of the information relates to other parts. The patient's name is put together with the address and a registration number.

By looking down — searching — the name and address file it's possible to find a name by reference to the registration number or the number in relation to a name. Similarly, the drug stock list file contains information about the cost of each drug and the quantity that should be held in stock.

The prescriptions file relates to both the patients and drugs file. A patient called M Hunter (No. 4914) was prescribed one Salbutamol inhaler on 5 November 1983. The cost of the inhaler was £4.75. The relations

between data in the tables could be much more complex.

For example, you may want to see the total cost of prescriptions which have been issued for Penicillin in the last year and to whom they were given — children are not charged. The prescriptions table must be searched for Penicillin between 1 January 1984 and 31 December 1984 and the registration numbers looked up. The age of the patient must be extracted from the patient file and the quantity prescribed costed for records matching the age criteria.

Next month I'll describe the four programs in detail, look at passwords, record and file sizes, and discuss how you can set about planning and building a database for your own purposes.

## Patients

name	address	no.
HUNTER, J	25 MILL ROAD	4250
HUNTER, M	25 MILL ROAD	4914
JAMES, A	135 WHEELER ST	1772
KYLE, J	2 NEWCROSS ST	5918
MARKS, B	101 RUTLAND RD	6664
WEBB, E	4 UPPER LANE	3350
WEBB, F	271 WARWICK ST	2218
DAWSON, R	11 ABBEY CLOSE	7253

## RELATIONAL DATABASE

## Drug Stocks

drug	stock	cost
SALBUTAMOL	10 INHALERS	4.75
PENICILLIN	1000 TABS	10.70
AMPICILLIN	1000 TABS	25.35
TETRACYCLINE	500 TABS	17.50
NITRAZEPAM	1000 TABS	19.10
OXAZEPAM	1500 TABS	27.80
PHENERGAN	400 TABS	11.15
WARFARIN	1200 TABS	35.60
ASPIRIN	2000 TABS	4.35

## Prescriptions

no.	date	drug	dose
4914	5/11/83	SALBUTAMOL	2 x 3(1)
3149	5/11/83	PENICILLIN	2 x 4(48)
1772	5/11/83	WARFARIN	1 x 4(80)
5918	6/11/83	PENICILLIN	2 x 4(48)
6664	6/11/83	NITRAZEPAM	2 x 1(80)
3149	10/11/83	PHENERGAN	1 ABN(20)

Figure 5.



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● **'The Typing Master'** is not a toy. It is a professionally-written program which has as its sole purpose the teaching of typing/keyboard skills in a way that is friendly and fun. It was written by a typing instructor and it has been marketed world-wide on CP/M, MSDOS, PC DOS and other operating system-based machines over the past three years. It has also been available on Newbrain and BBC Micro (Model A or B) for over a year and is now being released for Amstrad CPC (mono or colour), Commodore 64 and Sinclair QL!

● TAPE formats of the Basic version are available from the following selected list of distributors (media and prices are shown in brackets).

**NEWBRAIN** (Cassette: £15.00 (no VAT));  
GFG Microsystems, 36 Armitage Way, King's Hedges, Cambridge, CB4 2UE. Tel. (0223) 315120.

**BBC MICRO** (model A or B) (Cassette, usable with disk: £15.00 + VAT)

**AMSTRAD CPC** (mono or colour) (Cassette: £15.00 + VAT).  
E.C.H. Hobday, The Chestnuts, Rodmersham, Sittingbourne, Kent ME9 0PL. Tel. (0795) 24191.

**COMMODORE 64** (Cassette: £15.00 + VAT).

**SINCLAIR QL** (Cartridge: £20.00 + VAT).  
P. Ashpitel, 36 Athlone Avenue, Bury, Lancashire, BL9 5EE. Tel. (061-797) 5214.

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● DISK formats of the Basic program may be obtained from the following suppliers. They also supply a Business/Schools version which incorporates record keeping and many other facilities. Prices shown below are for the Basic version.

**APRICOT, SIRIUS & VICTOR** (tailored versions). (Disk: £50.00 + VAT).  
Anglia Business Computers, 1 Milton Road, Cambridge, CB4 1UY. Tel. (0223) 315580.

**CP/M80, CP/M86, MSDOS, PC DOS**. (Disk: £50.00 + VAT).  
Microcomputer Products International Limited, Central House, Cambridge Road, Barking, Essex, IG11 8NT. Tel. (01-591) 6511.

or,  
Software Limited, No. 2 Alice Owen Technology Centre, 251 Goswell Road, London, EC1. Tel. (01-833) 1173.

In case of difficulty contact:

**ANTHONY ASHPITEL SOFTWARE SYSTEMS**

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

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

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

RENUM versatile renumber  
ROLL all or part of screen in any  
direction by specified number of  
pixels, with or without attributes  
SCROLL the PLOT, but without wrap-  
round  
SORT arrays (very fast!)  
SPLIT program lines  
TRACE program execution  
UNITS used with DO or LOOP  
USING used with PRINT  
WHILE used with DO or LOOP  
XOR, YOR move PLOT origin  
XRG, YRG change PLOT scale

## FUNCTIONS

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

HEX8 decimal to hexadecimal  
INSTR string search  
MEM free memory  
MEMORY all of memory as a string  
MOD modules  
NUMBER 2 characters to number  
OR (bit-by-bit)

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

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CBM-64 an extra  
command.

```

1 REM **** REPEAT-UNTIL ****
2 REM      C-64
3
4 REM *** M. C. HART ***
5
6 REM SYNTAX: <R>(<EXP>)...<U>(<EXP>)
7
8 FOR J=828 TO 988:READ X:POKE J,X:NEXT:END
9
10 DATA 201,58,176,234,76,95,3,162
11 DATA 2,189,64,3,149,124,202,16
12 DATA 249,232,134,2,98,76,171,227
13 DATA 162,2,189,68,3,149,124,202
14 DATA 16,248,96,201,38,208,238,32
15 DATA 115,0,201,85,248,37,201,82
16 DATA 208,227,165,2,10,10,170,165
17 DATA 123,157,167,2,165,122,157,168
18 DATA 2,165,58,157,169,2,165,57
19 DATA 157,170,2,230,2,32,115,0
20 DATA 76,174,167,32,115,0,32,115
21 DATA 0,32,159,173,165,97,240,5
22 DATA 198,2,76,64,169,166,2,202
23 DATA 139,10,10,170,189,167,2,133
24 DATA 123,189,168,2,133,122,189,169
25 DATA 2,133,58,189,170,2,133,57
26 DATA 104,104,76,228,167
27
28
100 REM *** DEMO REPEAT-UNTIL ***
110
120 SYS 835 :REM INITIALISE
130
140 &R1A=A+1:PRINT"OUTER":A:REM OUTER
150
160 J=0 :REM NB ZERO BEFORE INNER LOOP
170
180 :&R1J=J+1:PRINT J,:REM INNER
190 :&U1J=J+1:PRINT:REM INNER
200
210 &U1A=A+1:REM OUTER
220
230 PRINT"--END--"
240
250 SYS 852 :REM RESTORE CHRGT
READY.

```

THOSE WHO like structured programming or even those who are just interested in 6502/6510 programming for its own sake might be interested in this Repeat-Until.

The routine works by altering Chrgot to look for and process the & symbol followed by R — for Repeat — or U — for Until. Other characters will be passed to the interpreter where they will generate a syntax error.



# REPEAT UNTIL

Unlike For-Next loops in CBM Basic a variable which is used within a loop — such as J in the inner loop in the demo provided — is not initialised back to a starting value and it is the responsibility of the programmer to ensure that such variables are set to the correct value before the loop is entered.

Notice also that the loop will always execute at least once: if a Do-While loop is required which may require the entire loop being skipped if the initial conditions are met then this is best tested for before the Repeat-Until loop is entered. When the routine is in operation, the interpreter will not handle spaces — outside quotes — in excess of one — hence the double colons in lines 180-190.

When Run the code will be read into the cassette buffer — if you totalise the X's in line 8 then they should provide you with a checksum of 15167. The routine is activated by a Sys 835 and restored to normal by a Sys 852. Run 100 runs the little demo routine.

## Disassembly.

B\*

PC SR AC XR YR SP  
:0008 30 4F 4F 00 F6

```

033C C9 3A      CMP #3A
033E B0 EA      BCS #032A
0340 4C 5F 03   JMP #035F
0343 A2 02      LDX #02
0345 BD 40 03   LDA #0340,X
0348 95 7C      STA #7C,X
034A CA         DEX
034B 10 F8      BPL #0345
034D E8         INX
034E 86 02      STX #02
0350 60         RTS
0351 4C AB E3   JMP #E3AB
0354 A2 02      LDX #02
0356 BD 3C 03   LDA #033C,X
0359 95 7C      STA #7C,X
035B CA         DEX
035C 10 F8      BPL #0356
035E 60         RTS

```

```

035F C9 26      CMP #26
0361 D0 EE      BNE #0351
0363 20 73 00   JSR #0073
0366 C9 55      CMP #55
0368 F0 25      BEQ #038F
036A C9 52      CMP #52
036C D0 E3      BNE #0351
036E A5 02      LDA #02
0370 0A         ASL
0371 0A         ASL
0372 AA         TAX
0373 A5 7B      LDA #7B
0375 9D A7 02   STA #02A7,X
0378 A5 7A      LDA #7A
037A 9D A8 02   STA #02A8,X
037D A5 3A      LDA #3A
037F 9D A9 02   STA #02A9,X
0382 A5 39      LDA #39
0384 9D AA 02   STA #02AA,X
0387 E6 02      INC #02
0389 20 73 00   JSR #0073
038C 4C AE A7   JMP #A7AE
038F 20 73 00   JSR #0073

```

```

CMP #26
BNE #0351
JSR #0073
CMP #55
BEQ #038F
CMP #52
BNE #0351
LDA #02
ASL
ASL
TAX
LDA #7B
STA #02A7,X
LDA #7A
STA #02A8,X
LDA #3A
STA #02A9,X
LDA #39
STA #02AA,X
INC #02
JSR #0073
JMP #A7AE
JSR #0073

```

```

0392 20 73 00   JSR #0073
0395 20 9E AD   JSR #AD9E
0398 A5 61      LDA #61
039A F0 05      BEQ #03A1
039C C6 02      DEC #02
039E 4C 40 A9   JMP #A940
03A1 A6 02      LDX #02
03A3 CA         DEX
03A4 8A         TXA
03A5 0A         ASL
03A6 0A         ASL
03A7 AA         TAX
03A8 BD A7 02   LDA #02A7,X
03AB 85 7B      STA #7B
03AD BD A8 02   LDA #02A8,X
03B0 85 7A      STA #7A
03B2 BD A9 02   LDA #02A9,X
03B5 85 3A      STA #3A
03B7 BD AA 02   LDA #02AA,X
03BA 85 39      STA #39
03BC 68         PLA
03BD 68         PLA
03BE 4C E4 A7   JMP #A7E4

```

## Location Explanation

033C-035E This is the initialisation.  
035F-0361 See if & character and exit to CHRGT in Rom if not found.  
0363-036C Get next character from the text and if it is a U then branch forward to \$038F — if it is not an R then branch back to Goto CHRGT in Rom — where a syntax error will be generated.  
036E-038C Get the contents of the 'Loop counter' which has been initialised to zero in

038F-039E

lines \$034D-\$034E. Multiply by four to provide an offset and then put into the X register.  
The characters & and then U have been identified so bump the text pointers by two (past U and :) and then access a Rom routine to input and evaluate the 'truth' of a condition. If the statement is 'true' then \$61 is non-zero so the loop counter is decremented and an exit made to Rom.

03A1-03C0

If "false" i.e. zero then a branch is made to \$03A1. Get the loop counter in A, decrement it and then multiply by four, putting it in an offset to restore the line number and text pointer bytes previously put on the temporary stack. Then pull two bytes off the normal stack and 'throw them away' before accessing a routine in Rom to execute a statement within a line.

VIC 20?

ORIC?

CBM64?

DRAGON?

AMSTRAD?

BBC?

ELECTRON?

SPECTRUM?

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\*PLEASE TICK WHERE APPROPRIATE

YC1

Keith Suddick with a program for the CBM-64 which will allow easy reading, writing and alteration of disc blocks.

YOU SHOULDN'T HAVE ANY MORE TROUBLE.

# TRAX



ANY 64 OWNERS who use a 1541 disc drive may well have gone through the trauma of having it turn six weeks' worth of their latest masterpiece into the kind of garbage that makes random numbers look sensible.

Fear not — as many users may know, this is quite often caused by an error in only one of the many blocks that may be used by the disc drive to store the file. In many cases it is quite easy to fix these errors — if not quite so easy to trace them in the first place.

Consider the way in which the 1541 stores files on a disc, take the most common type — a program file. First of all, the file has to have an entry in the directory. This directory entry contains details of the name, type and length of the file and the track and sector numbers of the block on which the actual file starts.

Each block on the disc is 256 bytes long and the details of the formats are given in the user manual for the disc drive. Briefly, however, in each block the first two bytes, or links, point to the next block in the file and the following 254 bytes are data in the file itself. The last block in a file is marked by links that are invalid track and sector numbers.

When an error occurs on a disc it can corrupt a file in several ways. The error may occur in the data part of the file, changing a character or keyword in a program for example. Another type of error could occur if the links from one block become corrupted and point to an incorrect block as the next in the file.

In both cases the error needs to be found — this may involve careful examination of the file as stored on the disc. Once the error is identified, attempts can be made to correct it, in the case of corrupted links this may involve searching areas of the disc for pieces of the file

and then linking them back together. It is not always possible to recover the whole of a file but unless the error is compounded by extensive writing to the disc after the error occurs, then perhaps only one or two blocks will be lost.

The details of detection and remedy of such errors on a disc is beyond this article and is more related to experience and even reasonable guess-work than a set of rules, but the manuals and reference guides provide all the information on how things are supposed to be stored on the disc and comparison with this should highlight the corruption.

Finding the error will probably mean careful inspection of the data on the disc and then some alterations to correct it. This is where the program Trax becomes useful.

Although the 1541 allows the use of random files, through which it is possible to access any block on the disc in any order, a program is needed to make use of this. While a simple program may suffice to deal with a particular situation, Trax is a more general program which allows easy reading, writing and alteration of disc blocks as well as allowing the use of the 1541's built in DOS commands.

When the program is running it will attempt to identify the disc that you want to work on. It does this by loading in the directory header and block allocation map from track 18, sector 0 and examining it — although the BAM is not used. During execution various things are displayed on the screen in several "windows".

The track and sector numbers of the block currently in the computer's memory are shown along with the track and sector numbers to which the current block is linked or points to. Along the bottom of the screen

the disk name, ID and operating system version are shown and below this the error channel from the disc drive is shown.

The largest of the windows on the screen is used to display the actual contents of the block in memory. There is a choice of either hexadecimal or ASCII displays, although editing can only be done hexadecimal mode. Because of the size of a block — 256 bytes — only one half of the block is displayed at any one time, in the bottom right hand corner of the screen is an indicator showing whether the display is the top or bottom half of the block, the bytes are also numbered in groups of eight. Finally, the top lines of the screen are used for communications with the program — prompts will appear here along with any responses that you may type.

In the case of a hard copy version of the display, both the hexadecimal and ASCII data is printed along with the track, sector, name, etc.

The commands provided by Trax are all invoked by single keys to make editing easier, although as a precaution commands that move data to and from the disc are obtained via the control key — Ctrl.

The commands may be summarised:

- Ctrl R: Read a specified block from the disc into memory.
- Ctrl W: Write the data in memory to the specified block on the disc.
- Ctrl U: Update the current block on the disc with the data in memory.
- Ctrl F: Follow the links from the current block and read the next block if possible.
- Ctrl P: Print the current block contents on a printer.
- Ctrl Q: Quit the program.

(continued on next page)

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\*: Switch between ASCII and hexadecimal display modes.  
↑: Switch page to display other half of block.  
@: Send following DOS command to disc drive.  
In addition the cursor keys and the Home key may be used to move around the block display to edit the data.

Note that all numbers are in hex including the track and sector numbers typed as responses to read and write commands although leading zeros may be omitted. The only exception to this is the error channel which shows numbers in decimal in line with the disc manual which gives more details on error conditions. DOS commands are sent to the disc drive exactly as typed, so the normal syntax applies. In addition, entering just return when asked for a track or sector number will substitute the current value and pressing the CLR key — Shift Home — during a response will cancel the command.

The program is relatively straightforward to type in; the Commodore control codes are as usual. The only exception is line 50 where the reverse characters u,w,f,r,p and x inside the quotes are obtained by pressing Ctrl and the given letter key whilst in quotes mode.

Don't forget to save a copy of the program before trying to use it and I strongly recommend testing it out with a blank but formatted disc to ensure the program is correct.

For anyone who doesn't want to type the program in I can supply tape copies for £2.00, write to: Keith Suddick, 6 Ravel Court, Jarrow, Tyne and Wear, NE32 3BW.

Place the required disc in the drive and run the program. Pressing return when asked will result in the program reading in track 18 sector 0 — the directory header, and getting from this data the name, id and operating system version of the disc. The first page of the block will be displayed along with the links and error channel. When the command prompt appears at the top of the screen you can either enter one of the commands listed

above or use the cursor keys to move the "cursor" around the block.

If you want to change a byte in a block then simply put the cursor on that byte and type the new value — remember the values are shown in hexadecimal — you will see the byte change and although it will have been altered in memory the change is not sent to the disc until either an Update command is used to rewrite the current block or a Write command is used to place the data in any block on the disc. Note that should you change either of the first two bytes in a block — the links, then the link display will change accordingly and any Follow commands will use the new values even if the block has not been written to the disc.

The first directory block is linked to track 18 sector 1 which is the start of the file entries and you can follow this link from the directory header by using the Follow command. The first files in the directory will be in this block and if you switch the display to ASCII using \* you will be able to see the file names more easily although you must change back to hex to be able to edit the block.

Since only half of the block is displayed at any time you can see the other half by using the ↑ to change the display.

If you find the file you want in the directory then this entry will tell you where the actual file starts and you can then get the first block of the file using the Read command and then follow the rest of the file — note that Follow will not work from the directory entry as this will link to the next directory block.

#### Program breakdown.

0-90: Initialisation.  
100-180: Main input loop. Edit block if requested and check for valid commands.  
200-260: Get track and sector numbers for read and write commands.  
300-360: Produce printed copy of current block.  
400-499: Move "cursor" around block display.  
500-590: Execute commands.  
600-630: Display block on screen.  
700-760: Convert to and from

hex/decimal.

800-899: Read specified block from the disc, update current track and sector values and set links to next block.  
900-999: Write current block data to specified block on disc.  
1000-1020: Read and display error channel from disc drive.  
2000-2150: Draw screen "windows".  
2200-2300: Attempted to identify disc — read track 18 (\$12) sector 0.  
2400-2550: Error messages for unreadable discs.  
3000-3070: Input a string subroutine.

```
0 rem trac: 1541 disk editor
1 rem k. suddick mar 1985
10 dimb(255):cl=214
20 r$=chr$(13):d$=chr$(20):z$=chr$(0):h$="0123456789abcdef"
30 cl$=""
40 c$=cl$+" "
50 ok$=""
60 b$=b$+" "
70 u$="u"
80 w$="w"
90 f$="f"
100 r$=r$+" "
110 k$=k$+" "
120 p$="p"
130 x$="x"
140 u$="u"
150 w$="w"
160 f$="f"
170 r$="r"
180 p$="p"
190 x$="x"
200 r$=r$+" "
210 k$=k$+" "
220 p$="p"
230 x$="x"
240 u$="u"
250 w$="w"
260 f$="f"
270 r$="r"
280 p$="p"
290 x$="x"
300 r$=r$+" "
310 k$=k$+" "
320 p$="p"
330 x$="x"
340 u$="u"
350 w$="w"
360 f$="f"
370 r$="r"
380 p$="p"
390 x$="x"
400 r$=r$+" "
410 k$=k$+" "
420 p$="p"
430 x$="x"
440 u$="u"
450 w$="w"
460 f$="f"
470 r$="r"
480 p$="p"
490 x$="x"
500 r$=r$+" "
510 k$=k$+" "
520 p$="p"
530 x$="x"
540 u$="u"
550 w$="w"
560 f$="f"
570 r$="r"
580 p$="p"
590 x$="x"
600 r$=r$+" "
610 k$=k$+" "
620 p$="p"
630 x$="x"
640 u$="u"
650 w$="w"
660 f$="f"
670 r$="r"
680 p$="p"
690 x$="x"
700 r$=r$+" "
710 k$=k$+" "
720 p$="p"
730 x$="x"
740 u$="u"
750 w$="w"
760 f$="f"
770 r$="r"
780 p$="p"
790 x$="x"
800 r$=r$+" "
810 k$=k$+" "
820 p$="p"
830 x$="x"
840 u$="u"
850 w$="w"
860 f$="f"
870 r$="r"
880 p$="p"
890 x$="x"
900 r$=r$+" "
910 k$=k$+" "
920 p$="p"
930 x$="x"
940 u$="u"
950 w$="w"
960 f$="f"
970 r$="r"
980 p$="p"
990 x$="x"
1000 r$=r$+" "
1010 k$=k$+" "
1020 p$="p"
1030 x$="x"
1040 u$="u"
1050 w$="w"
1060 f$="f"
1070 r$="r"
1080 p$="p"
1090 x$="x"
1100 r$=r$+" "
1110 k$=k$+" "
1120 p$="p"
1130 x$="x"
1140 u$="u"
1150 w$="w"
1160 f$="f"
1170 r$="r"
1180 p$="p"
1190 x$="x"
1200 r$=r$+" "
1210 k$=k$+" "
1220 p$="p"
1230 x$="x"
1240 u$="u"
1250 w$="w"
1260 f$="f"
1270 r$="r"
1280 p$="p"
1290 x$="x"
1300 r$=r$+" "
1310 k$=k$+" "
1320 p$="p"
1330 x$="x"
1340 u$="u"
1350 w$="w"
1360 f$="f"
1370 r$="r"
1380 p$="p"
1390 x$="x"
1400 r$=r$+" "
1410 k$=k$+" "
1420 p$="p"
1430 x$="x"
1440 u$="u"
1450 w$="w"
1460 f$="f"
1470 r$="r"
1480 p$="p"
1490 x$="x"
1500 r$=r$+" "
1510 k$=k$+" "
1520 p$="p"
1530 x$="x"
1540 u$="u"
1550 w$="w"
1560 f$="f"
1570 r$="r"
1580 p$="p"
1590 x$="x"
1600 r$=r$+" "
1610 k$=k$+" "
1620 p$="p"
1630 x$="x"
1640 u$="u"
1650 w$="w"
1660 f$="f"
1670 r$="r"
1680 p$="p"
1690 x$="x"
1700 r$=r$+" "
1710 k$=k$+" "
1720 p$="p"
1730 x$="x"
1740 u$="u"
1750 w$="w"
1760 f$="f"
1770 r$="r"
1780 p$="p"
1790 x$="x"
1800 r$=r$+" "
1810 k$=k$+" "
1820 p$="p"
1830 x$="x"
1840 u$="u"
1850 w$="w"
1860 f$="f"
1870 r$="r"
1880 p$="p"
1890 x$="x"
1900 r$=r$+" "
1910 k$=k$+" "
1920 p$="p"
1930 x$="x"
1940 u$="u"
1950 w$="w"
1960 f$="f"
1970 r$="r"
1980 p$="p"
1990 x$="x"
2000 r$=r$+" "
2010 k$=k$+" "
2020 p$="p"
2030 x$="x"
2040 u$="u"
2050 w$="w"
2060 f$="f"
2070 r$="r"
2080 p$="p"
2090 x$="x"
2100 r$=r$+" "
2110 k$=k$+" "
2120 p$="p"
2130 x$="x"
2140 u$="u"
2150 w$="w"
2160 f$="f"
2170 r$="r"
2180 p$="p"
2190 x$="x"
2200 r$=r$+" "
2210 k$=k$+" "
2220 p$="p"
2230 x$="x"
2240 u$="u"
2250 w$="w"
2260 f$="f"
2270 r$="r"
2280 p$="p"
2290 x$="x"
2300 r$=r$+" "
2310 k$=k$+" "
2320 p$="p"
2330 x$="x"
2340 u$="u"
2350 w$="w"
2360 f$="f"
2370 r$="r"
2380 p$="p"
2390 x$="x"
2400 r$=r$+" "
2410 k$=k$+" "
2420 p$="p"
2430 x$="x"
2440 u$="u"
2450 w$="w"
2460 f$="f"
2470 r$="r"
2480 p$="p"
2490 x$="x"
2500 r$=r$+" "
2510 k$=k$+" "
2520 p$="p"
2530 x$="x"
2540 u$="u"
2550 w$="w"
2560 f$="f"
2570 r$="r"
2580 p$="p"
2590 x$="x"
2600 r$=r$+" "
2610 k$=k$+" "
2620 p$="p"
2630 x$="x"
2640 u$="u"
2650 w$="w"
2660 f$="f"
2670 r$="r"
2680 p$="p"
2690 x$="x"
2700 r$=r$+" "
2710 k$=k$+" "
2720 p$="p"
2730 x$="x"
2740 u$="u"
2750 w$="w"
2760 f$="f"
2770 r$="r"
2780 p$="p"
2790 x$="x"
2800 r$=r$+" "
2810 k$=k$+" "
2820 p$="p"
2830 x$="x"
2840 u$="u"
2850 w$="w"
2860 f$="f"
2870 r$="r"
2880 p$="p"
2890 x$="x"
2900 r$=r$+" "
2910 k$=k$+" "
2920 p$="p"
2930 x$="x"
2940 u$="u"
2950 w$="w"
2960 f$="f"
2970 r$="r"
2980 p$="p"
2990 x$="x"
3000 r$=r$+" "
3010 k$=k$+" "
3020 p$="p"
3030 x$="x"
3040 u$="u"
3050 w$="w"
3060 f$="f"
3070 r$="r"
3080 p$="p"
3090 x$="x"
3100 r$=r$+" "
3110 k$=k$+" "
3120 p$="p"
3130 x$="x"
3140 u$="u"
3150 w$="w"
3160 f$="f"
3170 r$="r"
3180 p$="p"
3190 x$="x"
3200 r$=r$+" "
3210 k$=k$+" "
3220 p$="p"
3230 x$="x"
3240 u$="u"
3250 w$="w"
3260 f$="f"
3270 r$="r"
3280 p$="p"
3290 x$="x"
3300 r$=r$+" "
3310 k$=k$+" "
3320 p$="p"
3330 x$="x"
3340 u$="u"
3350 w$="w"
3360 f$="f"
3370 r$="r"
3380 p$="p"
3390 x$="x"
3400 r$=r$+" "
3410 k$=k$+" "
3420 p$="p"
3430 x$="x"
3440 u$="u"
3450 w$="w"
3460 f$="f"
3470 r$="r"
3480 p$="p"
3490 x$="x"
3500 r$=r$+" "
3510 k$=k$+" "
3520 p$="p"
3530 x$="x"
3540 u$="u"
3550 w$="w"
3560 f$="f"
3570 r$="r"
3580 p$="p"
3590 x$="x"
3600 r$=r$+" "
3610 k$=k$+" "
3620 p$="p"
3630 x$="x"
3640 u$="u"
3650 w$="w"
3660 f$="f"
3670 r$="r"
3680 p$="p"
3690 x$="x"
3700 r$=r$+" "
3710 k$=k$+" "
3720 p$="p"
3730 x$="x"
3740 u$="u"
3750 w$="w"
3760 f$="f"
3770 r$="r"
3780 p$="p"
3790 x$="x"
3800 r$=r$+" "
3810 k$=k$+" "
3820 p$="p"
3830 x$="x"
3840 u$="u"
3850 w$="w"
3860 f$="f"
3870 r$="r"
3880 p$="p"
3890 x$="x"
3900 r$=r$+" "
3910 k$=k$+" "
3920 p$="p"
3930 x$="x"
3940 u$="u"
3950 w$="w"
3960 f$="f"
3970 r$="r"
3980 p$="p"
3990 x$="x"
4000 r$=r$+" "
4010 k$=k$+" "
4020 p$="p"
4030 x$="x"
4040 u$="u"
4050 w$="w"
4060 f$="f"
4070 r$="r"
4080 p$="p"
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```
630 next:print next:poke1961,226-p$8:goto440
700 h$=mid$(h$,d$+u,u)+mid$(h$,d$+u,u):return
750 h$="0":h$=asc(right$(h$,c2))-a0-a0+c7*(c2-c3)*ax
760 d$=asc(right$(h$,u))-a0-d0+c7*(d2-d3)*x:return
800 print" "
810 print15,"u:2.0","t:1.0":gosub1000:ifthen880
820 t$=s$+d$:gosub700:t$=s$:gosub700:s$=h$
830 print15,"b:2.0"
840 t$=s$+d$:gosub700:t$=s$:gosub700:s$=h$
850 t$=s$+d$:gosub700:t$=s$:gosub700:s$=h$
860 print" "
870 print15,"s:2.0":gosub1000:ifthen880
880 print" "
890 return
900 print" "
910 print15,"b:2.0"
920 forv=0to255:print1,chr$(v):next
930 print15,"u:2.0":t$=s$:gosub1000:goto880
940 print15,"t:2.0":t$=s$:gosub1000:goto880
950 print15,"s:2.0":t$=s$:gosub1000:goto880
960 print15,"e:2.0":t$=s$:
```

THE FUTURE OF MANKIND IS IN YOUR HANDS!

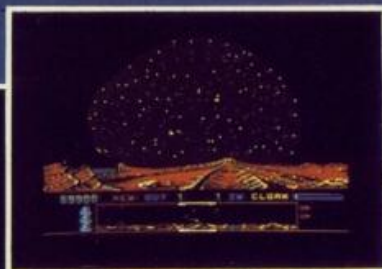
# DROPZONE

It's the year 2085. Only a handful of people have survived the robot wars that rocked the Solar System. In a final desperate bid for survival a Tacheon propelled star cruiser has been developed on Earth to transport survivors to new star system. But the cruiser relies on rare Ionian crystals for its power; crystals which are only abundant on Jupiter's second moon Io. A moonbase established on Io is under constant attack by aliens from Jupiter. It is your mission to escort the men and their precious crystals safely from the surface of Io to the Dropzone where the landing pad is located. You are equipped with the latest pulse-laser

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

64

ATARI



**Super smooth scrolling screen**  
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**Nine different alien attackers**  
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**Exploding volcanoes**  
**Ultra fast action**  
**Cassette £9.95**  
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# SPACE JUNK

## Nalin Sharma continues his epic for the CBM-64.

HERE IS a reminder of the loading and game instructions for Space Junk.

Insert cassette, press Shift and Run/Stop and start your cassette recorder. Loading time is about two minutes. Put your joystick into Port 2.

Can you retrieve all 32 satellites by mastering control of your ship, which can move up, down, left and right and can also fire bullets? However, beware of the four yellow junkies which patrol the skies. Unless you can work out how to destroy them you're in trouble! To help you there's a radar at the top of the screen which will pinpoint the junkies and any miscellaneous junk which appears from time to time and can be retrieved for bonus points.

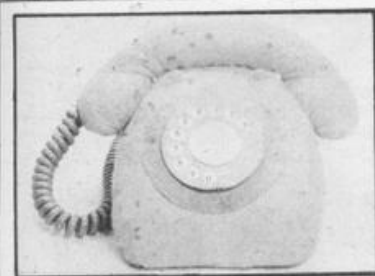
After every two sheets you'll get an extra life and an attempt at the challenge stage. Here you have 99 units of time to turn the four junkies into stormer — if you succeed you'll get 8000 points! Below your score is shown the number of satellites left to collect, together with the number of lives left.

Pressing F7 will freeze the game and pressing the Space-Bar will restart it. Tape copies of the program are available for £3.25 from Nalin Sharma, 35 Kitchener Road, Walthamstow, London E17 4LJ.

```

note: enter letters as capitals
34+0 c13a5354412048+9 2d4 3650 3000ed2+93+25632 356 37c0 20acaa3300d3778 325 3930 b6+57b6bbdb50eda 50+ 3aa0 +++++03c0f0c0c+++ 63c
34+2 47484809aa35000a 279 3660 5741564520425954 242 37c8 8c52545300dc377d 315 3938 efa+7a+9c0db5ff 50a 3aa8 +++++3333333303++ 30c
3500 35b68a4c44412023 269 3670 332c3330035094 10e 37d0 8c4c445820534341 26b 3940 0006330c330c33c 2a3 3ab0 +++++33333333c+++ 49e
3508 36001035b68a5354 272 3678 +25457534+554a44 326 37e0 50455000e+37828c 320 3948 330+0303030303d3b 056 3ab8 +++++3333333333++ 30c
3510 4120484947484809 262 3680 2842595420002c32 10d 37e8 525341545300+037 2c1 3958 cc70c0c0c0c0c0c0c 508 3ac0 +++++3333c+3333++ 49e
3512 aa96002635c0a84c 2db 3688 3420c31362c3232 187 37+0 878c4c4458205343 261 3960 0000000000181830 060 3ac8 +++++333303+303++ 45c
3520 4441202335003503 167 3690 2c34382c3139322c 18c 37+8 415045500053889 1+4 3968 0000007e00000000 07e 3ad0 +++++03+3c+3+03++ 504
3528 d48a535441205348 301 3698 36342c3137362c30 198 3800 03030+0+3+3++++ 2a0 3970 ++++++f0c0c+++ 798 3ad8 0103060c183+60++ 10c
3530 49454c44004635e8 281 36+0 302c3136302c3936 18e 3808 ++++++f0c0c+++ 7+8 3978 0040406060780308 218 3ae0 000000103+00++ 282
3538 8a4a535220534554 285 36a8 2c3134342c313132 185 3810 00000000000a0a8a 272 3988 1c1e0+0703000000 053 3a+0 +++++f0183060c1f 233
3540 5241444152005735 1+6 36b0 2c313230007e009e 213 3820 aaaaeeafafafaf+c 716 3990 000000000+03e00 296 3a+8 3+60c00000e00++ 3dc
3548 +48a5349c343+520 385 36b8 +2485850534+554e 328 3828 80a0a00000000000 2c0 3998 0000001818000000 030 3b00 +++++80000102e4 365
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3558 35+68a9c53494420 351 36c8 31362c33322c3438 190 3838 ea12a548902040b+ 398 39a8 e7+++db++++db++7e 717 3b10 0000000000000000 000
3560 4c444120534+554e 236 36d0 2c36342c38302c39 18+ 3840 7+00000001++++f+ 27e 39b0 5555+++db7e75ac3 56+ 3b18 000000000000++++ 1+e
3568 442c58007035+88a 2+c 36d8 362c3131322c0132 185 3848 ++++++0001030c+ 304 39b8 e7e7+++7e000000 44a 3b20 00000000++++0000 1+e
3570 5354412044555853 244 36e0 382c3134342c3136 190 3850 +83060c000++++f+ 4c6 39c0 6666++++3bd9339 57c 3b30 +++++000000000000 1+e
3578 49442c58000835+9 2c7 36e8 302c3137362c3139 190 3858 ++++++c000000001 33+ 39c8 bdc3++++7e000000 3+c 3b38 0000000000000000 000
3580 8a4c444120233000 10e 36+0 322c3230382c3232 188 3860 010307000+1830+8 160 39d0 +++++015e575+5700 46a 3b40 03060c1830e0c000 27d
3588 9935+8a53544120 35a 36+8 342c32343000c730 1ed 3868 0018181818183c0c 0+0 39d8 +++++9177+d57fb+44 501 3b48 +++++f0183060c000 3e9
3590 5748494348322c58 229 3700 a8+2545454534+55 36e 3870 6666667e66c3+++3 49b 39e0 +++++03+5dd79ed03 53c 3b50 00000183c187a18 102
3598 00a135+8a9494e50 34a 3708 4e44204259542032 1+3 3878 c37ec300++000000 303 39e8 +++++87++87++++ 708 3b58 00000183c187a18 102
35+0 00ad35+c0a435056 353 3710 34302c3232342c32 186 3880 00c0e060+0180c1+ 303 39+0 +++++3dbdf+d+dbc3++ 6+8 3b60 00000183c187a18 102
35+8 202332335000a05+e 297 3718 30382c3139322c31 18d 3888 00000000000000003 003 39+8 +++++7b++7+++++ 754 3b68 000018781e180000 30c
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3648 392c3235342c3235 193 37b8 00c537738c424551 2d3 3928 c0c0e4eeeb6+f+7+6 699 3a98 +++++03303+303++ 436 3c08 +++++99+99+99++++ 6c6

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Available on Telsoft.

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3c20: ++++++32000 5e0 3e38: 000000++fbb+e10c 3a6  
3c28: ++++++32000 5e0 3e40: 77++++bbbf+77+7 5d0  
3c30: ++++++32000 5e0 3e48: ++7+7b77++++d800 546  
3c38: ++++++32000 5e0 3e50: 000000++++d+926 3+c  
3c40: ++++++32000 5e0 3e58: 8++++b7b7+7+++f 5+0  
3c48: 7+7e7e7e7e7e7e7e7e 301 3e60: e+7e++++d+8e0500 4ce  
3c50: 0000000000000000 07a 3e68: 000000++++d+8e770 352  
3c58: 0000000000000000 141 3e70: e+e+7777++++f+777 638  
3c60: 000+3+3+00000000 08d 3e78: d+d++++7777+3a10 444  
3c68: 0000000000000000 23a 3e80: 000000++++f++++8339 3a9  
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3c80: 0000000000000000 +c+ 1+8 3e98: 0000000000000000e 363  
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3c90: 00+0+c+c000000000 2a8 3ea8: 80c0e060+8b0d87c 57c  
3c98: 0000000000000000 0aa 3eb0: 000000000031+3d+7 156  
3ca0: 0c300c300c300c30 0+0 3eb8: 030+1+3b7d6+d0b 32e  
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3cb0: 0000000000000000 +818 200 3ec8: 0000+++++ 5+a  
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3cc8: 003cc3+ff00+003c 339 3e0e: ++3+3+1c070100 1ba  
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3cd8: 2a3+003c003c003c 258 3e18: ++3+c+3c0e0000 527  
3ce0: a8+c003c003c003c 31b 3e20: 0004+3++++04+000 3+8  
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3cf0: 00000000++224+++ 264 3e30: f0c04+00+00+00+43 53a  
3cf8: 000+3667+7+88+ 3b6 3e38: ++00+00+00+00+ 4+b  
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3dc8: ++00+00+00+00+00+ 5c9 3ee8: 00db00+00+00+00+ 3bd  
3dd0: 0000+00c0e00+00+ 400 3ef0: 00+00+00+00+00+ 43f  
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3df8: ++05000000+0000 203 4018: 452053434c503200 1c9  
3e00: ++003+3c3+303+ 5ac 4020: 2+40044c4c445920 1c8  
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3e10: c++++0033333303+ 399 4030: 40094c4a4d5020a2 23e  
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3e20: 000000+0e+00378 357

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4090: 850d0d1ad0ad11d0 397  
4098: 297+8d11d0a9518d 39d  
40a0: 120d0a++8d190d0a 4a9  
40a8: 009d0edc20d04420 2+5  
40b0: ec45200434c+04a 39a  
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40c0: 8bd0+9a9320d2++ 581  
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40d0: 85+c0a9d95+ea011 537  
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40e0: 29a91085+c0a9085 451  
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4130: 11d0a9c0ad12d020 3e3  
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4158: e68da9818d150d0d 440  
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4220: 120d203a44a511c9 2++  
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4238: 206b+74c0c+1a50e 29e  
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4248: 03201a465a0e2907 168  
4250: 850+850e2049534c 224  
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4368: bd2770d2670+00e 3b+  
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4378: 9d2770e+2570d023 3a9  
4380: 70d2670+0034c34 356  
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4398: 3770c904d005a900 2+2  
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4640: e8+000d0f+550a200 50+  
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4668: 73850e0510850460 284  
4670: a200d096529d0470 358  
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4680: a9000d217060d9+a 30a  
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4690: a9d885+ea9018001 43c  
4698: 70a914a22c209346 2+4  
4700: 207e46207b4e6a000 268  
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4718: 1360a900a2009d00 25b  
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4868: 8a49+8d0c70ee37 380  
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4998: b0e25091+ba0d170 499  
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5008: e+60a0e688eae0c 5+1  
5010: 00d0f+c0a000d0+2 535  
5018: 6088d0+0c0a05+88 49c  
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5050: 0485+c0a9885+ea9 532  
5058: 0a8d2300a90e0d22 409  
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5068: a200a91220954600 2+8  
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5078: a01ba921a2e52095 3c1  
5080: 46206946a01ba921 29a  
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## TASWORD TWO

### The Word Processor

"If you have been looking for a word processor, then look no further."

CRASH June 1984

"The number of on-screen prompts, together with the excellent manual, make it ideal - even for an absolute beginner."

PERSONAL COMPUTER WORLD

September 1983

"Without doubt, the best utility I have reviewed for the Spectrum."

HOME COMPUTING WEEKLY April 1984

**TASWORD TWO ZX 48K Spectrum £13.90**

## TASWORD MSX

### The Word Processor

The Tasman Word Processor for MSX microcomputers.

All the features of the Spectrum version.

**TASWORD MSX MSX Computers £13.90**

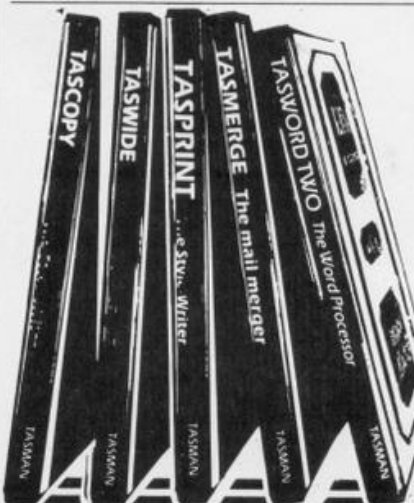
## TASCOPY

### The Screen Copier

Screen copy software for Spectrum with Interface 1 and Amstrad CPC 464. Print high resolution screen copies (in a choice of sizes), and also large 'shaded' copies with different dot densities for the various screen colours. Tascopy supports all eight pin dot matrix printers with Epson type control codes, e.g. Epson RX-80 and FX-80, Shinwa CP-80, Mannesmann Tally MT-80, Star DMP 510/515, Brother HRS, and also Amstrad DMP 1 with the CPC 464.

**TASCOPY ZX Spectrum £9.90**

**TASCOPY 464 Amstrad CP 464 £9.90**



## TASWORD 464

### The Word Processor

The Amstrad implementation of Tasword Two plus many extra features.

**TASWORD 464 Amstrad CPC 464 £19.95**

## TASMERGE

### The Mail Merger

Transfer data from MASTERFILE to TASWORD TWO! Letters and forms typed on TASWORD TWO can be printed with addresses and data taken from MASTERFILE. The mail merge facility allows, for example, multiple copies of a letter to be printed, each containing a different name and address taken from your MASTERFILE data. To use TASMERGE you must have one or more microdrives as well as TASWORD TWO and MASTERFILE by Campbell Systems. (version 9 or later).

**TASMERGE ZX 48K Spectrum £10.90**

## TASPRINT

### The Style Writer

A must for dot-matrix printer owners! Print your program output and listings in a choice of five impressive print styles. TASPRINT utilises the graphics capabilities of dot-matrix printers to form, with a double pass of the printhead, output in a range of five fonts varying from the futuristic DATARUN to the hand-writing style of PALACE SCRIPT. TASPRINT drives all dot-matrix printers with bit image graphics capabilities and can be

used to print TASWORD text files. TASPRINT gives your output originality and style!

**TASPRINT ZX 48K Spectrum £9.90**

**TASPRINT Amstrad CPC 464 £9.90**

## TASWIDE

### The Screen Stretcher

With this machine code utility you can write your own Basic programs that will, with normal PRINT statements, print onto the screen in the compact lettering used by TASWORD TWO. With TASWIDE you can double the information shown on the screen!

**TASWIDE ZX 48K Spectrum £5.50**

## TASMAN PRINTER INTERFACE

Plug into your Spectrum and drive any printer fitted with the Centronics standard parallel interface. Supplied complete with ribbon cable and driving software. The user changeable interface software makes it easy to send control codes to your printer using the method so successfully pioneered with TASWORD TWO. The cassette also contains fast machine code high resolution full width SCREEN COPY SOFTWARE for Epson, Mannesmann Tally, Seikosha, Shinwa, Star, and Tandy Colour Graphic (in colour!) printers. Compatible with microdrives and ZX Interface 1.

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## MEMORY LOOK

To enable the contents of the memory holding a Basic program to be examined I have written the following utility which uses line numbers from 9000 onwards. This allows it to be added to the end of existing programs using Merge "" instead of Load ""

Once installed the direct command Go To 9000 should be used to execute the routine. The screen is filled with the memory locations, the corresponding contents in decimal and where applicable the ASCII character or keyword.

The "scroll?" prompt appears after each screen fill and allows you to stop by pressing key N.

*Alan Pratt*

```

9000 REE EXHIBIT 280/4
9010 CLS LET S=PEEK 23635+PEEK
23636+256-1 GO TO 9210
9020 IF S=0 THEN
9030 IF S=13 THEN GO TO 9200
9040 IF S=14 THEN GO TO 9300
9050 IF S=10 THEN PRINT S:
PRINT
9060 IF S=9 AND S<100 THEN PRINT
9070 IF S=999 THEN PRINT S: S=9
9080 IF S=31 THEN PRINT PAPER 5.
CHRS 9
9090 IF S=32 THEN PRINT
9100 LET S=S+1 GO TO 9020
9200 PRINT S: P=PEEK 23636+256-1
9210 LET S=S+1 LET P=PEEK S+256
9220 PRINT S: PAPER 6/LINE
NO
9300 LET S=S+2 LET P=PEEK S+256
9310 S=S+1 PAPER 6/NO.
9320 PRINT S: S=9
9330 PRINT S: S=9 PAPER
9340 PRINT S+1
9350 FOR S=1 TO S+5
9360 PRINT PAPER S:
9370 NEXT S
9380 PRINT LET S=S+5 GO TO 9

```

## HEX-DEC/DEC-HEX

This is a machine-code program which is for the CBM 64 and readily converts either hexadecimal to decimal or decimal to hexadecimal.

To do this you simply type the following:

SYS 49152,\*\*\*\*\* (decimal

number)  
for hex/dec

SYS 49242,\$\*\*\*\* (hexadecimal number)

**Gary Taylor**

```

30000 REM HEX=DEC & DEC=HEX
30010 ADD=49152C=0
30020 READ A:IF A=0 THEN END
30030 FOR# ADD=C,A:C=C+1:GOTO 30020
620
30040 DATA 32,253,174,32,138,173
32,247,163,170,152,72,138,172
172
30050 DATA 169,36,32,218,255,184
32,38,192,184,32,43,192,184,32,
38
30060 DATA 192,184,32,43,192,96,
24,186,184,186,186,41,15,24,185,
48
30070 DATA 201,58,144,2,185,6,32
218,255,96,234,234,234,32,115
30080 DATA 201,58,41,15,144,2,18
5,8,96,32,61,192,18,10,18,10
30090 DATA 132,35,32,61,192,181,
35,133,35,96,32,115,8,281,36,24

```

```
30100 DATA 3,76,8,175,32,73,192,
133,34,32,73,192,165,34,166,35
30110 DATA 32,205,189,76,116,164,
254,234,-1
```

# RESPONSE

## BBC FILL-IN

■ I have owned my BBC Model B computer for over eight months and have not experienced any problems with it until now. I discovered the problem when I accidentally used a recently-obtained "fill" routine on a screen full of text. When the routine encounters the text, the computer locks up, and I have to resort to the Break key, or it produces a variety of very strange error messages, depending on which graphic mode it is used in. The "fill" routine uses the Point command and it is the lines which contact this command which produce the error messages. To start the routine, I used the command Procfill (500,500). I would be pleased if you could tell me if the fault is in the programming, if it is a universal fault in all PS 1.2's or if it is just my computer at fault. Here is the offending program:

```

10 DEFFROCFILL (X%, Y%)
20 CLEAR
30 X=X%:Y=Y%
40 IF POINT (X,Y)=0 THEN PLOT
    69,X%,Y%
50 IF POINT ((X+4),Y)=0 THEN
    PROCFILL ((X+4),Y)
60 IF POINT (X,(Y+4))=0 THEN
    PROCFILL (X,(Y+4))
70 IF POINT ((X-4),Y)=0 THEN
    PROCFILL ((X-4),Y)
80 IF POINT (X,(Y-4))=0 THEN
    PROCFILL (X,(Y-4))

```

Darren Powell,  
Thorne,  
Doncaster.

THE PROBLEM lies in the program, not in the operating system or your computer. For a start, you should not use `Clear` within a procedure as this strips the return address for exiting the procedure from the stack, so it can return to almost anywhere in the program.

The BBC Micro generates meaningless random error messages under certain circumstances, so the content of the messages you have generated is irrelevant. Your routine, even without the Clear, is probably the least sophisticated "fill" routine possible. As it is recursive, it is also very, very memory-hungry.

It probably consumes around 60 bytes every time it calls itself. When you try to "fill" on a page of text, more than half the screen is blank, so the number of self-calls will be huge, giving rise to the problems you've experienced. I suggest you delete the `Clear`, and only use your routine for filling relatively small shapes.

## COLOURED MAN

■ I have an Amstrad computer and am presently writing a program in Mode 1. I want to

Do you have a problem related to your micro? Tim Hartnell will do his best to help. Please include only one question per letter and mark it "Response Frame". Alternatively, perhaps you have an idea you'd like to pass on to others. Why not write to us with your top tips?

include a figure of a man, made up of five user-defined graphic shapes. However, I want to mix colours within particular defined graphics and cannot figure out how to do this. Can it be done?

*M Smith,  
Stoke-on-Trent.*

MODE 1, AS you know, gives four colours but there is no way in Basic which I can discover which will allow more than one colour to be used for a user-defined graphic. Although this would doubtless produce a program which ran more slowly, you could use Line and Draw to construct your figure as these do allow you to do colour changes.

## WHICH MODEM?

■ I am looking for help on the subject of modems for the Electron. I am interested in buying one, but am not sure which are available.

Richard Rennie,  
West Calder,  
West Lothian.

I HAVE BEEN unable to locate any modems made specifically for the Electron. If you get an RS-423 interface for your Electron, you will then be able to hook your computer to any modem made for the BBC. In fact, with this interface, you'll probably be able to use any standard 1200 baud modem.

## CBM-64 SOUND

■ In a recent edition of *Your Computer* magazine I saw an advertisement for a "digital sound sampler" for the ZX Spectrum. I own a Commodore 64, and wonder if there are similar products available for it? *Stewart Sadler, Tollesbury.*

WHILE I have not been able to track down a sound sampler as such, I've discovered that many of the music synthesiser programs available for

the 64 give you the capability of generating many non-musical sounds. The *Commodore Music Maker*, which you might have seen, includes a small keyboard which actually sits on the Commodore's keys, and comes with driver software. If you want to generate speech, the cassette program from an American company, *Big-Mouth*, is available. There is also the plug-in speech module from Commodore called *Magic Voice*.

### VIC DISC DRIVE

■ I am a Vic-20 owner, and after a couple of years' computing I now wish to invest in a disc drive. The obvious choice is the Commodore drive, but this is fairly expensive.

Andrew McFarlane,  
Sheffield.

THE EASIEST route to follow is to buy an RS-232 interface for your Vic-20, which will give you the ability to choose from a very wide range of disc drives — and, incidentally, other peripherals as well.

## AMSTRAD COLOUR

■ I am considering buying an Amstrad CPC-464. However, there is one thing I have not been able to find out from the articles which have been printed on it. If I buy a green-screen monitor version, can I plug the computer into a colour television? If I can, will it produce a colour picture, or is the "colour circuitry" only provided with the colour version?

Anthony Hodgson,  
Sunderland.

THERE IS only one type of Amstrad machine, in terms of its ability to produce a colour picture. The only difference is in the monitor provided with the one you buy. You cannot connect the CPC-464 up directly to a colour television. However, Amstrad make a modulator, costing around £30, for this purpose.

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120 YOUR COMPUTER, MAY 1985

```

15 RESORE 20: FOR a=USR "a" T
0 USR "0-1 READ b: POKE a,b: N
EXT a
20 DATA 0,0,0,7,15,25,24,24,0,
0,0,255,255,0,0,0,24,24,24,24,
24,24,24
30 DATA 0,0,0,0,224,240,56,24,24
24,24,24,56,240,224,0,0,0,24,24,20
15,7,0,0,0
40 DATA 169,255,189,60,24,153,
255,153,231,66,242,255,255,242,6
6,231,0,0,0,24,24,0,0,0
50 DATA 231,153,255,153,24,60,189,255,2
189,137,82,85,62,188,90,42,201,2
4,24,255,255,24,24,24
55 DATA 126,195,155,153,153,16
5,65,126
60 DATA .2,10,50,5,2,10,5,1,
-5,2,10,50,5,2,10,5,3
65 DATA .2,10,50,5,2,10,1,15
1,1,15,0,15,1,1,15,3,15,1,1,
15,3
70 DATA .4,0,50,1,4,5,2,4,1,
0,1,2,4,50,1,2,4,1,1
2,3,0,1,1
90 DATA .1,5,1,1,5,3,4,3,5
3,4,7,5,7,4,1,5
100 LET hi=0
200 LET l=1: LET li=3: LET h=2
300 LET s=0
205 FOR a=500 TO 300 STEP -100
210 LET p=a: GO SUB 1000: PRINT
#1: SCORE: "s, TAB 16: "HIGH: "h
310 LET i=a: PRINT AT 7,23: "FUE
L: "i AT 12,23: "LIVES: "li
212 PRINT AT 9,9: INK 7: "H" AT
9,12: BRIGHT 1: INK 2: "H"
213 LET d=5: LET e=5: LET li=5
214 RESTORE 60: LET c=INT (RND$
15)
300 FOR a=1 TO 18: READ b,c: IF
b=50 THEN PAUSE c: GO TO 216
215 NEXT b,c: LET ts=0: LET x=9
216 LET y=a: LET xr=12: LET yr=x: RA
NDOMIZE
220 LET ch=152: LET x1=x: LET y
1=y: LET xr1=xr: LET yr1=yr: IF
NOT r THEN GO TO 350
230 LET o=1: LET a$=INKEY$
240 IF y1 AND a$="k" THEN LET x=
x+2: (x AND a$="k") OR x>11 AND
x(20) AND a$="o") -2: (x(12) AND a$=
"i" OR x(1) AND a$="i" AND a$="o")):
L ET c=ch+2: LET x1=x: LET y1=y
240 IF x(9) AND x(12) THEN LET y=
y+2: (y AND a$="i") OR y>11 AND
y(20) AND a$="o") -2: (y(12) AND a$=
"i" OR y(1) AND a$="i" AND a$="o")):
IF y(1) THEN LET ch=ch+2: (y(1)
1) LET c=ch+2: (a$="o")
310 LET a=USR 23760
320 IF a=6 THEN LET s=s+5: LET
ts=ts+1: BEEP .005,0: IF ts=179
THEN GO TO 510
330 IF a=5 THEN LET s=s+50: BEE
P .1,20
340 PRINT #1: AT 1,7: s
350 IF x=xr AND y=yr THEN GO TO
1100
360 LET ch=152: IF AND#h<1 THE
N GO TO 450
370 LET a$=(l(1)-(l(1)-
385 IF l(1) AND o=11 OR p THEN
LET p=NOT p: GO TO 450
390 IF yr<9 AND yr(12) THEN LET
xr=xr+2: (xr AND a$="k") OR xr(20) AND
a$="o") -2: (xr(12) AND a$="i" OR
a=1 OR xr(1) AND xr(10) AND a=1)):
IF xr(xr1) THEN LET ch=ch+2: xr
1 LET l(1)=1+a
400 IF xr<9 AND xr(12) THEN LET
yr=yr+2: (yr AND a$="k") OR yr(20) AND
a$="o") -2: (yr(12) AND a$="i" OR
a=1 OR yr(1) AND yr(10) AND a=1)):
IF yr(yr1) THEN LET ch=ch+2: (yr
1) LET l(1)=1+a
450 LET a=USR 24011: IF NOT a A
ND AND<.9 THEN LET d=5
500 GO TO 220
510 FOR a=0 TO 100: NEXT a: LET
le=le+1: NEXT a: LET h=h+h
520 BORDER 1: PAPER 7: CLS: PR
INT AT 5,9: INK 0: FLASH 1: "WEL
L DONE!" AT 6,6: BONUS "250:"
e/4: POINTS
530 LET s=s+250:le/4: RESTORE 6
0: FOR a=1 TO 21: READ b,c: IF b
=50 THEN PAUSE c: GO TO 550
540 BEEP b,c:
550 NEXT a: PRINT #1: FLASH 1: "
PRESS ANY KEY TO CONTINUE"
555 IF INKEY$="" THEN GO TO 55
5
567 IF INKEY$="" THEN GO TO 557
560 GO TO 2005
1000 BORDER 0: PAPER 0: CLS: PR
INT USR 23760: INK 4
1015 PRINT INK 0: AT 10,0: "PR
INT AT 0,10: "AT 21,10: "A
T 10,0: "AT 10,21: "AT 1
1030 FOR a=0 TO 18 STEP 2: PRINT
AT a,a: "AT a,21-a: "FOR b=
a+1 TO 9: PRINT AT a,21-b: "A
T a,b: "AT b,a: "AT b,21-a: "
NEXT a
1040 PRINT AT 21,3: "AT 21-3,
21-a: "FOR b=12 TO 20-a: PRI
NT AT 21-a,b: "AT 21-a,21-b: "
AT b,a: "AT b,21-a: "NEXT
b: NEXT a
145 LET h=7: PRINT AT 2,23: "LEVEL
: "le
1050 RETURN
1100 PRINT AT y,x: FLASH 1: BRIG
HT 1: INK 2: PAPER 0: "IF USR
13097 THEN LET l(1)=y:
1105 DATA .6,0,1,0,5,6,0,5,
3,1,1,3,3,2,3,0,3,0,5,1,1,0
1110 IF l(1) THEN GO TO 210
1120 BORDER 2: PRINT INK 2: AT y,
x: "RESTORE 105: FOR a=1 TO
1130: READ b,c: BEEP b,c: NEXT a
1125 IF s>hi THEN LET hi=s: PRIN
T #1: FLASH 1: INK 7: PAPER 0: AT
1,21: hi
1130 BORDER 0: PRINT AT 17,23: "
LEVEL: "PRESS ANY KEY TO CONTIN
UE" AT 19,23: "ANOTHER: "AT
20,23: "GAME

```

## 210





```

2350 RSH
2360 FOR ##CALCULATE NO. OF SPOTS IN EACH PLAYER'S HAND##
2370 R=0: IFPT=0 THEN GOTO2390
2380 FOR I=1 TO P1: R=R+PCK(1,0)+PCK(1,1): NEXT I
2390 IFPT=0 THEN RETURN
2400 FOR I=1 TO P2: R=R+PCK(1,0)+PCK(1,1): NEXT I: RETURN
2410 PRINT "THE GAME OF DOMINOS IS PLAYED WITH A DECK OF 28 DOUBLE-ENDED"
2420 PRINT "TILES WITH PIPS OR SPOTS AT EACH END FROM 0 TO 6. PLAYERS ARE"
2430 PRINT "DEALT 6 OR 7 TILES EACH, DEPENDING ON WHICH GAME IS BEING"
2440 PRINT "PLAYED. THE REMAINDER GOING INTO A POOL CALLED THE 'YARD.'"
2450 PRINT "TILES ARE PLAYED TO EITHER END OF A CHAIN UNTIL ONE PLAYER HAS"
2460 PRINT "USED ALL HIS TILES OR NEITHER PLAYER CAN GO."
2470 GOSUB2710
2480 ONGOTO2490,2530,2600
2490 PRINT "IN BLOCK GAME PLAYERS ARE DEALT 7 TILES EACH AND THE GAME IS PLAYED."
2500 PRINT "TO 100 POINTS." : PRINT "THE PLAYER WITH THE HIGHEST DOUBLE STARTS"
2510 PRINT "AND PLAYS THAT TILE. THERE IS NO DRAW FROM THE YARD."
2520 GOTO2670
2530 PRINT "IN DRAW GAME PLAYERS ARE DEALT 7 TILES EACH AND THE GAME IS PLAYED."
2540 PRINT "TO 100 POINTS." : PRINT "PLAYERS DRAW TILES FROM THE DECK TO:"
2550 PRINT "DECIDE WHO STARTS. THE PLAYER WITH THE HIGHEST NUMBER OF"
2560 PRINT "SPOTS STARTING AND PLAYING ANY TILE."
2570 PRINT "IF UNABLE TO PLAY, THE PLAYER MUST DRAW FROM THE YARD UNTIL ABLE."
2580 PRINT "THE LAST 2 TILES IN THE YARD CAN'T BE DRAWN."
2590 GOTO2670
2600 PRINT "IN BERGEN PLAYERS ARE DEALT 6 TILES EACH. AND THE GAME IS PLAYED."
2610 PRINT "TO 15 POINTS." : PRINT "THE PLAYER WITH THE LOWEST DOUBLE STARTS"
2620 PRINT "AND PLAYS THAT TILE. IF UNABLE TO PLAY THE PLAYER MUST DRAW FROM"
2630 PRINT "THE YARD. IF STILL UNABLE TO PLAY THEN PLAY PASSES TO HIS OPP"
2640 PRINT "POINTS ARE SCORED BY WATCHING ENDS OF THE CHAIN. AN EXTRA POINT"
2650 PRINT "BEING SCORED IF ONE END IS A DOUBLE."
2660 GOSUB2710 GOTO1030
2670 GOSUB2710 PRINT "POINTS ARE SCORED AT END OF HAND BY THE PLAYER WITH THE"
2680 PRINT "TOTAL SPOTS ON HIS REMAINING TILES."
2690 PRINT "FROM HIS OPPONENTS. THE REMAINDER BEING"
2700 PRINT "THE SCORE FOR THAT HAND." GOSUB2710 GOTO1030
2710 PRINT "ANY KEY TO CONTINUE"
2720 GET# IF#="" THEN GOTO280
2730 PRINT "RETURN"

```

```

5230 S(C,2)=A
5280 GOSUB CLD:GOSUB CLX
5290 RETURN
5300 REM
5310 IF A=0 THEN S(0,3)=NOT S(0,3)
5320 IF A=1 THEN S(1,3)=NOT S(1,3)
5330 IF A=2 THEN S(2,3)=NOT S(2,3)
5340 IF A=3 THEN S(3,3)=NOT S(3,3)
5350 POSITION 21,12: ? S(C,3)
5380 GOSUB CLD
5390 RETURN
5400 POKE 53761,0:POKE 53763,0:POKE 53765,0:
POKE 53767,0
5480 GOSUB CLD
5900 REM
5910 POSITION 5,15: ? SP*(1,20)
5990 RETURN
6000 REM
6010 POSITION 5,14: ? SP*(1,21):A=0
6090 RETURN
6100 REM
6110 IF A<0 OR A>15 THEN FAIL=1:GOTO 6180
6120 POSITION 21,13: ? "
6122 POSITION 21,13: ? A
6130 S(C,4)=A
6180 GOSUB CLD:GOSUB CLX
6190 RETURN
6200 REM
6208 SUM=0
6210 IF S(4,0)=1 THEN SUM=SUM+1
6211 IF S(4,1)=1 THEN SUM=SUM+2
6212 IF S(4,2)=1 THEN SUM=SUM+4
6213 IF S(4,3)=1 THEN SUM=SUM+8
6214 IF S(4,4)=1 THEN SUM=SUM+16
6215 IF S(4,5)=1 THEN SUM=SUM+32
6216 IF S(4,6)=1 THEN SUM=SUM+64
6217 IF S(4,7)=1 THEN SUM=SUM+128
6220 POKE 53768,SUM

```

```

6290 RETURN
6300 REM CH
6310 GOSUB POKAUD
6320 IF A=0 THEN POKE 53761,S(0,1)+S(0,4):PO
KE 53760,S(0,2)
6322 IF A=1 THEN POKE 53763,S(1,1)+S(1,4):PO
KE 53762,S(1,2)
6324 IF A=2 THEN POKE 53765,S(2,1)+S(2,4):PO
KE 53764,S(2,2)
6326 IF A=3 THEN POKE 53767,S(3,1)+S(3,4):PO
KE 53766,S(3,2)
6390 GOSUB CLX:GOSUB CLD:GOSUB REGDIS
6390 RETURN
6400 REM START
6410 FOR I=1 TO 5:POSITION 30,1: ? "0":NEXT I
6490 RETURN
6500 REM REGDIS
6505 POSITION 21,12: ? " "
6506 POSITION 21,12: ? S(C,3)
6507 POSITION 21,11: ? " "
6508 POSITION 21,11: ? S(C,2)
6520 POSITION 21,10: ? " "
6521 POSITION 21,10
6522 IF S(C,1)=224 THEN ? "14"
6523 IF S(C,1)=192 THEN ? "12"
6524 IF S(C,1)=160 THEN ? "10"
6525 IF S(C,1)=128 THEN ? "8"
6526 IF S(C,1)=96 THEN ? "6"
6527 IF S(C,1)=64 THEN ? "4"
6528 IF S(C,1)=32 THEN ? "2"
6529 IF S(C,1)=0 THEN ? "0"
6530 POSITION 21,13: ? " "
6531 POSITION 21,13: ? S(C,4)
6590 RETURN
6600 REM BUZZ
6610 ? CHR$(125):REM CLEAR SCREEN
6690 RETURN
6700 REM PDIS

```

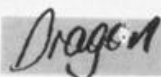
```

6705 GOSUB EDIS
6710 POSITION 2,22: ? "POKE 53768, ";SUM
6720 POSITION 20,18: ? "POKE 53761, ";S(0,1)+
S(0,4):POSITION 2,18: ? "POKE 53760, ";S(0,2)
6730 POSITION 20,19: ? "POKE 53763, ";S(1,1)+
S(1,4):POSITION 2,19: ? "POKE 53762, ";S(1,2)
6740 POSITION 20,20: ? "POKE 53765, ";S(2,1)+
S(2,4):POSITION 2,20: ? "POKE 53764, ";S(2,2)
6750 POSITION 20,21: ? "POKE 53767, ";S(3,1)+
S(3,4):POSITION 2,21: ? "POKE 53766, ";S(3,2)
6780 GOSUB CLD
6790 RETURN
6800 REM PDIS
6805 GOSUB EDIS
6810 POSITION 2,19: ? "SOUND 0, ";S(0,2);", "
";S(0,8);", ";S(0,4)
6820 POSITION 2,20: ? "SOUND 1, ";S(1,2);", "
";S(1,8);", ";S(1,4)
6830 POSITION 2,21: ? "SOUND 2, ";S(2,2);", "
";S(2,8);", ";S(2,4)
6840 POSITION 2,22: ? "SOUND 3, ";S(3,2);", "
";S(3,8);", ";S(3,4)
6880 GOSUB CLD
6890 RETURN
6900 POSITION 2,18: ? SP*
6910 POSITION 2,19: ? SP*
6920 POSITION 2,20: ? SP*
6930 POSITION 2,21: ? SP*
6940 POSITION 2,22: ? SP*
6950 RETURN
9000 POSITION 2,18: ? SP*
9010 POSITION 2,19: ? SP*
9020 POSITION 2,20: ? SP*
9030 POSITION 2,21: ? SP*
9040 POSITION 2,22: ? SP*
9050 RETURN
10000 END

```

## Speedy commands

Brian Allan,  
Scunthorpe,  
County Down.



HERE ARE two routines for the Dragon. One of them lets you enter 52 commands by pressing two keys. The second one lets you change the speed of printing. First, I will

show you how to use the single-key entry routine. Enter the listing. Save this then run it.

The routines are now activated. To use the single key entry option press the down arrow. The black cursor will change to a graphic character. To get a command press any letter — experiment for yourselves. 52 commands are available by using Shift. To enter the command

### EDIT

press E. Edit should appear on the screen.

You can put a line number after it. To enter a command like Point press P then the down arrow then J—Point will appear on the screen.

The print speed is held in locations 1022 and 1023. After the hex loader has finished enter

POKE 1022,20: LIST

You will see the program list slowly. The higher the value in 1022 and 1023 the slower the print speed. To switch off both routines enter

EXEC 32252

```

10 REM *****
20 REM ** ONE KEY ENTRY **
30 REM ** & PRINT SPEED **
40 REM ** M/C. ROUTINE. **
50 REM *****
60 REM **BY BRIAN ALLAN.**
70 REM *****
80 CLEAR 100,32224
90 CLS
100 PRINTAB(9);"KEYWORD & PRINT"
110 PRINTAB(9);"*****"
120 PRINT"please wait...LOADING THE HEX."
130 PRINT:PRINT"LOCATIONS."
140 PRINT:PRINT"EXEC 32225 - ROUTINES ON.":PRINT " 'E
XEC 32252' - ROUTINES OFF."
150 PRINT:PRINT "PEEK(1022)*256+PEEK(1023) IS THEPRINT
DELAY."
160 PRINT:PRINT "FOR KEYWORD - PRESS THE DOWN ARROW
THEN A (SHIFT-LETTER) OR (LETTER).52 COMMANDS AVAILA
BLE."
170 FOR AD=32225 TO 32767 STEP 10
180 CS=0
190 FOR Z=AD TO AD+9
200 READ H#:H=VAL("&H"+H#)
210 CS=CS+H
220 POKE Z,H
230 IF Z=32767 THEN 270
240 NEXT Z
250 READ CS#:SS=VAL("&H"+CS#)
260 IF SS<>CS THEN PRINT:PRINT "THERE IS AN ERROR IN L
INE":PEEK(49)*256+PEEK(50):END
270 NEXT AD
280 PRINT:PRINT:PRINT"ALL LOADED AND BOTH ROUTINES
ACTIVATED."
290 PRINT:PRINT
300 EXEC 32225

```

```

310 END
320 REM DATA FOR ROUTINES.
330 DATA B6,7E,B7,1,6A,B7,1,67,BE,7E,451
340 DATA 15,BF,1,6B,BE,7E,5,BF,1,68,379
350 DATA BE,0,0,BF,3,FE,39,86,39,B7,3FD
360 DATA 1,67,87,1,6A,39,BF,3,FC,BE,43F
370 DATA 3,FE,30,1,30,1F,26,FC,BE,3,364
380 DATA FC,39,81,A,26,E2,C1,E6,22,DE,56F
390 DATA BF,3,F2,10,BF,3,F4,FD,3,F6,570
400 DATA B6,C9,10,9E,8B,A7,A4,7F,1,19,499
410 DATA BD,B5,D,73,1,49,81,41,10,25,333
420 DATA 0,BA,81,7A,10,22,0,84,81,5B,317
430 DATA 25,6,81,60,22,2,20,7A,81,5B,2A6
440 DATA 25,2,80,6,60,40,8E,7E,D2,5F,3AA
450 DATA B7,3,FB,5C,F1,3,FB,27,8,A6,4CF
460 DATA 60,81,0,26,FA,20,F2,BF,3,F9,4EE
470 DATA 10,BE,3,F2,A6,80,81,0,27,7,398
480 DATA A7,A0,7C,3,F7,20,F3,10,BF,3,4A2
490 DATA F2,BE,3,F9,10,9E,8B,A6,80,81,5B9
500 DATA 0,27,36,81,40,22,2,8B,40,A7,2B4
510 DATA A0,10,8C,5,FF,22,2,20,EA,10,37E
520 DATA BF,3,FB,10,8E,4,0,E6,A8,20,40D
530 DATA E7,A0,10,8C,5,E0,25,F5,C6,60,548
540 DATA E7,A0,10,8C,6,0,25,F8,10,8E,414
550 DATA 3,FB,31,A8,E0,20,C4,10,9F,88,4D2
560 DATA BE,3,F2,10,BE,3,F4,FC,3,F6,56D
570 DATA 39,41,55,44,49,4F,0,44,49,4D,285
580 DATA 0,43,4C,45,41,52,0,52,45,41,23F
590 DATA 44,0,45,58,45,43,0,46,4F,52,250
600 DATA 0,47,4F,54,4F,0,50,52,49,4E,272
610 DATA 54,0,49,4E,50,55,54,0,4A,4F,27D
620 DATA 59,53,54,4B,28,0,43,49,52,43,294
630 DATA 4C,45,28,0,4C,49,53,54,0,53,248
640 DATA 4F,55,4E,44,0,54,48,45,4E,0,265

```

(continued on next page)

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```
650 DATA 4F,50,45,4E,0,50,4D,4F,44,45,2A7
660 DATA 0,44,52,41,57,0,52,45,54,55,26E
670 DATA 52,4E,0,53,43,52,45,45,4E,0,260
680 DATA 43,4C,4F,41,44,0,43,4C,53,0,245
690 DATA 53,45,54,28,0,53,54,45,50,0,250
700 DATA 4C,45,46,54,24,28,0,52,55,4E,26C
710 DATA 0,50,4F,4B,45,0,4D,4F,54,4F,26E
720 DATA 52,0,52,45,4D,0,43,4F,4C,4F,263
730 DATA 52,0,44,41,54,41,0,45,44,49,23E
740 DATA 54,0,4E,45,58,54,0,47,4F,53,27C
750 DATA 55,42,0,45,4C,53,45,0,49,4E,257
```

```
760 DATA 4B,45,59,24,0,50,4F,49,4E,54,297
770 DATA 28,0,50,41,49,4E,54,28,0,4C,21B
780 DATA 49,4E,45,0,41,4E,44,0,54,41,244
790 DATA 42,28,0,43,4C,4F,53,45,0,50,230
800 DATA 43,4F,50,59,0,43,48,52,24,28,264
810 DATA 0,52,45,53,54,4F,52,45,0,53,277
820 DATA 54,52,49,4E,47,24,28,0,43,53,266
830 DATA 41,56,45,0,53,4B,49,50,46,0,259
840 DATA 52,45,53,45,54,28,0,52,49,47,28D
850 DATA 48,54,24,28,0,4D,49,44,24,28,20E
860 DATA 0,52,45,4E,55,4D,0,50,45,45,261
870 DATA 4B,28,0,73
880 END
```

## Sideways dump

M K Mostowyj,  
Bretton Estate,  
Peterborough.

*Amstrad*

THIS PROGRAM will produce a hard copy of any screen in any mode as long as the graphics origin is set to its default (0,0). The final printout is two tone only and assumes that the

background colour is Paper 0.

The program is written in machine code. It is 202 bytes long and is located at &AAB3. Rather than having to use the Call statement to run the program, a new command is implemented via the resident system extension capability of the Amstrad.

To enter the program type in the basic listing and run it. If all is well you will be given the chance to save the code to tape.

To reload the code type:

```
MEMORY &AAB2:LOAD""&AAB3
and press Return. Once loaded
CALL &AAB3
```

to log on the new command. If you are using a Paper other than 0 you may inform the routine with

```
POKE &AAF8,n
where n = the Paper being used. Please take
note that it is Paper and not Ink.
```

### Listing 1.

```
10 MODE 1
20 MEMORY &AAB2
30 SUM=0:RESTORE 170
40 FOR N=&AAB3 TO &AB7C
50 READ X#
60 POKE N,VAL("&"+X#)
70 SUM=SUM+VAL("&"+X#)
80 NEXT
90 IF SUM<>&FA8 THEN SOUND 1,254,10:PRINT CLS:PRINT"
DATA WRONG PLEASE CHECK":END
100 CLS:PRINT"DATA LOADED CORRECTLY"
110 PRINT:PRINT"PLEASE INSERT TAPE FOR BYTES"
120 PRINT:PRINT"THEN PRESS ANY KEY"
130 IF INKEY#="" THEN 130
140 CLS:PRINT"SAVING DUMP,B:&AAB3,&CA"
150 SAVE "DUMP",B:&AAB3,&CA
160 END
170 DATA 01,c1,aa,21,bd,aa,cd,d1,bc,c9,00,00,00,00,c6,aa
180 DATA c3,d1,aa,44,55,4d,d0,00,00,00,00,00,00,cd,06
190 DATA b9,21,00,00,22,cb,aa,22,cd,aa,01,00,00,c5,3e,00
200 DATA 32,d0,aa,3c,32,cf,aa,06,07,c5,ed,5b,cb,aa,2a,cd
210 DATA aa,cd,df,bd,fe,00,28,0b,3a,cf,aa,47,3a,d0,aa,80
220 DATA 32,d0,aa,3a,cf,aa,a7,cb,17,32,cf,aa,2a,cb,aa,23
230 DATA 22,cb,aa,c1,10,d3,3e,1b,cd,73,ab,3e,4b,cd,73,ab
240 DATA 3e,00,cd,73,ab,3e,01,cd,73,ab,3a,d0,aa,cd,73,ab
250 DATA 2a,cb,aa,11,07,00,a7,ed,52,22,cb,aa,c1,03,79,fe
260 DATA 01,20,26,79,fe,91,20,21,3e,0a,cd,73,ab,2a,cb,aa
270 DATA 11,07,00,19,22,cb,aa,7c,fe,02,c2,dd,aa,7d,fe,84
280 DATA c2,dd,aa,3e,0f,cd,73,ab,c9,ed,43,cd,aa,c3,e0,aa
290 DATA c5,47,cd,2b,bd,78,30,fa,c1,c9
```

### Listing 2.

```
AAB3 01 C1 AA 21 BD AA CD D1
AAB4 BC C9 00 00 00 00 C5 AA
AAB5 C3 D1 AA 44 55 4D D0 00
AAB6 00 00 00 00 00 00 CD 06
AAB7 B9 21 00 00 22 CB AA 22
AAB8 CD AA 01 00 00 C5 3E 00
AAB9 32 D0 AA 3C 32 CF AA 06
AABE 07 C5 ED 5B CB AA 2A CD
AAF3 AA CD DF BD FE 00 28 0B
AAF8 3A CF AA 47 3A D0 AA 80
AB03 32 D0 AA 3A CF AA A7 CB
AB06 17 32 CF AA 2A CB AA 23
AB13 22 CB AA C1 10 D3 3E 18
AB1B CD 73 AB 3E 4B CD 73 AB
AB23 3E 00 CD 73 AB 3E 01 CD
AB2B 73 AB 3A D0 AA CD 73 AB
AB33 2A CB AA 11 07 00 A7 ED
AB3B 52 22 CB AA C1 03 78 FE
AB43 01 20 26 79 FE 91 20 21
AB4B 3E 0A CD 73 AB 2A CB AA
AB53 11 07 00 19 22 CB AA 7C
AB5B FE 02 C2 DD AA 7D FE 84
AB63 C2 DD AA 3E 0F CD 73 AB
AB6B C9 ED 43 CD AA C3 E0 AA
AB73 C5 47 CD 2B BD 78 30 FA
AB7E C1 C9
```

## Wild West

Ansazr Zeffass,  
Lehrberg,  
West Germany.

*Spectrum*

THIS GAME uses the excellent Sprite routine by Robert Newman — *Your Computer* January, 1984, page 106 — to create smooth animated graphics in different colours. The programs will work on the 48K machine only. However, it may be changed for a 16K Spectrum by changing the Clear statement in line 10 to

CLEAR 31199

and by changing all Peek and Poke addresses except line 10. The new values for Peek, Poke and Rand USR statements can be calculated from the information in Newman's article.

### The main program.

```
3 REM LINE 20 LOADS MACHINE
CODE SPRITE ROUTINE BY
R. NEWMAN - YOUR COMPUTER
1004 PAGE 106
10 POKE 23655,0: BORDER=0: PAR
ER 0: INK 0: INVER=0: OVER 0
BRIGHT 0: FLASH 10: CLEAR 0:
15 PRINT AT 10,1: PAPER 0: INK
0: WILD WE 0:
N: STOP THE TAPE YET!
40
20 FOR F=1 TO 25: BEEP .005,F
NEXT F: LOAD ""CODE
25 LET CU=0: LET PU=CU: GO TO
800
35 LET HI=0: LET CHI=HI: LET H
I=HI: LET CHI=CHI
40 GO SUB 500
50 RAND USR 55148
50 LET IS=INKEY$: IF PEEK 6520
70 THEN IS=" " OR IS="(" OR
N: POKE 65203,1: 2 AND IS="(" OR
CHK 65207:
1 IF NOT WAG THEN IF AND),96
THEN LET WAG=1: POKE 65260,120:
```

```
POKE 65265,1: 16: POKE 65267,255: P
OKE 65268,0: POKE 65269,0: POKE 65270,0: POKE 65271,0: POKE 65272,0: POKE 65273,0: POKE 65274,0: POKE 65275,0: POKE 65276,0: POKE 65277,0: POKE 65278,0: POKE 65279,0: POKE 65280,0: POKE 65281,0: POKE 65282,0: POKE 65283,0: POKE 65284,0: POKE 65285,0: POKE 65286,0: POKE 65287,0: POKE 65288,0: POKE 65289,0: POKE 65290,0: POKE 65291,0: POKE 65292,0: POKE 65293,0: POKE 65294,0: POKE 65295,0: POKE 65296,0: POKE 65297,0: POKE 65298,0: POKE 65299,0: POKE 65300,0: POKE 65301,0: POKE 65302,0: POKE 65303,0: POKE 65304,0: POKE 65305,0: POKE 65306,0: POKE 65307,0: POKE 65308,0: POKE 65309,0: POKE 65310,0: POKE 65311,0: POKE 65312,0: POKE 65313,0: POKE 65314,0: POKE 65315,0: POKE 65316,0: POKE 65317,0: POKE 65318,0: POKE 65319,0: POKE 65320,0: POKE 65321,0: POKE 65322,0: POKE 65323,0: POKE 65324,0: POKE 65325,0: POKE 65326,0: POKE 65327,0: POKE 65328,0: POKE 65329,0: POKE 65330,0: POKE 65331,0: POKE 65332,0: POKE 65333,0: POKE 65334,0: POKE 65335,0: POKE 65336,0: POKE 65337,0: POKE 65338,0: POKE 65339,0: POKE 65340,0: POKE 65341,0: POKE 65342,0: POKE 65343,0: POKE 65344,0: POKE 65345,0: POKE 65346,0: POKE 65347,0: POKE 65348,0: POKE 65349,0: POKE 65350,0: POKE 65351,0: POKE 65352,0: POKE 65353,0: POKE 65354,0: POKE 65355,0: POKE 65356,0: POKE 65357,0: POKE 65358,0: POKE 65359,0: POKE 65360,0: POKE 65361,0: POKE 65362,0: POKE 65363,0: POKE 65364,0: POKE 65365,0: POKE 65366,0: POKE 65367,0: POKE 65368,0: POKE 65369,0: POKE 65370,0: POKE 65371,0: POKE 65372,0: POKE 65373,0: POKE 65374,0: POKE 65375,0: POKE 65376,0: POKE 65377,0: POKE 65378,0: POKE 65379,0: POKE 65380,0: POKE 65381,0: POKE 65382,0: POKE 65383,0: POKE 65384,0: POKE 65385,0: POKE 65386,0: POKE 65387,0: POKE 65388,0: POKE 65389,0: POKE 65390,0: POKE 65391,0: POKE 65392,0: POKE 65393,0: POKE 65394,0: POKE 65395,0: POKE 65396,0: POKE 65397,0: POKE 65398,0: POKE 65399,0: POKE 65400,0: POKE 65401,0: POKE 65402,0: POKE 65403,0: POKE 65404,0: POKE 65405,0: POKE 65406,0: POKE 65407,0: POKE 65408,0: POKE 65409,0: POKE 65410,0: POKE 65411,0: POKE 65412,0: POKE 65413,0: POKE 65414,0: POKE 65415,0: POKE 65416,0: POKE 65417,0: POKE 65418,0: POKE 65419,0: POKE 65420,0: POKE 65421,0: POKE 65422,0: POKE 65423,0: POKE 65424,0: POKE 65425,0: POKE 65426,0: POKE 65427,0: POKE 65428,0: POKE 65429,0: POKE 65430,0: POKE 65431,0: POKE 65432,0: POKE 65433,0: POKE 65434,0: POKE 65435,0: POKE 65436,0: POKE 65437,0: POKE 65438,0: POKE 65439,0: POKE 65440,0: POKE 65441,0: POKE 65442,0: POKE 65443,0: POKE 65444,0: POKE 65445,0: POKE 65446,0: POKE 65447,0: POKE 65448,0: POKE 65449,0: POKE 65450,0: POKE 65451,0: POKE 65452,0: POKE 65453,0: POKE 65454,0: POKE 65455,0: POKE 65456,0: POKE 65457,0: POKE 65458,0: POKE 65459,0: POKE 65460,0: POKE 65461,0: POKE 65462,0: POKE 65463,0: POKE 65464,0: POKE 65465,0: POKE 65466,0: POKE 65467,0: POKE 65468,0: POKE 65469,0: POKE 65470,0: POKE 65471,0: POKE 65472,0: POKE 65473,0: POKE 65474,0: POKE 65475,0: POKE 65476,0: POKE 65477,0: POKE 65478,0: POKE 65479,0: POKE 65480,0: POKE 65481,0: POKE 65482,0: POKE 65483,0: POKE 65484,0: POKE 65485,0: POKE 65486,0: POKE 65487,0: POKE 65488,0: POKE 65489,0: POKE 65490,0: POKE 65491,0: POKE 65492,0: POKE 65493,0: POKE 65494,0: POKE 65495,0: POKE 65496,0: POKE 65497,0: POKE 65498,0: POKE 65499,0: POKE 65500,0: POKE 65501,0: POKE 65502,0: POKE 65503,0: POKE 65504,0: POKE 65505,0: POKE 65506,0: POKE 65507,0: POKE 65508,0: POKE 65509,0: POKE 65510,0: POKE 65511,0: POKE 65512,0: POKE 65513,0: POKE 65514,0: POKE 65515,0: POKE 65516,0: POKE 65517,0: POKE 65518,0: POKE 65519,0: POKE 65520,0: POKE 65521,0: POKE 65522,0: POKE 65523,0: POKE 65524,0: POKE 65525,0: POKE 65526,0: POKE 65527,0: POKE 65528,0: POKE 65529,0: POKE 65530,0: POKE 65531,0: POKE 65532,0: POKE 65533,0: POKE 65534,0: POKE 65535,0: POKE 65536,0: POKE 65537,0: POKE 65538,0: POKE 65539,0: POKE 65540,0: POKE 65541,0: POKE 65542,0: POKE 65543,0: POKE 65544,0: POKE 65545,0: POKE 65546,0: POKE 65547,0: POKE 65548,0: POKE 65549,0: POKE 65550,0: POKE 65551,0: POKE 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65694,0: POKE 65695,0: POKE 65696,0: POKE 65697,0: POKE 65698,0: POKE 65699,0: POKE 65700,0: POKE 65701,0: POKE 65702,0: POKE 65703,0: POKE 65704,0: POKE 65705,0: POKE 65706,0: POKE 65707,0: POKE 65708,0: POKE 65709,0: POKE 65710,0: POKE 65711,0: POKE 65712,0: POKE 65713,0: POKE 65714,0: POKE 65715,0: POKE 65716,0: POKE 65717,0: POKE 65718,0: POKE 65719,0: POKE 65720,0: POKE 65721,0: POKE 65722,0: POKE 65723,0: POKE 65724,0: POKE 65725,0: POKE 65726,0: POKE 65727,0: POKE 65728,0: POKE 65729,0: POKE 65730,0: POKE 65731,0: POKE 65732,0: POKE 65733,0: POKE 65734,0: POKE 65735,0: POKE 65736,0: POKE 65737,0: POKE 65738,0: POKE 65739,0: POKE 65740,0: POKE 65741,0: POKE 65742,0: POKE 65743,0: POKE 65744,0: POKE 65745,0: POKE 65746,0: POKE 65747,0: POKE 65748,0: POKE 65749,0: POKE 65750,0: POKE 65751,0: POKE 65752,0: POKE 65753,0: POKE 65754,0: POKE 65755,0: POKE 65756,0: POKE 65757,0: POKE 65758,0: POKE 65759,0: POKE 65760,0: POKE 65761,0: POKE 65762,0: POKE 65763,0: POKE 65764,0: POKE 65765,0: POKE 65766,0: POKE 65767,0: POKE 65768,0: POKE 65769,0: POKE 65770,0: POKE 65771,0: POKE 65772,0: POKE 65773,0: POKE 65774,0: POKE 65775,0: POKE 65776,0: POKE 65777,0: POKE 65778,0: POKE 65779,0: POKE 65780,0: POKE 65781,0: POKE 65782,0: POKE 65783,0: POKE 65784,0: POKE 65785,0: POKE 65786,0: POKE 65787,0: POKE 65788,0: POKE 65789,0: POKE 65790,0: POKE 65791,0: POKE 65792,0: POKE 65793,0: POKE 65794,0: POKE 65795,0: POKE 65796,0: POKE 65797,0: POKE 65798,0: POKE 65799,0: POKE 65800,0: POKE 65801,0: POKE 65802,0: POKE 65803,0: POKE 65804,0: POKE 65805,0: POKE 65806,0: POKE 65807,0: POKE 65808,0: POKE 65809,0: POKE 65810,0: POKE 65811,0: POKE 65812,0: POKE 65813,0: POKE 65814,0: POKE 65815,0: POKE 65816,0: POKE 65817,0: POKE 65818,0: POKE 65819,0: POKE 65820,0: POKE 65821,0: POKE 65822,0: POKE 65823,0: POKE 65824,0: POKE 65825,0: POKE 65826,0: POKE 65827,0: POKE 65828,0: POKE 65829,0: POKE 65830,0: POKE 65831,0: POKE 65832,0: POKE 65833,0: POKE 65834,0: POKE 65835,0: POKE 65836,0: POKE 65837,0: POKE 65838,0: POKE 65839,0: POKE 65840,0: POKE 65841,0: POKE 65842,0: POKE 65843,0: POKE 65844,0: POKE 65845,0: POKE 65846,0: POKE 65847,0: POKE 65848,0: POKE 65849,0: POKE 65850,0: POKE 65851,0: POKE 65852,0: POKE 65853,0: POKE 65854,0: POKE 65855,0: POKE 65856,0: POKE 65857,0: POKE 65858,0: POKE 65859,0: POKE 65860,0: POKE 65861,0: POKE 65862,0: POKE 65863,0: POKE 65864,0: POKE 65865,0: POKE 65866,0: POKE 65867,0: POKE 65868,0: POKE 65869,0: POKE 65870,0: POKE 65871,0: POKE 65872,0: POKE 65873,0: POKE 65874,0: POKE 65875,0: POKE 65876,0: POKE 65877,0: POKE 65878,0: POKE 65879,0: POKE 65880,0: POKE 65881,0: POKE 65882,0: POKE 65883,0: POKE 65884,0: POKE 65885,0: POKE 65886,0: POKE 65887,0: POKE 65888,0: POKE 65889,0: POKE 65890,0: POKE 65891,0: POKE 65892,0: POKE 65893,0: POKE 65894,0: POKE 65895,0: POKE 65896,0: POKE 65897,0: POKE 65898,0: POKE 65899,0: POKE 65900,0: POKE 65901,0: POKE 65902,0: POKE 65903,0: POKE 65904,0: POKE 65905,0: POKE 65906,0: POKE 65907,0: POKE 65908,0: POKE 65909,0: POKE 65910,0: POKE 65911,0: POKE 65912,0: POKE 65913,0: POKE 65914,0: POKE 65915,0: POKE 65916,0: POKE 65917,0: POKE 65918,0: POKE 65919,0: POKE 65920,0: POKE 65921,0: POKE 65922,0: POKE 65923,0: POKE 65924,0: POKE 65925,0: POKE 65926,0: POKE 65927,0: POKE 65928,0: POKE 65929,0: POKE 65930,0: POKE 65931,0: POKE 65932,0: POKE 65933,0: POKE 65934,0: POKE 65935,0: POKE 65936,0: POKE 65937,0: POKE 65938,0: POKE 65939,0: POKE 65940,0: POKE 65941,0: POKE 65942,0: POKE 65943,0: POKE 65944,0: POKE 65945,0: POKE 65946,0: POKE 65947,0: POKE 65948,0: POKE 65949,0: POKE 65950,0: POKE 65951,0: POKE 65952,0: POKE 65953,0: POKE 65954,0: POKE 65955,0: POKE 65956,0: POKE 65957,0: POKE 65958,0: POKE 65959,0: POKE 65960,0: POKE 65961,0: POKE 65962,0: POKE 65963,0: POKE 65964,0: POKE 65965,0: POKE 65966,0: POKE 65967,0: POKE 65968,0: POKE 65969,0: POKE 65970,0: POKE 65971,0: POKE 65972,0: POKE 65973,0: POKE 65974,0: POKE 65975,0: POKE 65976,0: POKE 65977,0: POKE 65978,0: POKE 65979,0: POKE 65980,0: POKE 65981,0: POKE 65982,0: POKE 65983,0: POKE 65984,0: POKE 65985,0: POKE 65986,0: POKE 65987,0: POKE 65988,0: POKE 65989,0: POKE 65990,0: POKE 65991,0: POKE 65992,0: POKE 65993,0: POKE 65994,0: POKE 65995,0: POKE 65996,0: POKE 65997,0: POKE 65998,0: POKE 65999,0: POKE 66000,0: POKE 66001,0: POKE 66002,0: POKE 66003,0: POKE 66004,0: POKE 66005,0: POKE 66006,0: POKE 66007,0: POKE 66008,0: POKE 66009,0: POKE 66010,0: POKE 66011,0: POKE 66012,0: POKE 66013,0: POKE 66014,0: POKE 66015,0: POKE 66016,0: POKE 66017,0: POKE 66018,0: POKE 66019,0: POKE 66020,0: POKE 66021,0: POKE 66022,0: POKE 66023,0: POKE 66024,0: POKE 66025,0: POKE 66026,0: POKE 66027,0: POKE 66028,0: POKE 66029,0: POKE 66030,0: POKE 66031,0: POKE 66032,0: POKE 66033,0: POKE 66034,0: POKE 6
```

# SOFTWARE *File*

The game *Wild West* allows one player to take part in a deadly gunfight. Full instructions are included in the program. It is you against Slim Joey, who is controlled by the computer. Joey will be able to move faster than you — especially on the higher levels — so he's a really tough opponent. Some extra features are cacti spread all over the scenario — a desert — and a covered wagon which will appear at random and will explode if hit by a bullet.

Type in the program carefully and save it on tape with

SAVE "wild west" LINE 1

Load the 48K Sprite routine and save it immediately behind the main program with

SAVE "spmov48k" CODE 64551,611

Verify the recordings and try to run the program. Check all Peek/Poke/Rand USR

statements and the sprite data hold in lines 520-560 and 1050-1070 — graphics — if the game does not work properly.

A lot of work may be saved by editing similar lines and changing the small differences — e.g. 70-72 and 75-77.

### Program structure.

1-25	Set-up
50-86	Main loop
70-72	Subroutine: Player's bullet hit
75-77	Subroutine: Joey's bullet hit
100-110	Subroutine: Player/Joey hit
150	Subroutine: Print score table
160-270	End of game
500-600	Subroutine: Set up screen and Poke initial values for sprites
800-900	Instructions and selection of skill level
1000-1070	Subroutines: Set up user- defined graphics (1000-1030) and sprite graphics (1040-1070)

*The machine code.*

```

30 against slim Joey, whose n
ame is "Slim" feared throughout
the west."
335 PRINT "" He moves faster, h
is bullet is faster - so good l
uck, boy!"
340 PRINT "" You will only surv
ive 2 hits. And you cannot mov
e once Joey has been hit, his
bullet may hit you in the me
n time."
350 GO SUB 1000: PRINT #0: PAPE
R 5: INK 0: " PRESS ANY K
EY: " BEEP 1,-10: PAUSE
0: CLS
360 PRINT "" The cacti and cove
red wagons will gain you no b
onus points. It is just him or
you."
370 PRINT "" Move by pressing
keys P or L (up/down) and pul
l the trigger by pressing key Q
"
380 PRINT AT 19,0: " Press key 1
to select game level (1-5):
6:hard) " BEEP 1, 10
390 LET IS=INKEY$: IF IS="1" OR
IS="5" THEN GO TO 800
400 LET LEV=VAL IS: BRIGHT 0: G
O TO 30
1000 RESTORE 1000: FOR F=USR "A"
TO USR "F"+7: READ G: POKE F,G:
NEXT F
1010 DATA 16,144,146,146,242,18,
30,16,16,16,18,146,146,158,240,1
8
1020 DATA 20,17,8,5,37,21,108,44,
0,0,4,72,80,38,168,116
1030 DATA 136,88,113,94,7,7,7
138,164,168,117,83,232,128,192
1040 FOR F=64000 TO 64064: READ
G: POKE F,G: NEXT F
1050 DATA 7,0,15,128,5,0,9,0,5,0
0,199,224,83,150,15,160,15,64
0,15,0,128,7,128,5,0,5,0,11,0,0,0,2
6,0,162,0,0,0,0,16,0,20,0,0,2,2,2
98,0,191,0,0,0,190,0,94,62,0,0,60,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1060 FOR F=64085 TO 64127: READ
G: POKE F,G: NEXT F
1070 DATA 15,0,16,128,95,95,192,
40,192,43,192,48,192,48,192,48,1
92,48,192,64,128,63,192,15,0,1
92,144,128,65,240,128,16
9900 CLS: PRINT AT 16,8: "@ A.ZE
R PRESS 1984"

```

*The hex loader.*

```

10 DEF FN h(h$)=16*(CODE h$(1)
-45-(7 AND h$(1)>"9")+CODE h$(2)
)-45-(7 AND h$(2)>"9")
20 INPUT "Start":s,f
30 INPUT "Finish":s,f
40 FOR n=s TO f STEP 8
50 LET tot=0: PRINT n:; " ";
60 INPUT h$: PRINT h$;
70 LET x=0
80 FOR b=1 TO LEN h$ STEP 2
90 LET z=FN h(h$): LET tot=tot
+
100 POKE n+X,z
110 LET h$=h$(3 TO ): LET x=x+1
120 NEXT b
130 PRINT " = ";: INPUT t: PRIN
T
140 IF tot<t THEN PRINT "input
error - try again": GO TO 50
150 NEXT n
160 REM enter STOP to stop

```

[illegible]

## Graphics 7 Paintbox

Christopher Jones,  
Herne Bay,  
Kent.



THIS PROGRAM allows the user to draw a picture on a Graphics screen. These pictures may be stored on cassette for retrieval at a later time, so that finished pictures may be viewed again and again or unfinished pictures completed. A number of paint programs are now on the Atari market, but my program allows the user to sample the possibilities of this type of program without parting with any cash!

One of the main considerations while writing this program was to keep it as user-friendly as possible. There are on-screen prompts at all times, and all options are performed in a similar way. In addition to the joystick only the number keys are used to carry out instructions. Although the Atari computer has a vast range of colours to display, I have deliberately kept the choice down to a simple minimum.

The colours are also named — rather than using a combination of hue and luminance — which means that children of reading age should be able to use the program. If anyone is not satisfied with my choice of colours they are easily changed: lines 3000-5000 contain the relevant routines.

When you have typed in the program save it on a cassette and then run it. The screen will

show a menu of options:

**SCREEN** — First select the screen colour of your choice.

**PALETTE** — Next select three colours with which you wish to draw your picture.

**COLOUR** — This command allows you to choose a working colour from your palette. This colour will then be used when you select draw, circle, etc.

**DRAW** — A cursor will appear in the centre of the screen in the colour you have chosen. Move the cursor by pushing the joystick in the required direction. If you wish to draw then keep the joystick button depressed and move the joystick in the required direction. To plot a point — useful for stars — simply fire the button once and move on.

**DRAWTO** — A cursor will appear in the centre of the screen. Move the cursor to one end of the line you wish to draw and hit any key. Then move the cursor to the other end and hit any key. A line will be drawn between the two points.

**ERASE** — When the cursor appears move it to the area you wish to erase. Hold the joystick button down and move over the points and lines you wish to erase.

**CIRCLE** — Move the cursor to the point where you wish the circle's centre to be and hit any key. Then move the cursor left or right to establish the radius of the circle and hit any key.

**FILL** — Move the cursor to the area you wish to fill and hit any key. The area must be enclosed and must be filled with the same colour with which it was drawn. Awkward shapes may need more than one fill.

**SAVE** — Put a blank tape in the cassette unit. When you hear two beeps press play and record, then hit return.

**LOAD** — Put the tape on which you saved the picture in the cassette unit. When you hear a beep press play, then hit return.

Choose your screen colour carefully. It need not be merely a background, but an integral part of the picture e.g. a grey screen colour could be used for the surface of the moon.

If you wish to erase part of a filled in area select a working colour which will show up against that area and then select erase. When the picture is finished try putting a frame around it by using draw or drawto.

Screen colours and palette colours can be changed at any time, often with interesting results. Experimentation is the best approach in this respect, so don't be shy!

If the program should stop for any reason — such as a misuse of Fill — then type Goto 1000 and you will be able to continue work on that picture.

The circle routine in my program is based on the one in Ian Sinclair's *Boots Guide to the Atari 600XL*. I have adapted it to plot a continuous line as the circumference of the circle, because any gaps would interfere with the smooth running of the fill routine. In my version it is also possible to have semicircles and arcs at the edges of the screen.

The display list interrupt routine which protects the colours in the text window is based on the one in Peter Budgell's article on Graphics 10/7 in *Analog 14*. I have altered it to fit in with the colour requirement of my program.

```

1 REM GRAPHICS 7 PAINTBOX
2 REM CHRISTOPHER P. JONES
3 REM APRIL 1984
9 REM INITIALISE
10 OPEN #1,4,0,"K:"
20 GRAPHICS 7
25 DIM A$(10),C1$(10),C2$(10),C3$(10),R(
3,2)
35 R(1,1)=0:R(1,2)=0:R(2,1)=0:R(2,2)=0:R
(3,1)=9:R(3,2)=14
36 GOSUB 11000
37 POKE 752,1
38 SETCOLOR 4,8,8:POKE 54286,192
40 GOTO 1000
199 REM MAIN LOOP
200 X=80:Y=40
205 X1=X:Y1=Y:COLOR C:PLOT X,Y
250 GOSUB 800
255 IF PEEK(764)<255 THEN 2500
265 IF S=15 AND FLAG=0 THEN 350
270 IF FLAG=0 THEN 350
280 COLOR B
290 PLOT X1,Y1
295 LOCATE X,Y,B
305 GOTO 205
350 IF ERASE=1 THEN COLOR 0:PLOT X1,Y1
360 GOTO 295
399 REM FILL
400 Y2=Y:X2=X:COLOR C
405 Y2=Y2-1:LOCATE X2,Y2,C1
410 IF C1<>C THEN 405
415 Y3=Y
420 Y3=Y3+1:LOCATE X2,Y3,C1
425 IF C1<>C THEN 420
450 K=Y3-Y2
460 FOR L=1 TO K:X2=X
465 LOCATE X2,Y2+L,C1
470 IF C1=C THEN 500
480 PLOT X2,Y2+L
485 X2=X2-1
490 GOTO 465
500 X2=X+1
505 LOCATE X2,Y2+L,C1
510 IF C1=C THEN 530
515 PLOT X2,Y2+L:X2=X2+1
520 GOTO 505
530 NEXT L
535 POKE 764,255
550 GOTO 1000
599 REM CIRCLE
600 IF Q=1 THEN 610
601 Q=1:D=B:COLOR C:PLOT X,Y:X2=X:Y2=Y:P
OKE 764,255:GOTO 295
610 Q=0
620 R=X-X2:COLOR C
640 FOR N=0 TO 360
645 Z=X2+R*SIN(N)
646 IF Z<0 OR Z>159 THEN 660
647 O=Y2+R*COS(N)
648 IF O<0 OR O>79 THEN 660
650 PLOT Z,O
660 NEXT N
665 COLOR D:PLOT X2,Y2
680 GOTO 1000
800 REM JOYSTICK INPUT
810 S=STICK(0)
815 T=STRIG(0):FLAG=SGN(T)
825 IF S=10 OR S=11 OR S=9 THEN X=X-1
830 IF S=6 OR S=7 OR S=5 THEN X=X+1
835 IF S=10 OR S=14 OR S=6 THEN Y=Y-1
840 IF S=13 OR S=5 OR S=9 THEN Y=Y+1
845 IF X<0 THEN X=0
850 IF Y<0 THEN Y=0
855 IF X>159 THEN X=159
860 IF Y>79 THEN Y=79
895 RETURN
899 REM DRAWTO
900 IF Q=1 THEN 910
901 COLOR C:PLOT X,Y
905 Q=1
906 X2=X:Y2=Y
907 POKE 764,255:GOTO 295
910 X3=X:Y3=Y
911 COLOR C
915 PLOT X3,Y3:DRAWTO X2,Y2
920 POKE 764,255:Q=0:GOTO 1000
999 REM MAIN MENU
1000 ? "}"
1001 FOR K=1 TO 3:SETCOLOR K-1,R(K,1),R(
K,2):NEXT K
1005 POKE 764,255
1010 ? "DRAW(1),DRAWTO(2),ERASE(3),CIRCL
E(4), FILL(5),SCREEN(6),COLOUR(7),PALETT
E(8)SAVE(9),LOAD(0)?"
1015 ERASE=0:LOCATE 80,40,B
1018 FILL=0:DRAW=0
1019 DRTO=0:CIRCLE=0
1020 GET #1,A
1025 IF A<48 THEN 1020
1030 IF A>57 THEN 1020
1040 IF A=49 THEN DRAW=1:GOTO 2000
1050 IF A=53 THEN FILL=1:GOTO 2200
1055 IF A=51 THEN ERASE=1:GOTO 2100
1060 IF A=52 THEN CIRCLE=1:GOTO 2150
1065 IF A=50 THEN DRTO=1:GOTO 2050
1070 IF A=54 THEN 3000
1075 IF A=55 THEN 3500
1080 IF A=56 THEN 4000
1085 IF A=57 THEN 10000
1090 IF A=48 THEN 10500
2000 ? "}"
2005 ? "PRESS BUTTON TO PLOT,HOLD BUTTON
TO DRAW,HIT ANY KEY TO RETURN"
2010 GOTO 200
2050 ? "}"
2055 ? "HIT ANY KEY TO ESTABLISH POINTS"
2060 GOTO 200
2100 ? "}"
2105 ? "HOLD BUTTON TO ERASE,HIT ANY KEY
TO RETURN"
2110 GOTO 200
2150 ? "}"
2155 ? "HIT ANY KEY TO ESTABLISH CENTRE
AND RADIUS(LEFT-RIGHT)"
2160 GOTO 200
2200 ? "}"
2205 ? "HIT ANY KEY TO FILL AN ENCLOSED
SPACE"
2210 GOTO 200
2500 IF ERASE=1 THEN COLOR B:PLOT X,Y:GO
TO 1000
2505 IF DRAW=1 THEN COLOR B:PLOT X,Y:GO

```

```

0 1000
2510 IF FILL=1 THEN COLOR 0:PLOT X,Y:GOT
0 400
2515 IF DRTO=1 THEN 900
2520 IF CIRCLE=1 THEN 600
2999 REM SCREEN COLOURS
3000 ? "):"
3005 ? "GREY(0),BLUE(1),ORANGE(2),GREEN(
3), PINK(4),PURPLE(5)?";
3010 GET #1,SET
3011 IF SET<48 THEN 3010
3012 IF SET>53 THEN 3010
3015 IF SET=49 THEN SET=8
3020 IF SET=51 THEN SET=13
3030 SETCOLOR 4,SET,8
3035 GOTO 1000
3499 REM PLOT COLOUR
3500 ? "):"
3505 ? C1%:"(1),";C2%:"(2),";C3%:"(3)?"
3525 GET #1,A:C=A-48
3530 IF C<1 OR C>3 THEN 3525
3535 GOTO 1000
3999 REM PALETTE COLOURS
4000 ? "):"
4005 ? "WHITE(0),BLACK(1),BLUE(2),GREEN(
3), YELLOW(4),RED(5),ORANGE(6),BROWN(7
) PICK 3";
4015 FOR K=1 TO 3
4020 GET #1,A:A=A-48
4025 IF A<0 OR A>7 THEN 4020
4030 IF A=0 THEN A$="WHITE":R(K,1)=9:R(K
,2)=14

```

```

4035 IF A=1 THEN A$="BLACK":R(K,1)=0:R(K
,2)=0
4040 IF A=2 THEN A$="BLUE":R(K,1)=7:R(K,
2)=6
4045 IF A=3 THEN A$="GREEN":R(K,1)=13:R(K
,2)=10
4050 IF A=4 THEN A$="YELLOW":R(K,1)=15:R
(K,2)=12
4055 IF A=5 THEN A$="RED":R(K,1)=3:R(K,2
)=4
4060 IF A=6 THEN A$="ORANGE":R(K,1)=2:R(K
,2)=8
4065 IF A=7 THEN A$="BROWN":R(K,1)=2:R(K
,2)=2
4071 ON K GOSUB 4600,4700,4800
4075 NEXT K
4080 GOTO 1000
4600 C1%=A$:RETURN
4700 C2%=A$:RETURN
4800 C3%=A$:RETURN
9999 REM SAVE ROUTINE
10000 ? "):" ? "PREPARE CASSETTE FOR SAVE
"
10005 SCREEN=PEEK(88)+256*PEEK(89)
10010 OPEN #2,B,0,"C:"
10015 FOR T=0 TO 3199
10020 PUT #2,PEEK(SCREEN+T)
10025 NEXT T
10030 PUT #2,SET
10035 FOR T=1 TO 3
10040 PUT #2,R(T,1):PUT #2,R(T,2)
10045 NEXT T

```

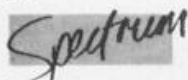
```

10050 CLOSE #2
10055 GOTO 1000
10499 REM LOAD ROUTINE
10500 ? "):" ? "PREPARE CASSETTE FOR LOAD
"
10505 SCREEN=PEEK(88)+256*PEEK(89)
10510 OPEN #2,4,0,"C:"
10515 FOR T=0 TO 3199
10520 GET #2,A:POKE SCREEN+T,A
10525 NEXT T
10530 GET #2,SET
10535 FOR T=1 TO 3
10540 GET #2,A:R(T,1)=A:GET #2,A:R(T,2)=
A
10545 NEXT T
10550 CLOSE #2
10551 SETCOLOR 4,SET,6
10555 GOTO 1000
10999 REM PROTECT TEXT WINDOW
11000 DIM DL$(29)
11010 RESTORE 11050:FOR X=0 TO 28:READ I
:POKE ADR(DL$)+X,I:NEXT X
11020 POKE PEEK(560)+256*PEEK(561)+84,14
1
11030 POKE 513,INT(ADR(DL$)/256):POKE 5
12,ADR(DL$)-PEEK(513)*256
11040 RETURN
11050 DATA 72,169,0,141,10,212,141,27,20
8,169,144,69,79,37
11060 DATA 78,141,24,208,169,10,69,79,37
,78,141,23,208,104,64

```

## McConverter

Ed Corteen,  
Westbury,  
Wiltshire.



THIS PROGRAM is designed to convert machine code into data statements which are then ready for publication. I have used the method used by Ian Briscoe in his Windos program.

To use the program simply type it into your Spectrum altering the program to suite. The addition of the interface 1 and Microdrives alters the base address of Basic so use Let Poke =23761 for non-Microdrive users and LET Poke =23819 if the Microdrives are fitted.

The program as listed is self-explanatory. Run the program and you will be presented

with the Menu. If your program is a long one it is probably best if you use option 3 first to ensure you don't run out of memory when using Edit to enter copies of line 1000.

Once the program has been run always use Goto g to run. Now use option 1 to initialise the variables. Use Edit to enter copies of line 1000. Use a line interval of 10.

Next use option 2 to check that you have entered enough copies.

Now we come to the interesting part. If you look in the manual page 166, you will see how the lines of Basic are organised. We know the address and length of each line — 119 bytes. Option 4 will read the machine code, convert it to Hex notation and Poke the code into each line. At the same time it calculates the checksum and this is Poked in at the end of the line. Using Edit to enter copies of line 1000

reserves space at the correct address for your machine code.

This process is quite slow being Basic. It takes about 40 seconds per line. Clever machine-code programmers can convert this.

Once the code has been Poked into each line it can be checked with option 5. To publish your masterpiece simply send off the data lines with the loader program (lines 7200 to 7630) plus any extra Basic lines required. And there you have it — all the hours spent converting and checking your code have been overcome.

The data lines once "decompiled" can now be anywhere in your completed program. But remember they must be at the beginning of your program while they are being converted. If they aren't you will end up with some very strange looking lines or more likely a crash!

```

1000 DATA "00000000000000000000000000
000000000000000000000000000000000000
000000000000000000000000000000000000
000000000000000000000000000000000000",1234
1010 DATA "00000000000000000000000000
000000000000000000000000000000000000
000000000000000000000000000000000000
000000000000000000000000000000000000",1234
1020 REM use 100 characters per
line, with 4 characters for chec
ksum
1030 REM use line interval of 10
for data statements.
6000 REM AUTOLINE
6010 REM ED CORTEEN
6020 REM January 1985
6990 REM after running program
use GO TO g to run
7000 LET g=7000:CLS:PRINT "En
ter....."
7010 PRINT "1:To initialise"
7020 PRINT "2:To check number of
DATA lines"
7030 PRINT "3:To load m/c code"
7040 PRINT "4:To Decompile progr
am"
7045 PRINT "5:To compile program
"
7050 IF INKEY#="" THEN GO TO 70
50

```

```

7060 IF INKEY#="1" THEN GO TO 8
000
7070 IF INKEY#="2" THEN GO TO 8
055
7080 IF INKEY#="3" THEN GO TO 8
500
7090 IF INKEY#="4" THEN GO TO 8
100
7100 IF INKEY#="5" THEN GO TO 7
200
7110 GO TO 7050
7195 REM **hex loader**
7197 REM change address as neede
d
7200 CLEAR 58999
7210 LET address=59000
7220 LET line=1000:RESTORE line
7230 FOR a=1 TO line:
REM **number of DATA lines**
7240 GO SUB 7500
7245 PRINT line;" OK.";
7250 LET line=line+10
7260 NEXT a
7270 CLS:PRINT "Code in memory
."
7280 INPUT "name of code? ";z$:
INPUT "length of code? ";length
7290 SAVE "m";1;z$CODE address,
length
7300 PRINT "Verifying..":VERIFY

```

```

*"m";1;z$CODE
7310 PRINT "Finished saving ";z$
7320 GO TO 7000
7500 READ a:checksum
7510 LET total=0
7520 FOR i=1 TO LEN a:STEP 2
7530 LET high=CODE a:(i)-48
7540 LET low=CODE a:(i+1)-48
7550 LET high=high-39*(high>9)
7560 LET low=low-39*(low>9)
7570 LET byte=(16*high)+low
7580 LET total=total+byte
7590 POKE address,byte
7600 LET address=address+1
7610 NEXT i
7620 IF total<>checksum THEN PR
INT "Error in line ";line;"." "c
heck and re-run":STOP
7630 RETURN
7990 REM **initialise**
8000 CLS:PRINT "enter lenth of
m/c CODE ";PRINT "this must be
rounded UP to the nearest 50":
INPUT i:
8005 LET x=INT (1/50):REM numbe
r of lines required
8010 PRINT "use EDIT to create "
x;" copies of line 1000"

```

(continued on next page)

(continued from previous page)

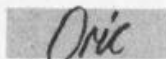
```
8015 PRINT##0;"press any key to
LIST program": PAUSE 0
8020 CLS: LIST 1000
8040 REM **check number of data
lines**
8050 REM *detects the quote mark
after each data statement**
8053 REM if no microdrive fitted
LET poke=23761
8055 LET poke=23819: LET line=0
8065 FOR p=poke TO poke+(x+1)*11
9 STEP 119: IF PEEK (p-1)<>34 TH
EN GO TO 8080
8070 LET line=line+1: NEXT p
8080 PRINT AT 8,0;"you have ente
red ";line;" copies of line 100
0"
8090 GO TO 7050
8095 REM **decompiling routine**
8100 LET poke=23819: INPUT "star
```

```
t of code? ";peek
8110 LET linenumber=990
8115 FOR p=poke TO poke+((x-1)*1
19) STEP 119
8120 LET linenumber=linenumber+1
0: PRINT AT 10,0;"decompiling li
ne ";linenumber
8130 GO SUB 9000
8140 NEXT p
8150 PRINT AT 12,0;"FINISHED!"
8155 PRINT##0;"Hit any key to co
ntinue": PAUSE 0
8160 GO TO 7000
8490 REM **loading routine**
8500 IF poke=23819 THEN GO TO 8
550
8510 PRINT##0;"prepare cassette
and hit any key": PAUSE 0
8520 LOAD "CODE
8530 GO TO 7000
8550 CAT 1: INPUT "name of CODE
?";z$
8560 LOAD "m";1;z$CODE
8570 GO TO 7000
```

```
9000 DIM a$(2): LET checksum=0
9010 LET a=p
9030 FOR a=a TO a+99 STEP 2
9040 LET a$=FN h$(PEEK peek)
9050 LET checksum=checksum+PEEK
peek
9060 LET peek=peek+1
9070 POKE a,CODE a$(1)
9080 POKE a+1,CODE a$(2)
9090 NEXT a
9100 DIM c$(4): LET c$=STR$ chec
ksum
9110 FOR f=2 TO 5: POKE a+f,CODE
c$(f-1): NEXT f
9120 RETURN
9960 REM ***dec-hex converter***
9970 DEF FN k$(x,y)="0123456789a
bcdef"(INT (x/16^y)-16*INT (x/16
^(y+1))+1)
9980 DEF FN h$(x)=FN k$(x,1)+FN
k$(x,0)
9998 ERASE "m";1;"autoline"
9999 SAVE "m";1;"autoline": VER
IFY "M";1;"autoline"
```

## Hires and Gnasher

Karl Williams,  
Swansea,  
West Glamorgan.



HIRES COPY provides a direct screen to printer dumping utility which handles text and graphics on all Oric computers except the 16K machine for which the addresses in lines 10020,

10050, 10060 and 11010 must be altered.

Oric Gnasher is a Pac-man style program following the usual rules and is designed for use on the Atmos although it should run on the Oric-I 48K.

Cursor keys are used to guide your man around the maze. However, points are lost if you retrace your steps which is also dangerous as the ghost follows in your footsteps and gets

closer towards the end of the game, the maze has been designed with this in mind.

Moving over the fruit enables you to kill the ghost before the screen returns to normal. The object is to eat all the dots and move onto the pyramid. More screens could be added by using more data after lines 2120 to 2180 with appropriate adjustments in the rest of the program.

### Hire copy.

```
10015 LPRINT CHR$(18):LPRINT"I"
10020 A=EA000
10030 REPEAT
10040 A=A+1
10050 UNTIL PEEK(A)>64 OR A=EBF3F
10060 IF A=EBF3F THEN LPRINT"MO,-400":PING:END
10070 X=PEEK(A)-64
10080 IF X/32=1 THEN X=X-32:S=1:GOSUB 11000
10090 IF X/16=1 THEN X=X-16:S=2:GOSUB 11000
10100 IF X/8=1 THEN X=X-8:S=3:GOSUB 11000
10110 IF X/4=1 THEN X=X-4:S=4:GOSUB 11000
```

```
10120 IF X/2=1 THEN X=X-2:S=5:GOSUB 11000
10130 IF X/1=1 THEN S=6:GOSUB 11000
10140 GOTO 10030
11000 REM *PRINTER*
11010 B=A-EA000
11020 CY=INT(B/40)
11030 CX=((B-CY*40)*6)+S)*2
11035 CY=CY+2
11040 LPRINT"X";CX;",";CY:LPRINT"D";CX+1;",";CY
11050 LPRINT"X";CX;",";CY-1:LPRINT"D";CX+1;",";CY-1
11060 RETURN
```

### Gnasher.

```
0 CLS:PAPER 0:INK 1
1 DIM H(1000),N(1000):C$="2500"IS3:HR$="Karl Williams
"IN:2500
2 PRINT CHR$(6),CHR$(20),CHR$(17)
3 GOSUB 5000
4 CLS
5 GOSUB 1000
20 GOSUB 2000
25 GOSUB 3000
30 X=21:Y=0:D=1:E=26
35 EXPLODE
40 FOR K=LEV TO 5 STEP -1
42 V=42:W=44:R=46:AM=175
45 IF K/2=INT(K/2) THEN W=41:R=43:V=174:AM=47
50 AM=DEK(765)
52 RIK=3:INK(K):YID=D-1
53 IF D=0 THEN GOSUB 6000
54 IF D=0 THEN PAPER(7):INK(4):V=43:WAIT 10 ELSE PAF
ER 9
55 IF A=45310 THEN L=50RN(X,Y):GOTO 130
70 IF A=40351 THEN X=X-1:GOTO 110
80 IF A=40255 THEN X=X+1:GOTO 110
90 IF A=40319 THEN Y=Y+1:GOTO 110
100 IF A=40375 THEN Y=Y-1
110 L=50RN(X,Y)
115 IF L=40 THEN X=X:Y=Y:N(K):GOTO 140
120 IF L=45 THEN P=P+10:Q=0+1:GOTO 140
125 IF L=52 THEN P=P-5:GOTO 140
130 IF L=45 OR L=48 OR L=47 OR L=40 THEN 210
135 IF S(1) THEN R=555:GOTO 4000
140 PLOT R(K),N(K),32:PLOT X,Y,V
145 IF K=LEV-LEV,07 THEN 155
150 UNK=X+1/51+1:PLOT D,E,32:PLOT R(W),N(W),W:DPRINT(
L,W)U
155 PLOT 21,9,AM:PLOT AX,AY,AV
157 PLOT 21,9,AM:PLOT AX,AY,AV
160 SOUND 1,*,2:RPLAY 1,*,4,1000
170 PRINT 16,0,4:PRINT 31,0,0
180 PRINT 18,1:INT(P/(A-(VAL(R)/2))):PRINT 21,1:INT
P/10:PRINT 31,1,C$
195 IF S(1) THEN R=555:GOTO 4000
198 NEXT K
200 R=777:GOTO 4000
210 A=50310
220 IF L=48 OR L=174 THEN P=0:P=250:PQ=P+1:Q=25:G
OSUB 3000:GOTO 120
240 IF L=47 OR L=175 THEN 200
250 IF L=43 OR L=44:AND D=0 THEN 270
260 PLOT X,Y,V:PING:FOR H=500 TO 1 STEP 1:SOUND 1,M,1
5:NEXT H:P=500
265 J=1:R=1:GOTO 140
270 PLOT R(K),N(K),32:FOR H=1 TO 300:SOUND 1,H,0:PLAY
1,1,2,5:NEXT H
275 P=500:S=1:GOTO 150
280 IF D(1/2)=0 THEN 290 ELSE 310
290 PLOT X,Y,V:PLOT R(K),N(K),32:FOR H=0 TO 300 STEP
3:PAPER H/40
300 SOUND 1,300,H,15:NEXT H:P=1000:R=111:GOTO 4000
310 SHOOT:S=1:GOTO 150
```

```
320 SOUND 1,RND(1)*1000+1,15:PAPER 1:EXT HR=111:GOT
O 4000
330 SHOOT:S=1:GOTO 150
1000 REM REDEFINE CHARACTERS
1010 FOR A=4400 TO 4463
1020 READ D:POKE A,D
1030 NEXT A
1040 RETURN
1050 DATA 12,12,30,51,51,30,12,12,30,63,45,45,63,51,
3,30,30,63,45,63,33,51,63
1060 DATA 30,14,21,21,31,27,17,17,14,31,21,31,31,3
1,31,31,0,0,0,12,12,0,0,0
1070 DATA 0,0,12,30,63,63,30,12,0,0,12,12,30,63,0
2000 REM SET UP SCREEN
2005 CLS:PAPER 0
2010 PRINT CHR$(135):PRINT CHR$(135)
2015 GOSUB 4000
2020 PLOT 9,0:"LEVEL=":PLOT 24,0:"LIVES="
2025 PLOT 1,1:"POINTS=":PLOT 16,1:"TIME=":PLOT 25,1:"HIS
CORE="
2030 FOR C=1 TO 55
2040 IF C/32 THEN D=40 ELSE D=1
2050 READ D,C,F
2060 FOR S=C+40040 TO F+40040 STEP D:POKE D,40:NEXT G
,C
2070 FOR H=40162 TO 40999:IF PEEK(H)=32 THEN POKE H,4
0
2080 NEXT H
2090 FOR I=40162 TO 40900 STEP 40:POKE 1,32:NEXT I
2100 FOR I=40199 TO 40959 STEP 40:POKE 1,32:NEXT I
2110 DATA 85,118,165,170,172,189,191,196,247,256,258,
260,262,274,327,334
2120 DATA 489,416,458,459,463,465,491,499,542,544,571
,579,623,625,649,657
2130 DATA 781,782,784,785,729,738,744,754,769,770,807
,809,812,810,824,829
2140 DATA 832,834,858,858,865,890,894,908,902,907,911
,916,965,998,370,384
2150 DATA 123,923,285,485,565,645,367,767,449,689,852
,892,796,376,290,330
2160 DATA 619,699,788,808,421,661,782,862,384,344,546
,666,580,660,809,909
2170 DATA 358,710,791,871,312,672,354,714,236,516,596
,676,150,998
2200 RESTORE:RETURN
3000 FRAX:GAY
3005 B=INT(RND(1)*3)+1:IF B=1 THEN AX=35:AY=21
3010 IF B=2 THEN AX=24:AY=12
3020 IF B=3 THEN AX=10:AY=21
3030 IF AX=6 AND AY=6 THEN 3005
3040 IF D=25 THEN PRINT 2,0:CHR$(129):PRINT CHR$(129
)
3050 RETURN
4000 WAIT 200:CLS:PAPER 0:INK 4
4005 PING
4010 IF D=111 THEN G$="COMBATIONS:"
4020 IF R=777 THEN G$="Sorry you ran out of time!"
4030 IF R=555 THEN G$="Sorry you ran out of lives!"
4040 SH=140:LEN(G)=72
4045 PRINT:PRINT CHR$(4)
4055 PRINT:PRINT CHR$(4)
```

```
4060 PRINT:PRINT CHR$(27);C;"":CHR$(27);N:"(SFC:SP)1:08
4065 PRINT:PRINT CHR$(4)
4070 PRINT:PRINT "LEVEL:";TAB(10):CHR$(135);A$
4075 PRINT:PRINT "SHOTS:";TAB(10):CHR$(135);J$
4080 PRINT:PRINT "FRUIT OBTAINED:";TAB(10):CHR$(135);F$
4090 PRINT:PRINT "LIVES LEFT:";CHR$(135);TAB(10);S:G
4100 PRINT:PRINT CHR$(27);B:"You scored ";INT(F/4-V
R(A*11)):" points!"
4110 IF P/4=VAL(A$):CH THEN 4140
4120 PRINT:PRINT CHR$(135):CHR$(140);"You have beaten
the previous DISCORE"
4125 PRINT:PRINT CHR$(140);"of ";C$;" points by "
110
4130 CR=STR$(P):PRINT:INPUT "Your NAME:";H$;H$=P
4140 PRINT:PRINT"Again? Y or N":REPEAT:GET X:UNTIL X
=>"Y" OR <=>"N"
4150 IF <=>"Y" THEN 4100
4160 PRINT CHR$(6),CHR$(17),CHR$(20)
4170 CLS:PAPER 4:INK 7:PING:CALL 503
4180 PRINT:PRINT"Enter level 1,2 or 3":CHR$(135);
4190 REPEAT:GET A:UNTIL VAL(A)=0 AND VAL(A)=4:PING
:PRINT A$
4190 LEV=4-VAL(A$):*75+400
4195 S=3:R=0:P=0:B=0:P=0:D=0:G=0:GOTO 10
5000 CLS:PAPER 0:INK 2
5010 PRINT CHR$(4)
5020 PRINT CHR$(27);0:"":CHR$(27);N:"" ORIC GNA
SHER"
5025 PRINT CHR$(4)
5030 PRINT:PRINT:PRINT"Use Cursor keys to guide yours
elf"
5040 PRINT:PRINT"through the maze but beware of Bolli
u"
5050 PRINT:PRINT"the Gaelic Ghost! He can only be "
5060 PRINT:PRINT"destroyed in the short time after yo
u"
5070 PRINT:PRINT"have eaten the fruit found somewhere
"
5080 PRINT:PRINT"in the maze."
5085 PRINT:PRINT"Your final objective being to ge
t"
5090 PRINT:PRINT"to the flashing pyramid after eating
"
5095 PRINT:PRINT"all the dots!"PRINT
5098 PRINT TAB(0):CHR$(135);"Enter level 1,2 or 3":C
HR$(135);
5099 REPEAT:AX=EY:GOSUB 1,RND(1)*300,12:WAIT 20:UNTIL
VAL(A$)=0 AND VAL(A$)=4
5099 PRINT VAL(A$):LEV=C-VAL(A$):*75+400
5100 PRINT:PRINT CHR$(135):CHR$(140);(SFC(5)):"Press "R
ETURN TO "NEXT"
5100 REPEAT:SOUND 1,RND(1)*500,12:WAIT 15:UNTIL KEY=
CHR$(13)
5110 PING:RETURN
4000 FOR D=4 TO 24:PRINT 1,0:CHR$(INT(RND(1)*5)+129)
6010 NEXT D
6020 PRINT 2,0:CHR$(135):PRINT CHR$(135)
6030 RETURN
```

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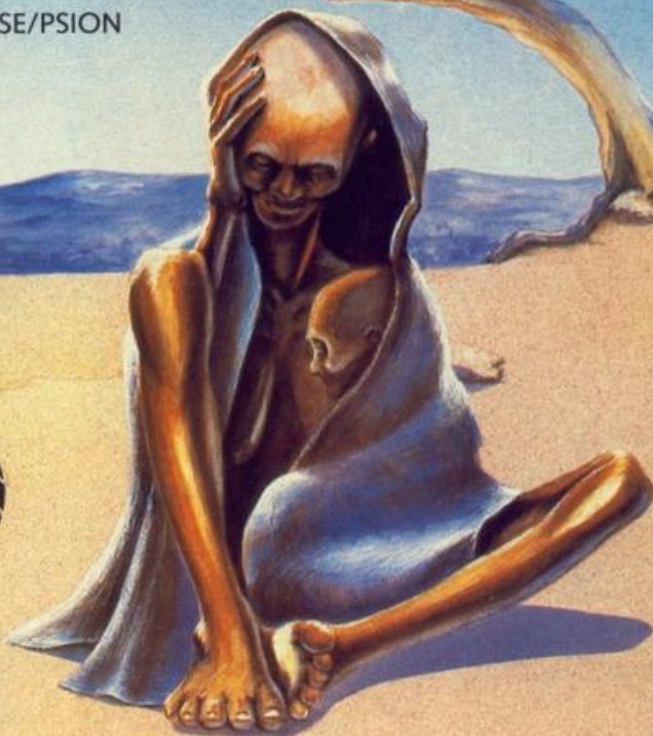
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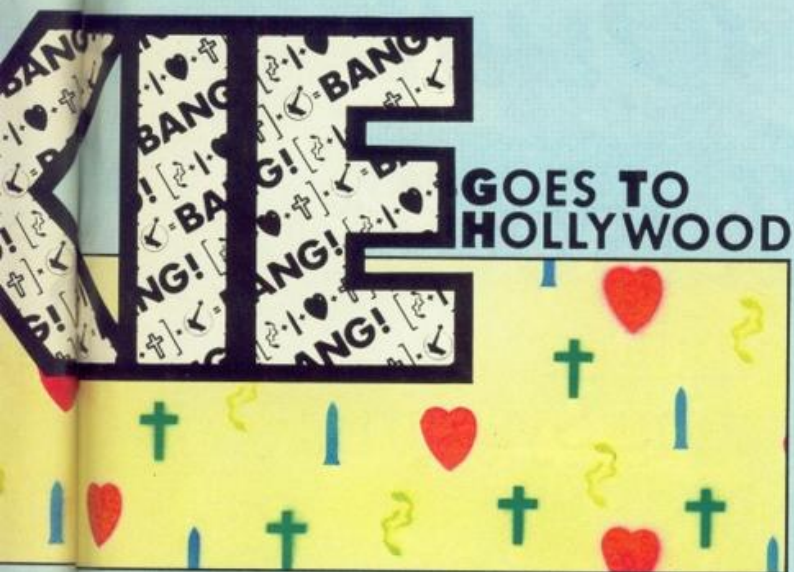
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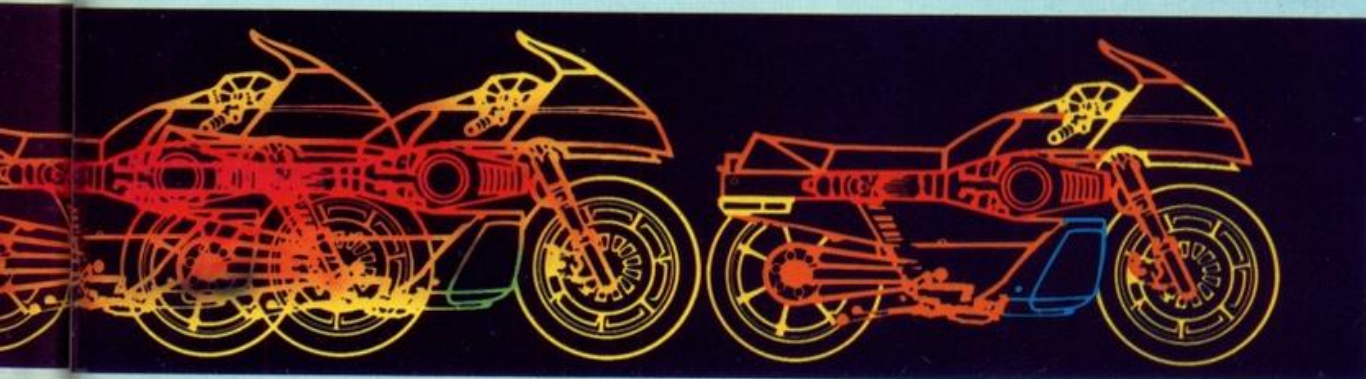
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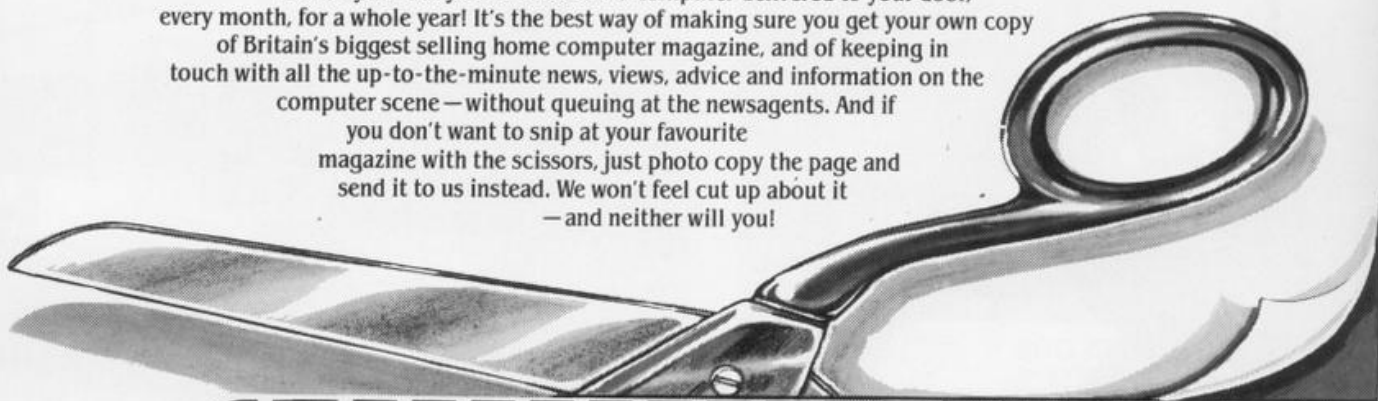


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Up to 255 sprites, each with its own user defined dimensions, can be scrolled, spun, reflected, enlarged or inverted with amazing speed and smoothness. Sprites can even stretch across several screens so scrolling landscapes are easy to achieve. Sinclair's own sound and graphics commands such as CIRCLE, DRAW and BEEP are fully supported.

**MULTITASKING** Without doubt White Lightning's most innovative feature is its use of interrupts to effectively run two programs at once. This means that while one program smoothly scrolls a landscape in the background, a second can animate the characters.

**SPRITE DESIGN** White Lightning comes complete with a separate 20k program for developing sprites used in the main system. Not only can you use this to design your own sprites from scratch, it also comes complete with 168 pre-defined characters covering games like Asteroids, Pac-Man, Assault Course, Defender, Space Invaders, City Bomber, Lunar Lander, Frogger, Centipede, Donkey Kong and many, many more. These characters are ready to use or can be enhanced. And sprites can be saved to tape between editing sessions before being finally loaded into the main program.

Machine Lightning is an advanced games writing utility which includes a full Macro Assembler, a Monitor/Disassembler, a Sprite Generator Program and the object code for the White Lightning graphics routines which have almost 100 documented entry points in 3k of code. The comprehensive manual explains how to use two copies of the object code to run machine code routines concurrently using the Z80 interrupts. Games written using Machine Lightning can be marketed with no restrictions.

**THE MACRO ASSEMBLER** This is arguably the most comprehensive assembler yet available for the Spectrum 48k. It supports Macros, conditional assembly and a full screen editor, and occupies 16k of memory.

**THE MONITOR/DISASSEMBLER** As well as all the usual monitor features, Spectre-Mac allows up to 10 breakpoints in ROM or RAM, has front panel display and single stepping.

**THE SPRITE GENERATOR** This is the same Sprite Designer/Editor supplied with White Lightning and can be used to design up to 255 sprites, up to a maximum of 12k.

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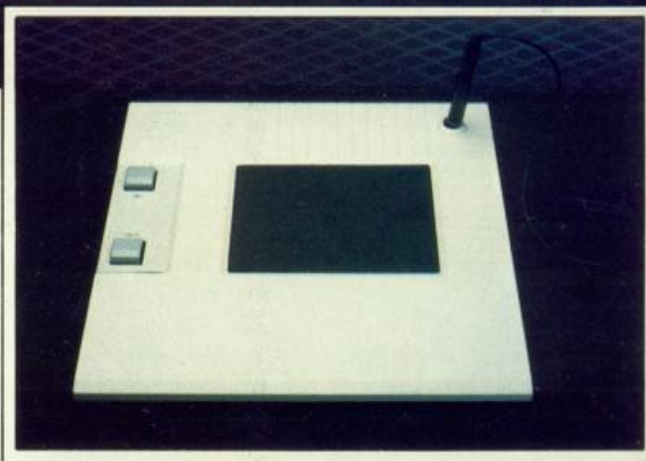
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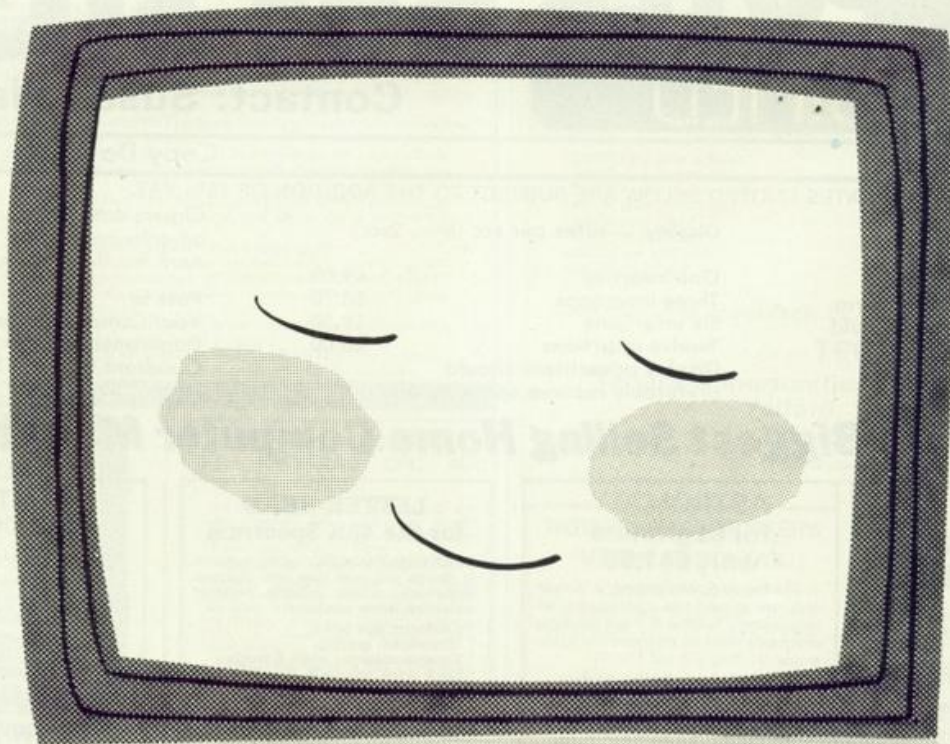
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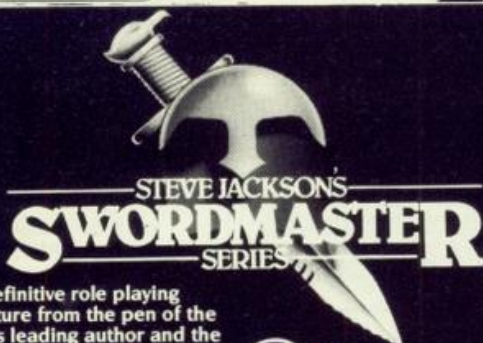
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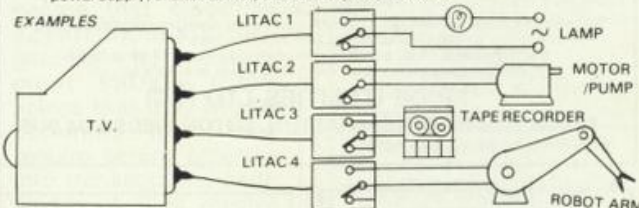
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Local, national and international micro events are updated here. To publicise your event, phone Paul Bond on 01-661 3472.

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Organised by Reed Exhibitions, Surrey House, 1 Throwley Way, Sutton, Surrey. Takes place from June 4-6 at Earls Court, London. Trade only. Admission by business registration. Contact Harry Hudson on 01-643 8040 for more details.



Leonov Captain Tanya Kirbuk (Helen Mirren) and Dr Heywood Floyd (Roy Scheider) discuss how to save the mission from disaster in MGM/UA's new movie "2010".

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