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COMPUTER

MAY 1985

BRITAIN'S BIGGEST-SELLING HOME COMPUTER MAGAZINE

Vol. 5 No. 5

**CAN A MICRO
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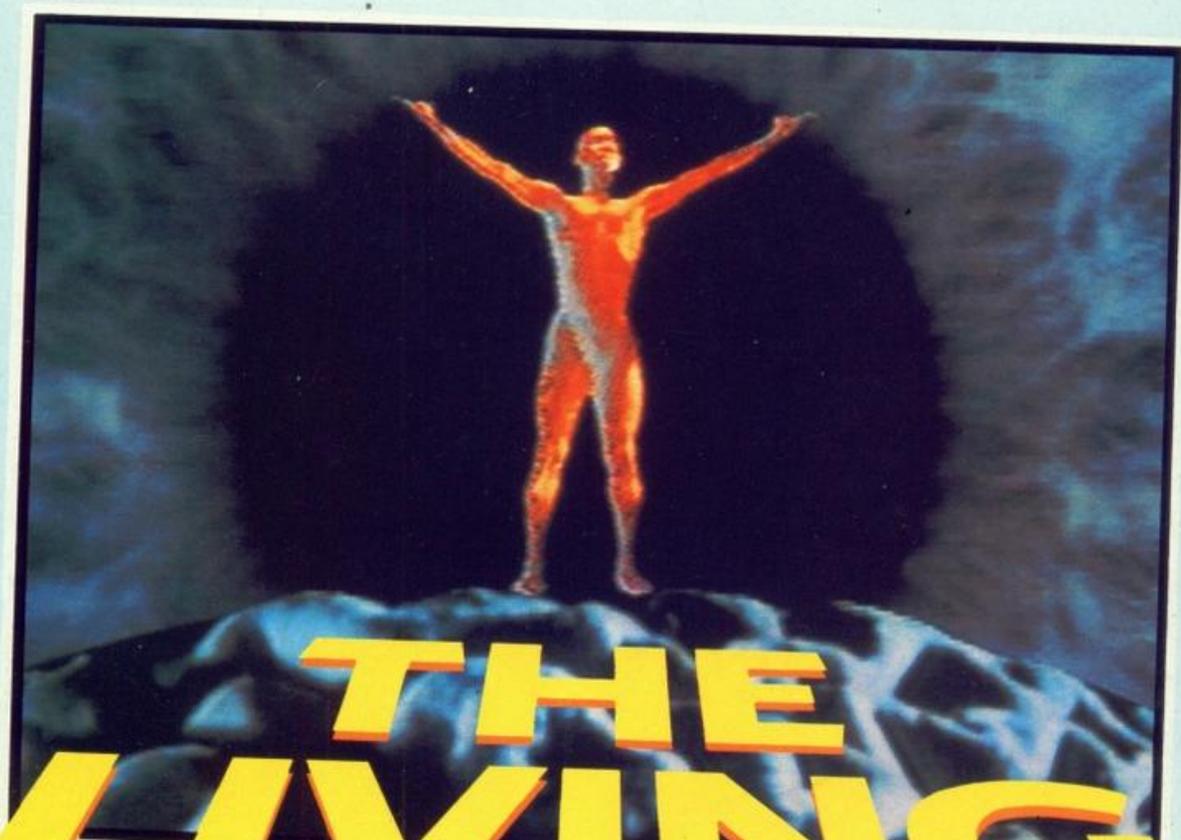
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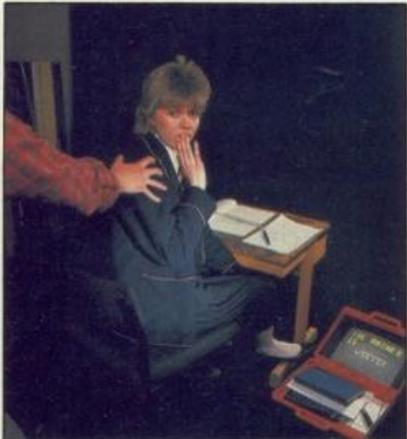
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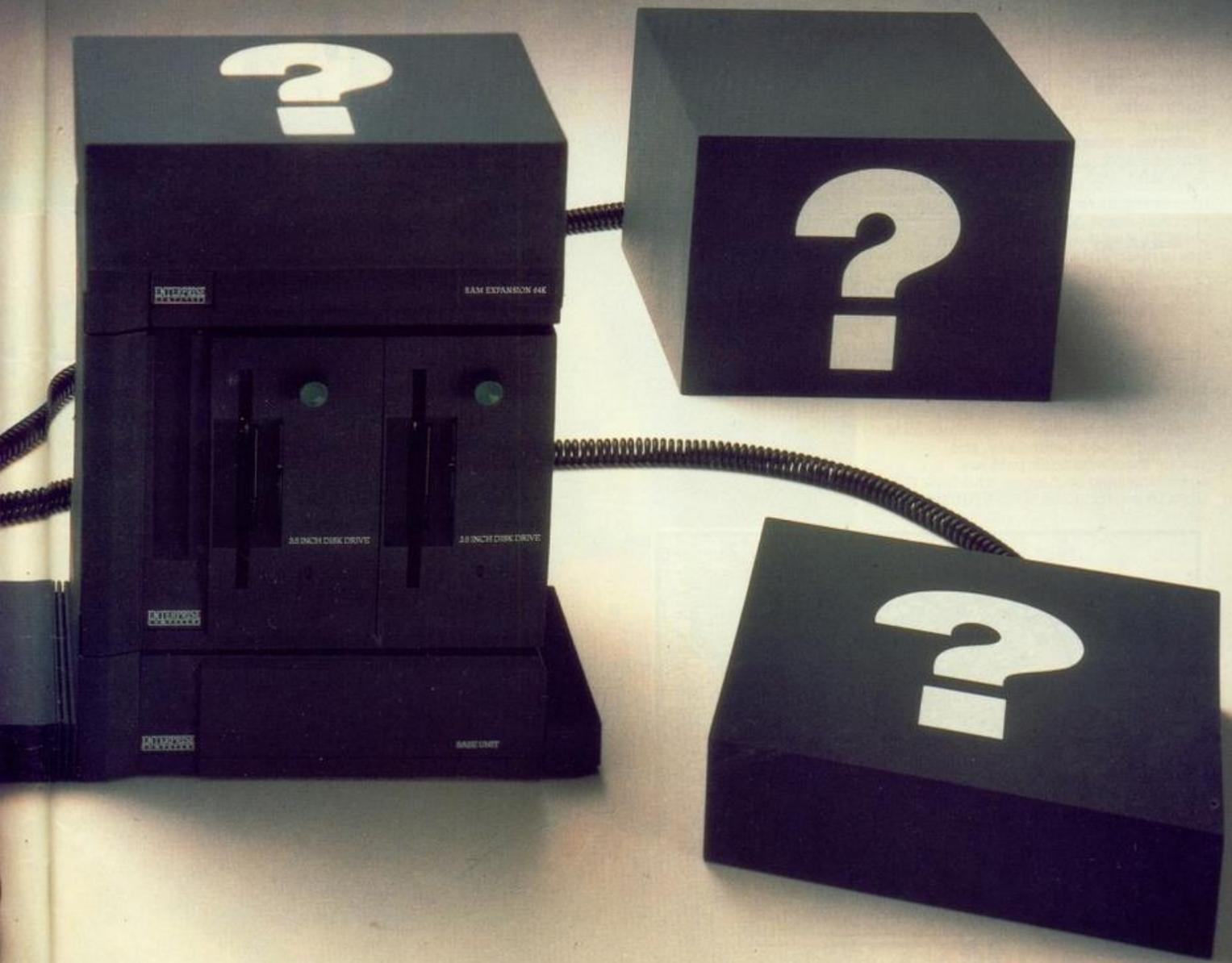
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The new Enterprise 64.

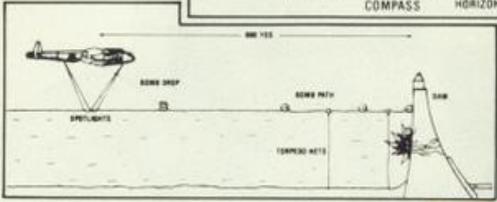
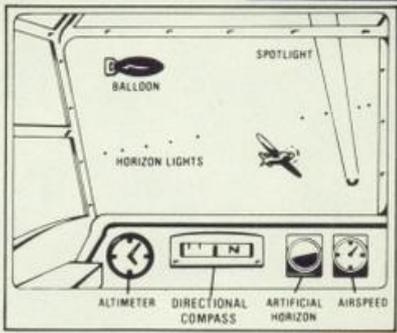
It hasn't just overtaken technology. It's left every other home computer straggling in the distance.

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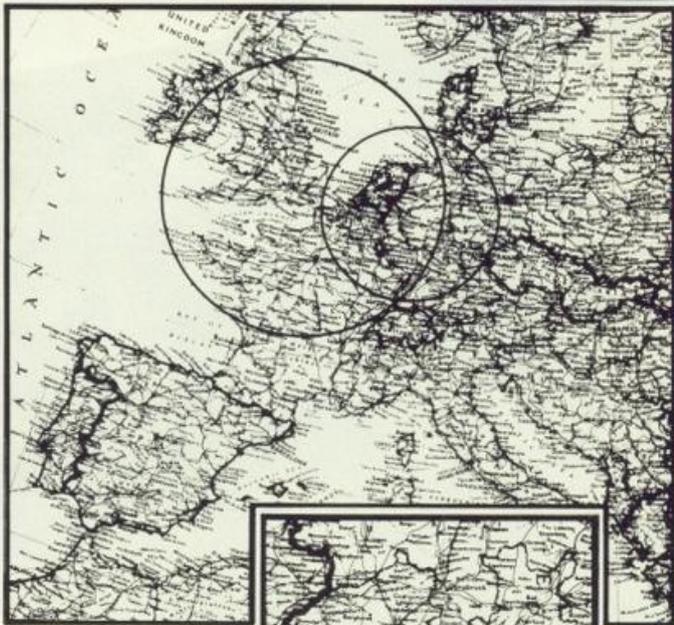
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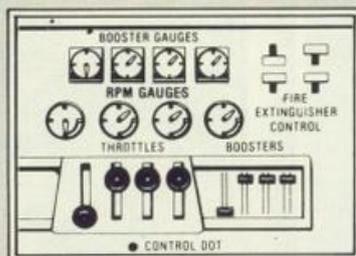


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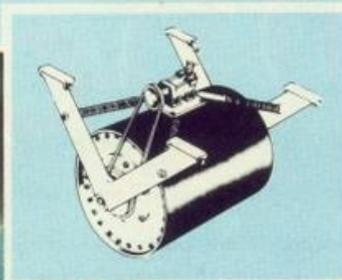
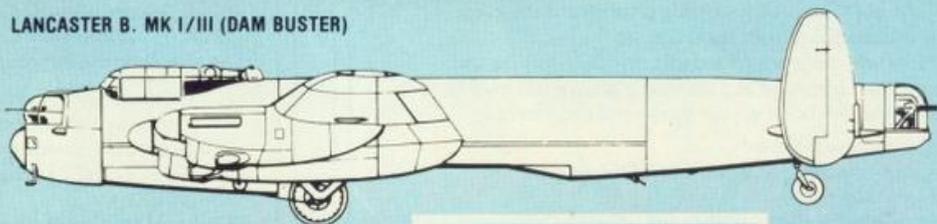
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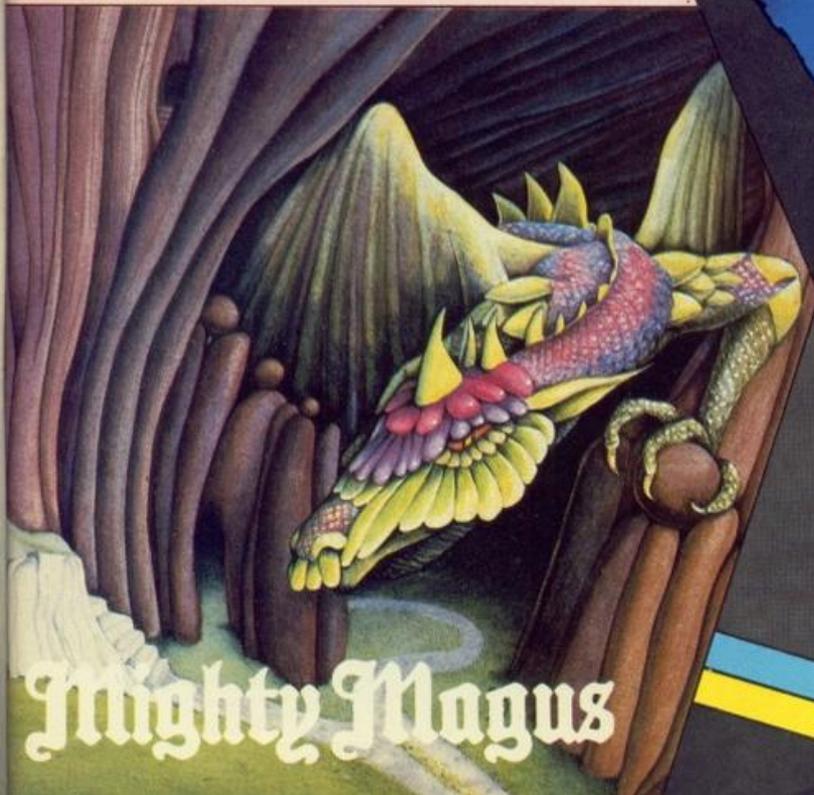


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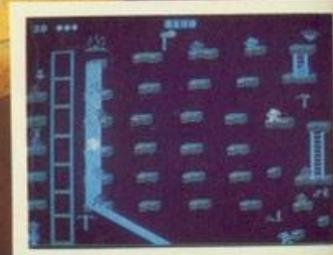
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Editors of Electronic Games

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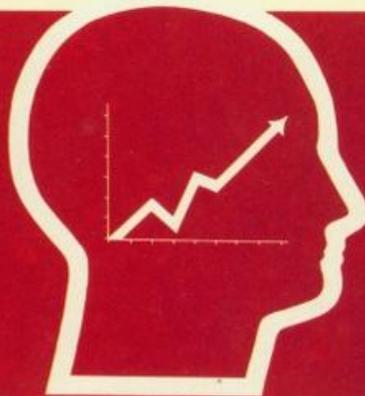
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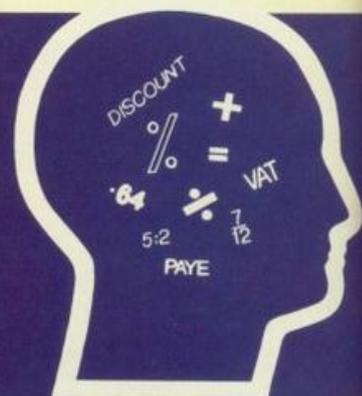
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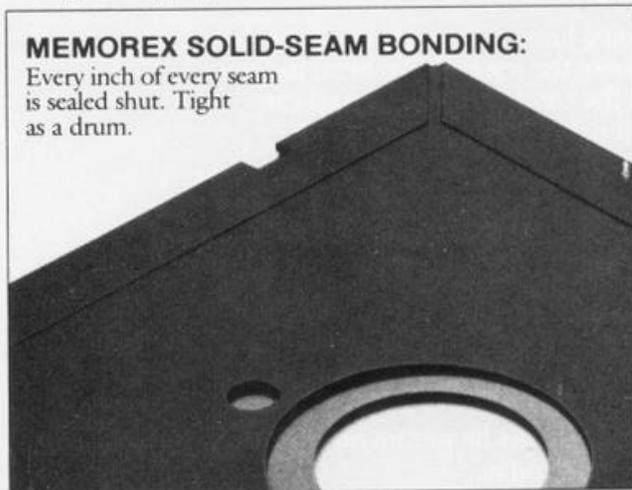
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All Quasi wants is to be left alone, but those nasty soldiers think that he stole the royal jewels. Quasi didn't steal them!

Quasi wants the soldiers to leave him alone. They fire nasty arrows at him. Quasi doesn't want to, but Quasi will throw big rocks at the nasty soldiers.

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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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 Miconet 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.

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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 queuing 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.

British
TELECOM

MODEM COMPETITION

1000 FREE MODEMS

500 for Spectrum/Spectrum +
350 for BBC Model B
150 for Commodore 64

And if you haven't got a square-type BT phone socket, British Telecom will arrange to alter your installation at no charge!

HOW TO ENTER

(Monday 22nd April to Sunday 5th May 6pm to midnight)

For the 5 questions 'phone

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)

- (a) already has a square-type BT 'phone socket * or
(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.

Name (Block Capitals)

Telephone number

Signature

Date 1985

E. I have read the rules of the British Telecom Modem competition and agree to abide by them. I am over 18 years old.

Signature of entrant

Date 1985

Name (Block Capitals)

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Postcode

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SURREY
CR4 2XU

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What's my line?

Hacking charges against Mouse

STEVE GOLD, otherwise known as Micronet's Micromouse, and Robert Schiffreen, 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".

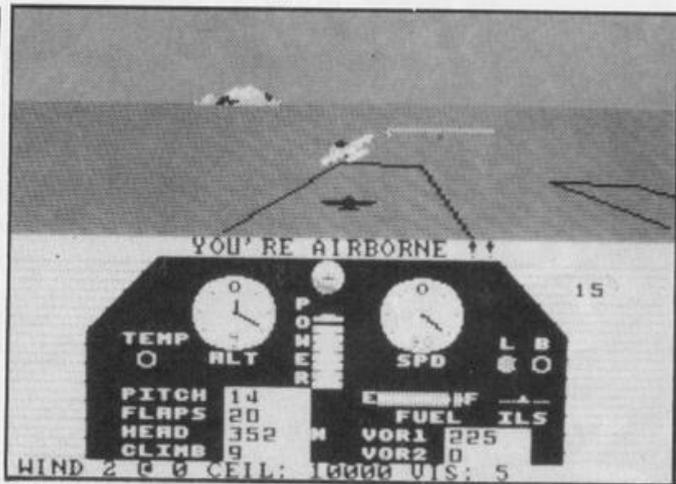
RIGHT STUFF

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

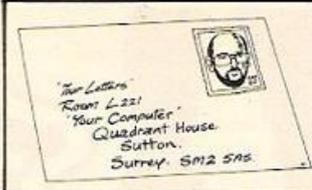
Game	Company	Machine
1 Booty	Firebird	Sp
2 Everyones a Wally	Microgen	Sp
3 Starstrike	Real Time	Sp
4 Match Day	Ocean	Sp
5 Alien 8	Ultimate	Sp
6 Ghostbusters	Activision	Sp
7 Wild Bunch	Firebird	Sp
8 Monkey Magic	Solar	16
9 Broad Street	Argus	64
10 Skool Daze	Microsphere	Sp
11 Airwulf	Elite	Sp
12 Blackbusters	Macsen	Sp
13 Overdrive	Superior	EI
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	EI

Sp = Spectrum/Bc = BBC/16 = C16
 EI = 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	EI
2 Mini Office	Database	EI
3 Overdrive	Superior	EI
1 Mutant Monty	Amsoft	Am
2 Sorcery	Virgin	Am
3 Mini Office	Database	Am

Source = Webster's 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 evey 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.

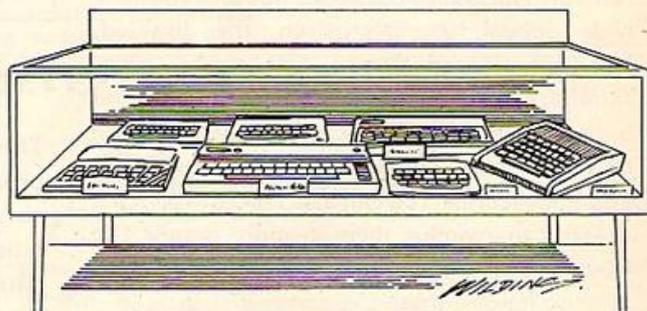
PRESTEL WARNING

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.



How to Order

The Games Player Interface costs only £12.95 and like all our products is covered by a comprehensive guarantee. You can obtain your interface from any good computer store or by completing the order form below and returning it to: dk'Tronics Ltd, Shirehill, Saffron Walden, Essex. or by telephone, quoting your Access or Barclaycard number.

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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) In addition 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 Pkchachanja* 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 "0 TO 9999"
40 PRINT "FROM"
50 PRINT "PRYING EYES"
10000 A=PEEK(43)+PEEK(44)+256
10010 ADDRESS=PEEK(A)+PEEK(A+1)+
256
10020 LINE=PEEK(A+2)+PEEK(A+3)+2
56
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?").

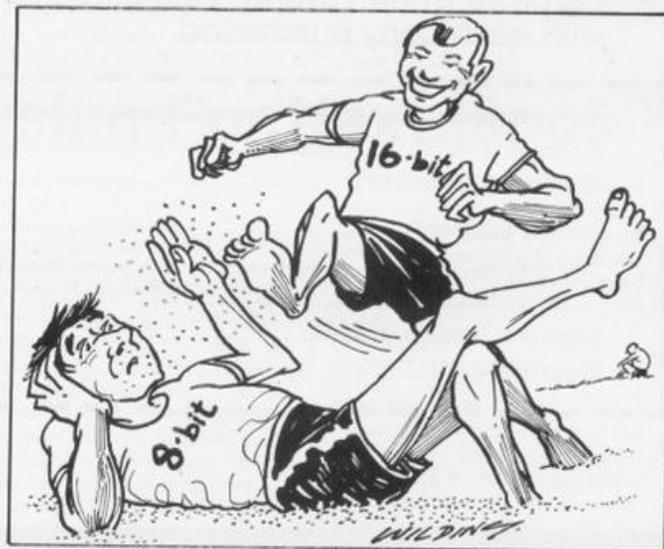
Maybe you even know enough not to get into a situation you can't handle — like trying to sing the praises of a CBM-64 to someone who owns an IBM PC. But at the end of the day there are still those bits of the conversation when names are dropped or antique machines referred to that make you feel like 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-laner. 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 buying 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 DS
30 PRINT DS
40 IF DS="ORANGES" THEN 60
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 AS="YOUR COMPUTER"
20 BS="PUT"
30 FOR L=1 TO LEN(AS)
40 IF MID$(AS,L,LEN(BS))=BS THEN GOTO 70
50 IF L>LEN(AS) 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 BS to "OUR" and Run the program again; next, make BS="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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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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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/dis-assembler/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

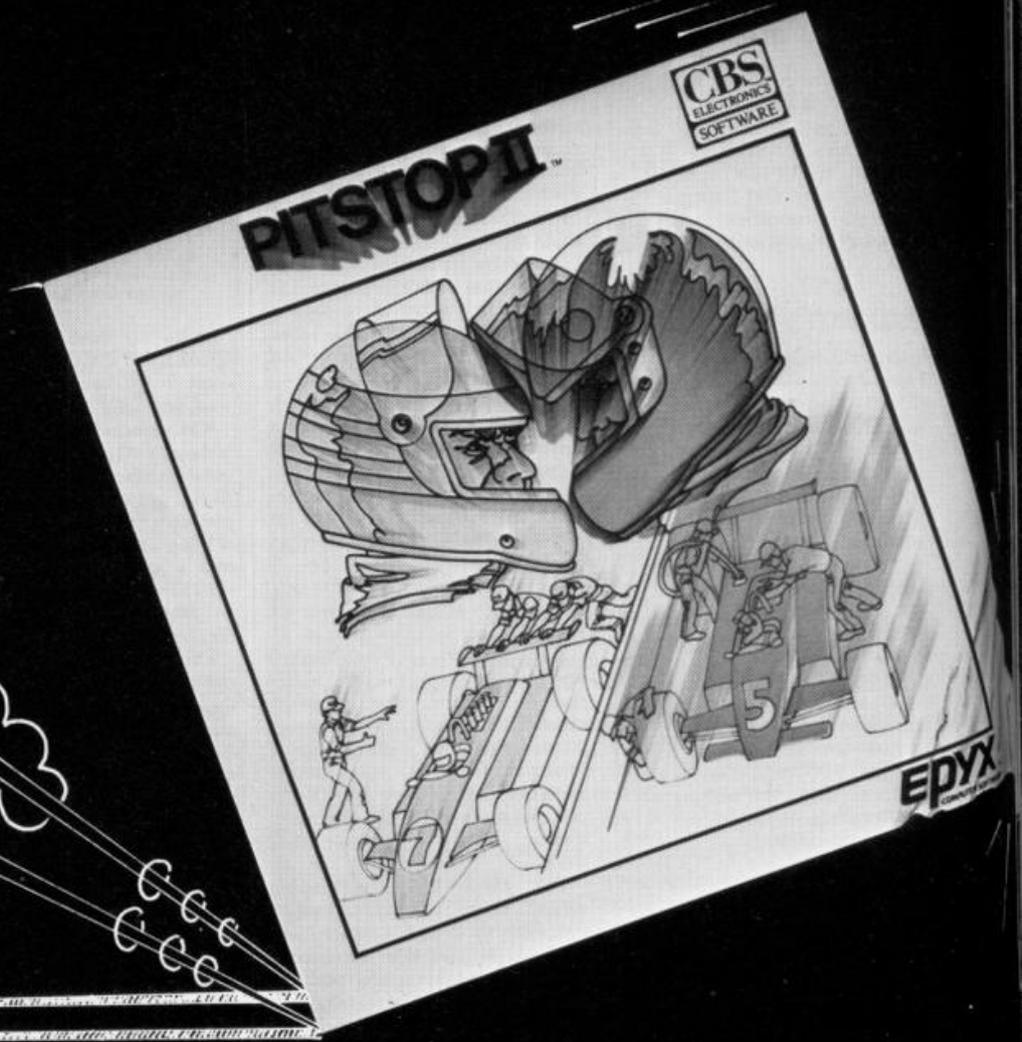
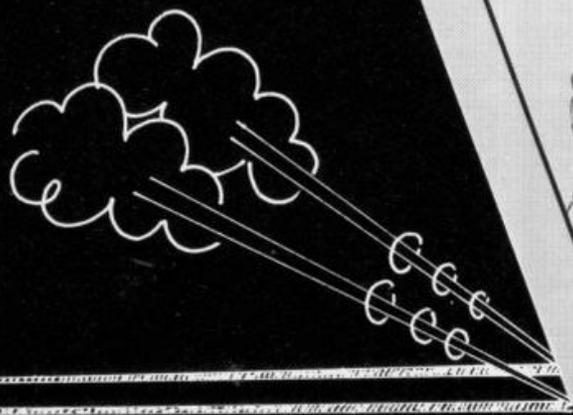
which takes a few minutes. The phone book you load on booting the software can contain up to 50 named pages. Each entry on a page is given its own number and prompt string, so once you're through, logging-on is automatic.

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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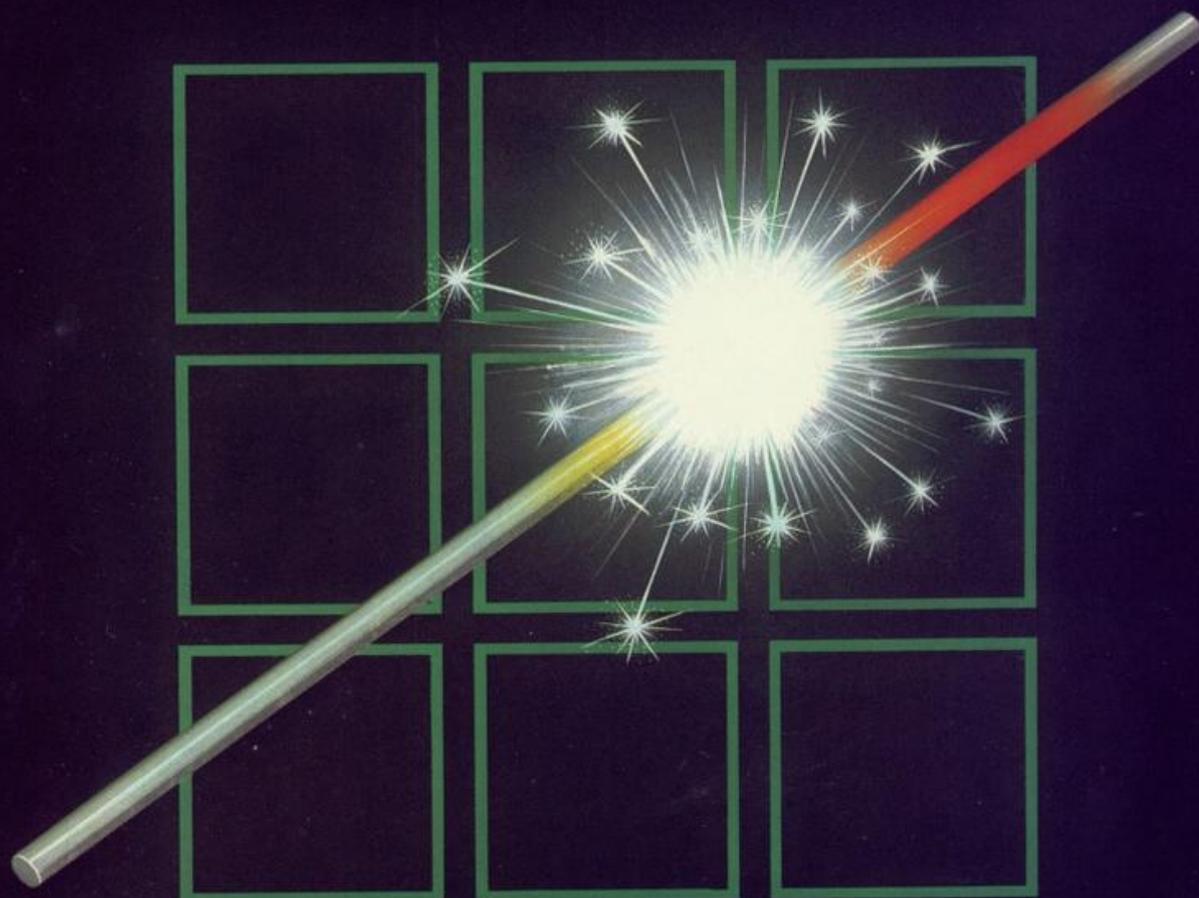
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Star chart

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.

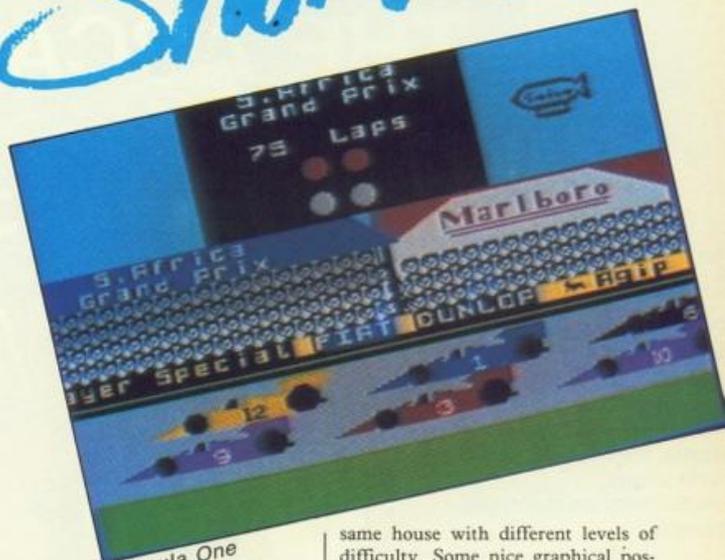
The graphics are functional rather than brilliant — but the heads of the crowd turn to watch the cars and the Goodyear airship moves majestically across the screen. After the race you are shown who won and how they're doing in the championship stakes. Other interactive elements of the game include deciding 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 Stoa Safebreaker

Shortlist



Formula One

Sam Stoa Safebreaker

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

★ ★ ★

THE LATEST character to emerge from the warren of the Gremlin Gang, Sam Stoa 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 stoa — 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 stoa 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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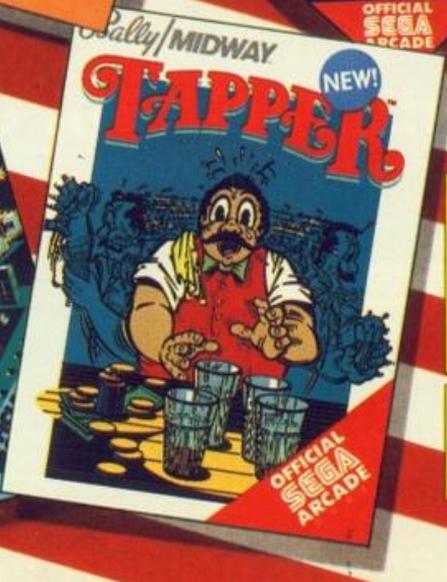
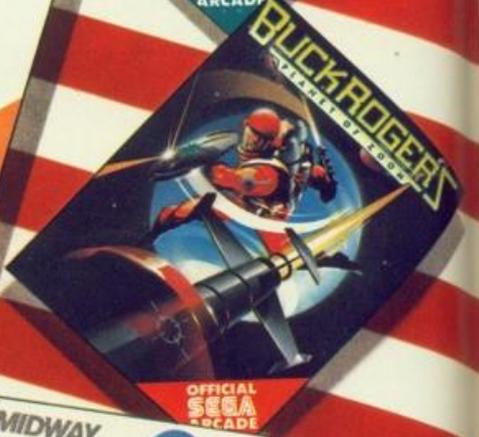
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Star★ chart

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 minibus 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

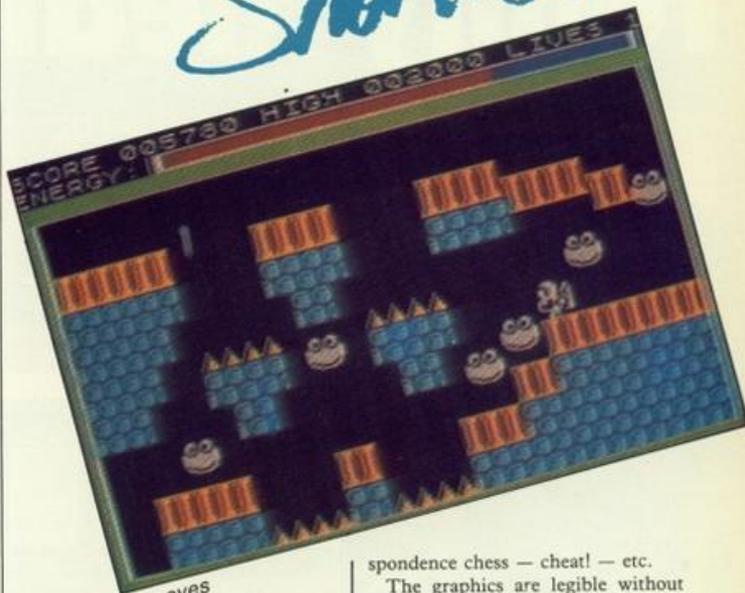
★ ★ ★
XXABANEANS RULE OK. Well, of course it's not OK since they intend to wipe out all intelligent life and have the universe to themselves. The dummies have invaded earth in a giant starship disguised as a meteorite. Your job is to penetrate down through the 10 levels of the ship and destroy its power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

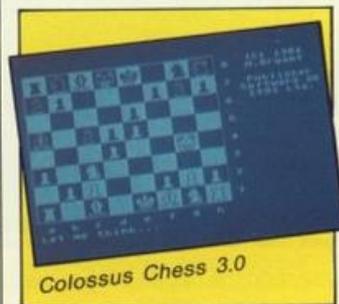
The graphics are legible without being showy. Move entry is simple, by either typing them in (e2-e4) or using the cursor keys. Pressing the space-bar toggles between the game board and a separate screen which lists the moves, shows the time on each player's clock, position and material rating and the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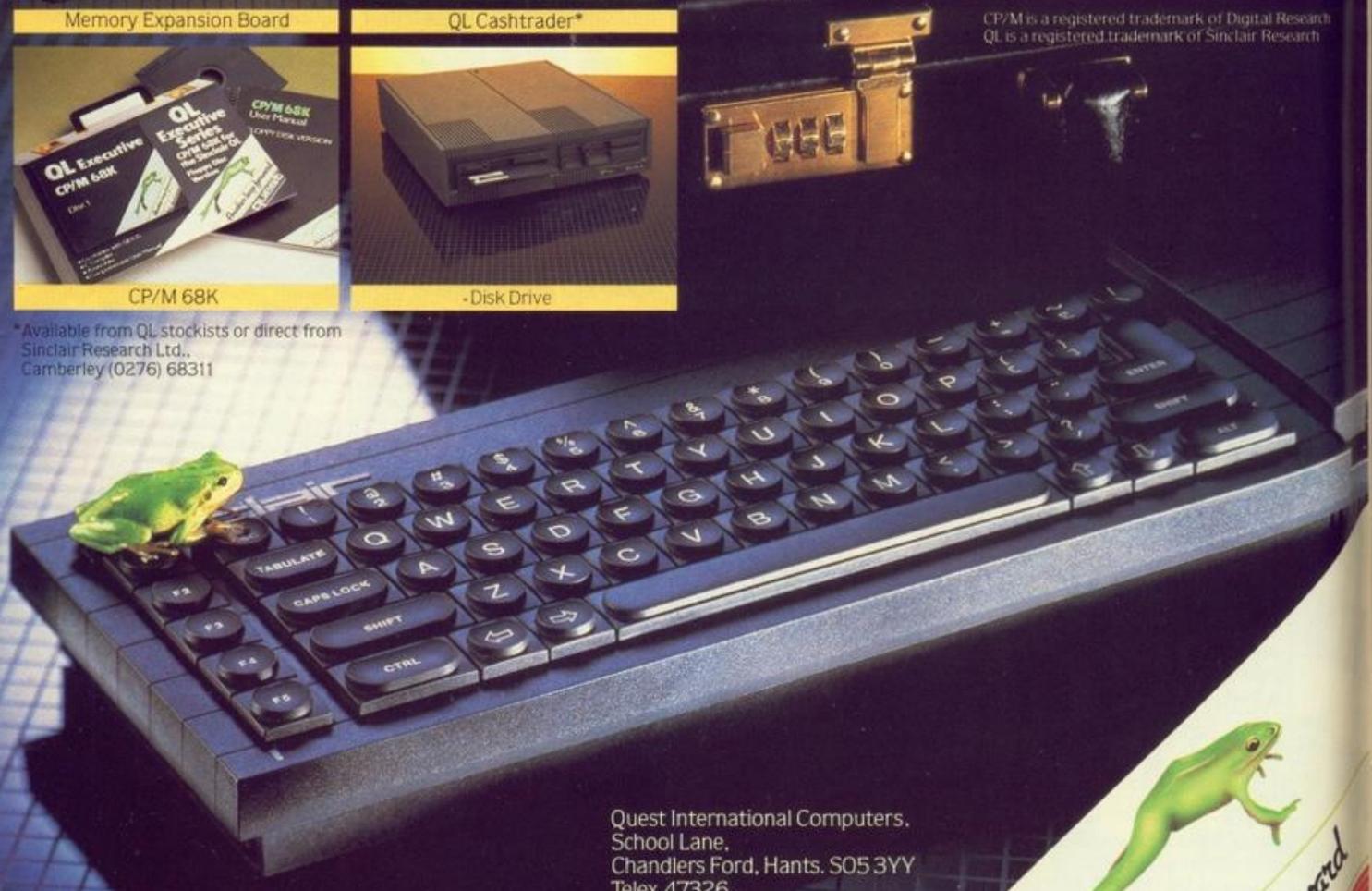
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Star★ chart

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

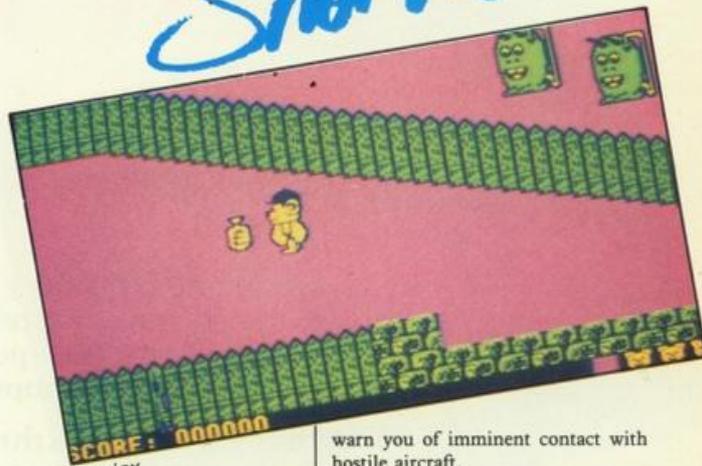
■ BBC
■ Superior Software
■ Arcade Classic
■ £9.95
★ ★ ★

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)

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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.

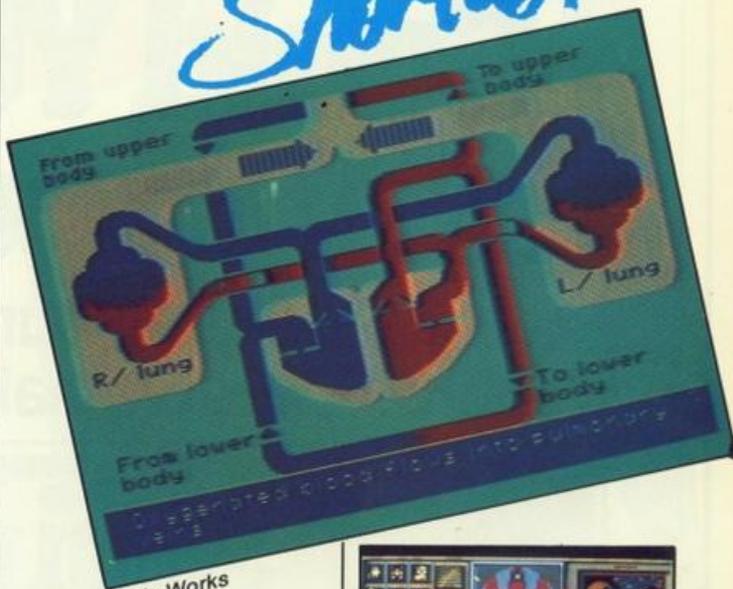
The final program in the suite, Marathon, is like a flight simulator for the human body. Running eight times faster than real time, the simulation allows you to enter a course from 5-26 miles.

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



Body Works

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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Stringer

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 Media plans to
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 bid to
 away

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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 Vic 20 £5.95 . . . ZX 81 £5.95

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

Corner

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.

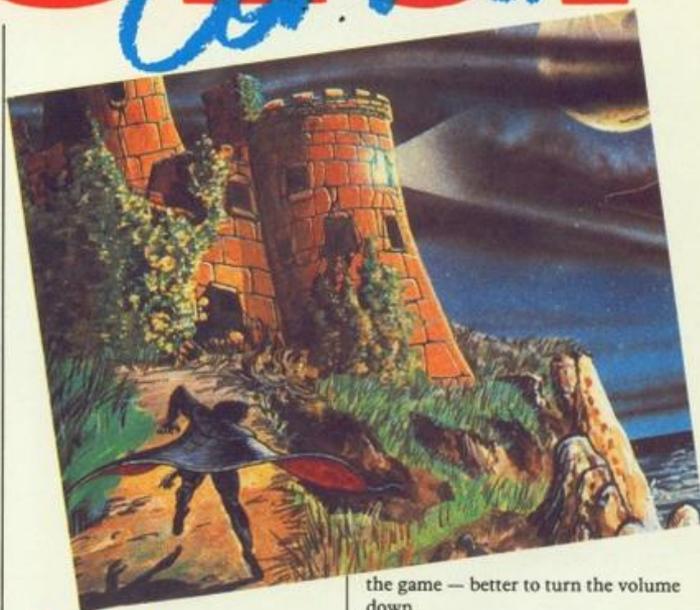
Although the plot and puzzles are identical to the 64 version, the Spectrum program wins hands down in the graphics department, has a small edge in the text input contest but, naturally enough, loses by a mile in the music stakes.

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 QUILLED 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.

The 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.

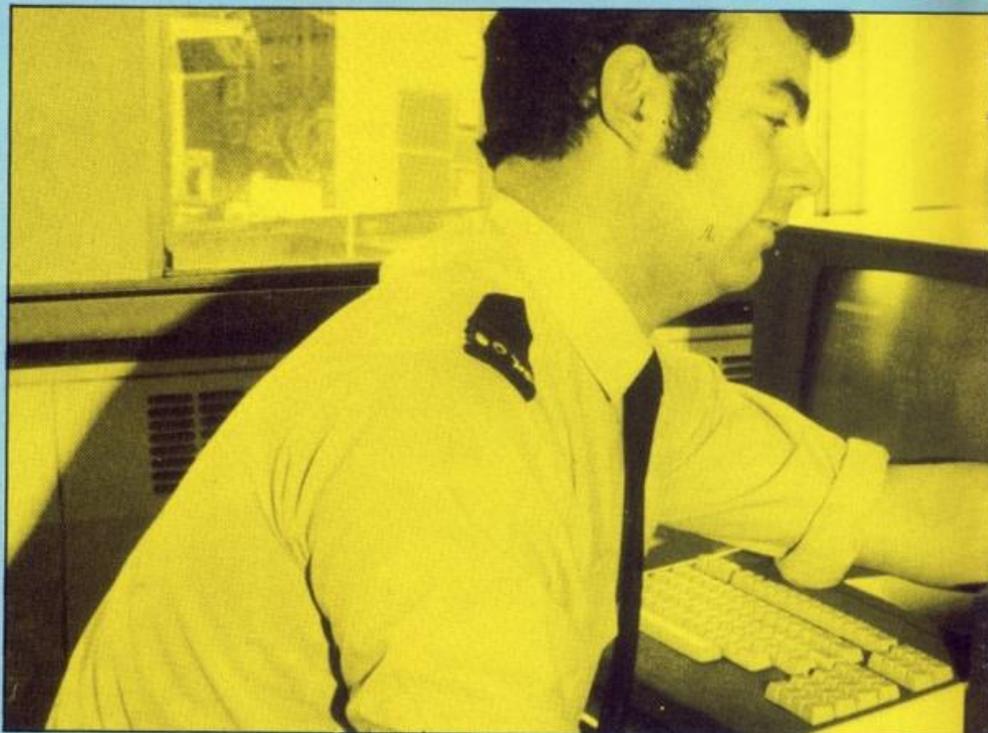
COMPUTER CRIMINALS will steal at least £1 billion in Britain this year — that's a Great Train Robbery every day in 1985. But unlike the train robbers, most of the electronic thieves will get away with it and even if they are caught, financial institutions are unwilling to prosecute because public confidence 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 unscripted diversion of funds.

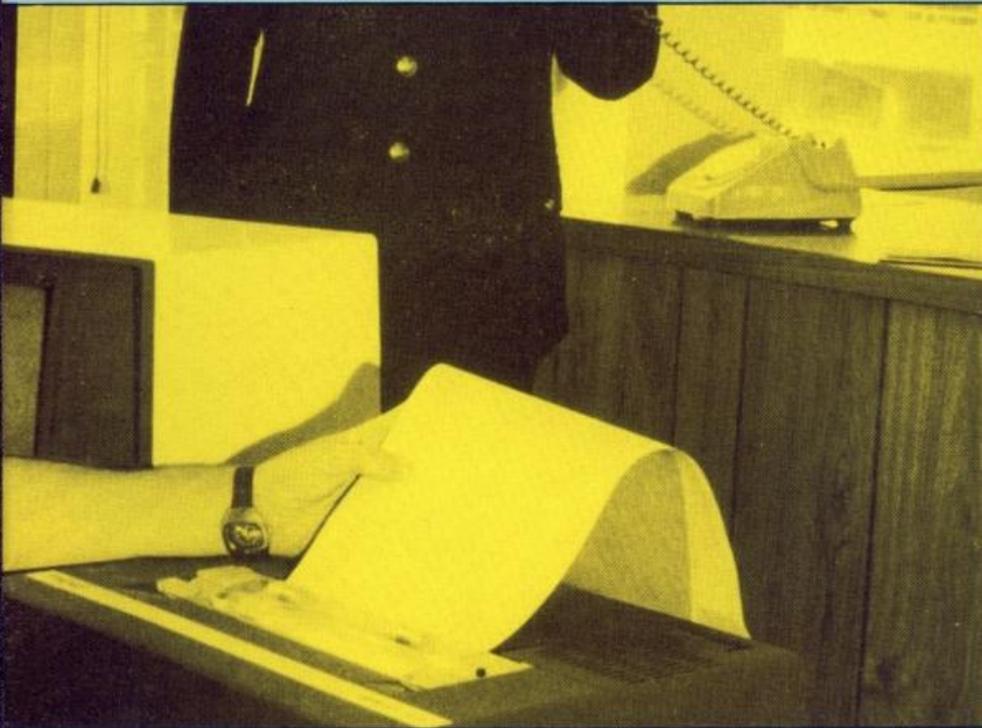
These became known as Time Bombs if they were triggered by the central processor clock and Logic Bombs if they were set off by a par-

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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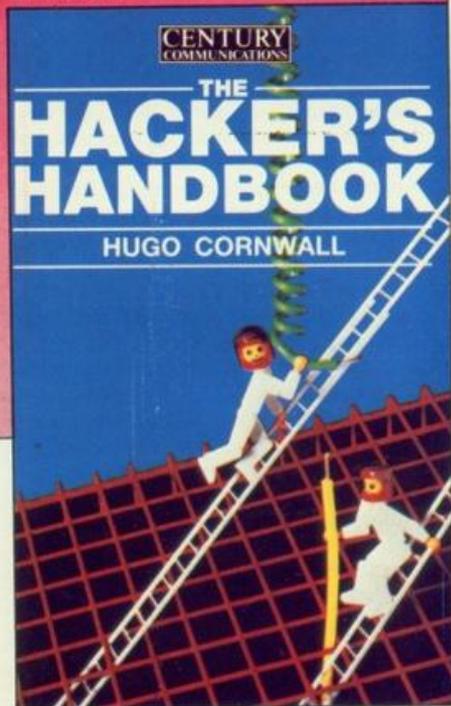
WIN AN ENTERPRISE

Competition



Win £600 of prizes from Enterprise for the best idea how to cheat in an exam or pull off a scam using a computer. Five runners will each get two great books on hacking and computer crime.

Enterprise computers is putting up its first 128K Ram computer together with a printer and software to make a fabulous first prize.



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

COMPUTER CRIMES AND CAPERS

TEN STORIES OF CRIME AND SUSPENSE SET IN THE HIGH-TECH WORLD OF MODERN COMPUTERS

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



Runners-up can brush up their cheating with Viking Press's Isaac Asimov collection of silicon science fiction called Computer Crimes and Capers plus...

RULES

- 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.
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Idea _____

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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.

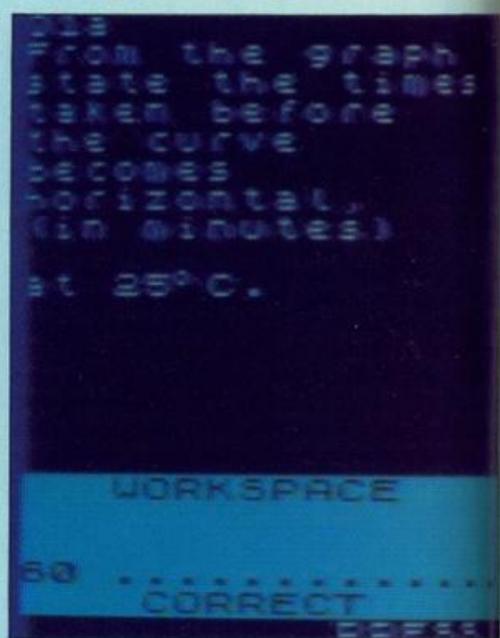
Thus the program constantly makes the user think for himself as well as providing information. It's the kind of service a good teacher would like to give, but never has the time — or perhaps the database — for.

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.

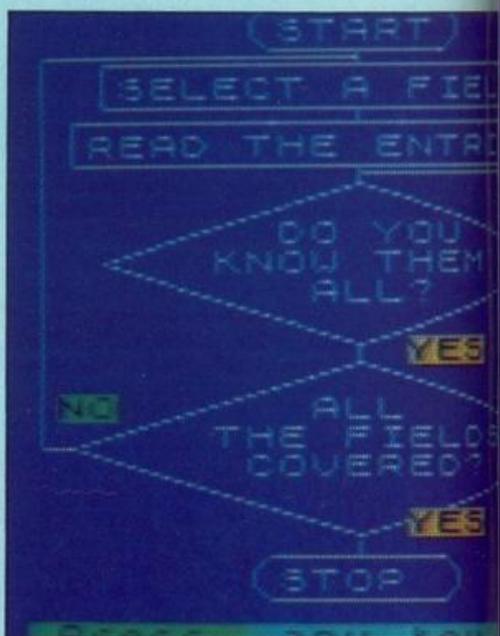
In the Hill MacGibbon/Pan Study Aids Software series you get two tapes and the Pan Study Aid book in a hefty £14.95 package. The program starts off with Diagnostic Test in which you have to choose the answers from an accompanying booklet. On completion you get a report showing how you've done.

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

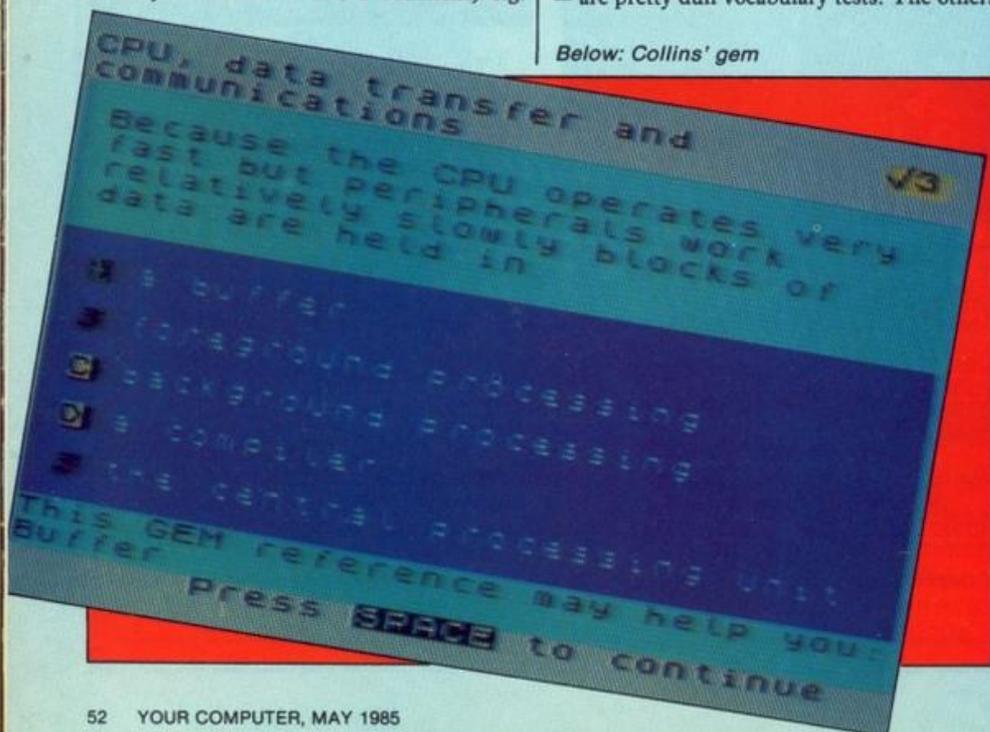


Above: Pan biology



Above: Longman's biology

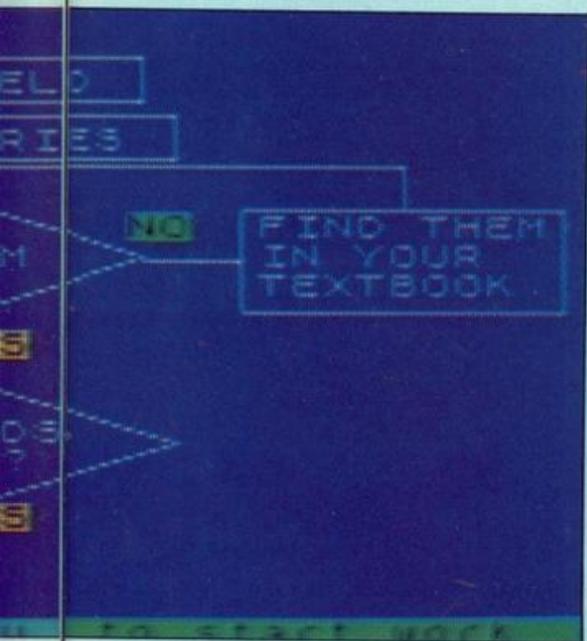
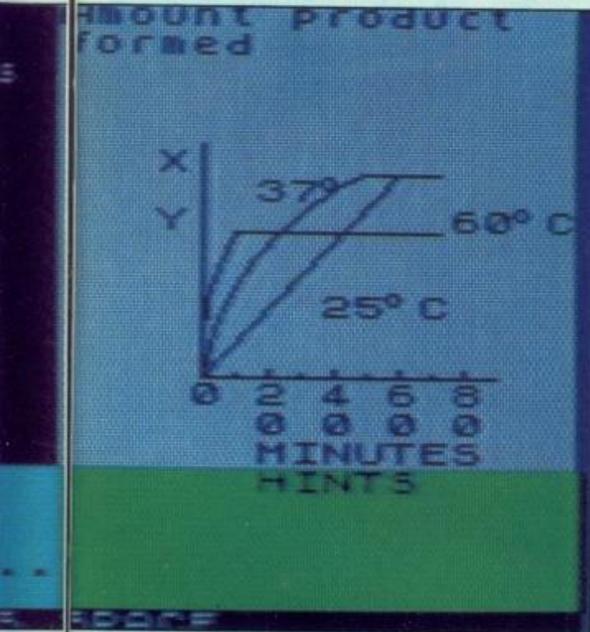
Below: Collins' gem



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.

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

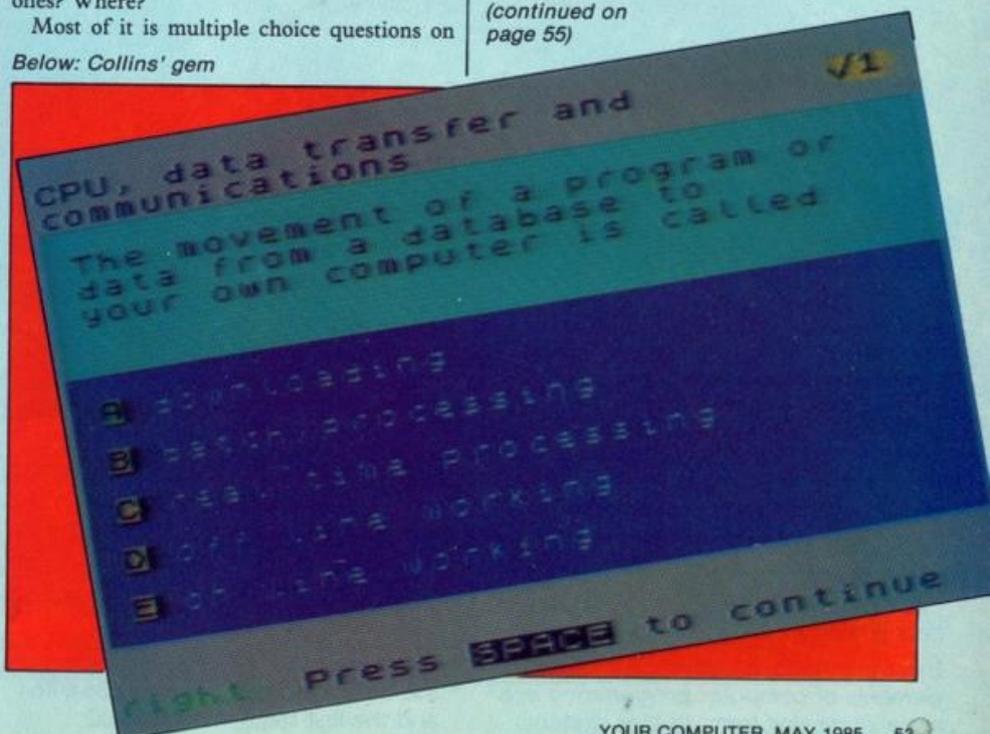
various topics. But each section contains only 20-32 questions, which doesn't really seem enough. There is also a diagram program. The package doesn't really have enough to offer the student in terms of variety or fun. Both Longman and Collins offer Computer Studies revision software, the Collins once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

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THE BBC & ACORN ELECTRON First Steps in BASIC

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

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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

ANSWER: (d) IS CORRECT. Here is a Hint:
The Mechanical Advantage A is L/h and the effort E required is the load L divided by A .

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).

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 r to repeat, f to finish, or n for next.

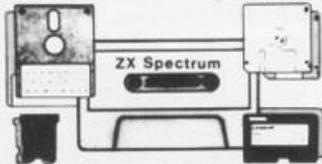
Left: Longman's biology

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(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 $x = 1$

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
---	---	----

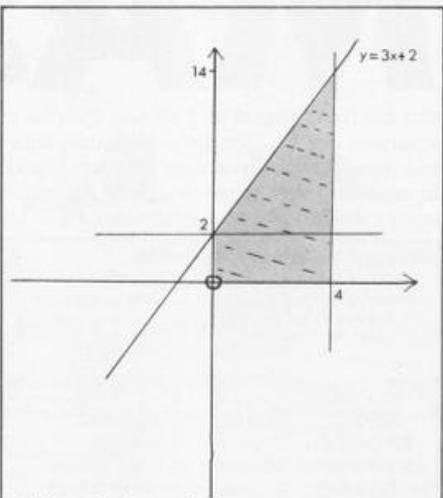


Figure 2. Area of triangle + rectangle.
 $= \frac{1}{2} \times 4 \times 10 + 2 \times 4$
 $= 20 + 12$
 $= 32$

-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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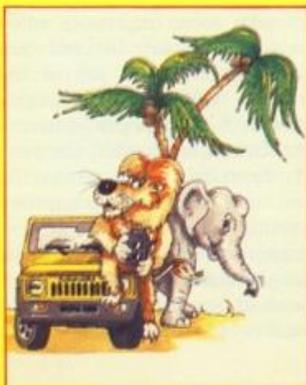
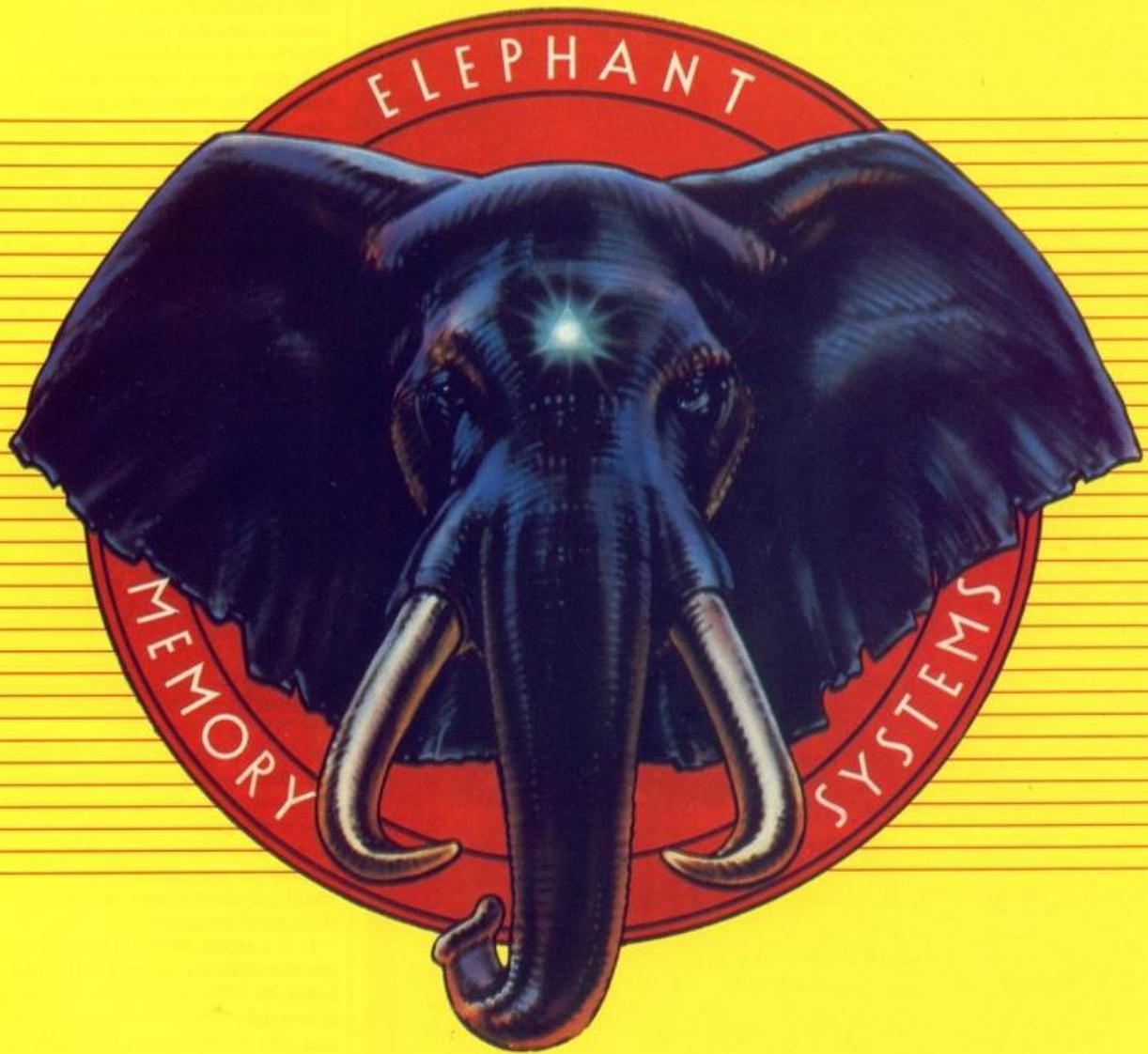
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AMSTRAD AND SPECTRUM LANDSCAPE

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.

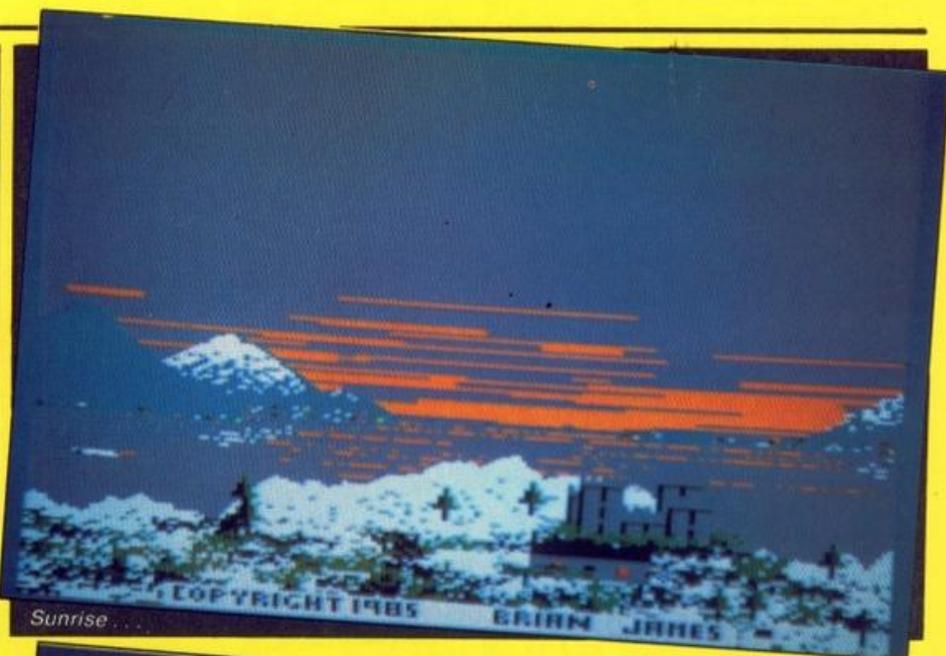
Routines for plotting

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.

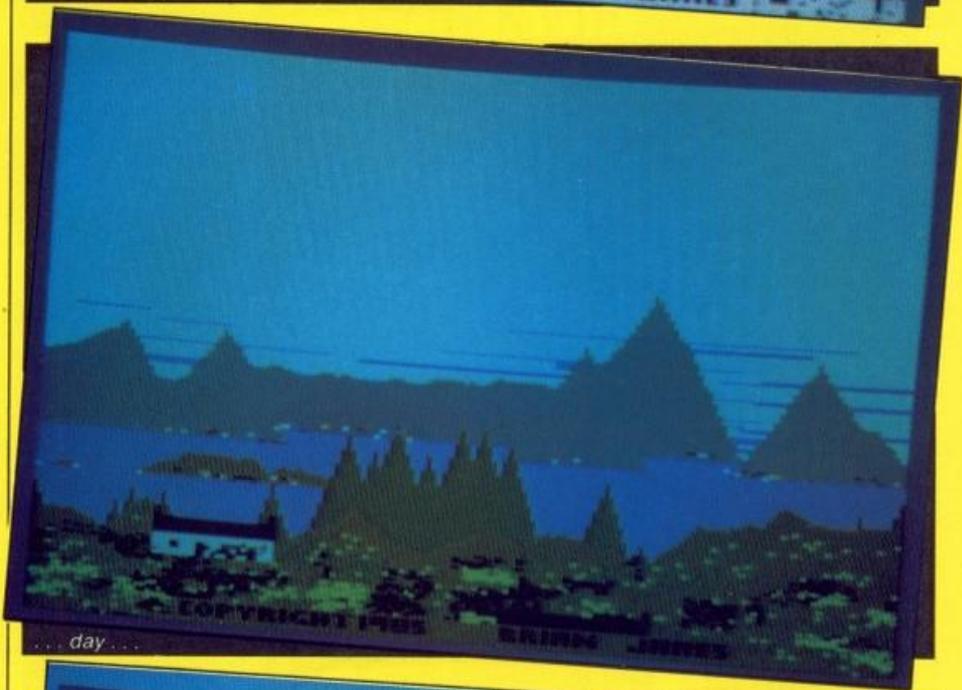
In the Landscape Creator, the object was to have the maximum variety of pictures. Whether it is creating a rugged skyline, an island, a patch of buttercups, or a castle, a flexible routine is used which combines probability functions with appropriate mathematics.

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)



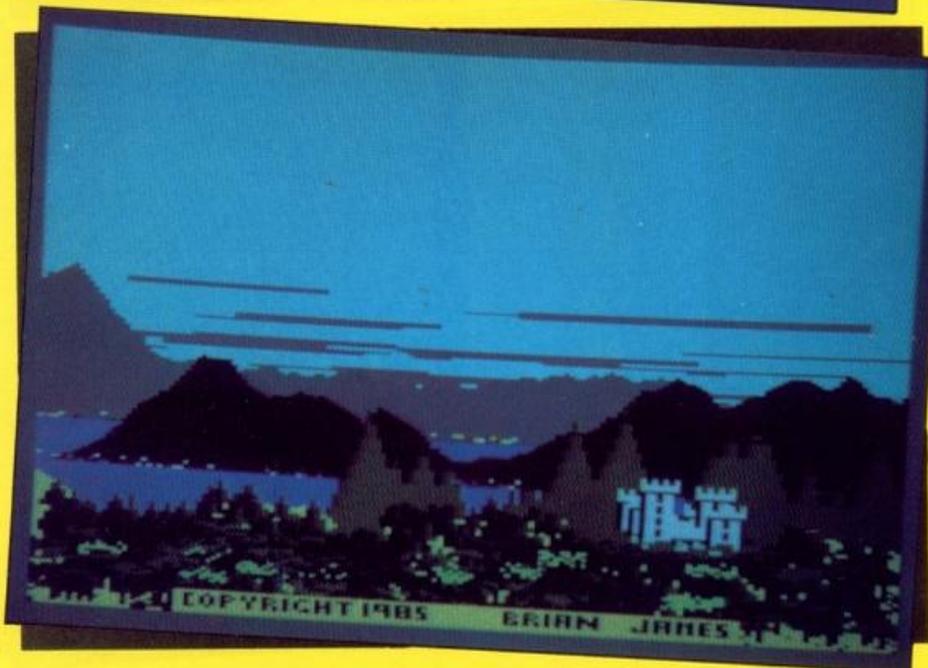
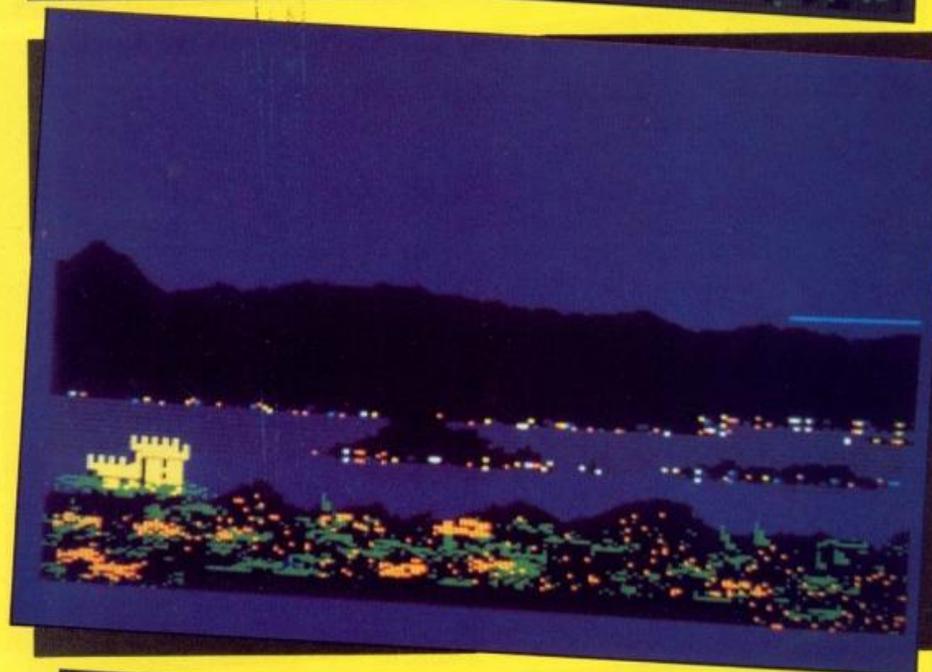
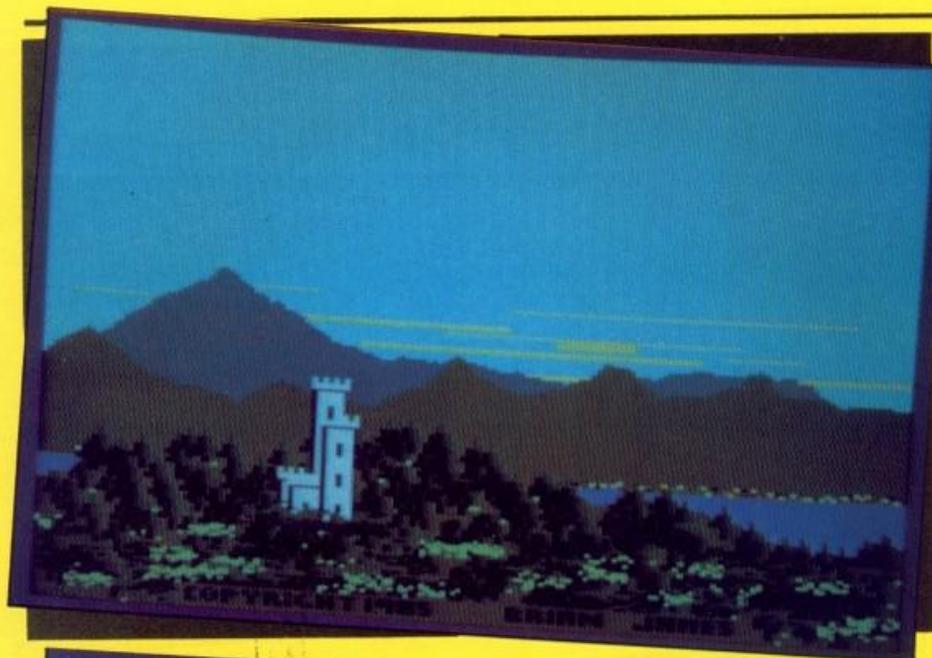
... sunrise ...



... day ...



... sunset ...



(continued from previous page)

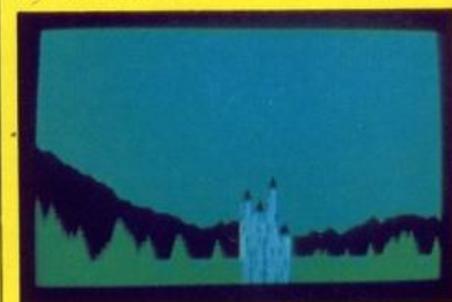
reflecting the hills and sky beyond. The precise formulation of the fundamental properties of a landscape is a subjective process — and this is where the art comes in — and the inspiration for this task came from the Highlands of Scotland and also Cumbria.

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 phases. 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.

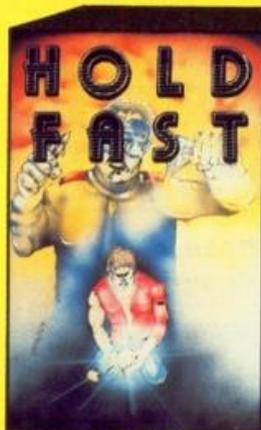
The number of sine waves used in nn . You can try putting in a larger number, say $nn=20$ or $nn=50$. The curve becomes more and more complex — but very much slower. This method is very good for smooth curves, but becomes too cumbersome and slow for very rough crinkly lines.

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.

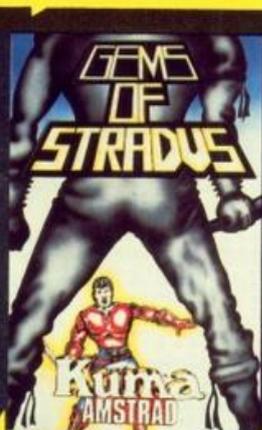
I can supply the Landscape Creator doubly recorded on cassette, for the Amstrad or the Spectrum 48K. Send £5 for the Amstrad version, or £3 for the Spectrum version, to — Brian James, 21 Lamond Place, Aberdeen AB2 3UT.

the only choice

Kuma AMSTRAD CPC464 software



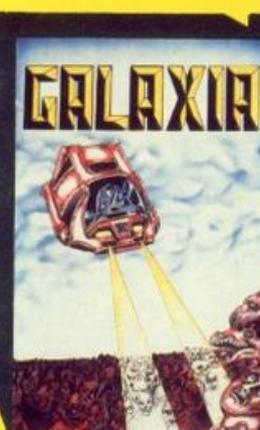
Holdfast



Gems of Stradus



Star Avengers



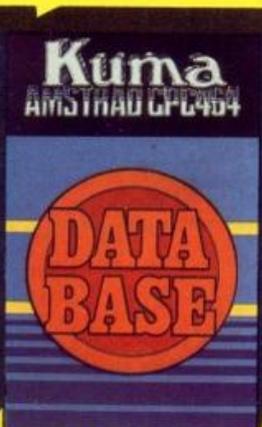
Galaxia



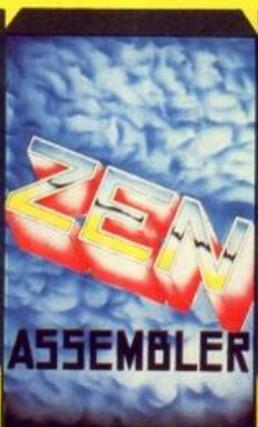
Music Composer



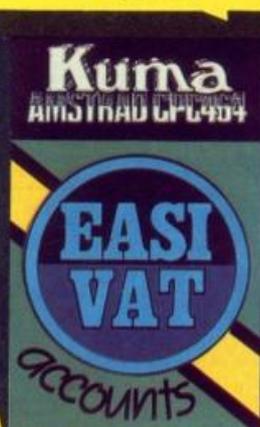
Logo



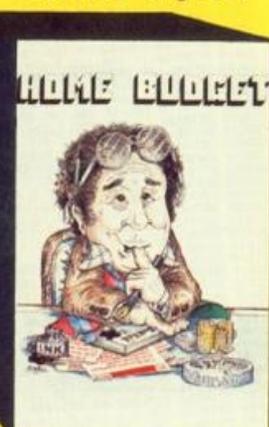
Database



ZEN Assembler



EASIVAT



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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 READR: IFR=1THEM40
20 POKE36864+T256+X,R: NEXTX
48 NEXTX
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 DTR185,0,140,141,1,212,165,0,149,141,0,212,169,17,141,4,212,165,0,147
100 DTR169,0,141,0,147,141,212,165,0,149,141,0,212,165,0,150,141,1,147,76,49,234
110 POKE37632,0:POKE37633,0:FOR=0T02:READR:LF,D
130 POKE38144+T,22:POKE38145+T,227:POKE38400+T,180:POKE37380,T+1
140 DTR220,177,30,25,177,30,32,54,30,20,214,30,25,177,30,22,227,30,22,227,30
150 DTR170,214,30,25,177,30,32,54,30,20,214,30,25,177,30,22,227,30,22,227,30
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1000 DTR25,177,30,25,177,30,32,54,30,20,214,30,25,177,30,22,227,30,22,227,30
```


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:LOCX=4000
50 FOR ZX=0 TO 2
60 CLS
70 PROCdatachasvert
80 X%=340
90 RESTORE XX
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 CIRCX=0 TO 360 STEP 30:XX=CIRCX*PI/90:AX=44*
COS XX:BX=44*SIN XX:MOVE 0,0:DRAW AX,BX: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,ZX-7,8,ZX-7
,8,ZX-4,5,ZX-4,5,ZX-1,8,ZX-1,8,ZX+2,5,ZX+2,5,ZX+5,8,ZX
+5
350 DATA -1007,ZX-7,-4,ZX-7,-4,ZX-4,-7,ZX-4,-7,ZX-1,
-4,ZX-1,-4,ZX+2,-7,ZX+2,-7,ZX+5,-4,ZX+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,-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,
3,0,3,3,0,3,1,1,3,2,3,3,2,9,0,0,9,3,3,3,4,7,8,1500,150
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,-2,3,0,2,0,3,1,3,2,9,0,8,9,3,3,3,4,7,8,2,3
,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 AX,BX:IF AX=1500 THEN GOTO 620
610 PROCdraw
620 UNTIL AX=1500:PROCstore:RESTORE XX:CLS:MOVE 0,0
630 REPEAT:READ AX,BX:IF AX=1500 THEN GOTO 670
640 IF AX>1000 THEN AX=AX-1000:CX=AX:AX=BX:BX=CX:AX=
AX+1000:PROCdraw:UNTIL FALSE
650 IF AX<-1000 THEN AX=AX+1000:CX=AX:AX=BX:BX=CX:AX=
AX-1000:PROCdraw:UNTIL FALSE
660 CX=AX:AX=BX:BX=CX:PROCdraw
670 UNTIL AX=1500:PROCstore:RESTORE XX:CLS:MOVE 0,0
680 REPEAT:READ AX,BX:IF AX=1500 THEN GOTO 700
690 AX=AX*-1:BX=BX*-1:PROCdraw
700 UNTIL AX=1500:PROCstore:RESTORE XX:CLS:MOVE 0,0
710 REPEAT:READ AX,BX:IF AX=1500 THEN GOTO 750
720 IF AX>1000 THEN AX=AX-1000:CX=AX:AX=BX:BX=CX:AX=
```



BBC

TANKS



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.

```

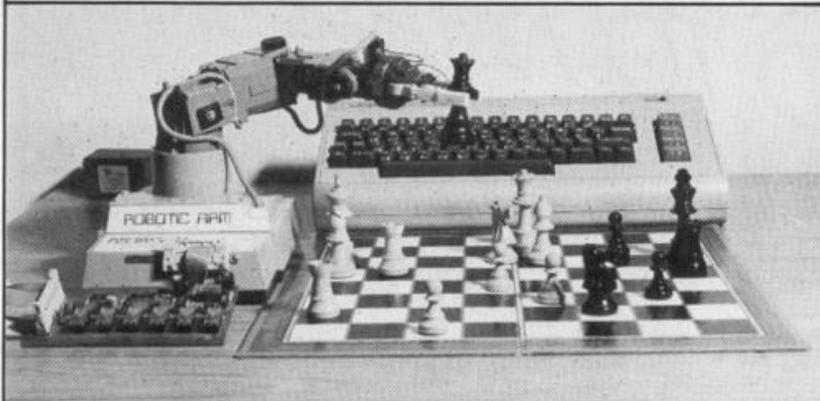
AX=1:BX=BX-1:AX=AX+1000:PROCdraw:UNTIL FALSE
730 IF AX<1000 THEN AX=AX+1000:CL=AX:AX=BX:BX=CX:AX
=AX-1:BX=BX-1:AX=AX-1000:PROCdraw:UNTIL FALSE
740 CX=AX:AX=BX:BX=CX:AX=AX-1:BX=BX-1:PROCdraw
750 UNTIL AX=1500:PROCstore:CLS:ENDPROC
760
770 DEFPROCdraw$1$0
780 CL:MOVE B,B
790 REPEAT:READ AX,BX:IF AX=1500 THEN GOTO 810
800 PROCdraw
810 UNTIL AX=1500:PROCstore:RESTORE X:CLS:MOVE B,0
820 REPEAT:READ AX,BX:IF AX=1500 THEN GOTO 840
830 AX=AX-1:PROCdraw
840 UNTIL AX=1500:PROCstore:RESTORE X:CLS:MOVE B,0
850 REPEAT:READ AX,BX:IF AX=1500 THEN GOTO 870
860 AX=AX-1:BX=BX-1:PROCdraw
870 UNTIL AX=1500:PROCstore:RESTORE X:CLS:MOVE B,0
880 REPEAT:READ AX,BX:IF AX=1500 THEN GOTO 900
890 BX=BX-1:PROCdraw
900 UNTIL AX=1500:PROCstore:CLS: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 FX=66A10 TO 66AF:7LOCX=7FX:LOCX=LOCX+1:NEXT
990 FOR FX=66B00 TO 66BAF:7LOCX=7FX:LOCX=LOCX+1:NEXT
1000 FOR FX=66C00 TO 66CAF:7LOCX=7FX:LOCX=LOCX+1:NEXT
1010 ENDPROC

```

Listing 3.

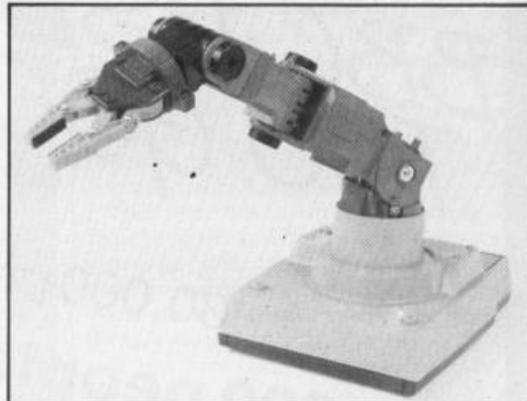
10 HEN TANKS-3 BY N. SHEARD
20 CN ERROR GOTO 50
30 HIX=0
40 SCOREX=0
50 MODE 7:VDU 23(8202)0;0;0
60 PROCINSTRUCTIONS
70 MODE 4:VDU 23(8202)0;0;0
80 VDU 19,1,0,0,0,0;VDU 19,0,3,0,0,0
90 LIVESX=4
100 PROCachinocode
110 RESTOREPROCdata
120 PROCnewlife
130 GOTO 160
140 RESTOREPROCdata
150 PROCscreen
160 SX=20;HX=16
170 TURX=0;CHASX=0;ROTX=1
180 DIRX=0;TRACKX=2;SUNX=4
190 PROCgame
200 IF 765030=0 AND 765030=0 AND 765040=0 AND 765040=0
AND SCOREX=SCOREX+1000;RESTOREPROCdata;CLS;GOTO140
210 GOTO 190
220
230 DEFPROCdraw
240 AX=(AX+72)+4000;BX=(BX+72)+4000
250 EX=(EX+320)+(CX+0)+5000;7672=EX MOD 256
260 7674=AX MOD 256;7675=AX DIV 256
270 7676=BX MOD 256;7677=BX DIV 256
280 7678=EX MOD 256;7679=EX DIV 256
290 CALL control
300 ENDPROC
310
320 DEFPROCcheck
330 EX=(EX+320)+(CX+0)+5000
340 7672=EX MOD 256;7673=EX DIV 256
350 CALL check
360 ENDPROC
370
380 DEFPROCclear
390 EX=(EX+320)+(CX+0)+5000
400 7672=EX MOD 256;7673=EX DIV 256
410 CALL blank
420 ENDPROC
430
440 DEFPROCdata
450 DATA 0,12,1,15,2,14,3,13
460 FOR ZX=45000 TO 45007;READ XI;ZX=XI;NEXT
470 DATA 16,20,17,23,18,22,19,21
480 FOR ZX=45010 TO 45017;READ XI;ZX=XI;NEXT
490 DATA 24,28,25,31,26,30,27,29
500 FOR ZX=45020 TO 45027;READ XI;ZX=XI;NEXT
510 DATA 0,134,162,99,166,144,12,06,200,0,102,236,96
0
520 MEMX=4200
530 FOR X=1 TO 14;READ PX;AX=X
540 REPEAT:IF AX AND PX THEN THEMX=1 ELSE THEMX=0
550 AX=AX DIV 2;MEMX=MEMX+1;UNTIL AX=0;NEXT X
560 VDU 23,224,85,178,85,178,85,178,85,178
570 VDU 23,225,0,0,255,0,255,0,0
580 VDU 23,226,0,0,0,24,24,0,0
590 DATA 1,1,0,0,10,2,2,25,1,1,4,10,2,2,5,1,1,0,0,
18,2,35,6,1,1,0,0,10,2,35,27
600 FOR ZX=45030 TO 45047;READ XI;ZX=XI;NEXT
610 REPEAT:715030=(INT(RND(4))-1)*40=>UNTIL RND(1)
>.2
620 FOR ZX=45040 TO 45077;ZX=0;NEXT
630 DATA 13,6,13,6,13,6,21,12,29,6,33,6,49,12,49,6,4
1,6,33,6,21,12,33,6,13,12,13,6,13,6,13,6,21,12,29,6,33
6,49,12,49,6,4,1,6,33,6,21,12,33,6,13,6,13,6,21,1
640 LOCX=45700;REPEAT:READ AX;BX;LOCX=AX;7(LOCX)=
BX;LOCX=LOCX+2;UNTIL AX=1
650 ENDPROC
660
670 DEFPROCTank
680 TRACKX=TRACKX+4;IF TRACKX=14 TRACKX=0
690 IF ROTX<0 SUNX=SUNX-1 ELSE SUNX=SUNX+1
700 IF SUNX<0 ROTX=0
710 IF SUNX<3 ROTX=0
720 IF LIVESX=1 GOTO 740
730 AX=(7(45010)+SUNX)+72+4000;7674=AX MOD 256;7675
=AX DIV 256;7600=LIVESX+1;7676=AX MOD 256;7677=
740 CX=0;DX=HX
750 CHASX=CHASX-(INKEY(67))+INKEY(98)
760 TURX=TURX-(INKEY(67))+INKEY(98)
770 TURX=TURX-(INKEY(185))+INKEY(184)
780 IF TURX<0 TURX=0
790 IF TURX>72 TURX=0
800 IF CHASX<0 CHASX=0
810 IF CHASX>72 CHASX=72
820 AX=(7(45010)+SUNX)+72+4000;7674=AX MOD 256;7675
830 FILX=CX;FILY=DX
840 IF INKEY(99) AND CHASX=0 THEN DX=DX-1
850 IF INKEY(99) AND CHASX=72 THEN DX=DX+1
860 IF INKEY(99) AND CHASX=0 THEN DX=DX-1
870 IF INKEY(99) AND CHASX=72 THEN DX=DX+1
880 VARX=CX;VARY=DX
890 CX=FILX;DX=FILY
900 PROCclear
910 CX=VARX;DX=VARY
920 PROCcheck
930 IF 7679=0 CX=0;DX=HX ELSE SX=CX;HX=DX
940 PROCdraw
950 IF INKEY(1) AND TURX MOD 2=0 THEN GOTO 960;ELSE
ENDPROC
960 FX=45078;IF 7FX=0 GOTO 980
970 FX=45074;IF 7FX=0 GOTO 980 ELSE ENDPROC
980 7FX=1;7(FX-1)=TURX;7(FX+2)=0X=1;7(FX+3)=0X=1;ZX=
FX;PROCnewshell;CX=7(FX+2);DX=7(FX+3);PROCshellcheck;S
OUND 0,-15,4,2
990 IF 7678=0 7FX=0
1000 ENDPROC
1010
1020 DEFPROCscreen
1030 MEMX=4200
1040 FOR YX=4 TO 20 STEP 3;FOR X=2 TO 35 STEP 3;IF ?
MEMX=MEMX+1;CX=X;DX=Y;PROCdraw
1050 MEMX=MEMX+1;NEXT Y;NEXT X;CHR\$(224);NEXT
1060 FOR YX=0 TO 20;PRINTTAB(YX,0);CHR\$(224);NEXT
NEXT
1070 FOR AX=0 TO 30;PRINTTAB(0,AX);CHR\$(224);CHR\$(224)
;PRINTTAB(30,AX);CHR\$(224);CHR\$(224);NEXT
1080 FOR AX=0 TO 30;PRINTTAB(AX,3);CHR\$(224);NEXT
1090 FOR AX=47800 TO 47877 STEP 2;7(AX+85)=7(AX+1)-170;
NEXT
1100 FOR AX=0 TO 2;PRINTTAB(26,AX);CHR\$(224);CHR\$(224)
;CHR\$(224);NEXT
1110 PRINTTAB(29,3);CHR\$(225);CHR\$(225);CHR\$(225);PRI
NTTAB(0,30);CHR\$(224);CHR\$(224)
1120 PRINTTAB(5,2);"SCORE=";SCOREX;PRINTTAB(5,1);"HI-
SCORE=";HI
1130 IF LIVESX=4 GOTO1150
1140 CX=29;FOR VARX=0 TO LIVESX-1;AX=2;BX=18;CX=29+VA
RX;DX=0;PROCclear;NEXT
1150 IF LIVESX=1 ENDPROC
1160 CX=29;FOR VARX=0 TO LIVESX-2;AX=2;BX=18;CX=29+VA
RX;DX=0;PROCdraw;NEXT
1170 ENDPROC
1180
1190 DEFPROCsearch
1200 FOR ZX=45030 TO 45047 STEP 0
1210 ENNX=7(ZX+6);ENYX=7(ZX+7)
1220 IF ZX=0 NEXT ZX;ENDPROC
1230 PROCsearch
1240 CX=ENNX;DX=ENYX
1250 PROCclear
1260 IF 7(ZX+4)<18 GOTO 1310
1270 IF 7(ZX+2)=0 THEN CX=DX-1
1280 IF 7(ZX+2)=2 THEN CX=CX+1
1290 IF 7(ZX+2)=4 THEN DX=DX+1
1300 IF 7(ZX+2)=6 THEN DX=DX-1
1310 PROCcheck;IF 7678=0 7(ZX+6)=CX;7(ZX+7)=DX ELSE C
X=ENNX;DX=ENYX;7(ZX+6)=CX;7(ZX+7)=DX
1320 AX=(45000+7(ZX+2));BX=(45020+7(ZX+3))
1330 PROCdraw
1340 7678=0
1350 AX=(INT(RND(3))-1)+4+45000
1360 IF 7(ZX+3) MOD 2=0 AND 7(AX+0) AND RND(1)>.2 7(AX+1)
7(AX+2)=7(ZX+3);7(AX+2)=7(ZX+6);7(AX+3)=7(ZX+7);+1;F
X=ZX;DX=0;PROCnewshell;PROCnewshell;ZX=7(AX+2);7(AX+2)
1370 IF 7678=1 7678=0
1380 NEXT ZX;ENDPROC
1390
1400 DEFPROCdraw
1410 7(ZX+3)=7(ZX+2)+SUNX+4
1420 7(ZX+4)=7(ZX+3)+0 AND (ENNX-2) MOD 3=0 AND (ENYX-1)
MOD 3=0 THEN PROCinfection
1430 IF 7(ZX+4)=18 7(ZX+2)=7(ZX+2)+1;7(ZX+3)=7(ZX+3)+
1;7(ZX+4)=7(ZX+4)-1
1440 IF 7(ZX+4)=18 7(ZX+2)=7(ZX+2)-1;7(ZX+3)=7(ZX+3)-
1;7(ZX+4)=7(ZX+4)+1
1450 IF 7(ZX+4)=0 OR 7(ZX+4)=18 7(ZX+4)=0
1460 IF 7(ZX+3)>250 7(ZX+3)=7
1470 IF 7(ZX+3)>7 7(ZX+3)=7(7(ZX+3)-1)
1480 IF 7(ZX+2)>7 7(ZX+2)=7
1490 IF 7(ZX+2)>7 7(ZX+2)=7
1500 ENDPROC
1510
1520 DEFPROCdirection
1530 CX=ENNX;DX=ENYX;EX=(DX+320)+(CX+0)+5000;7670=EX
MOD 256;7670=EX DIV 256
1540 CALL tankcheck;VARX=7670
1550 IF VARX=0;ENDPROC
1560 IF VARX=1;GOTO 1590
1570 IF VARX=1;DIRX=1;REPEAT:DIRX=DIRX+1;IF DIRX=4 T
HEN ENDPROC
1580 UNTIL 7(DIRX+5000)=1;PROCnewdirect;ENDPROC
1590 AX=7(ZX+2)+4;IF AX>7 AX=AX-8
1600 7(45000)=4+2;+1
1610 AX=INT(RND(4))+4+5000;IF 7(AX)=1 DIRX=(AX-5000);
PROCnewdirect;ENDPROC ELSE GOTO1610
1620
1630 DEFPROCnewdirect
1640 AX=7(ZX+2)/2
1650 IF AX=DIRX=2 OR DIRX=AX=2 7(ZX+4)=4;ENDPROC
1660 IF AX=0 AND DIRX=0 7(ZX+4)=18;ENDPROC
1670 IF AX=0 AND DIRX=3 7(ZX+4)=2;ENDPROC
1680 IF AX=DIRX=0 7(ZX+4)=2;ENDPROC
1690 IF AX=DIRX=0 7(ZX+4)=18;ENDPROC
1700 ENDPROC
1710
1720 DEFPROCgame
1730 TIME=0
1740 PROCshell
1750 PROCnewshell
1760 PROCtank
1770 PROCnewshell
1780 PROCshell
1790 PROCnewshell
1800 REPEAT UNTIL TIME>35
1810 PRINTTAB(5,2);"SCORE=";SCOREX
1820 IF SCOREX=HI;HI=SCOREX
1830 PRINTTAB(5,1);"HI-SCORE=";HI
1840 ENDPROC
1850
1860 DEFPROCachinocode
1870 FOR 7FX=0 TO 2 STEP 2
1880 FX=45100
1890
1900 OPT pass
1910 .move
1920 LDY #610
1930 .loop
1940 DEY;LDA(70);Y;ORA(67);Y;STA(67);Y;DPY#0;BNE 1
oop;RTS
1950
1960 .control
1970 LDA 674;STA 670;LDA 675;STA 671;JSR move;LDA 674
;STA 670;LDA 675;STA 671;JSR move;LDA 674;CLC;ADC #610
;STA 674;LDA 675;ADC #610;STA 675;LDA 674;CLC;ADC #610;
STA 674;LDA 677;ADC #610;STA 677;LDA 675;CLC;ADC #640;S
TA 672
1980 LDA 673;ADC #610;STA 673
1990 LDA 674;ADC #610;STA 674
2000 LDA 675;ADC #610;STA 675
2010 LDA 676;ADC #610;STA 676
2020 LDA 677;ADC #610;STA 677
2030 LDA 678;ADC #610;STA 678
2040 LDA 679;ADC #610;STA 679
2050 LDA 680;ADC #610;STA 680
2060 LDA 681;ADC #610;STA 681
2070 LDA 682;ADC #610;STA 682
2080 LDA 683;ADC #610;STA 683
2090 LDA 684;ADC #610;STA 684
2100 LDA 685;ADC #610;STA 685
2110 LDA 686;ADC #610;STA 686
2120 LDA 687;ADC #610;STA 687
2130 LDA 688;ADC #610;STA 688
2140 LDA 689;ADC #610;STA 689
2150 LDA 690;ADC #610;STA 690
2160 LDA 691;ADC #610;STA 691
2170 LDA 692;ADC #610;STA 692
2180
2190 .shellcheck
2200 LDY #68
2210 .s_loop
2220 DEY;LDA(672);Y;BNE s_found;DPY #6;BNE s_loop;L
DA #6;STA 670;RTS
2230 .s_found;LDA #6;STA 670;RTS
2240
2250 .buffer
2260 LDA #250;LDA #60;JSR LFFFA;STX 670;RTS
2270
2280 .tankcheck
2290 LDA #0;STA 670;LDA 670;BCC #0;STA 671;LDA 671;BCC
#0;STA 672;LDA 672;BCC #0;STA 673;LDA 673;BCC #0;STA 674
;LDA 674;BCC #0;STA 675;LDA 675;BCC #0;STA 676;LDA 676;B
CC #0;STA 677;LDA 677;BCC #0;STA 678;LDA 678;BCC #0;STA
679;LDA 679;BCC #0;STA 680;STA 680;STA 680;STA 680
2300 LDA 670;BCC #0;STA 671;LDA 671;BCC #0;STA 672;LDA
672;BCC #0;STA 673;LDA 673;BCC #0;STA 674;LDA 674;BCC
#0;STA 675;LDA 675;BCC #0;STA 676;LDA 676;BCC #0;STA
677;LDA 677;BCC #0;STA 678;LDA 678;BCC #0;STA 679;LDA
679;BCC #0;STA 680;STA 680;STA 680;STA 680
2310 END
2320 END

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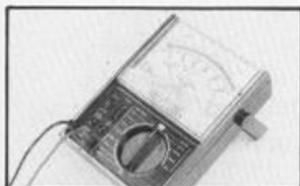


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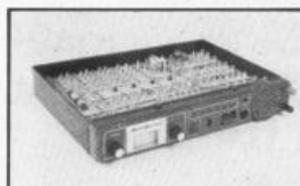
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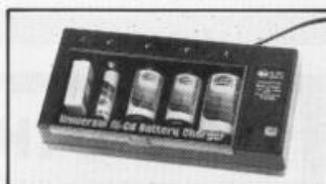
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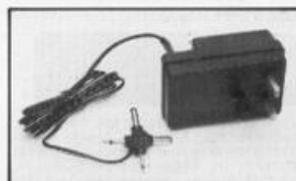


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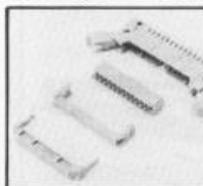
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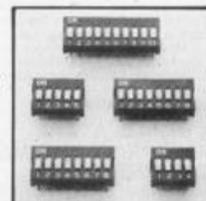
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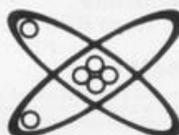
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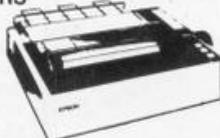
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Interface

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.



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00416	2045474753205746	00928	CD10677CEE10E610	=	961	31440	2020202000004504C	=	2028	31952	47C50046454E40CE	=	749
00424	4943482004B41408A	00936	F60307E61020022AC	=	676	31448	48415344550545050	=	846	31960	02444F4F825535445	=	546
00432	00484133204C4F753	00944	20C22A958E1D1C1110	=	981	31456	452059445555204E	=	846	31968	D00148414C4C5741	=	650
00440	542E20974354E20	00952	D9210975A7030079	=	1080	31464	414045300047A0E1	=	785	31976	D9035535441495203	=	315
00448	414C402045474753	00960	4F3E359132058C0	=	904	31472	050825C0D17537	=	978	31984	015338415245205E	=	434
00456	2048415645500424E	00968	A175C34978CD995A	=	1135	31480	CD1878C08F7E30FE	=	1318	31992	4F4FC0014D41494E	=	857
00464	454E2B46464554E44	00976	3E00C01CC8D05721	=	531	31488	00280F8C0D1067F1	=	890	32000	20424544524F4FCD	=	650
00472	20524455455524E4E	00984	0502197EC922C058	=	704	31496	C1E1772110E4C3A1	=	1172	32008	014C4956494E4720	=	490
00480	20E447054434E20	00992	17320435CEBAF08CD	=	917	31504	75C1E135682310FB	=	923	32016	524F4FC033504154	=	877
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00496	00C4C47431154494F	1008	3A818C1F79300CFE	=	745	31520	F8C0E6520F61C28	=	1086	32032	4820424544524FAF	=	850
00504	4E2E2B2B2E20415E4	1016	53CA3378FEAFC3E	=	1050	31528	F81D186C21D05806	=	747	32040	CD034C414E44494E	=	646
00512	4844454549454E47	1024	783813FE52CA2C7E	=	866	31536	04C5555C0A175C0	=	1315	32048	C70142415448524F	=	648
00520	4844454549454E47	1032	FE00CA9278FE3138	=	1091	31544	AD65110802CDD7503	=	687	32056	4FC0004741524147	=	677
00528	0048444745463004F	1040	05FE350AF0781AE6	=	1146	31552	044850248383220	=	496	32064	C501535452454504	=	797
00536	2020454154414C20	1048	78FB20029292901	=	400	31560	52455155449524544	=	500	32072	0248524F54524044	=	455
00544	434F4C4C4955494F	1056	007D09034F08000	=	543	31568	040A4550204544F52	=	528	32080	4F4FCD00504F4E44	=	673
00552	4844454549454E47	1064	0E231FF590C793C	=	786	31576	3A8CC12E19E9A22A9	=	854	32088	2320202020A00043	=	387
00560	414E454448444E47	1072	471A901F0D6E0186	=	839	31584	E811E8503E0490C0	=	845	32096	4F4C504F53524048	=	856
00568	204544534523020	1080	772413C110EFD108	=	839	31592	3066A7CD1878E1C1	=	1090	32104	4541D00048454447	=	682
00576	002D2020202020270	1088	3CE50720A1001A13	=	543	31600	73845D40003E0590	=	553	32112	45524FD700465255	=	692
00584	4844454549454E47	1096	C87F2892BAC5910	=	902	31608	471A05200028E2E20	=	416	32120	49542054524545D3	=	704
00592	4844454549454E47	1104	9CD0D5E1007D22	=	818	31616	F8E84110AC05C500	=	1193	32128	0857414CC02354	=	601
00600	4F5054494F4E532C	1112	6850E0632A75E11	=	601	31624	CD106C141E12010	=	871	32136	5245455420434FAF	=	754
00608	004F52205320454E	1120	C178AF32FB792100	=	946	31632	AR0CA1785C3E7008	=	1028	32144	4E45D0247415244	=	646
00616	0020535441525420	1128	0022A958DF4793E	=	926	31640	205021500197E21	=	246	32152	454E20504154C800	=	608
00624	2020203803D4020	1136	0E232FB793E0532A7	=	708	31648	577B06044E280423	=	583	32160	6699888611996500	=	909
00632	002020200000647	1144	581134721060222	=	359	31656	10FAC90104000500	=	400	32168	F9390E8598F900	=	428
00640	2041D04020452020	1152	A958C0F4791E000E	=	887	31664	3001097FC8E30D0F	=	639	32176	46998886611996500	=	754
00648	004F205020542049	1160	0521C050E218E75	=	889	31672	00141515177FFDFF	=	541	32184	66998886611996500	=	740
00656	004F205020542049	1168	3E4732A758060916	=	477	31680	002722220027222	=	285	32192	2ACDFFC2178519AC	=	1908
00664	2D20202020202020	1176	0AE30CE57910FB14	=	1079	31688	202722220027222	=	285	32200	1A81C999E901F55	=	710
00672	2D20202020202020	1184	1A830606CDE57910	=	830	31696	202722220027222	=	400	32208	210027925722868	=	615
00680	2D20202048454959	1192	FB1C1C3E44E32A758	=	745	31704	202722220027222	=	285	32216	3A85225CF8F53254	=	952
00688	4224F4152442C2041	1200	0020E2F4C97EE020	=	1067	31712	202722220027222	=	304	32224	354F38483463F447	=	531
00696	4844454549454E47	1208	C822A958C0D1D67E	=	1066	31720	202722220027222	=	473	32232	423E463A8374754	=	517
00704	65535447528044F	1216	C1E120C0C033651A	=	1033	31728	202722220027222	=	277	32240	5430525E2E27042	=	908
00712	0055544943CB494E	1224	3CC082608C20A958	=	843	31736	202722220027222	=	325	32248	3F80A700340F00	=	908
00720	45445542641434520	1232	10F211B8750E05D5	=	819	31744	202722220027222	=	478	32256	0000000000000000	=	0
00728	49C9454544050534	1240	060521D0651A8E23	=	616	31752	202722220027222	=	273	32264	1818181818001800	=	144
00736	4FAE20E0505384	1248	13200710F3F10D20	=	586	31760	202722220027222	=	282	32272	FF00FF00FF00FF00	=	1020
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00760	FB240D20F2FB76F3	1272	00281E0C21D27511	=	1028	31784	202722220027222	=	330	32296	1F007F007F00F00	=	316
00768	09E1E511E255001	1280	0050878796781814F	=	475	31792	202722220027222	=	693	32304	3C007000FF00FF00	=	696
00776	1C0307E08008CDA1	1288	11156505005ED5021	=	910	31800	202722220027222	=	274	32312	007003F007F00F00	=	452
00784	78CD00653E1FC031	1296	75C078587734FEED	=	1007	31808	202722220027222	=	410	32320	0000FF00FF00FF00	=	908
00792	7811A07721000422	1304	88C1C1E10185635006	=	1007	31816	202722220027222	=	292	32328	FF00C000100E100	=	708
00800	3A958C033662C2604	1312	910E05E0E0011E575	=	910	31824	202722220027222	=	273	32336	00005100C300C300	=	519
00808	209958C033660804	1320	11156505005ED5021	=	907	31832	202722220027222	=	394	32344	FC00F005800F000	=	660
00816	3A958C033660804	1328	00C00E0009D02DF	=	933	31840	202722220027222	=	268	32352	000000015336000	=	168
00824	3E0732A758F84008	1336	00C00E0011800C0	=	933	31848	202722220027222	=	268	32360	0000000000000000	=	95
00832	2E0952C2C22A958E	1344	D75A0000000205745	=	847	31856	202722220027222	=	268	32368	0000000000303000	=	95
00840	5E81643C38598CD	1352	404C0804444FE4E21	=	511	31864	202722220027222	=	461	32376	3F000F007001F00	=	116
00848	5E6501C03366C110	1360	474930804143454945	=	487	31872	202722220027222	=	330	32384	7CC65492A2C27C00	=	1022
00856	D7110E00CDD76A00	1368	456204F42030204FAE	=	503	31880	202722220027222	=	448	32392	7CC20233838F000	=	82
00864	04484559424F4152	1376	456204F42030204FAE	=	503	31888	202722220027222	=	828	32400	7CC20233838F000	=	82
00872	442041344E545E4F	1384	456204F42030204FAE	=	503	31896	202722220027222	=	997	32408	7CC20233838F000	=	82
00880	4308044E545E4F	1392	2045454950435004849	=	478	31904	202722220027222	=	630	32416	081802848F008000	=	414
00888	4545444E45442841	1400	474930804143454945	=	478	31912	202722220027222	=	395	32424	FC0080FC02C27C00	=	1080
00896	5300003A0211032E	1408	482245503008444444	=	478	31920	202722220027222	=	514	32432	3C080FC02C27C00	=	858
00904	8958E1D005800411	1416	482245503008444444	=	478	31928	202722220027222	=	649	32440	FE02043E08101000	=	362
00912	E850C5E8C03366E1	1424	482245503008444444	=	430	31936	202722220027222	=	621				
00920	05E2359A7CD977B	1432	20202020200000000	=	830	31944	202722220027222	=	643				

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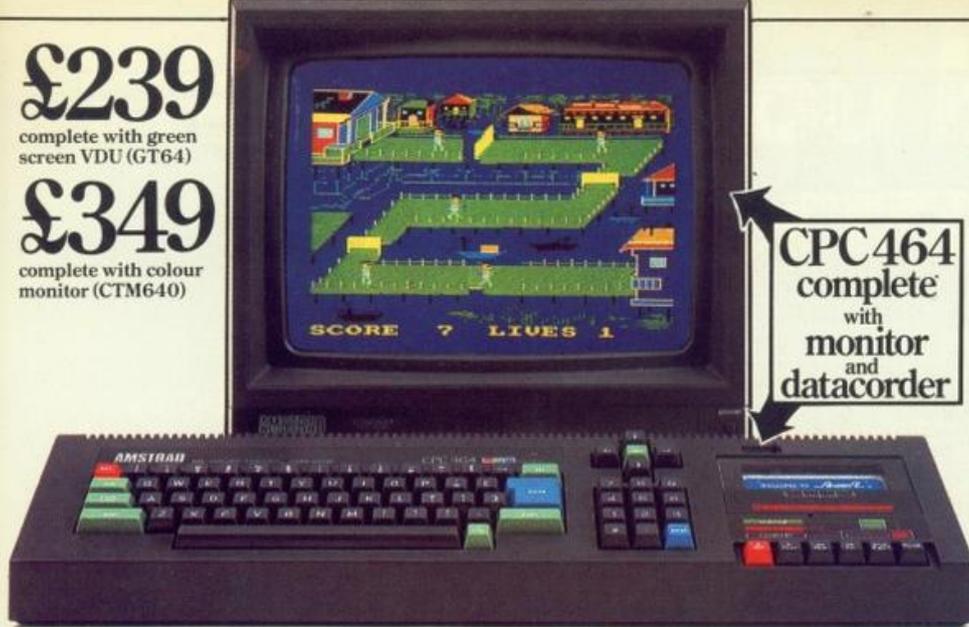
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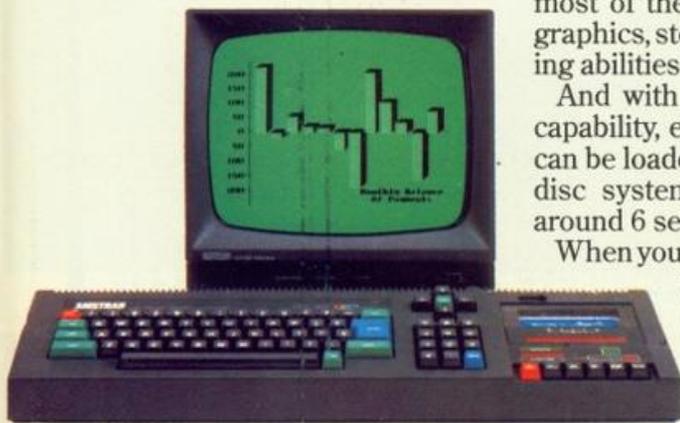
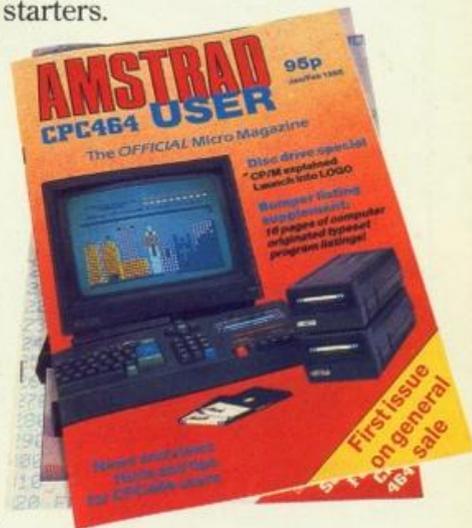
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```
10 MEMOY HIMEM-10
20 start=HIMEM+1
30 !ASSEMBLE, start
40 'get start
50 'limit &FFFF
60 *ORG start
70 'CP 10:SCF:RET Z
80 'RST 1,&B7F2
90 *ORG &BD2B
100'JP start
110'END
```

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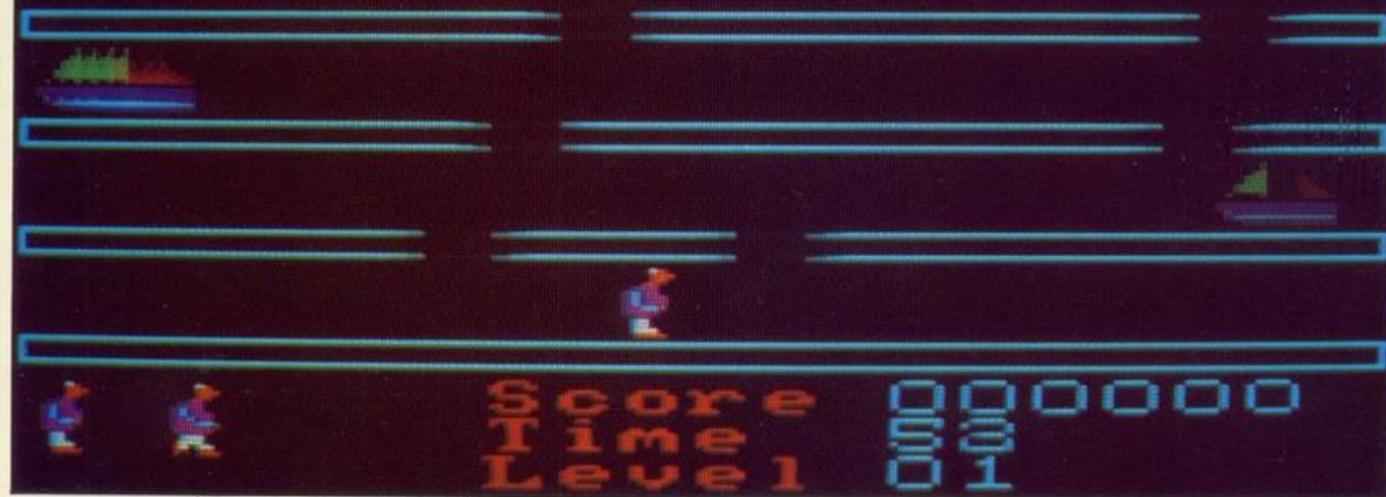
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AMSTRAD JUMPER

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,5 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$,N,1):GOSUB 400
320 IF E=1 THEN D=N:N=4:NEXT:RETURN
330 D=D*16+C$: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 ? A90F8D06502A90E20=2E4	51312 ? 72CE29F9C980D0E4=5C6
51016 ? D2FFA9008D15D0A9=4DD	51320 ? 20D2CB80DA9973CE=599
51024 ? FF8D8A02B8A8E92CE=510	51328 ? 08202ECC009D0F0=4EB
51032 ? 20CAC920C7CB20F8=4D5	51336 ? A000AD75CE298D0=4C2
51040 ? C8AD90CE931F823=532	51344 ? 8FA52B85FB18A52C=3D8
51048 ? C935F014C936D006=43F	51352 ? 6D75CE85FC4C8C8=587
51056 ? 208EC74C5BC7A914=410	51360 ? AD78CE85F8AD79CE=607
51064 ? 20D2FF202FCB0D0B=52E	51368 ? 85FC20D2CB80A20=55E
51072 ? 203FC8A92020D2FF=461	51376 ? D9CC20D2FFC820D9=607
51080 ? 4C93C94C4AC82063=411	51384 ? CC202ECC001D00EA=528
51088 ? CC2022CD9A95B85FD=4F1	51392 ? A92020D2FFAD75CE=56A
51096 ? A9CE85FE2028CDA0=547	51400 ? 202ECD20D2CB80E7=4D7
51104 ? 002095CC202FCBC9=404	51408 ? CD7CCEFB08A95820=503
51112 ? 44F00BC954D0ED20=4E1	51416 ? D2FF2030C84C57C8=52C
51120 ? D2FFA901D007A944=4EF	51424 ? 20D2CB80F8C87DCE=65D
51128 ? 20D2FFA90885BA20=4B9	51432 ? D0E8AD75CE808993=687
51136 ? 25CD9A08208BCC89=4A3	51440 ? CED00E2038C8A991=4EE
51144 ? 8D85FD99CD85FEA0=6A0	51448 ? 20D2FF4C7CE94C57=51F
51152 ? 002095CC2025CD20=383	51456 ? C8A0008C7CCE807D=447
51160 ? 95CC98480048C83=4CC	51464 ? CE20D2CB80F091FB=58F
51168 ? CE20D8C968A82025=4C4	51472 ? 202ECC8CC77CED0=4D3
51176 ? CD2095CC9848A906=4C5	51480 ? F020D2CB80E0CD7C=59E
51184 ? 8D83CE20D8C9ADA7=5E3	51488 ? CEF008A95820D2FF=4D8
51192 ? CE85FBAD80CE85FC=6EA	51496 ? 4C57C820D2CB80CE=4CE
51200 ? 68A82060CB8A90185=39A	51504 ? CD7CCEFB0834C23C9=473
51208 ? B885B998A293A0CE=539	51512 ? 20ACC82038C8AD75=406
51216 ? 20D2FFA909CE8A9A=567	51520 ? CE8A90089993CEAD=506
51224 ? CEE8D001C82025CD=479	51528 ? 84CEC98D02D02520BC=436
51232 ? A9FB20D8FF20F1CB=597	51536 ? C8A9C820F3C8A955=568
51240 ? 6020D9CC90D000B=3FE	51544 ? 2016CDA95020F3CB=43B
51248 ? A90085C7A92020D2=3E0	51552 ? 20C7CBAC73CEC888=54F
51256 ? FFA90D20D2FF60A9=4E7	51560 ? B993CCE02398D0F7=54D
51264 ? 02029C8A90D20D2=306	51568 ? 4C5BC7A9552016CD=3DF
51272 ? FF602063CC8000A9=43F	51576 ? 20F1CB4C63C9AC77=4EF
51280 ? FF9993CE8D0FA20=5FB	51584 ? CE20D2CB80D0FA20=57D
51288 ? D2CB9FB20D2CB80=5ED	51592 ? D2CB20D2CB804C7C9=53E
51296 ? FB8D72CEA0008C7C=4D0	51600 ? 4C5CC8A52B85F8A5=4F5

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,
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,
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 Telssoft, 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 Telssoft 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 ? 25CD90220ABCC20=364	52552 ? 300318690720D2FF=2F4
51624 ? 08A52285F8852385=447	51936 ? CE6DCFC8DDCFCEAD=68F	52248 ? 95CCAD88CE20D2FF=573	52560 ? 60444F574E4C4F41=2C4
51632 ? FC4C9BC91885F869=57D	51944 ? D2CE6DD09CE8DD0CE=68E	52256 ? A92020D2FFA90320=3A6	52568 ? 44204D454E552131=243
51640 ? 02852D852F8531A5=37B	51952 ? 8005CECECE0E660=625	52264 ? ABCC20D8C6904D7D=48A	52576 ? 2020205245434549=228
51648 ? FC6900852E853085=412	51960 ? 2063CC0A90F8D8602=414	52272 ? CE8D7DCEA209AD7D=4AA	52584 ? 5645213520202045=1FE
51656 ? 32602063CC09026D=3E1	51968 ? A95185FD9CDB85FE=575	52280 ? CE2A9018AD7DCE49=411	52592 ? 58495420544F2042=28A
51664 ? 84CEA908D02DE60=4A3	51976 ? A000209DCC0205CD=343	52288 ? 088D7DCEAD7DCE49=460	52600 ? 4153494321362020=22F
51672 ? 8E01CE8C82CEA200=533	51984 ? 209DCC209DCC209D=30F	52296 ? 108D7DCE2E7DCE2E=3D5	52608 ? 2053415645204259=28A
51680 ? A9098DCE202FCB=4D4	51992 ? CC20222CD0A9CC20=3A8	52304 ? 7DCEAD0E160A000=516	52616 ? 5445532128205553=285
51688 ? C914F016C90DF051=4E2	52000 ? 95CC2022CD2095CC=411	52312 ? A9009900D4C8C018=40E	52624 ? 452012205344F50=26D
51696 ? C924D01920D2FF8D=544	52008 ? 202FCB20D2FF608E=421	52320 ? D0F660A99320D2FF=5B3	52632 ? 209220544F205245=2C4
51704 ? C3CE84CE5C9E000=64B	52016 ? 81CE8C82CE2069CC=480	52328 ? 6048A9A2290FD01F=37E	52640 ? 545524E20544F20=20C
51712 ? D0E3E00F0DFD20D2=554	52024 ? 20ECC20CACC0900=48F	52336 ? ASD448A5A22910F0=4A1	52648 ? 40454E552029145=28C
51720 ? FFC84CE5C9C3090=554	52032 ? D00D20FDCC931F0=45D	52344 ? 05A9A44C80CC9A20=42B	52656 ? 4E54552204E554D=2F9
51728 ? D4C93A901548ADC3=444	52040 ? 062001CC4C35CB0D=314	52352 ? 20D2FFA90085D4A9=51C	52664 ? 4245522021494620=281
51736 ? CEC924F004694CE5=460	52048 ? 80CEA8E1CEAC82CE=597	52360 ? 9D20D2FF6885D468=53F	52672 ? 4144445245535320=2E6
51744 ? C968C941908FC947=48A	52056 ? 60AE92CE9A45BC7=4CE	52368 ? 6020D2FFC8B1FDC9=620	52680 ? 4953209494E204845=2C8
51752 ? 80B820D2FF38E930=4D5	52064 ? 2022CD92285FD9A9=465	52376 ? 21D0F6C8602025CD=489	52688 ? 582C119D9D9D9D9D=476
51760 ? C90A9002E907E005=36A	52072 ? CE85FEA0002095CC=4D4	52384 ? A90C208BCC2095CC=4B9	52696 ? 9D9D9D9D9D9D9D9D=500
51768 ? F0B9D3CCE84CE5=61A	52080 ? 2025CD800FA92099=393	52392 ? 60A9058E81CEA9A9=4E6	52704 ? 9D9D9D9D9D9D9D9D=481
51776 ? C9E000F0A0E001D0=52A	52088 ? 93CE80D0F8D93CE=619	52400 ? 2020D2FFC8B0FAE=603	52712 ? 4958205749544820=305
51784 ? 07ADC3CE924F895=4FF	52096 ? 202FCB914D018C0=417	52408 ? 81CE60C914F008C9=505	52720 ? 2421535441525420=2E3
51792 ? A92020D2FFA99F9D=54F	52104 ? 00F0F520D2FF80A9=58F	52416 ? 7FF00160A91460A9=456	52728 ? 4144445245535320=31E
51800 ? C3CEA2008ECFCE8E=544	52112 ? 209993CE4C80CB9=50A	52424 ? 7F6020E4FFC9C190=50C	52736 ? 464F522041524541=1D3
51808 ? D0CE8ED1CE8ED2CE=659	52120 ? 0DF0020D2FF9993=4BD	52432 ? 07C9D8B00338E960=4AF	52744 ? 202145494E41C20=120
51816 ? ADC3CE924D006A9=512	52128 ? CEC8C810D0D8A920=579	52440 ? 60C941900EC95B90=494	52752 ? 4144445245535320=236
51824 ? 0F8DCDCE88DC3CE=5DD	52136 ? 20D2FF60A92020D2=48A	52448 ? 08C9619006C97BB0=49C	52760 ? 464F522041524541=238
51832 ? C9FF01D20CB0A80=582	52144 ? FFA94F20D2FFA94B=58C	52456 ? 02492060480A4808=2D5	52768 ? 202150524F475241=22C
51840 ? 3418DC3CE5DCFC=524	52152 ? 20D2FF60A9138D00=452	52464 ? 20E1FFD0034C59CB=533	52776 ? 4D20544595440420=237
51848 ? 80CEA9006DD0CE=566	52160 ? DEA9128D00E180A9=45D	52472 ? 2868A86680D00E=485	52784 ? 204D415820313620=1E5
51856 ? 8DD0CE2082084C75=534	52168 ? 538D00DEA9528D00=40E	52480 ? A9016A9003A90060=250	52792 ? 4348415227532920=219
51864 ? C9ADCFCE8C3CE99=634	52176 ? DE60A996188D87CE=547	52488 ? 4D01DE6048AD00E=307	52800 ? 21124E4F54205641=21B
51872 ? A3CE8ADD0CE99A3=660	52184 ? 8C82CE8C82CE2004=4D4	52496 ? 49026A6A6808200C=223	52808 ? 4C4944922C205452=2A5
51880 ? CEC8188C83CEAC82=561	52192 ? CC20ECCCE87CE00=577	52504 ? CDB0F8D01DE20EC=508	52816 ? 5920414741494E20=289
51888 ? CEAE81CE602025CD=4E0	52200 ? 02386020FDC80EE=509	52512 ? CC602025CD2028CD=373	52824 ? 3A22014449534320=216
51896 ? A200BD41CE921F0=50D	52208 ? 60A9FA8C82CEA820=597	52520 ? A90D20D2FF604829=3A0	52832 ? 4F52205441584520=26B
51904 ? 0720D2FFE84BCA=570	52216 ? 04CC88D0FAAC82CE=616	52528 ? F06A6A6A6A0930C9=3CA	52840 ? 2820442F54202920=1E0
51912 ? 4CDE9ADCDE8DCE=65E	52224 ? 602004CC8A2A8CA=3EE	52536 ? 3A300318690720D2=21F	52848 ? 3F21800000000000=0D0

TELSOFT



A reminder of how to use the Telsoft service.

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

CALL 8&A00

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=&9FFF
20 CLS:PRINT
30 INPUT "START ADDRESS (Hex):"A$
40 A=VAL("1"+A$)
50 IF A>=F7 THEN 200
60 IF A<=A00 OR A>=FE7 THEN 20
70 PRINT "A"
80 INPUT "B,C$
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
```

Figure 2. BBC.

```
6000 :A9C80FEA20120F4,4C6
6001 :FF20616C204B6C9,38A
6002 :131F00BC934F8E9C9,4CB
6003 :35F0064C0C6A4C7,200
6004 :1AA98C2033FFA9E,4FD
6005 :1A00A2FF28FFAFA,482
6006 :03A20020FF4FFA92,363
6007 :A28220FF4FFA92,363
6008 :FEA20020FF4FFA9,4BC
6009 :0C20C3FF20FF78A9,439
6010 :15A20120FF4FFA9,439
6011 :A9FF809056FD0FA,507
6012 :A915A20120FF4FF20,394
6013 :0C6C90F200C6C00,346
6014 :FB0A00047784708A,41B
6015 :798A7047805708,308
6016 :D5A0A57029FC90,499
6017 :D0E2200C8C80099,468
6018 :7180C20D56C0097,364
6019 :D0F800005742908,422
6020 :1D089511C8571BA5,354
6021 :1D8571C857200C6,209
6022 :180520C8F08205,524
6023 :06C01800F8057320,435
6024 :1B20D200C8B0A05,3CC
6025 :7AF000A95020E3FF,478
6026 :20C7FF4C676A200C,34F
6027 :1C0000C57F000A9,40C
6028 :5020E3FF20E77F4C,44B
6029 :67A0A573A09056F,43E
6030 :0E0E20E77FA9020,380
6031 :E3FF4C676A200C,469
6032 :A0000470478200C,2C9
```

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

```
6030 :496CC60F000230A0,374
6031 :A5BAC9020062079,369
6032 :6E00C6A0991A201,447
6033 :20F4FF90A47E00F,55C
6034 :608AA220CAEBCA00,5AA
6035 :FBAA6A00047EAB,458
6036 :20496CB008FAA7E,449
6037 :A0A9E90000A2FF20,452
6038 :FF4FFA900059A99C,468
6039 :20E3FF20A86AD984,3E4
6040 :20006C80909052A9,29F
6041 :6F0503A00020F8A0,39C
6042 :20156DC941F000C9,378
6043 :42F011C943F0174C,3A2
6044 :616CA900A20120F4,335
6045 :FF4C876CA900A203,3C4
6046 :20F4FF4C876CA900,433
6047 :A28420F4FF68AA5,4CE
6048 :7C20E3FFA47E20A8,468
6049 :60A90020006E20F8,2C4
6050 :60A90020006E20F8,2C4
6051 :F0B0C942F011C943,413
6052 :F0174C161CA900A2,372
6053 :0120F4FF4C87A0A9,37F
6054 :87A20320FF4FFA9,37F
6055 :6DA90720006E20F8,39C
6056 :6DA90720006E20F8,39C
6057 :E6A0A57029FC90,499
6058 :A9C80FEA20120F4,4C6
6059 :FF20616C204B6C9,38A
6060 :131F00BC934F8E9C9,4CB
6061 :35F0064C0C6A4C7,200
6062 :1AA98C2033FFA9E,4FD
6063 :1A00A2FF28FFAFA,482
6064 :03A20020FF4FFA92,363
6065 :A28220FF4FFA92,363
6066 :FEA20020FF4FFA9,4BC
6067 :0C20C3FF20FF78A9,439
6068 :15A20120FF4FFA9,439
6069 :A9FF809056FD0FA,507
6070 :A915A20120FF4FF20,394
6071 :0C6C90F200C6C00,346
6072 :FB0A00047784708A,41B
6073 :798A7047805708,308
6074 :D5A0A57029FC90,499
6075 :D0E2200C8C80099,468
6076 :7180C20D56C0097,364
6077 :D0F800005742908,422
6078 :1D089511C8571BA5,354
6079 :1D8571C857200C6,209
6080 :180520C8F08205,524
6081 :06C01800F8057320,435
6082 :1B20D200C8B0A05,3CC
6083 :7AF000A95020E3FF,478
6084 :20C7FF4C676A200C,34F
6085 :1C0000C57F000A9,40C
6086 :5020E3FF20E77F4C,44B
6087 :67A0A573A09056F,43E
6088 :0E0E20E77FA9020,380
6089 :E3FF4C676A200C,469
6090 :A0000470478200C,2C9
```

```
250 A=A+0:GOTO 50
260 PRINT "TYPING ERROR!"
270 A=A+(A DIV 8):GOTO 50
280 *SAVE "DOWNLOAD" &000 &F07
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
```

```
6090 :09C80FEA20120F4,4C6
6091 :FF20616C204B6C9,38A
6092 :131F00BC934F8E9C9,4CB
6093 :35F0064C0C6A4C7,200
6094 :1AA98C2033FFA9E,4FD
6095 :1A00A2FF28FFAFA,482
6096 :03A20020FF4FFA92,363
6097 :A28220FF4FFA92,363
6098 :FEA20020FF4FFA9,4BC
6099 :0C20C3FF20FF78A9,439
6100 :15A20120FF4FFA9,439
6101 :A9FF809056FD0FA,507
6102 :A915A20120FF4FF20,394
6103 :0C6C90F200C6C00,346
6104 :FB0A00047784708A,41B
6105 :798A7047805708,308
6106 :D5A0A57029FC90,499
6107 :D0E2200C8C80099,468
6108 :7180C20D56C0097,364
6109 :D0F800005742908,422
6110 :1D089511C8571BA5,354
6111 :1D8571C857200C6,209
6112 :180520C8F08205,524
6113 :06C01800F8057320,435
6114 :1B20D200C8B0A05,3CC
6115 :7AF000A95020E3FF,478
6116 :20C7FF4C676A200C,34F
6117 :1C0000C57F000A9,40C
6118 :5020E3FF20E77F4C,44B
6119 :67A0A573A09056F,43E
6120 :0E0E20E77FA9020,380
6121 :E3FF4C676A200C,469
6122 :A0000470478200C,2C9
```

Figure 1. Spectrum.

```
80 INPUT "i"i$
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=b*(2^n+1 TO 2^n+1)
125 GO SUB 300: LET y=x
130 IF e=1 THEN GO TO 260
140 LET x=b*(2^n+2 TO 2^n+2)
145 GO SUB 300: LET y=y+1*x
```

```
150 IF e=1 THEN GO TO 260
170 POKE a,y: LET a=a+1
180 LET t=y: NEXT n: LET y=0
190 FOR e=1 TO 3
200 LET t=t+(17*a TO 17*a)
205 GO SUB 300: LET y=y+1*x
210 IF e=1 THEN LET a=a-1: GO TO 260
220 NEXT a
230 IF t=y THEN PRINT "i"i$: GO TO 50
```

```
240 PRINT "Checksum Error"
250 LET a=a-8: GO TO 50
260 PRINT "Typing Error"
270 LET a=INT (a/8): GO TO 50
280 *SAVE "download"CODE &0000,1136
290 POKE 23650,8: STOP
300 LET e=0: LET x=CODE x$-40-7*(x$>9)
310 IF x<0 OR x>15 THEN LET e=1
320 RETURN
```

Figure 2. Spectrum.

```
60200 :E0EE12133E0012CD,340
60210 :D7ECCD46ECC3A0EA,601
60220 :CD1FEDDAAEA2178,510
60230 :1FE20E121E5E3A,524
60240 :40E6F854F3E000C47,3CC
60250 :3E000E2000CDD7EC,46F
60260 :3E213200CC3FFEB,462
60270 :3E0032A6EF3270E,307
60280 :1ED00C80F0E00C0D1F,40C
60290 :EDDAAEA3273EFCDD,634
60300 :1EBC3A68EFFF00020,586
60310 :0E3A69FE6A003A73,432
60320 :1E12133E0012CD,340
60330 :1216A6EBC22DE0D,504
60340 :1FEDDAAEA2178E,5A2
60350 :1ECC220E3E6F32E2,599
60360 :EE3E6832E3E3E000,498
60370 :32E4EE3A000CFE21,501
60380 :2003CD15ECCDD7EC,553
60390 :CD4A6E21E3E3A6A9,505
60400 :EF854F3E000C473A,422
60410 :0021E5EED4B6A6EF,561
60420 :0C7E7E00C200E423,4FC
60430 :0D20F63E6AC0B4ED,589
60440 :3E01D3FEC3A6A6C,5E8
60450 :1E020F3E6AC0B4ED,589
60460 :1E020F3E6AC0B4ED,589
60470 :1E020F3E6AC0B4ED,589
60480 :1E020F3E6AC0B4ED,589
60490 :1E020F3E6AC0B4ED,589
60500 :1E020F3E6AC0B4ED,589
```

```
60440 :31D3FF3E0F320FC,505
60450 :320D5C32405C30E1,250
60460 :D3FE21F55CC9F7F,560
60470 :CD5E0C3A5E0D15,52F
60480 :1ECCD46ECC3A0EA,601
60490 :2165EE3E000C0DFE,442
60500 :CD0AECDDA3ECCDA6,654
60510 :E2C350C7ECCD77EC,58F
60520 :84EC3CD3A3ECC3E3,490
60530 :CD0FCE004ECC9C0,600
60540 :A3E3CE07C0DFECC,561
60550 :84EC3C97FE000C,520
60560 :00C8F53E20C0BEE,528
60570 :F13DC3FECDDA0E,650
60580 :CD3ECCDA6ECC30E,5A6
60590 :CD0F3E0F320FC,505
60600 :09B513E6FC0B1FCB,60C
60610 :1FCB1FCB1FF630FE,4CF
60620 :3AFAC6ECC6871213,490
60630 :1E16A0F630FE4A6A,60A
60640 :D4ECC6871213C921,46C
60650 :CDEE3C00484E0E16,69C
60660 :173E20772310F3C,339
60670 :00779E52170EFAE,538
60680 :750E00E78A0771,449
60690 :380073E0D737A6F,3C9
```

```
60670 :E0EE10326FEF3721,305
60680 :16EFCB1A230B1600,350
60690 :20E2C1E19C1000B1,394
60700 :216A00CDB053C93E,32F
60710 :963277EFCDD47EDA,529
60720 :2EEDF1C36A6ACDCA,508
60730 :ED78681F60D23FE,548
60740 :1AF2177E35200237,29C
60750 :1C9D77E038EBC9C,507
60760 :147E0D8FEC0B37C9,5E6
60770 :15D08FF3A01E000,5C7
60780 :200A3E3610023E37,107
60790 :D3FDB77F1C9F53A,675
60800 :01E0E00200A3E36,376
60810 :D3FDB77F1C9F53A,675
60820 :00D08F6E00837C00,544
60830 :1FE68237C00B7FE6,626
60840 :30E00A0B70F7A73A,3E0
60850 :81E0E00200A3E36,376
60860 :10023E3630023E37,452
60870 :1C9D77E038EBC9C,507
60880 :1FC36A6A3E0D23D,5E0
60890 :20E2C1E19C1000B1,394
60900 :20E2C1E19C1000B1,394
60910 :20E2C1E19C1000B1,394
60920 :20E2C1E19C1000B1,394
60930 :20E2C1E19C1000B1,394
60940 :20E2C1E19C1000B1,394
60950 :20E2C1E19C1000B1,394
60960 :20E2C1E19C1000B1,394
60970 :20E2C1E19C1000B1,394
60980 :20E2C1E19C1000B1,394
60990 :20E2C1E19C1000B1,394
61000 :20E2C1E19C1000B1,394
61010 :20E2C1E19C1000B1,394
61020 :20E2C1E19C1000B1,394
61030 :20E2C1E19C1000B1,394
61040 :20E2C1E19C1000B1,394
61050 :20E2C1E19C1000B1,394
61060 :20E2C1E19C1000B1,394
61070 :20E2C1E19C1000B1,394
61080 :20E2C1E19C1000B1,394
61090 :20E2C1E19C1000B1,394
61100 :20E2C1E19C1000B1,394
61110 :20E2C1E19C1000B1,394
61120 :20E2C1E19C1000B1,394
61130 :20E2C1E19C1000B1,394
61140 :20E2C1E19C1000B1,394
61150 :20E2C1E19C1000B1,394
61160 :20E2C1E19C1000B1,394
61170 :20E2C1E19C1000B1,394
61180 :20E2C1E19C1000B1,394
61190 :20E2C1E19C1000B1,394
61200 :20E2C1E19C1000B1,394
```

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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

(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" C
ODE : STOP
9998 CLEAR 59999: LOAD "Toolbytes"CODE 60000: STOP
9999 RANDOMIZE USR 60000
```

Error Reports.

Error message	Task completed	May occur in
Range error		Most routines: it means it's done as told B, C, M, N, R, T, U. Increment > 100 A B C D J K L M P R . S. Start > Finish Line > 9996. Non-existent line in 0.
Numbers reversed		C M N R T U. Speaks for itself.
Invalid line number		R. Check what you are trying to do. B C E M. Not enough unused line numbers. C D. No actual lines from start to finish
Zero not allowed		
Lines would overlap		
No room at destination		
Zero block!		

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
2 REM Lines 9997-9999 are referred to as LI
3 ting 2 in the tent. LISTING 3 is, of course,
4 the first program on this tape!
5
6 9997 STOP : ERASE "m";"Toolkit": ERASE "m";"Toolby
7 tes": SAVE "m";"Toolbits": VERIFY "m";"Toolkit":
8 SAVE "m";"Toolbytes"CODE 60000,5368: VERIFY "m";"
9 Toolbytes"CODE : STOP
10 9998 CLEAR 59999: LOAD "m";"Toolbytes"CODE 60000: S
11 TOP
12 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 channels 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.

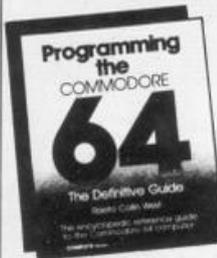
Warning — Line 9999: If at any time there is an attempt to append to the existing program — i.e., creating lines after the last one present — using functions B, C, E, M or U, then although the functions will appear to work, the new lines will be formed in the variables area, and the computer will not 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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0100	LD	HL, 12006h	PC 0000	00E0 FF 00 FF 00 FF 00 FF 00
0105	LD	DE, C1800h	SP 0004	00E0 FF 00 FF 00 FF 00 FF 00
010A	OR	A	IX 0000	00F0 FF 00 FF 00 FF 00 FF 00
0107	SBC	HL, DE	IX 0000	00F0 FF 00 FF 00 FF 00 FF 00
0109	LD	SP, HL	0000 HL 0000	0100 2A 04 00 11 00 18 87 E07a
010A	PUSH	HL	0000 DE 0000	0108 32 F9 E3 2A 04 00 5F 167a
010B	LD	A, 12004h	0000 BC 0000	0110 09 0E 0E CD 05 06 11 BEM...
010E	LD	E, A	0000 AF 00FF	0118 01 0E 0E CD 05 06 3C 20M...
010F	LD	B, E50	0000 0100	0120 19 21 00 61 7E 87 20 0811, 71,
0111	LD	C, E5E	18 0078	0128 5F 0E 02 E3 CD 05 00 E1M...
0113	CALL	09005	I SE W INC		
011A	LD	DE, C010E	SP 17 1E HL DE BC AF		
0119	LD	C, E0F	0004 0000 0000 0000 0000 0000		
011B	CALL	09005			
011E	INC	A	00FE C3 C C3 C C3 C C3 C C0		
011F	LD	HL, E015A	0020 03 . 03 . 03 . 03 . 28 *		
0121	LD	HL, E01D0	2323 01 0 01 0 01 0 01 0 01 0		
0124	LD	A, 0A1	0019 00 1 00 1 00 1 00 1 00 1		
0125	OR	A	0124 00 . 00 . 00 . 00 . 00 . 11		
0126	LD	HL, E0133	30E3 C3 C C3 C C3 C C3 C C0		
0128	LD	E, A	FE7E 04 . 04 . 04 . 04 . 1B .		
0129	LD	C, E02	2040 00 1 00 1 00 1 00 1 00 1		

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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 — i.e., 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 Proprog 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()

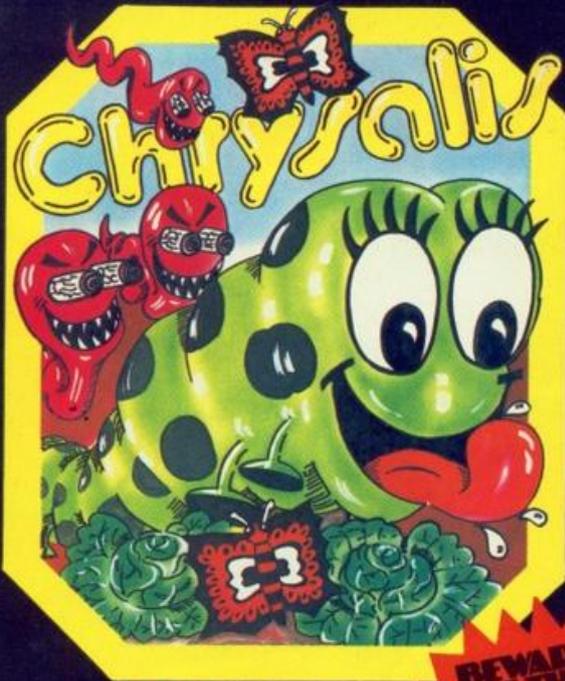
Procedures / functions:

DEFPROC PROC ENDPROC

DEFFN FN =

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

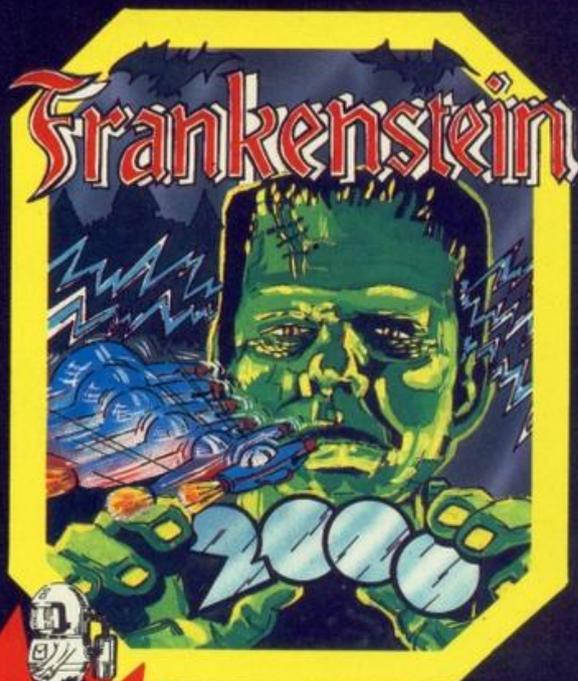
In addition, the following are supported: REM, () (brackets), = (assignment), : (for multi-statement lines), integer constants, + and - (unary sign operators), & (for hex constants).



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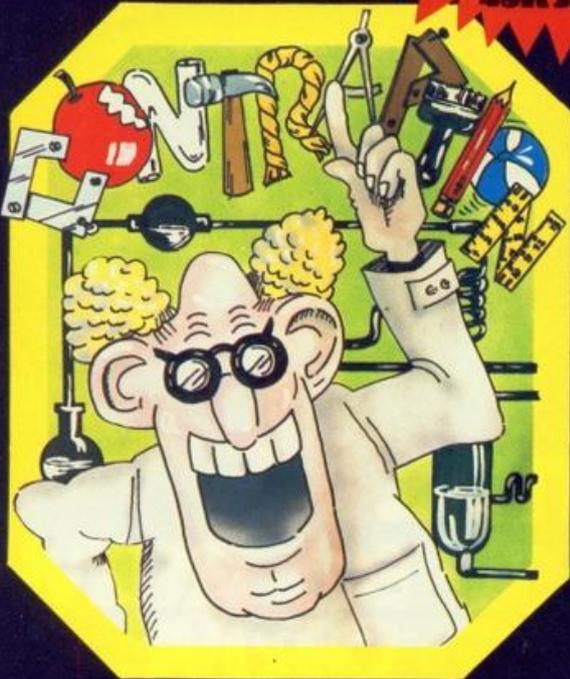
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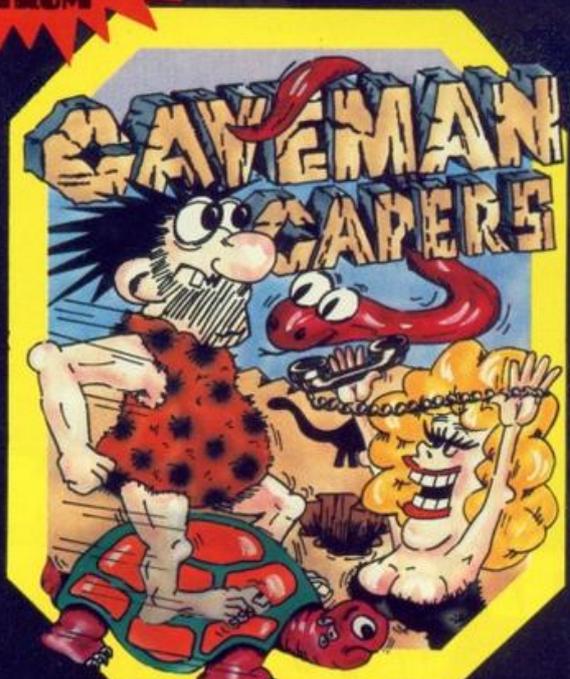
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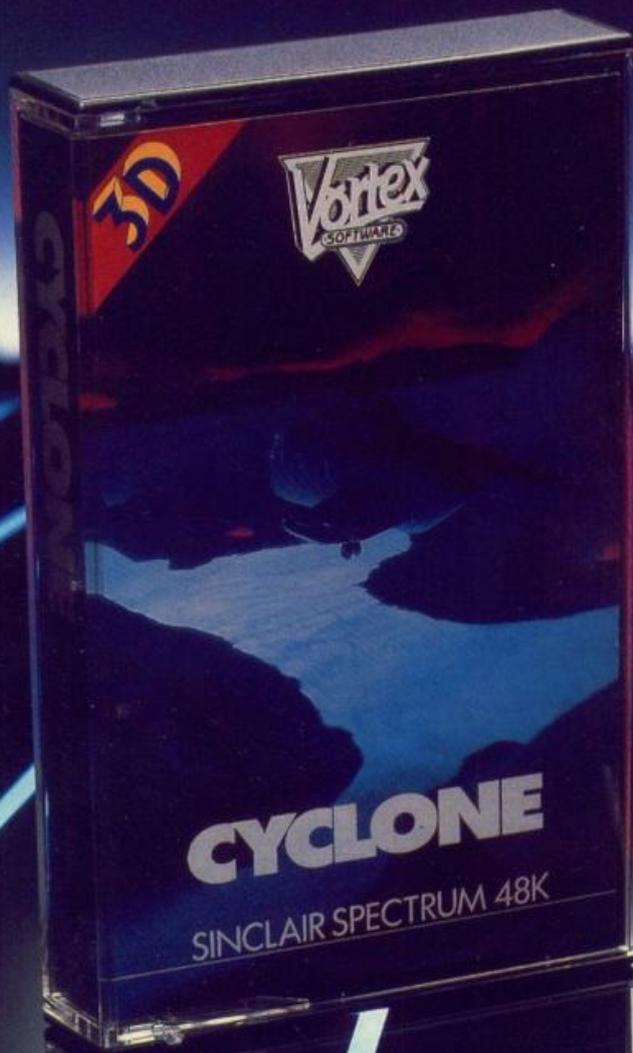
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Hex loader.

```

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$(LEN(a$) TO LEN(a$))="h" THEN
150 a$=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$;" ";
270 FOR q=0 TO 1
280 dec_hex PEEK(addr+q),2
290 PRINT d$;
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$,v
440 v=0:t=0
450 FOR i=0 TO LEN(h$)-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 i
540 END DEFINE
550 LOCAL c,a$,b
560 b=INT(d$)
570 a$=a$+a$(1 TO 1)
580 b=ABS(b)
590 REPEAT work
610 c=(b/16-INT(b/16))*16
620 IF c=9 THEN
630 d$=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$=FILL$(?"",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
		2 *	A procedure to enlarge part of the screen	0016'	7602
		3 *	By Carsten Greve	0018'	41FA 015A
		4 *	Started on the 14th of December 1984	001C'	7001
		5 *	Finished on the 22nd of December 1984	001E'	4E42
		6 *	For the SINCLAIR QL version JM	0020'	4A80
		7		0022'	6600 0144
		8	HEAP_ROOM EQU 8192	0026'	76FF
		9	MT_ALCHP EQU 24	0028'	700E
		10	IO_OPEN EQU 1	002A'	4E43
		11	SD_CURE EQU 14	002C'	4A80
		12	IO_FBYTE EQU 1	002E'	6600 0138
		13	UT_ERRO EQU 202	0032'	72FF
		14	MT_FRJOB EQU 5	0034'	74FF
		15	MT_DMODE EQU 16	0036'	7010
		16		0038'	4E41
		17	START	003A'	E309
0000'		18	MOVE.L #HEAP_ROOM,D1	003C'	1801
0000'	223C 0000 2000	19	MOVEQ #-1,D2	003E'	284D
0006'	74FF	20	MOVEQ #MT_ALCHP,DO	0040'	76FF
0008'	7018	21	TRAP #1	0042'	7001
000A'	4E41	22	TST.L DO	0044'	4E43
000C'	4A80	23	BNE JOB_END	0046'	4A80
000E'	6600 0158	24	MOVE.L A0,A5		
0012'	2A48				
				25	
				26	MOVEQ #-1,D1
				27	MOVEQ #2,D3
				28	LEA.L DEUNAME,A0
				29	MOVEQ #IO_OPEN,DO
				30	TRAP #2
				31	TST.L DO
				32	BNE JOB_END
				33	MOVEQ #-1,D3
				34	MOVEQ #SD_CURE,DO
				35	TRAP #3
				36	TST.L DO
				37	BNE JOB_END
				38	
				39	MOVEQ #-1,D1
				40	MOVEQ #-1,D2
				41	MOVEQ #MT_DMODE,DO
				42	TRAP #1
				43	LSL.B #1,D1
				44	MOVE.B D1,D4
				45	
				46	LOOP_0 MOVE.L A5,A4
				47	MOVEQ #-1,D3
				48	MOVEQ #IO_FBYTE,DO
				49	TRAP #3
				50	TST.L DO

(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_JOB

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
    
```

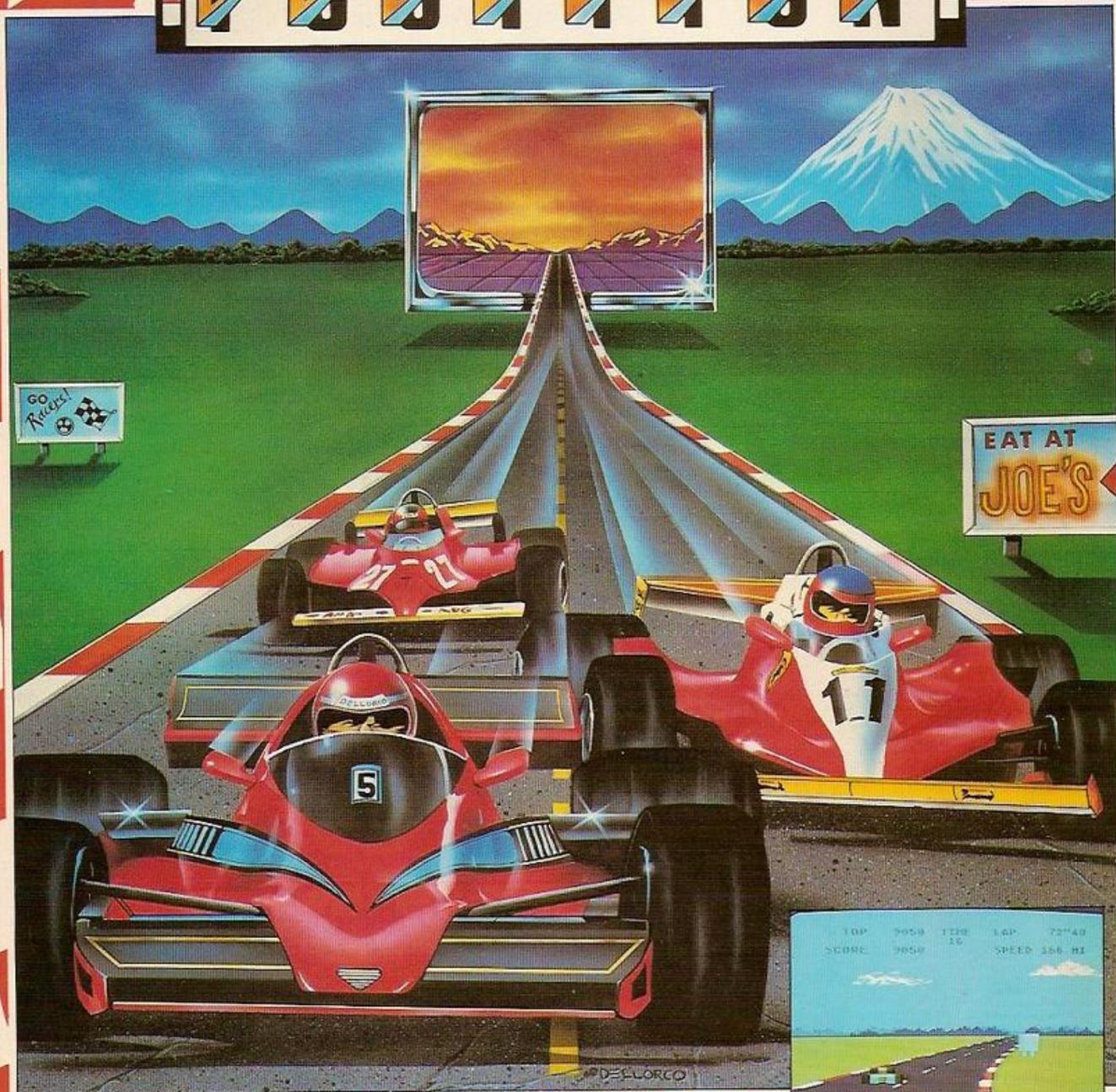
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(listing continued from page 99)

```

0048' 6600 011E      51      BNE      JOB_END
004C' B23C 0031      52      CMP-B   ##31,D1
0050' 671C           53      REQ-S   AREA_1
0052' B23C 0032      54      CMP-B   ##32,D1
0056' 6736           55      BEQ-S   AREA_2
0058' B23C 0033      56      CMP-B   ##33,D1
005C' 6750           57      BEQ-S   AREA_3
005E' B23C 0034      58      CMP-B   ##34,D1
0062' 676A           59      REQ-S   AREA_4
0064' B23C 000A      60      CMP-B   ##0A,D1
0068' 6700 0104      61      BEQ     END_JOB
006C' 60D0           62      BRA-S   LOOP_0
      63
006E' 227C 0002 0000 64 AREA_1 MOVE-L ##20000,A1
0074' 28D9           65 LOOP_1 MOVE-L (A1)+,(A4)+
0076' 2209           66      MOVE-L A1,D1
0078' 0801 0006      67      BTST   #6,D1
007C' 67F6           68      BEQ-S  LOOP_1
007E' D3FC 0000 0040 69      ADDA-L ##40,A1
0084' B3FC 0002 4000 70      CMPA-L ##24000,A1
0088' 66E8           71      BNE-S  LOOP_1
008C' 605E           72      BRA-S  FILL_SCR
      73
008E' 227C 0002 0040 74 AREA_2 MOVE-L ##20040,A1
0094' 28D9           75 LOOP_2 MOVE-L (A1)+,(A4)+
0096' 2209           76      MOVE-L A1,D1
0098' 0801 0006      77      BTST   #6,D1
009C' 66F6           78      BNE-S  LOOP_2
009E' D3FC 0000 0040 79      ADDA-L ##40,A1
00A4' B3FC 0002 4040 80      CMPA-L ##24040,A1
00A8' 66E8           81      BNE-S  LOOP_2
00AC' 603E           82      BRA-S  FILL_SCR
      83
00AE' 227C 0002 4000 84 AREA_3 MOVE-L ##24000,A1
00B4' 28D9           85 LOOP_3 MOVE-L (A1)+,(A4)+
00B6' 2209           86      MOVE-L A1,D1
00B8' 0801 0006      87      BTST   #6,D1
00BC' 67F6           88      BEQ-S  LOOP_3
00BE' D3FC 0000 0040 89      ADDA-L ##40,A1
00C4' B3FC 0002 8000 90      CMPA-L ##28000,A1
00CA' 66E8           91      BNE-S  LOOP_3
00CC' 601E           92      BRA-S  FILL_SCR
      93
00CE' 227C 0002 4040 94 AREA_4 MOVE-L ##24040,A1
00D4' 28D9           95 LOOP_4 MOVE-L (A1)+,(A4)+
00D6' 2209           96      MOVE-L A1,D1
00D8' 0801 0006      97      BTST   #6,D1
00DC' 66F6           98      BNE-S  LOOP_4
00DE' D3FC 0000 0040 99      ADDA-L ##40,A1
00E4' B3FC 0002 8040 100     CMPA-L ##28040,A1
00EA' 66E8           101     BNE-S  LOOP_4
      102
00EC' 284D           103 FILL_SCR MOVE-L A5,A4
00EE' 227C 0002 0000 104     MOVEA-L ##20000,A1
00F4' 1214           105 LOOP_FS MOVE-B (A4),D1
00F6' E809           106     LSR-B  #4,D1
00F8' C27C 000F      107     AND-W  ##F,D1
00FC' D204           108     ADD-B  D4,D1
00FE' 45FA 007A      109     LEA-L  BIT_DATA,A2
0102' 1432 1000      110     MOVE-B 0(A2,D1-W),D2
0106' 1342 0080      111     MOVE-B D2,#80(A1)
010A' 12C2           112     MOVE-B D2,(A1)+
010C' 121C           113     MOVE-B (A4)+,D1
010E' C27C 000F      114     AND-W  ##F,D1
0112' D204           115     ADD-B  D4,D1
0114' 1432 1000      116     MOVE-B 0(A2,D1-W),D2
0118' 1342 0081      117     MOVE-B D2,#81(A1)
      118
011C' 1342 0001      118     MOVE-B D2,1(A1)
0120' 1214           119     MOVE-B (A4),D1
0122' E809           120     LSR-B  #4,D1
0124' C27C 000F      121     AND-W  ##F,D1
0128' D204           122     ADD-B  D4,D1
012A' 45FA 004E      123     LEA-L  BIT_DATA,A2
012E' 1432 1000      124     MOVE-B 0(A2,D1-W),D2
0132' 1342 0080      125     MOVE-B D2,#80(A1)
0136' 1282           126     MOVE-B D2,(A1)
0138' 121C           127     MOVE-B (A4)+,D1
013A' C27C 000F      128     AND-W  ##F,D1
013E' D204           129     ADD-B  D4,D1
0140' 1432 1000      130     MOVE-B 0(A2,D1-W),D2
0144' 1342 0082      131     MOVE-B D2,#82(A1)
0148' 1342 0002      132     MOVE-B D2,2(A1)
014C' 5689           133     ADDQ-L #3,A1
014E' 3209           134     MOVE-W A1,D1
0150' 0801 0007      135     BTST   #7,D1
0154' 679E           136     BEQ-S  LOOP_FS
0156' D3FC 0000 0080 137     ADDA-L ##80,A1
015C' B3FC 0002 8000 138     CMPA-L ##28000,A1
0162' 6690           139     BNE-S  LOOP_FS
0164' 6000 FED8      140     BRA    LOOP_0
      141
0168' 3478 00CA      142 JOB_END MOVE-W UT_ERR0,A2
016C' 4E92           143     JSR    (A2)
016E' 7005           144 END_JOB MOVEQ  #MT_FRJOB,D0
0170' 72FF           145     MOVEQ #-1,D1
0172' 4E41           146     TRAP  #1
      147
0174' 0004           148 DEVNAME DC-W 4
0176' 434F 4E5F      149     DC-B  'CON '
      150     These are for MODE 4
017A' 00           151 BIT_DATA DC-B %00000000
017B' 03           152     DC-B  %00000011
017C' 0C           153     DC-B  %00001100
017D' 0F           154     DC-B  %00001111
017E' 30           155     DC-B  %00100000
017F' 33           156     DC-B  %00100011
0180' 3C           157     DC-B  %00111000
0181' 3F           158     DC-B  %00111111
0182' C0           159     DC-B  %10000000
0183' C3           160     DC-B  %10000011
0184' CC           161     DC-B  %10001100
0185' CF           162     DC-B  %10001111
0186' F0           163     DC-B  %11100000
0187' F3           164     DC-B  %11110011
0188' FC           165     DC-B  %11111100
      166     These are for MODE 8
0189' FF           166     DC-B  %11111111
018A' 00           167     DC-B  %00000000
018B' 05           168     DC-B  %00000101
018C' 0A           169     DC-B  %00001010
018D' 0F           170     DC-B  %00001111
018E' 50           171     DC-B  %01010000
018F' 55           172     DC-B  %01010101
0190' 5A           173     DC-B  %01011010
0191' 5F           174     DC-B  %01011111
0192' A0           175     DC-B  %10100000
0193' A5           176     DC-B  %10100101
0194' AA           177     DC-B  %10101010
0195' AF           178     DC-B  %10101111
0196' F0           179     DC-B  %11100000
0197' F5           180     DC-B  %11110101
0198' FA           181     DC-B  %11111010
0199' FF           182     DC-B  %11111111
      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.

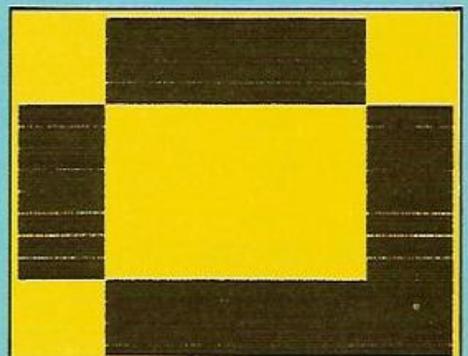
EXECMDV1_ZOOM= With this command you also run the code, but you stay in Superbasic. To make a Zoom you must



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_512x256a0-0:CLS #4
4 FOR n=0 TO 250 STEP 40
5   q=1:j=1
6   FOR m=1 TO 11
7     FOR f=1 TO 50
8       k=f:IF q=k
9         CALL box+2,j,k,h,f,10-f/10,10-f/10,1
10      j=j+1
11     NEXT f
12     q=1-q
13     NEXT m
14     FOR f=1 TO 512 STEP 5:CALL box+2,f,h,f,10,10,4
15     NEXT h
16     FOR f=1 TO 32:PAN #4,16
17     GO TO 4
18     box=RESPR(240):LBYTES mdv1_code,box:RUN
19     MODE 4:PRINT "Loading Basic Demonstration"
20     MERGE mdv1_basic_demo:GO TO 100
```

Code loader.

```
1 st=RESPR(250)
2 REMARK
3 DATA 96,22,82,18,181,236,62,65,235,4,81,4,97,230,82
4 287,72,2,180,174,8,41,183,235,8,65,8,3,8,34,184,76,22
5 7,88,8,3,239,2,2,176,76,14,235,8,283,41,8
15 REMARK
16 DATA 78,82,68,82,4,78,4,97,230,83,287,96,18,62,66,2
17 25,157,2,66,56,2,8,34,184,188,8,234,28,1,2,85,2,73,8,1
18 3,8,74,8,188,112,8,227,246,135,41,8,126
25 REMARK
26 DATA 96,65,183,69,81,117,96,42,62,64,285,4,81,2,97,
27 258,126,66,182,1,128,8,2,65,228,7,2,3,226,65,182,65,82
28 125,28,3,34,8,1,7,227,29,283,41,8,1,112
35 REMARK
36 DATA 10,83,12,183,286,66,4,81,2,97,230,83,287,96,6,
37 78,8,8,34,52,8,42,182,76,28,7,2,14,8,74,8,65,198,3,2
38 28,124,218,224,144,11,81,81,176,8
45 REMARK
46 DATA 97,66,181,6,235,135,82,287,96,38,62,65,235,4,8
47 1,117,68,255,8,124,12,8,1,8,2,66,8,3,96,235,228,3,26,8
48 0,2,14,0,194,218,1,227,288,8,8,141,159,70
51 DATA 117
55 REMARK
56 RESTORE
57 tot=0
58 FOR q=8 TO 4
59   FOR f=8 TO 46
60     READ @Poke st+q*5,d
61     tot=tot+d
62   NEXT f
63   NEXT q
64   READ @Poke st+235,d
65   tot=tot+d
66 IF tot<18992 THEN PRINT "error"
67 PRINT "code stored ok from 'st': length 236 bytes"
158 STOP
```

Assembly listing.

```
MODE EQU 163892
SCREEN EQU 131872
*
* 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
ADDQ #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 COPY Y
ANDI,W #252,D2
CMP,W D2,D4
BNE RANGX Y OUT OF RANGE ?
MOVE,W D1,D4 COPY X
MOVE,L #MODE,A1 MODE STORAGE AREA
CPI,B #8,(A1) MODE 8 ?
BEQ,S MODEB YES..
*
* EITHER MODE 8 OR MODE 4 ROUTINE USED HERE
*
MODE4 ANDI,W #511,D1 0XX512
CMP,W D1,D4 X OUT OF RANGE ?
BNE RANGX
LSR,W #2,D1 X AND 7
ANDI,W #7,D1 * X3=X AND 7
MOVE,W #254,D5 MASK=11111110
ANDI,B #3,D3 COLOURS 0-3
MOVE,B D3,D6 COPY COLOUR
ANDI,B #1,D3 BOTTOM 1 BIT OF COLOUR BYTE 1
LSR,B #1,D6 TOP 1 BIT OF COLOUR BYTE 2
BRA,S ALLOK
*
*
MODEB ANDI,W #255,D1 0XX256
CMP,W D1,D4 X OUT OF RANGE ?
BNE,S RANGX
LSR,W #1,D4 X AND 3
ANDI,W #3,D1 X AND 3
LSL,W #1,D1 X*2 * X3=2*(X AND 3)+X-1
ADD #1,D1
MOVE,B #252,D5 MASK=11111100
AND,B #15,D3 COLOURS 0-15
MOVE,B D3,D6 COPY COLOUR
ANDI,B #3,D3 BOTTOM 2 BITS OF COLOUR BYTE1
LSR,B #2,D6 TOP 2 BITS OF COLOUR BYTE2
*
* SCREEN ADDRESS= Y*128 + (IF MODE8 X/4 AND 510,IF MODE4 X/2 AND 510)
* MODE 4 AND MODE 8 ROUTINES BOTH END UP HERE
*
ALLOP LSL,W #7,D2 Y2=Y*128
MOVE,L #SCREEN,A1 GET START OF SCREEN
ADD,W D2,A1 ADDR=ADDR+Y2
ANDI,W #510,D4 LOSE ANY ODD 1
ADD,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 SCREEN
AND,B D5,(A1) MASK OF SCREEN
OR,B D6,(A1) OR 2ND BYTE WITH SCREEN
RANGX MOVEM,W (A7)+,D1-D6 RETRIEVE REGISTERS
MOVED #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.

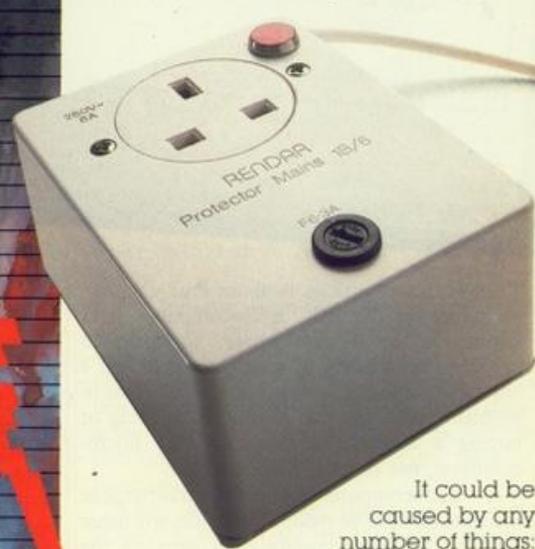
The Stripbloc is RFI filtered against spikes, 'dirty' mains and 'unclean' power.

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.

Stripbloc includes: ■ 1 five outlet mains unit with RFI filter ■ 2m cable with moulded 13A mains plug ■ 5 rewirable right-angled plugs
Spikebloc includes: ■ 1 mains protection unit with integral 13A mains socket ■ 2m cable with moulded 13A plug



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.

Send to (no stamp required):
Rendar Limited, FREEPOST,
Durban Road, Bognor Regis PO22 9RL.

Please send me the following items:

Item	Quantity	Price	Total
Stripbloc		£24.99	
Spikebloc		£49.99	
		TOTAL	

Name _____
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)

DATA

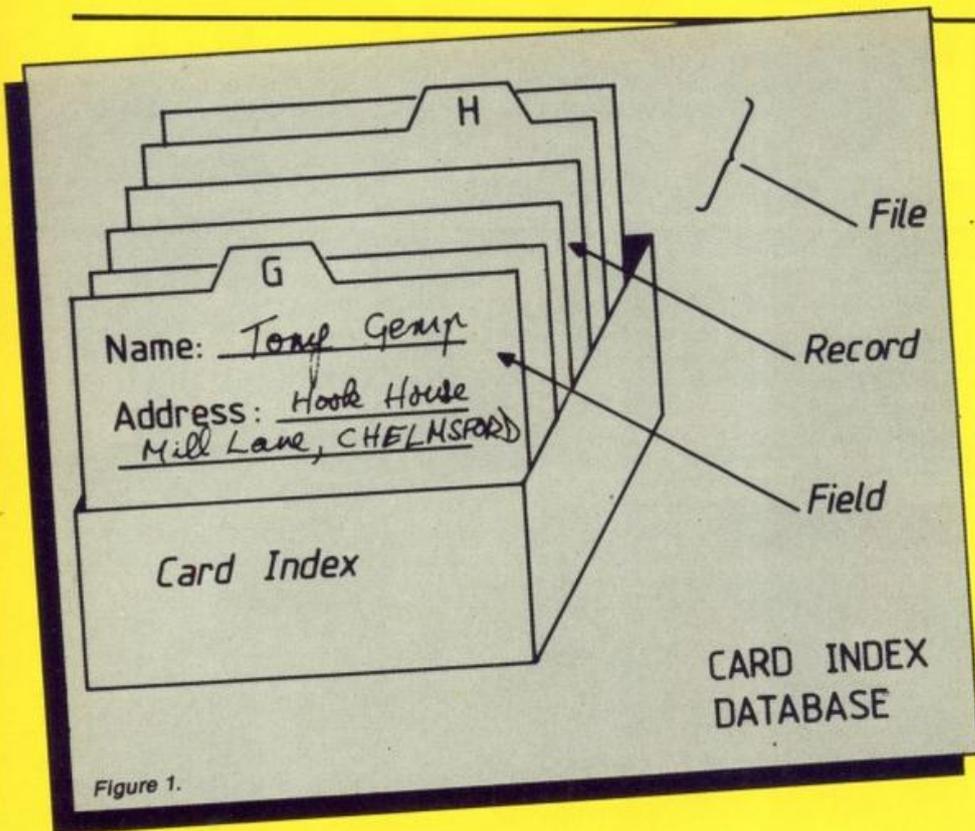


Figure 1.

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.

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 Viewsheet 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

Figure 2.

NAME: Corton-Charlemagne	MERCHANT: S H Jones
VINTAGE: 1980	TELEPHONE: 0295 11796
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

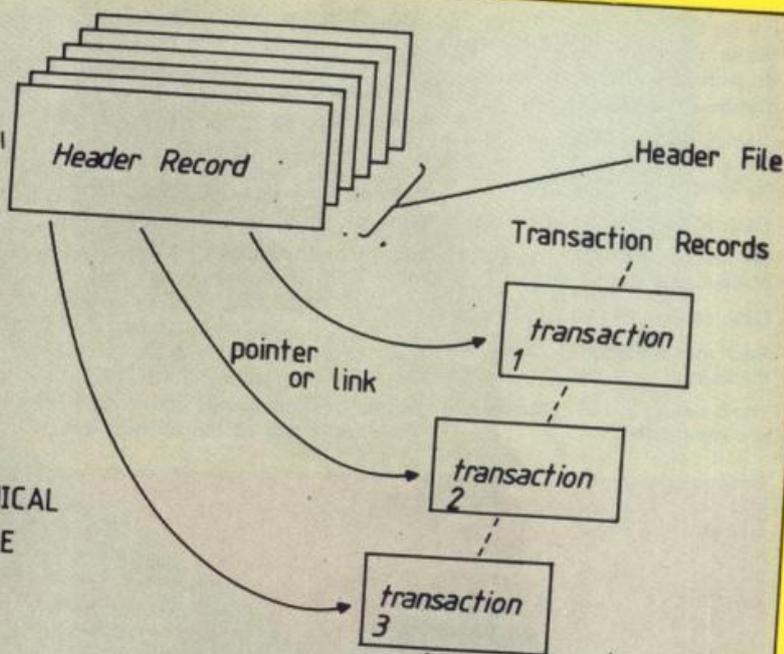


Figure 4.

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

Drug Stocks

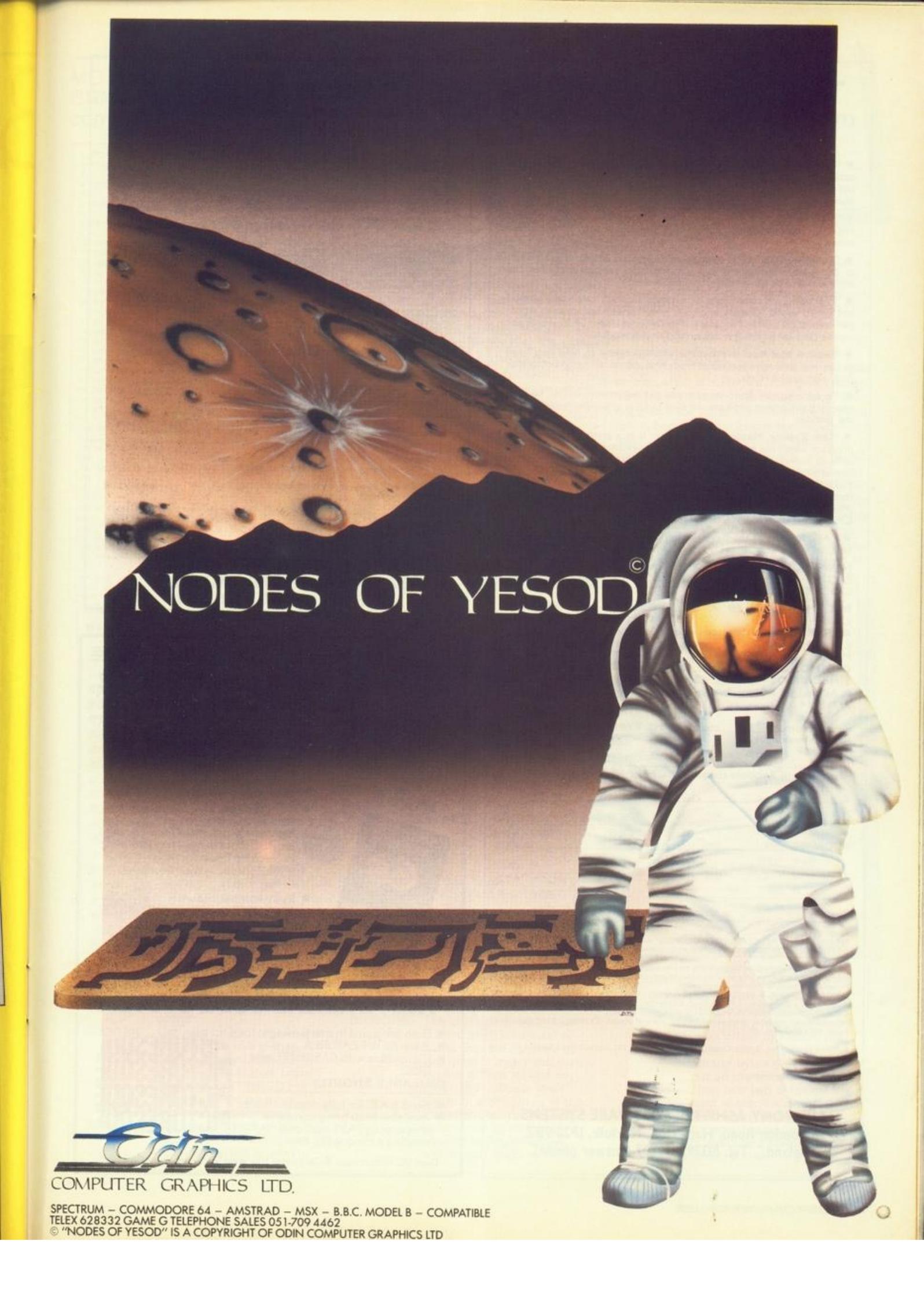
drug	stock	cost
SALBUTAMOL	10 INHALERS	4.75
PENICILLIN	1000 TABS	10.70
AMPICILLIN	1000 TABS	25.35
TETRACYCLINE	500 TABS	17.50
NITRAZEPAM	1000 TABS	19.10
OXAZEPAM	1500 TABS	27.80
PHENERGAN	400 TABS	11.15
WARFARIN	1200 TABS	35.60
ASPIRIN	2000 TABS	4.35

RELATIONAL DATABASE

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 ABX(20)

Figure 5.

An astronaut in a white spacesuit stands on a brown, cratered moon surface. In the background, dark, jagged mountain ranges rise against a light sky. A stone tablet with ancient script lies on the ground to the left of the astronaut. The title 'NODES OF YESOD' is printed in white serif font across the middle of the scene.

NODES OF YESOD[©]

Odin
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TELEX 628332 GAME G TELEPHONE SALES 051-709 4462
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THE TYPING MASTER

(The Keyboard Skills program that puts you in a class of your own)

● 'The Typing Master' program exists to teach you to type. The easily met target is 30 words per minute with 95% accuracy after 30 half-hour sessions. The following facilities help you to accomplish this standard.

● 'Sight & Type' introduces you to the keyboard with the correct finger for each key and takes you to a speed of around 12 words per minute.

● 'Touch-Typing' takes your speed to around 24 words per minute at the same time ensuring that you learn the peripheral keys to the same standard as those more commonly used.

● 'Practice Exercises' gives Non-Timed accuracy oriented exercises and Timed speed/accuracy exercises. Your results are given in words per minute and percent accuracy. The target standard of 30 words per minute (and far beyond) is achieved with this module.

● 'Session Monitor' overlays the whole program to hold your hand all the way through the course from first use of the program to that final, very useful result.

● To back up this Basic version you get documentation on how to approach the course and a record card to fill-in as you progress through the sessions.

● '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, PCDOS 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.

Please send me _____ copies of **THE TYPING MASTER (Basic Version)**

for the _____ computer at £ _____ per copy (+ VAT where shown). I enclose cheque/postal order for total amount:

£ _____

NAME: _____

ADDRESS: _____

PLEASE SEND THE COMPLETED COUPON AND PAYMENT DIRECT TO THE DISTRIBUTOR FOR YOUR COMPUTER AS SHOWN ABOVE.

● 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, PCDOS, (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
56 London Road, Harleston, Norfolk, IP20 9BZ,
England. Tel. (0379) 852807 (answer phone).

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ENHANCED BASIC FOR SPECTRUM 48K
FOR GRAPHICS — STRUCTURED PROGRAMMING
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Features: Commands are single-entry keywords in graphics mode. Syntax is checked on entry. Fully compatible with Spectrum Basic. Microdrive compatible. Comprehensive manual.

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

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

FILL enclosed area with specified ink or paper
GET wait for keypress
JOIN two program lines
KEYIN a string
KEYWORDS new keywords on/off
LIST/LLIST line TO line
USED (used with GOTO, GOSUB)
ON ERROR trap errors (with LINE, STAT and ERRORT)
PLOT a string line, 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 line ROLL, but without wrap round
SORT arrays (very fast!)
SPLIT program lines
TRACE program execution
UNTIL used with DO or LOOP
USING used with PRINT
WHILE used with DO or LOOP
XOR, **XOR** move PLOT origin
XRO, **YRG** change PLOT scale

FUNCTIONS

AND (bit-by-bit)
BIN decimal to binary
CHAR number to 2 characters
COSE fast cosine
DEC hexadecimal to decimal
DPEEK double PEEK
FILLED filled area

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

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

Only £11.00 inclusive! (Upgrade price for Release 1.0 owners is £4.00. This includes a 12-page supplement to your manual. Please quote date of purchase. If you did not purchase from us, state supplier and return original cassette.)

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(or £11.50 for foreign orders). Cheques payable to BETASOFT.

I don't believe it! Please send me full details of Beta Basic 1.8. I enclose a stamped addressed envelope.

NAME: _____

ADDRESS _____

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BIRMINGHAM B13 9SQ.

SPECTRUM THE MACHINE CODE SYSTEM

* "... one of the all too few jewels of Spectrum programming... deserves a place in every serious programmer's library" (Simon Springett—Popular Computing Weekly—June 1984)

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£8.50 INC VAT, P&P

£7.50 INC VAT, P&P



MC Hart gives your CBM-64 an extra command.

REPEAT UNTIL

```

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 162,2,189,60,3,149,124,202
14 DATA 16,240,96,201,39,208,230,32
15 DATA 115,0,201,85,240,37,201,82
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 199,2,76,64,169,166,2,202
23 DATA 139,10,10,170,189,167,2,133
24 DATA 123,189,168,2,133,122,189,169
25 DATA 2,133,59,189,170,2,133,57
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 :&R:J=J+1:PRINT J,:REM INNER
190 :&U:J=4:PRINT:REM INNER
200 :
210 &U:A=10: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 CHRGT 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.



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.

PC	SR	AC	XR	YR	SP	
:0008	30	4F	4F	00	F6	B*
033C	C9	3A				CMP #03A
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 #026
0361	D0	EE				BNE #0351
0363	20	73	00			JSR #0073
0366	C9	55				CMP #055
0368	F0	25				BEQ #038F
036A	C9	52				CMP #052
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
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 <i>not</i> an R then branch back to Goto CHRGT in Rom — where a syntax error will be generated.	038F-039E 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.
036E-038C	Get the contents of the 'Loop counter' which has been initialised to zero in	
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.	

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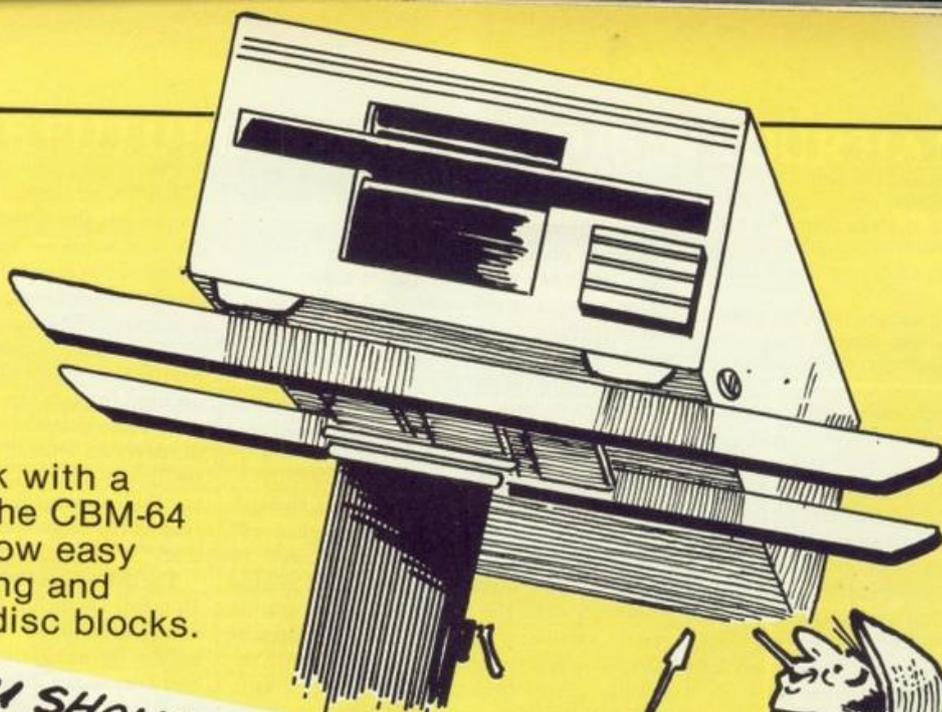
*PLEASE TICK WHERE APPROPRIATE

YCI

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, Jarro, 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.	hex/decimal.
100-180: Main input loop. Edit block if requested and check for valid commands.	800-899: Read specified block from the disc, update current track and sector values and set links to next block.
200-260: Get track and sector numbers for read and write commands.	900-999: Write current block data to specified block on disc.
300-360: Produce printed copy of current block.	1000-1020: Read and display error channel from disc drive.
400-499: Move "cursor" around block display.	2000-2150: Draw screen "windows".
500-590: Execute commands.	2200-2300: Attempted to identify disc — read track 18 (\$12) sector 0.
600-630: Display block on screen.	2400-2550: Error messages for unreadable discs.
700-760: Convert to and from	3000-3070: Input a string subroutine.

```

0 rem trak: 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$="0123456789abcde"
30 cl$=""
40 cl$=cl$+" "+mid$(cl$,2)+""
50 ok$=""
60 bl$=""
70 sw=15:et=8:u=1:ft=15:t4=40:c3=3:ax=16:c9=9:c7=7:a0=40:c2=2:b8=128
80 e$(0)="1st":e$(1)="2nd":n$(0)="hexadecimal":n$(1)="ASCII"
90 gosub2000:goto180
100 getk$:ifk$=""then100
110 k$=asc(k$):ifk$(40ork$70or(k$57andk$(65)then160
120 pokep,peek(cp+u):pokecp+u,k+64*(k$57)+b0
130 xcx+cy+et+P#B: b(x)=x*(b(x)andft)+k-49+7*(k$57)
140 ifC2thenPrint"tab(150)";linking":gosub850:Print" ";
150 goto180
160 forx=1to100:ifk$(mid$(ok$,x,1)thennext:goto100
170 ifx(6thenonx$gosub400,410,420,430,440:goto100
175 onx-5gosub500,510,520,530,540,550,560,300,999
180 Print"Command Print":goto100
200 mx=2:tt=ss$:"Print"tab(8)
210 Print"Track: ";:gosub3000
220 ifC" thenh$=15:gosub750:tt=gd:goto240
230 dett:gosub700:Print" ";:gosub3000:ifthenreturn
240 Printtab(8);:sector: ";:gosub750:ssd:return
250 ifC" thenh$=15:gosub750:tt=gd:goto240
260 dss:gosub700:Print"tab(16)";return
300 open4,7:Print#4:Printcl$:andcopy being printed.
310 Print#4:"Disk "dn$ "ID "id$ "OS "os$
320 det:gosub700:Print#4:"Track "tr$ "ID "id$:gosub700:Print#4:"Sector" h$r
330 forx=0to15:dw=16:gosub700:Print#4,h$ " ";:ax="":forx=0to15
340 cb(x)=x+1:dw=16:gosub700:Print#4,h$ " ";:next
350 ax$=asc(x):gosub700:Print#4,h$ " ";:next
360 Print#4," / "ax:next:Print#4,r$r$
370 close4:return
400 cx=(cx+1)and7:goto450
410 cx=(cx-1)and7:goto450
420 cy=(cy+1)and15:goto450
430 cy=(cy-1)and15:goto450
440 cy="":cx=""
450 ifdthenreturn
460 fori=0to1:pokecp+1,peek(cp+1)and127:next
470 cp=114:cy=et4+cx#3
480 fori=0to1:pokecp+1,peek(cp+1)or128:next
499 return
500 Printcl$:"Updating block."
501:tt=ss$:gosub900:return
510 Printcl$> Write ":gosub200:ifthen590
511 gosub900:return
520 Printcl$> Trying to follow link.":tt=ss$:
521 gosub900:ifthenreturn
522 gosub900:return
530 Printcl$> Read ":gosub200:ifthen590
531 gosub521
540 Printcl$> Enter DOS command -R-:ax=30
541 gosub3000:ifthen590
542 close:Print#15,15:gosub1000:open1,0,2,"*":return
550 P=1-P:Printcl$> Displaying "e$(P)" page.":goto600
560 dw=1-d:Printcl$> Switching display to "s$(d)":goto600
590 Printcl$> Cancelled >:forx=1to200:next:return
600 Print" ";:forx=0to1:br=x#B:dw=1:gosub700:Print" ";:b$="":
610 forx=0to1:dw=(x#B):ifdthenpoke1149+et4+cx#3,d:goto630
620 gosub700:Print" ";

```

```

630 next:Print:next:poke1961,226-P#B:goto440
700 h$=mid$(h$,d+(x+u)+mid$(h$,dandft)+u):return
750 h$="0":h$=asc(right$(h$,c2))-40+(c7*(c9)+ax)
800 Print" ";:spc(150);:reading
810 Print#15,"u:2.0","t:ss:gosub1000:ifthen880
820 tt=ss$:det:gosub700:tt=h$:gosub700:ns=h$
830 Print#15,"b:P,2.0"
840 forx=0to255:getk$,as=b(x)=asc(as+z8):next:P,
850 ntab(0):n$=b(1):det:gosub700:nt=h$:dss:gosub700:ns=h$
860 Print" ";:spc(236)ts";:
870 Print" ";:spc(150)nt$";:
880 Print" ";:tab(150)";
899 return
900 Print" ";:spc(150);:writing
910 Print#15,"b:P,2.0"
920 forx=0to255:Print#1,chr$(b(x)):next
930 Print#15,"u:2.0","t:ss:gosub1000:goto800
995 Print"Exit...":close:Print#15,"i":close15:Print" ";:end
1000 poke1,22:Print#1,thener#er$+ax:ifst,then1010
1010 get#15,as:ifst,thener#er$+ax:ifst,then1010
1020 er=val(er$):er#er$+mid$(cl$,2,33-len(er$)):Printers":return
2000 Print" ";:
2010 Print" ";:
2020 forx=1to16:Print" | "tab(27)";:|:next
2030 Print" ";:
2040 Print" ";:
2050 Print" ";:
2060 Print" ";:
2070 Print" ";:
2080 Print" ";:
2090 bl$="":
2100 bl$=bl$+";:
2110 bl$=bl$+";:
2120 bl$=bl$+";:
2130 Print" ";:tab(20)";:";:spc(29);:Printtab(20)bl$";:
2140 Print" ";:spc(9)";:";:Current";:Print" ";:tab(29)";:Linked to
2150 Print" ";:Press RETURN to ID disk."
2200 Print" ";:
2210 getk$:ifk$=Or$then2210
2220 Printcl$
2230 open15,0,15,"i":gosub1000:ifthen2500
2240 open15,2,""
2250 tt=18:ss=0:gosub800:gosub1000:ifthen2400
2260 dn$=""forx=144to161:dn$=dn$+chr$(b(x)):next
2270 id$=chr$(b(162))+chr$(b(163))+os$+chr$(b(165))+chr$(b(166))
2280 poke1,20:Print#15,"";:dn$=dn$+chr$(b(167))+os$+cl$;
2300 P,":cx$,cy$:gosub600:goto440
2400 Printcl$> Directory error - cannot ID disk.
2410 dn$="":id$="":os$="":
2490 Printcl$> cannot initialise drive - unrecoverable
2510 Print" error. Press RETURN to re-start."
2520 getk$:ifk$=""then2520
2530 ifk$=thener#er$;:
2540 ifk$=thener#er$;:
2550 goto2520
3000 er,":l$="":Print" ";:
3010 getk$:ifk$=""then3010
3020 ifk$=thener#er$;:return
3030 ifk$=Or$then1:return
3040 ifk$=Or$then1:ifC" thenl$=left$(l$,len(l$)-1):Print#1:goto3010
3050 ifasc(k$)and127<33then3010
3060 iflen(l$)=20then3010
3070 l$=l$+k$:Print" ";:goto3010

```

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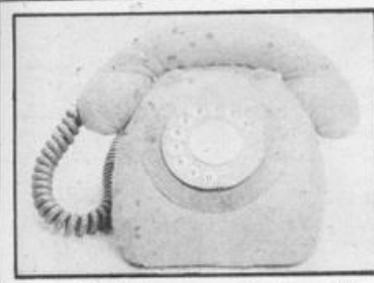
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SPACE JUNK

```

note: enter letters as
capitals
34+0 c13a5354412048+9 2d4
34+2 47484809aa35000a 279
3500 35b66a4c44412023 269
3506 3600j035b08a5354 272
3510 4120404947484809 262
3518 aa36002635a0a94c 20b
3520 4441202335903535 167
3528 d48a535441205348 301
3530 49454c44004635a8 201
3538 8a4a535220534554 285
3540 5241444152005735 1+6
3548 +48a5349c343+520 385
3550 4c4458020230000c 1c7
3558 35f68a9c53494420 351
3560 4c444120534+554e 236
3568 442c58007d35f98a 2+c
3570 5354412044555853 244
3578 49442c58000835+9 2c7
3580 8a4c444120233000 1c6
3588 9935f98a53544120 35a
3590 7548494348322c58 229
3598 00a135f09a494e50 34a
35a0 00ad35f0c8a435056 353
35a8 20233235000a35+e 297
35b0 8a424e45209c5349 267
35b8 4400c23510865254 27c
35c0 5300d735748c5241 2+1
35c8 53549a34204c4441 266
35d0 20534154539100a2 20e
35d8 357e6b434502023 261
35e0 3100+235888b424e 2+0
35e8 452046494e524153 282
35f0 34000336928b4a53 227
35f8 52204254c4c404+ 233
3600 4c53001436976b4a 255
3608 5352205348495043 23c
3610 4+4c530025363c8b 270
3618 4a5352204d495343 23b
3620 48444c52003536a6 23b
3628 8b46494e52415334 282
3630 202c3000d22+9d+2 2+c
3638 563252454c204259 226
3640 542023234382c3234 1a4
3648 392c3235342c3235 193
3650 3000ed2+93+25632 356
3658 5741564520425954 242
3660 203332c3332c33 177
3668 332c33300035094 10e
3670 +25457534+554e44 326
3678 28+259542000c32 16d
3680 34302c31362c3232 167
3688 342c33322c323033 16b
3690 2c34382c3139322c 18c
3698 36342c3137362c30 198
3700 302c3136302c3936 18e
3708 2c3134342c313132 185
3710 2c31323007e309e 213
3718 +2485850534+554e 328
3720 442042595420302c 1c+
3728 31362c33322c3438 190
3730 2c36342c38302c39 18+
3738 362c3131322c3132 185
3740 382c3134342c3136 190
3748 302c3137362c3139 190
3750 322c3230382c3232 188
3758 342c32343000c730 1ed
3760 a8+2524546534+55 36e
3768 4e44204259542032 1+3
3770 34302c3232342c32 186
3778 30382c3139322c31 16d
3780 37962c3136302c31 18d
3788 34342c3132382c31 18c
3790 31322c39362c3030 192
3798 2c36342c34382c33 18d
3800 322c31362c3000e1 202
3808 30b2+29153432042 35d
3810 59542039362c3134 1cd
3818 342c36342c313736 194
3820 00+23016+6902022 2+2
3828 535041434532222c 1ec
3830 300000005c8c4445 1a9
3838 50000b375f8c4a53 2a2
3840 5220504c4+545341 245
3848 5453009337646c52 263
3850 5453009a37696c52 2d3
3858 4153549a32204c44 264
3860 4120534154539120 2+d
3868 214c45465400b937 23c
3870 5e8c434d50202331 24e
3878 00c537738c424551 263
3880 37c0 20acaa3300d3778 325
3888 8c52545300ac377d 315
3890 8c4c445820534941 26b
3898 50455000e+37820c 320
3900 4a535220434c4541 224
3908 525341545300+437 2c1
3910 878c4c4458205343 261
3918 415045500053889 1+4
3920 03030+0+3+3+3+3+3 2a0
3928 0000000000000000 07e
3930 0000000000000000 07e
3938 0040406060703038 218
3940 1c1e0+0703000000 053
3948 000000000+03e00 296
3950 0000001818000000 030
3958 000000c3dbdb++db 453
3960 dbe7db+fdb7db+f 738
3968 e7++db+db+db+7e 717
3970 5555+db7e75ac3 56f
3978 e7e7+7e000000 44a
3980 6666+db3db5939 57c
3988 bdc3+++7e000000 3+c
3990 +++015e575+570 46a
3998 +++9177+d5f+64 501
39a0 +++03f5dd7e9d03 53c
39a8 ++++87+87+87+87 708
39b0 ++c3dbdf+db3++ 6+8
39b8 ++c7db7e+7e+7e+7e 754
39c0 ++++++7e000000 7+8
39c8 ++++0330333333++ 39c
39d0 ++++0733073307++ 378
39d8 ++++03333+3303++ 3a8
39e0 ++++0733333307++ 3a4
39e8 ++++033+073+03++ 388
39f0 ++++033+073+03++ 3c4
39f8 ++++033+333303++ 3a8
39a0 ++++0333033333++ 3cc
39a8 ++++03c+0c+0c+03++ 570
39b0 ++++03c+0c+0c+03++ 57c
39b8 ++++3333073333++ 7d0
39c0 ++++3+3+3+3303++ 3+0
39c8 ++++3303333333++ 3cc
39d0 ++++0333333333++ 3cc
39d8 ++++0333333303++ 39c
39e0 ++++0333333303++ 39c
39e8 ++++0333033+3+3++ 3c4
39f0 ++++0333033+3+3++ 31c
39f8 ++++0733073333++ 438
39a0 b6+57b6bbdb50eae 50f
39a8 efafb7fa9c0db5ff 50a
39b0 0006330c30c30c30c 2a3
39b8 330+030303030303 056
39c0 0000c30c633c633 34e
39c8 cc70c00c00c0000d 508
39d0 000000000101830 060
39d8 0000007e00000000 07e
39e0 ++++++7e000000 798
39e8 0040406060703038 218
39f0 1c1e0+0703000000 053
39f8 000000000+03e00 296
39a0 0000001818000000 030
39a8 000000c3dbdb++db 453
39b0 dbe7db+fdb7db+f 738
39b8 e7++db+db+db+7e 717
39c0 5555+db7e75ac3 56f
39c8 e7e7+7e000000 44a
39d0 6666+db3db5939 57c
39d8 bdc3+++7e000000 3+c
39e0 +++015e575+570 46a
39e8 +++9177+d5f+64 501
39f0 +++03f5dd7e9d03 53c
39f8 ++++87+87+87+87 708
39a0 ++c3dbdf+db3++ 6+8
39a8 ++c7db7e+7e+7e+7e 754
39b0 ++++++7e000000 7+8
39b8 ++++0330333333++ 39c
39c0 ++++0733073307++ 378
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Available on Telsoft.

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3d30:	0103070+f001e1e1e 074	3f48:	++00+++0+00+00+ 5+a	4220:	8d11d0a9+fb8d12d0 481	4448:	45c7c052ad7c052c 9 425	4670:	1869485+e003+5+fb 408
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previous page)

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5040	04c61260ad2e227	2cb	4bf8	00d0c94cd0e5a2a4	4e0	4e80	04d030a9010020748	2+5	5168	a9ac0d00b1a596a7	555	5448	9546207e46207e46	2a3
5048	09+0069d+006c9+8	503	4c00	8a48a0c201a4920	2e2	4e88	a9008d18d0c0c0e04	30+	5170	aa0a0eaf2b34601	15e	5450	a9078d0170a00a2	24a
5050	04c61260ad2e227	2cb	4c08	5249a21e20bd4668	24c	4e90	0d201150ad0200c	495	5178	203d20444e452050	40f	5458	00a92320046207e	265
5058	09+0069d+006c9+8	503	4c10	aa0e09d0e0aa200	54c	4e98	ad00a0900004a901	327	5180	4c41594552204741	225	5460	46207e4600a91a20	20a
5060	04c61260ad2e227	2cb	4c18	8a48a0c920094920	206	4ea0	4e004a901850ca	304	5188	40454603203d2054	14c	5468	209846a00aa2020	29c
5068	09+0069d+006c9+8	503	4c20	3e4aa21420bd4668	209	4ea8	04d0c90c0004a901	327	5190	574+20504c415945	241	5470	7e46207e46209046	24c
5070	04c61260ad2e227	2cb	4c28	aae8e015d0eaa308	442	4e88	850768aa68a8ad10	36b	5198	522047414045405	22b	5478	ce9a4660a9008512	34e
5078	09+0069d+006c9+8	503	4c30	8d2b009d2cd0a994	44e	4e90	d0c902d00aa0d020	344	5200	4e4b4945545244+	26b	5480	2090551be8e000d0	30a
5080	04c61260ad2e227	2cb	4c38	ad05a219201a4920	2d3	4e98	05a505c908009a9	366	5208	50455253544+524e	24c	5488	10a20120bd46a512	28d
5088	09+0069d+006c9+8	503	4c40	3649207e46207e46	247	4ea0	008505a30c0901d0	2c+	5210	4552544845204a55	237	5490	c9ff+0b054c+f0a0	56d
5090	04c61260ad2e227	2cb	4c48	207e46207e46a907	278	4ea8	1c0e16a007+a90085	311	5218	4645504c41594552	25d	5498	00a9511be8e000d0	30a
5098	09+0069d+006c9+8	503	4c50	a23a201b45a9380d	2ea	4e88	064ce74ea90ad051	328	5220	4645504c41594552	1cc	5500	+9a90185230524a2	396
5100	04c61260ad2e227	2cb	4c58	03d0a9b0800d0a9	44+	4e90	07a9019d51d0e8a3	407						



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TOP TIPS

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 REM EXAMINE MEMORY
9010 CLS LET P=PEEK 9000+PEEK
9020 PRINT P; " "
9030 IF P=13 THEN GO TO 9200
9040 IF P=10 THEN GO TO 9000
9050 IF P=10 THEN PRINT S;
9060 IF P=9 AND P<100 THEN PRINT
9070 IF P=99 THEN PRINT S;
9080 IF P=31 THEN PRINT PAPER S;
9090 IF P=32 THEN PRINT
9100 LET S=P+1 GO TO 9020
9110 PRINT S; " " PAPER S; LINE
9120 LET S=P+2 LET P=PEEK S+PEEK
9130 PRINT S; " " PAPER S; NO.
9140 PRINT S; " " PAPER S; NO.
9150 LET S=P+3 GO TO 9100
9160 PRINT S; " "
9170 PRINT S; " "
9180 FOR I=3 TO 5
9190 PRINT PEEK I;
9200 NEXT I
9210 PRINT LET S=P+S GO TO 91
```

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:

```
for dec/hex
SYS 49152,***** (decimal
number)
for hex/dec
SYS 49242,$***** (hexadecimal
number)
```

Gary Taylor

```
30000 REM HEX-DEC & DEC-HEX
30010 ADD=49152: C=0
30020 READ A:IF A=0 THEN END
30030 POKE ADD+C,A: C=C+1: GOTO 30
020
30040 DATA 32,257,174,32,138,175
30050 DATA 247,183,178,152,72,136,72
30060 DATA 169,36,32,210,255,184
30070 DATA 32,38,192,184,32,42,192,184,32,
38
30080 DATA 192,184,32,43,192,96,
24,186,186,186,186,41,15,24,185,
48
30090 DATA 281,58,144,2,185,6,32
30100 DATA 210,255,96,234,234,32,115,8
30110 DATA 281,58,41,15,144,2,18
5,8,96,32,61,192,18,18,18,18
30120 DATA 133,35,32,61,192,181,
35,133,35,96,32,115,8,281,36,248
30130 DATA 3,76,8,175,32,73,192,
133,34,32,73,192,165,34,166,35
30140 DATA 32,205,189,76,116,164
30150 DATA 234,-1
```

RESPONSE

Frame

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 DEFPROCfill (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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34-way	£3.10	£1.95	£1.85	24-way	£2.15	£2.45	34-way	£2.85	(Centronics)		
40-way	£3.40	£2.00	£1.85	40-way	£2.15	£2.45	50-way	£2.90	36-way plug	£4.95	
50-way	£3.85	£2.25	£2.00	50-way	£2.30	£2.65	60-way	£3.25	36-way socket	£5.95	
60-way	£4.80	£2.60	£2.25	60-way	£2.45	£2.85	D CONNECTORS				
PRINTER LEADS			COMPUTER LEADS			SOLDER BUCKET			Male	Female	
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BBC serial	£8.95		7 pin DIN plug to 2x3.5mm	£2.25	14 way	18	£2.30				
AMSTRAD	£15.75		1x2.5mm Jack plugs	£2.25	15 way	20	£3.60				
MEMOTECH	£12.75		5 Pin DIN plug to 2x3.5mm	£2.20	20 way	30	£5.00				
EINSTEIN	£12.75		1x2.5mm Jack plugs	£2.20	24 way	36	£6.80				
IBM PCC	£15.95		6 Pin DIN Plug to 5 Pin DIN Plug	£1.95	25 way	40	£8.50				
SPECTRUM interface 1 to RS 232	£9.75		2x3.5mm Jack plugs to 2x3.5mm Jack plugs 10	£1.25	26 way	45	£10.75				
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14	£1.00		2x28-way (Spectrum)	£2.10	10 way	15	£28				
16	£1.40		2x6-way Commodore	£1.20	14 way	18	£32				
24	£1.80		2x12-way	£1.60	15 way	20	£36				
28	£3.95		DOUBLE SIDED PLUG			16 way	22	£40			
40	£2.15		ZX81 23-way	£1.25	20 way	30	£50				
TELEPHONE CONNS			MONITOR LEADS			24 way	36	£60			
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Surface extn socket	£2.50		BNC plug to phone plug	£2.95	26 way	45	£70				
Dual outlet adaptor	£4.25		QL to colour monitor	£4.95	34 way	60	£80				
Line jack cord 3mtr	£1.85		QL to mono monitor	£1.25	37 way	65	£85				
BT jack plug	48p		SPECTRUM EXTENSION LEADS			50 way	70	£95			
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(continued from previous page)

```

1980 PR=PR+1:IFPR=2THENQ200
1990 WT=1:GOTO270
2000 CT=CT-1:FORJ=FTOCT:GZ(J,0)+CZ(J+1,0):GZ(J,1)+CZ(J+1,1):NEXTJ
2010 IFSO=BRNDG=3RNDL:DRTHENS=C$+2:GOSUB2050:IFLDRDRTHENS=C$+1
2020 GOSUB1170:SD=SD+1:WT=1:IFCT=0THENQ200
2030 GOTO270
2040 PRINTD1$D$:"I'LL PLAY THE 'R'." :B FORI=1TO3000:NEXT:RETURN
2050 PRINTD1$D$:IFLDRDRTHENS=3:"TRIPLE HEADER." :GOTO270
2060 PRINT:"DOUBLE HEADER."
2070 FORI=1TO2000:NEXT:RETURN
2079 REM ##END OF HAND##
2080 FORI=1TO1000:NEXT:PRINT"Q"
2090 GOSUB620:GOSUB1200:PRINT"Q"
2100 IFSO=3THENQ170
2110 GOSUB2370:PRINTD$:"YOU HAVE 'R' SPOTS." :PRINT"I HAVE 'B' SPOTS"
2120 IFC$THENPRINT"YOU WIN THE HAND." :G=1:GOTO2150
2130 IFRD$THENPRINT"YOU WIN THE HAND." :G=2:GOTO2160
2140 PRINT"R DRAWH HAND." :G=0:GOTO2200
2150 FS=FS+1-R:GOTO2200
2160 CS=CS+1-B:GOTO2200
2170 PRINTD$:IFFT=0THENPRINT"YOU GET ONE POINT FOR GOING OUT." :FS=FS+1:G=1:GOTO
2200
2180 IFC$=0THENPRINT"YOU GET ONE POINT FOR GOING OUT." :G=2:CS=CS+1:GOTO2200
2190 PRINT"END OF HAND." :G=0
2200 GOSUB1170:IFPS=CSORCSGTHENQ240
2210 IFSO=1THENQ220
2220 IFSO=0THENQ230
2230 GOTO2310
2240 IFSO=0THENQ220
2250 IFSO=2THENQ230
2260 IFSO=0THENQ230:"YOU" :GOTO2320
2270 GOTO2310
2280 FORI=1TO5000:NEXT:GOTO40
2290 RE="BUT I" :GOTO2320
2300 RE="BUT YOU" :GOTO2320
2310 RE="AND"
2320 IFSO=CSTHENPRINTD$:GOSUB6000:DRASH:GAME." :GOTO2340
2330 PRINTD$:GOSUB6000:RE" WIN THE GAME."
2340 PRINT:PRINT"PRESS RETURN."
2350 GETH:IFA=COR(13):THENQ250

```

```

2360 REM
2370 REM ##CALCULATE NO. OF SPOTS IN EACH PLAYER'S HAND##
2370 R=0:R=0:IFFT=0THENQ220
2380 FORI=1TOFT:R=R+PS(I,0)+PS(I,1):NEXTI
2390 IFC$=0THENRETURN
2400 FORI=1TOCT:R=B+CZ(I,0)+CZ(I,1):NEXTI: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 OHSO=0:GOTO2490:2530:2600
2490 PRINT" IN BLOCK GAME PLAYERS ARE DEALT 7 TILES EACH AND THE GAME IS PLAYED."
2500 PRINT"TO 50 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 BERGON 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 MATCHING ENDS OF THE CHAIN. AN EXTRA POINT"
2650 PRINT"BEING SCORED IF ONE END IS A DOUBLE."
2660 GOSUB2710:GOTO130
2670 GOSUB2710:PRINT"POINTS ARE SCORED AT END OF HAND BY THE PLAYER WITH THE"
2680 PRINT"TOTAL SPOTS ON HIS REMAINING TILES. SUBTRACTING HIS SPOTS"
2690 PRINT"FROM HIS OPPONENTS. THE REMAINDER BEING"
2700 PRINT"THE SCORE FOR THAT HAND." :GOSUB2710:GOTO130
2710 PRINT"PRESS ANY KEY TO CONTINUE"
2720 GETH:IFA=COR(13):THENQ270
2730 PRINT"RETURN"

```

Sound experimenter

Edward Upsdell,
Thonex,
Switzerland.



THIS PROGRAM is for an Atari with at least 32K of memory. It aims to help in understanding sound on the Atari and experiment with the sound.

Type in the program and run it. You should see something like figure 1.

To use sound register 0 type 0, hit Return, type REG, and hit Return. The rest is basically the same. Type in the number, hit Return, command, Return. This is used for the REG, FRE, DIS, VOL commands. Next is the FRC command. It does not have to be preceded by a number. Its function is to produce a click from the TV. A value of one in this place means on and a zero signal that it is off. The first eight lines, B7 to B0, are the bits

in the AUDCTL register. To change bit seven to one, type B7, Return. To return it back to zero again, type B7, Return. These changes are technical and give no indication on what the sound will be like. It is best to experiment. Enough to say that using B0 through B4 turns on both sound channels associated with B7.

To hear the sound type in the register number, press Return, type in CH and hit Return again. It is possible to listen to all four channels at once. To turn off the sound type in Off and hit Return. The sound must be off to change one of the parameters. When you want to look at the sound statements to write them down for future reference, type in SDIS and hit Return. This will show the numbers for all four channels. When you use this sound in one of your own programs just type in the same numbers.

If any of the eight bits have a one beside them then in order to view the sound you must type in PDIS. This prints out the Poke

statements for that sound. The SDIS command will not give you the full information. Again, when you went to use this sound, just copy the Poke statement into your program.

Figure 1.

```

AUDCTL (REG)ISTER 4
          9 BIT POLY:(B7):0
clock Ch.0 w/1.79 MHz:(B6):0
clock Ch.2 w/1.79 MHz:(B5):0
          clock Ch.1 w/Ch.0:(B4):0
          clock Ch.3 w/Ch.2:(B3):0
          clock Ch.0 w/Ch.2HiP:(B2):0
          clock Ch.1 w/Ch.3HiP:(B1):0
          15 kHz:(B0):0

```

```

SOUND (REG)ISTER:
(DIS)TORTION:
(FRE)QUENCY:
(VOL)UME:

```

```

X:
D: ?
USABLE COMMANDS:
REG DIS FRE FRC VOL OFF CH SDIS
PDIS

```

```

10 REM *****
20 REM #SOUND EXPERIMENTER#
25 REM # BY #
30 REM # EDWARD UPSDELL #
40 REM #
50 REM # COPYRIGHT(C)1984 #
60 REM *****
80 DIM S(5,8),IN$(50),SP$(35)
85 SP$=""
*:REM 35 SPACES
90 FOR I=0 TO 8:FOR J=0 TO 5:S(J,I)=0:NEXT J
:NEXT I
100 REG=5000:DIS=5100:FRE=5200:FRC=5300:OFF=
5400
102 CLD=5900:CLX=6000:VOL=6100:POKAUD=6200:C
H=6300:START=6400:REGDIS=6500:BUZZ=6600
104 PDIS=6700:SDIS=6800:EDIS=6900
1002 GRAPHICS 0:POKE 752,1
1008 POSITION 2,0:?"AUDCTL (REG)ISTER 4"
1010 POSITION 2,1:?"          9 BIT POLY:(
B7):"
1020 POSITION 2,2:?"clock Ch.0 w/1.79 MHz:(
B6):"
1030 POSITION 2,3:?"clock Ch.2 w/1.79 MHz:(
B5):"
1040 POSITION 2,4:?"clock Ch.1 w/Ch.0:(
B4):"
1050 POSITION 2,5:?"clock Ch.3 w/Ch.2:(
B3):"
1060 POSITION 2,6:?"clock Ch.0 w/Ch.2 HiP:(
B2):"
1070 POSITION 2,7:?"clock Ch.1 w/Ch.3 HiP:(
B1):"
1080 POSITION 2,8:?"          15 kHz:(
B0):"
1090 POSITION 2,9:?"SOUND (REG)ISTER:"
1100 POSITION 2,10:?"(DIS)TORTION:"
1110 POSITION 2,11:?"(FRE)QUENCY:"
1120 POSITION 2,12:?"FORCE OUTPUT:"
1126 POSITION 2,13:?"(VOL)UME:"
1128 POSITION 2,14:?"X:"
1130 POSITION 2,15:?"D:"
1140 POSITION 2,16:?"USABLE COMMANDS:":POS
TION 2,17:?"REG DIS FRE FRC VOL OFF CH PDIS
SDIS"
1500 GOSUB START
2000 REM JUMP TABLE
2008 FOR IZ=1 TO 2 STEP 0
2010 POSITION 5,15:POKE 752,0:INPUT IN$:POKE
752,1
2020 TRAP 2040:A=VAL(IN$):TRAP 40000
2030 POSITION 5,14:?"A:GOSUB CLD
2040 IF IN$="REG" THEN GOSUB REG
2042 IF IN$="DIS" THEN GOSUB DIS
2044 IF IN$="FRE" THEN GOSUB FRE
2046 IF IN$="FRC" THEN GOSUB FRC
2048 IF IN$="OFF" THEN GOSUB OFF
2049 IF IN$="CH" THEN GOSUB CH
2058 IF IN$="VOL" THEN GOSUB VOL
2060 IF IN$="B7" THEN S(4,7)=NOT (S(4,7)):P
OSITION 30,1:?"S(4,7):GOSUB CLD
2061 IF IN$="B6" THEN S(4,6)=NOT (S(4,6)):P
OSITION 30,2:?"S(4,6):GOSUB CLD
2062 IF IN$="B5" THEN S(4,5)=NOT (S(4,5)):P
OSITION 30,3:?"S(4,5):GOSUB CLD
2063 IF IN$="B4" THEN S(4,4)=NOT (S(4,4)):P
OSITION 30,4:?"S(4,4):GOSUB CLD
2064 IF IN$="B3" THEN S(4,3)=NOT (S(4,3)):P
OSITION 30,5:?"S(4,3):GOSUB CLD
2065 IF IN$="B2" THEN S(4,2)=NOT (S(4,2)):P
OSITION 30,6:?"S(4,2):GOSUB CLD
2066 IF IN$="B1" THEN S(4,1)=NOT (S(4,1)):P
OSITION 30,7:?"S(4,1):GOSUB CLD
2067 IF IN$="B0" THEN S(4,0)=NOT (S(4,0)):P
OSITION 30,8:?"S(4,0):GOSUB CLD
2070 IF IN$="PDIS" THEN GOSUB PDIS
2072 IF IN$="SDIS" THEN GOSUB SDIS
2980 IF FAIL=1 THEN GOSUB BUZZ
2989 FAIL=0
2990 NEXT IZZ
5000 REM REG
5010 IF A<0 OR A>3 THEN FAIL=1:GOTO 5088
5020 IF A>0 OR A<4 THEN POSITION 21,9:?"A
5030 C=A
5040 GOSUB REGDIS
5088 GOSUB CLD:GOSUB CLX
5090 RETURN
5100 REM
5110 IF A<0 OR A>14 THEN FAIL=1:GOTO 5180
5112 IF INT(A/2)-A/2<0 THEN FAIL=1:GOTO 518
0
5120 IF A=0 THEN D1=0
5121 IF A=2 THEN D1=32
5122 IF A=4 THEN D1=64
5123 IF A=6 THEN D1=96
5124 IF A=8 THEN D1=128
5125 IF A=10 THEN D1=160
5126 IF A=12 THEN D1=192
5127 IF A=14 THEN D1=224
5130 POSITION 21,10:?"A
5140 S(C,1)=D1:S(C,5)=A
5170 S(C,8)=A
5180 GOSUB CLD:GOSUB CLX
5190 RETURN
5200 REM
5210 IF A<0 OR A>255 THEN FAIL=1
5218 POSITION 21,11:?"
5220 POSITION 21,11:?"A

```

SOFTWARE *File*

```

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 PDKAUD
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
6790 RETURN
6800 REM START
6810 FOR I=1 TO 5:POSITION 30,11: ? "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

```

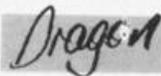
```

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,
Scunfield,
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,88,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,50,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,88,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,BE,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)

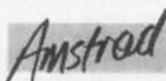
(continued from previous page)

```
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,49,50,40,0,259
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.



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.

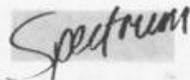
```
10 MODE 1
20 MEMORY &AAB2
30 SUM=0:RESTORE 170
40 FOR N=&AAB3 TO &AB7C
50 READ X#
60 POKE N,VAL("&"+X#)
70 SUM=SUM+VAL("&"+X#)
80 NEXT
90 IF SUM<>&FA8 THEN SOUND 1,254,10:PRINT"
DATA WRONG PLEASE CHECK":END
100 CLS:PRINT"DATA LOADED CORRECTLY"
110 PRINT:PRINT"PLEASE INSERT TAPE FOR BYTES"
120 PRINT:PRINT"THEN 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,d0,00,00,00,00,00,00,00,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,c1,03,78,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
AABA 07 C5 ED 5B CB AA 2A CD
AABB AA CD DF BD FE 00 28 0B
AABC 3A CF AA 47 3A D0 AA 80
AABD 32 D0 AA 3A CF AA A7 CB
AABE 17 32 CF AA 2A CB AA 23
AABF 22 CB AA C1 10 D3 3E 1B
AAB0 CD 73 AB 3E 4B CD 73 AB
AAB1 3E 00 CD 73 AB 3E 01 CD
AAB2 73 AB 3A D0 AA CD 73 AB
AAB3 2A CB AA 11 07 00 A7 ED
AAB4 52 22 CB AA C1 03 78 FE
AAB5 01 20 26 79 FE 91 20 21
AAB6 3E 0A CD 73 AB 2A CB AA
AAB7 11 07 00 19 22 CB AA 7C
AAB8 FE 02 C2 DD AA 7D FE 84
AAB9 C2 DD AA 3E 0F CD 73 AB
AABA C9 ED 43 CD AA C3 E0 AA
AABB C5 47 CD 2B BD 78 30 FA
AABC C1 C9
```

Wild West

Anszar Zerkass,
Lehrberg,
West Germany.



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
TER 1-84, PAGE 106
10 POKE 23655,0: BORDER=0: PAF
BEEP 10: INK 0: INK 0: OVER 0
PRINT "WILD WEST"
STOP THE TAPE YET!
FOR F=1 TO 25: BEEP .005:F
NEXT F: LOAD ""
LET CU=0: LET PU=CU: GO TO
80
90 LET HI=0: LET CHI=HI: LET H
I=CHI: LET CHI=CHI
GO SUB 300
40 RAND USR 65148
50 LET USR=USR: OR USR=0
60 THEN USR=USR: OR USR=0
70 THEN USR=USR: OR USR=0
80 THEN USR=USR: OR USR=0
90 THEN USR=USR: OR USR=0
100 THEN USR=USR: OR USR=0
110 THEN USR=USR: OR USR=0
120 THEN USR=USR: OR USR=0
130 THEN USR=USR: OR USR=0
140 THEN USR=USR: OR USR=0
150 THEN USR=USR: OR USR=0
160 THEN USR=USR: OR USR=0
170 THEN USR=USR: OR USR=0
180 THEN USR=USR: OR USR=0
190 THEN USR=USR: OR USR=0
200 THEN USR=USR: OR USR=0
210 THEN USR=USR: OR USR=0
220 THEN USR=USR: OR USR=0
230 THEN USR=USR: OR USR=0
240 THEN USR=USR: OR USR=0
250 THEN USR=USR: OR USR=0
260 THEN USR=USR: OR USR=0
270 THEN USR=USR: OR USR=0
280 THEN USR=USR: OR USR=0
290 THEN USR=USR: OR USR=0
300 THEN USR=USR: OR USR=0
310 THEN USR=USR: OR USR=0
320 THEN USR=USR: OR USR=0
330 THEN USR=USR: OR USR=0
340 THEN USR=USR: OR USR=0
350 THEN USR=USR: OR USR=0
360 THEN USR=USR: OR USR=0
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5500 THEN USR=USR: OR USR=0
5510 THEN USR=USR: OR USR=0
5520 THEN USR=USR: OR USR=0
5530 THEN USR=USR: OR USR
```

SOFTWARE *File*

```

40+(120 AND (CHI=3 OR HI=3))
50 GO TO 50
60 LET SP=0
70 POK 65230,0 POK
80 THEN GO TO 100
90 PEEK 65230<60> AND
100 THEN POK 65230,0 LET
110 CY=18 FOR LET CY=21-INT
120 PRINT AT CX,CY,INK 2,("R
130 CD AT CX+1,CY,("R
140 NEXT F PRINT AT
150 AT CX+1,CY,("R
160 RETURN
170 LET CY=INT (PEEK 65230/8)
180 LET CX=21-INT (PEEK 65231/8) "R
190 INT AT CX,CY,INK 2,FLASH 1 "R
200 BEEP .005,0 PRINT AT CX,CY,
210 RETURN
220 LET SC=0 POK 65253,0 POK
230 IF PEEK 65246<10> AND
240 THEN GO TO 110
250 POK 65246,21 THEN GO TO 110
260 POK 65246,130 AND PEEK
270 THEN POK 65258,0 LET
280 CY=18 FOR LET CY=21-INT
290 PRINT AT CX,CY,INK 2,("R
300 CD AT CX+1,CY,("R
310 NEXT F PRINT AT
320 AT CX+1,CY,("R
330 RETURN
340 LET CX=21-INT (PEEK 65246/8)
350 LET CY=INT (PEEK 65247/8) "R
360 INT AT CX,CY,INK 2,FLASH 1 "R
370 BEEP .005,0 PRINT AT CX,CY,
380 RETURN
390 FOR F=0 TO 255 STEP 5 BEEP
400 F/10 OUT 254,F NEXT F LE
410 CHI=CHI+1 GO SUB 150
420 RETURN
430 FOR F=255 TO 0 STEP -5 BEE
440 F/10 OUT 254,F NEXT F L
450 HI=HI+1 GO SUB 150
460 RETURN
470 LET HITS=HITS+STR$ CHI+
480 WILDS=HITS+STR$ HI+
490 INPUT "PRINT #0; PAPER 5
500 INK 1,5" RETURN
510 IF CHI=3 AND HI=3 THEN LET
520 " --- BOTH HAVE BEEN KILLED -
530 GO TO 200
540 IF CHI=3 THEN LET PU=PU+1
550 " --- YOU HAVE SURVIVED
560 IF HI=3 THEN LET CU=CU+1 L
570 " --- YOU HAVE BEEN KILLE
580
590 RANDOMIZE USR 65155 PRINT
600 AT 4,0 BRIGHT 1; PAPER 5; INK 0
610
620 LET S$=" SCORE SLIM JOEY "
630 +STR$ CU+ " YOU "+STR$ PU
640 IF LEN S$>32 THEN LET S$=S$
650 GO TO 250
660 PRINT AT 20,0; PAPER 7; INK
670
680 INPUT "PRINT #0; INK 0;"
690 "Another game (press Y or N) ?"
700 BEEP .5,-10
710 IF INKEY$="Y" THEN CLS GO
720 870
730 IF INKEY$="N" THEN GO TO 99
740
750 GO TO 250
760 RANDOMIZE USR 65155
770 BORDER 6; PAPER 6; INK 0; C
780 GO SUB 160
790 FOR F=65203 TO 65313 STEP 1
800 POK F,0 NEXT F
810 RANDOMIZE RESTORE S20 FO
820 65200 TO 65274 READ G; POK
830 G,0 NEXT F
840 DATA 200,INT (RND+140)+25,0
850 LEU,2,0,1,0,0,250,0,11,10,0
860 DATA 1,0,0,0,0,0,0,0,0,0,0
870 DATA 1,0,0,0,0,0,0,0,0,0,0
880 DATA 1,0,0,0,0,0,0,0,0,0,0
890 DATA 0,0,0,0,0,0,0,0,0,0,0
900 DATA 0,0,0,0,0,0,0,0,0,0,0
910 DATA 0,0,0,0,0,0,0,0,0,0,0
920 DATA 0,0,0,0,0,0,0,0,0,0,0
930 DATA 0,0,0,0,0,0,0,0,0,0,0
940 DATA 0,0,0,0,0,0,0,0,0,0,0
950 DATA 0,0,0,0,0,0,0,0,0,0,0
960 DATA 0,0,0,0,0,0,0,0,0,0,0
970 DATA 0,0,0,0,0,0,0,0,0,0,0
980 DATA 0,0,0,0,0,0,0,0,0,0,0
990 CLS PRINT AT 10,8;"@ A.ZE
RFA55 1984"

```

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

```

against slim Joey, whose n
ame is feared throughout
the west."
335 PRINT " He moves faster, h
is bullet is faster - so good l
ucky, 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 mea
ntime."
350 GO SUB 1000 PRINT #0; PAPE
R 6; INK 0; " PRESS ANY K
EY." BEEP 1,-10 PAUSE
0 CLS
360 PRINT " The cacti and cove
red waggon 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 put
the trigger by pressing key 0
"
380 PRINT AT 19,0;" Press key 1
to select game level (1-5;
6=hard) " BEEP 1,-12
390 LET IS=INKEY$: IF IS<"1" OR
IS="6" THEN GO TO 890
400 LET LEU=VAL IS: BRIGHT 0; G
O TO 30
410 RESTORE 1000 FOR F=USR "A"
TO USR "F"+7: READ G; POK F,G:
NEXT F
420 DATA 16,144,146,146,242,16,
30,16,16,16,16,146,146,158,240,1
6
430 DATA 2,17,9,5,37,21,108,44,
0,0,4,72,60,35,168,176
440 DATA 1,36,21,138,74,38,227,7
178,164,138,176,183,252,188,190,7
1040 FOR F=64000 TO 64064: READ
G; POK F,G: NEXT F
450 DATA 7,0,15,128,5,0,9,0,0
,0,0,199,224,63,150,15,160,15,64
,15,128,7,128,5,0,5,0,11,0,0,0,20
,0,62,0,20,0,16,0,20,0,0,20,0,0
,96,191,128,190,0,94,0,62,0,0,0
,20,0,20,0,20,0,224
460 FOR F=64096 TO 64127: READ
G; POK F,G: NEXT F: RETURN
470 DATA 15,0,16,128,96,96,192,
48,192,48,192,48,192,48,192,48,1
92,48,192,48,64,32,63,192,15,0,1
99,144,255,48,128,16
480 CLS PRINT AT 10,8;"@ A.ZE
RFA55 1984"

```

The hex loader.

```

10 DEF FN h(h$)=16+(CODE h$(1)
-48-17 AND h$(1)/9))+CODE h$(2)
11-48-17 AND h$(2)/9)
20 INPUT "start "s;
30 INPUT "Finish "f;
40 FOR n=s TO f STEP 8
50 LET tot=0: PRINT n;
60 INPUT h$: PRINT h$;
70 LET x=0
80 FOR b=1 TO LEN h$ STEP 2
90 LET z=FN h(h$): LET tot=tot
+z
100 POK n+x,z
110 LET h$=h$(3 TO ): LET x=x+1
120 NEXT b
130 PRINT " = "; INPUT t: PRIN
T t
140 IF tot<>t THEN PRINT "input
error - try again": GO TO 50
150 NEXT n
160 REM enter STOP to stop

```

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.

```

45551 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45552 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45553 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45554 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45555 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45556 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45557 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45558 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45559 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45560 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45561 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45562 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45563 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45564 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45565 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45566 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45567 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45568 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45569 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45570 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45571 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45572 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45573 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45574 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45575 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45576 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45577 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45578 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45579 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45580 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45581 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45582 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45583 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45584 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45585 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45586 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45587 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45588 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45589 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45590 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45591 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45592 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45593 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45594 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45595 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45596 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45597 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45598 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45599 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
45600 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

```

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,B,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*SGN(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 Y>159 THEN Y=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

```


(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

```

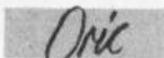
```

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"M";CX;",";CY:LPRINT"D";CX+1;",";CY
11050 LPRINT"M";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":S#="H#":F#="Karl Williams"
2 H#="2500
2 PRINT CHR$(A),CHR$(B),CHR$(C)
3 GOSUB 5000
4 CLS
10 GOSUB 1000
20 GOSUB 2000
30 GOSUB 3000
38 F#="21":V#="0":I#="E":26
39 EXPLODE
40 FOR K=LEV TO 1 STEP -1
42 V#="21":W#="4":R#="4":M#="175
45 IF I#="2":INT(I#/2) THEN W#="1":M#="3":R#="174":M#="47
50 A#="E#":765)
52 R#="1":N#="0":Y#="0":0-1
53 IF D#="0 THEN GOSUB 6000
54 IF D#="0 THEN PAPER(I#):INK(A#):M#="3":WAIT 10 ELSE PAF
ER 0
55 IF A#="5310 THEN L#="0":R#="1":Y#="0":130
70 IF A#="8251 THEN X#="1":Y#="0":110
80 IF A#="8255 THEN X#="1":Y#="0":110
90 IF A#="8319 THEN Y#="1":Y#="0":110
100 IF A#="8375 THEN Y#="1
110 L#="0":R#="1":Y#="0":140
115 IF L#="40 THEN X#="1":Y#="0":140
120 IF L#="45 THEN P#="1":Y#="0":140
130 IF L#="45 OR L#="48 OR L#="48 OR L#="48 THEN 210
135 IF S#="1 THEN R#="55":GOTO 4000
140 PLOT R#(X),N#(X),32:PLOT X,Y,V
145 IF K#="LEV":0-7 THEN 155
150 UN#="K#":I#="1":PLOT D,E,32:PLOT R#(X),N#(X),W#(R#(X),
L#(W#(X))
155 PLOT 21,9,AN:PLOT AX,AV,AV
157 PLOT 21,9,AN:PLOT AX,AV,AV
160 SOUND 1,*,2,P:PLAY 1,*,*,1000
170 PRINT 16,0,AN:PRINT 31,0,0
180 PRINT 10,1,INT(I#/(A#-VAL(A#)/2)):PRINTR21,1,INT
I#/10:PRINTR 31,1,C#
185 IF S#="1 THEN R#="55":GOTO 4000
190 NEXT K
200 R#="77":GOTO 4000
210 A#="510
220 IF L#="48 OR L#="174 THEN F#="P#":P#="250":P#="0":0-25:0
GOSUB 3000:GOTO 135
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,H,1
5:NEXT H:HP#="500
265 I#="R#":I#="1":GOTO 140
270 PLOT R#(X),N#(X),32:FOR H#="1 TO 380:SOUND 1,H,0:PLAY
1,1,2,5:NEXT H
275 P#="500":S#="1":GOTO 150
280 IF D#="0 THEN 290 ELSE 310
290 PLOT X,Y,V:PLOT R#(X),N#(X),32:FOR H#="0 TO 300 STEP
3:PAPER N#(H)
300 SOUND 1,300-H,15:WAIT H:P#="1000":R#="111":GOTO 4000
310 SHOOT:S#="1":GOTO 150

```

```

320 SOUND 1,RND(1)*1000+1,15:PAPER 1:WAIT H#="111":GOTO
0 4000
330 SHOOT:S#="1":GOTO 150
1000 REM REDEFINE CHARACTERS
1010 FOR A#="4400 TO 4464
1020 HEAD B#="0":A#="0
1030 NEXT A
1040 RETURN
1050 DATA 12,12,30,51,51,30,12,12,30,63,45,45,63,51,0
3,30,30,63,45,63,51,63
1060 DATA 30,18,21,21,31,27,17,17,14,31,21,31,51,1
1,31,31,0,0,12,12,0,0,0
1070 DATA 0,0,12,30,63,30,12,0,0,12,12,30,30,63,0
2000 REM SET UP SCREEN
2005 CLS:PAPER 0
2010 PRINT CHR$(135):PRINT CHR$(130)
2015 GOSUB 4000
2020 PLOT 9,0,"LEVEL#":PLOT 24,0,"LIVES#
2025 PLOT 1,1,"POINTS#":PLOT 16,1,"TIME#":PLOT 25,1,"THIS
CORE#
2030 FOR C#="1 TO 35
2040 IF C#="32 THEN D#="E ELSE D#="
2050 READ D,C,F
2060 FOR S#="4000 TO F+4000 STEP D:POKE D,40:NEXT G
,C
2070 FOR H#="4016 TO 4099:IF PEEK(H#)="32 THEN POKE H,4
0
2080 NEXT H
2090 FOR L#="4016 TO 4900 STEP 40:POKE 1,32:NEXT L
2100 FOR I#="4019 TO 4929 STEP 40:POKE 1,32:NEXT I
2120 DATA 85,118,165,170,172,189,191,196,247,256,258,
260,262,274,327,334
2130 DATA 409,416,450,459,463,465,491,499,542,544,571
579,623,625,649,657
2140 DATA 781,782,784,785,729,730,744,754,769,770,807
808,812,810,824,829
2150 DATA 833,834,850,858,865,890,894,900,902,907,911
916,965,990,370,384
2160 DATA 123,923,280,405,565,645,367,767,449,689,852
892,796,376,290,330
2170 DATA 619,699,798,608,421,661,702,662,384,344,346
660,380,660,809,909
2180 DATA 350,710,791,871,312,672,354,714,236,516,596
676,150,998
2200 RESTORE:RETURN
3000 F#="K#":G#="AY
3005 B#="INT(RND(1)*3)+1":IF B#="1 THEN A#="35":AY="21
3010 IF B#="2 THEN A#="24":AY="0
3020 IF B#="3 THEN A#="0":AY="3
3030 IF A#="F AND AY="S 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 R#="111 THEN G#="COMBINATION#":
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="48":LEN(G#)=72
4045 SH="48":LEN(G#)=72
4045 PRINT:PRINT CHR$(4)

```

```

4000 PRINT:PRINT CHR$(27);"0";CHR$(27);"0";SPC(5):GOTO 100
4005 PRINT:PRINT
4010 PRINT:PRINT "LEVEL#";TAB(10):CHR$(135);AY
4020 PRINT:PRINT "SHOTS#";TAB(10):CHR$(135);I#
N
4030 PRINT:PRINT "FRUIT OBTAINED";TAB(10):CHR$(135);F#
FC
4040 PRINT:PRINT "LIVES LEFT";CHR$(135);TAB(10):I#-S
4100 PRINT:PRINT CHR$(27);"B You scored ";INT(I#/(4-V
R#(0)))"; points"
4110 IF P#/(4-VAL(A#))>0 THEN 4140
4120 PRINT:PRINT CHR$(135):CHR$(140);"You have beaten
the previous HIGHSCORE"
4125 PRINT CHR$(135):CHR$(140);"of ";C#"; points by "
I#
4130 C#="STR#(I#):PRINT:INPUT "Your NAME#";N#(I#)
4140 PRINT:PRINT"Again? Y or N":REPEAT:GET X:UNTIL X
#="Y" OR X#="N"
4150 IF X#="Y" THEN 4100
4160 PRINT CHR$(A),CHR$(17),CHR$(20)
4170 CLS:PAPER 4:INK 7:PING:CLS 505
4180 PRINT:PRINT"Enter level 1,2 or 3";CHR$(135)
4185 REPEAT:GET A:UNTIL VAL(A#)=0 AND VAL(A#)=4:PING
:PRINT A#
4190 LEV#="4-VAL(A#):*75:400
4195 S#="3:R#="0:P#="1":G#="D#="0:G#="0:GOTO 10
5000 CLS:PAPER 0:INK 2
5010 PRINT CHR$(4)
5020 PRINT CHR$(27);"0";CHR$(27);"N ORIC GNA
SHER"
5025 PRINT CHR$(4)
5030 PRINT:PRINT"Use Cursor keys to guide yours
elf"
5040 PRINT:PRINT"through the maze but beware of Goli
ath"
5050 PRINT:PRINT"the Goliath Ghost! He can only be"
5060 PRINT:PRINT"destroyed in the short time after yo
u"
5070 PRINT:PRINT"have eaten the fruit found somewhere"
5080 PRINT:PRINT"in the maze."
5085 PRINT:PRINT"Your final objective being to ge
t"
5090 PRINT:PRINT"to the flashing pyramid after eating"
5095 PRINT:PRINT"all the dots";PRINT
5099 PRINT TAB(0);CHR$(135);"Enter level 1,2 or 3";C
HR$(135)
5099 REPEAT:AY#="E":SOUND 1,RND(1)*300,12:WAIT 2:UNTIL
VAL(A#)=0 AND VAL(A#)=4
5099 PRINT VAL(A#)-VAL(A#):TAB(10);*75:400
5095 PRINT:PRINT CHR$(135):CHR$(140);SPC(5);"Press R
ETURN TO RESTART"
5100 REPEAT:GOTO 1,RND(1)*500,12:WAIT 15:UNTIL KEY#
CHR$(13)
5110 PING:RETURN
4000 FOR D#="4 TO 24:PRINT 1,0,CHR$(INT(RND(1)*15)+129)
4010 NEXT D
4020 PRINT 2,0,CHR$(135):PRINT CHR$(135)
4025 RETURN

```

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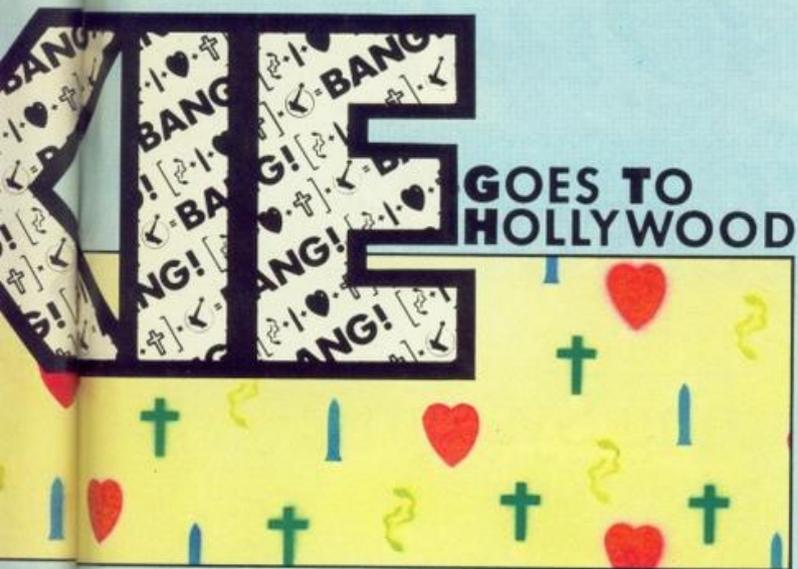


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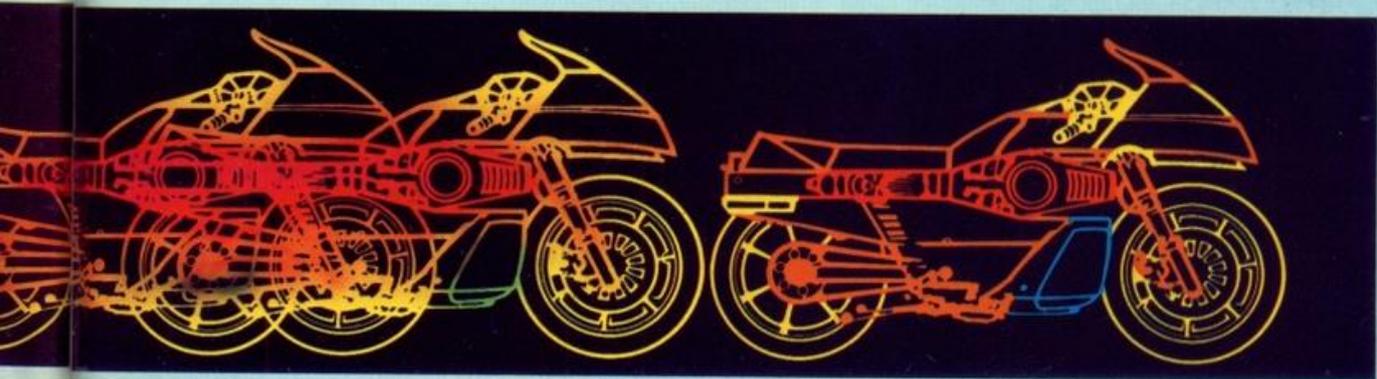
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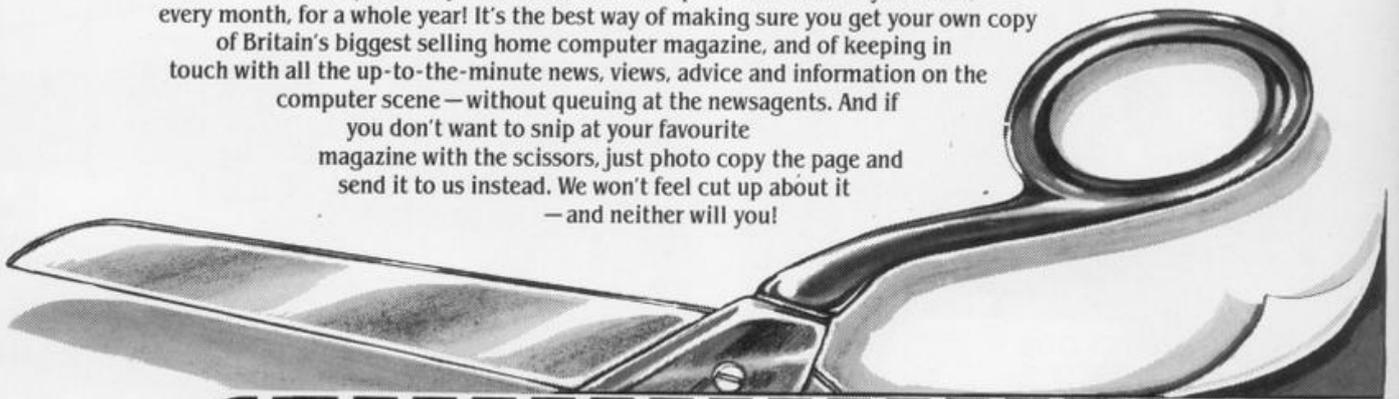


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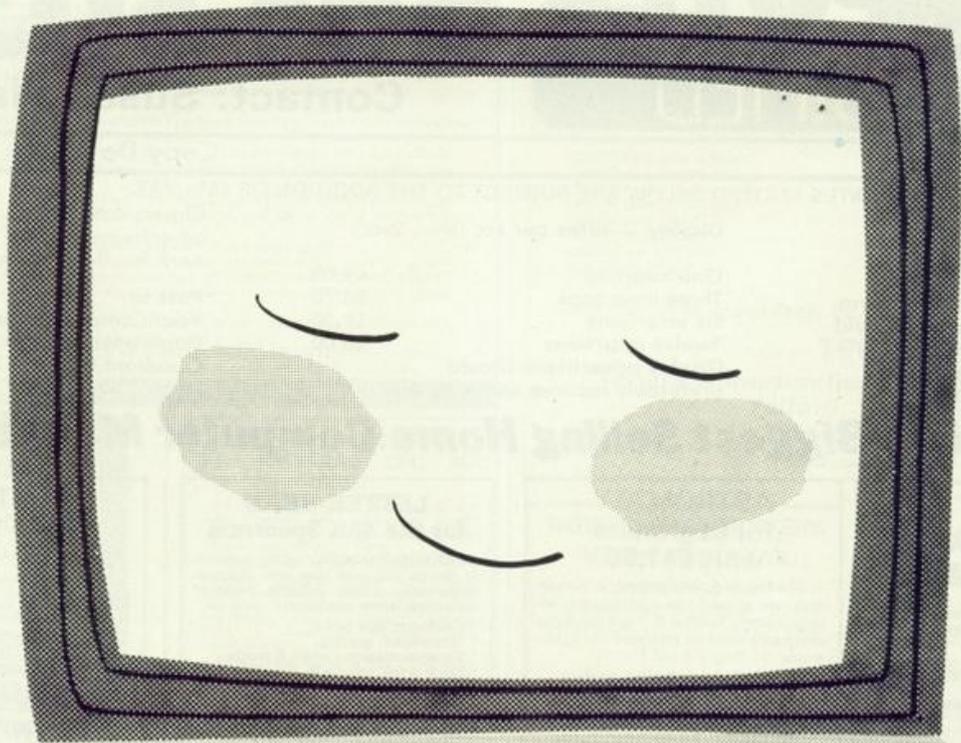
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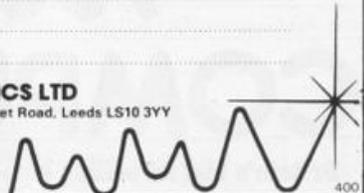
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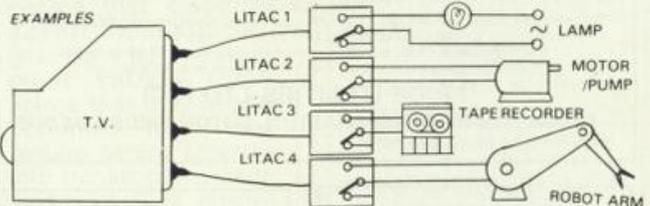
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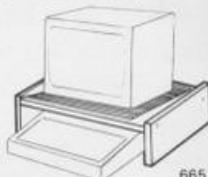
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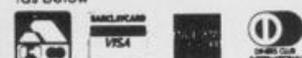
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