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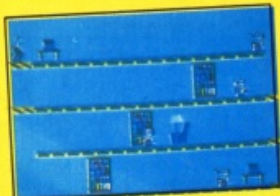
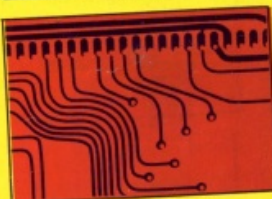
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John Dawson furrows his brow, cups his chin in his hand and squares up to some of the best electronic opponents in a bid to find the best plays.



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Paul Bond takes his surf-board up to Manchester and Liverpool to reveal Ocean's plans to flood the market with exciting software.



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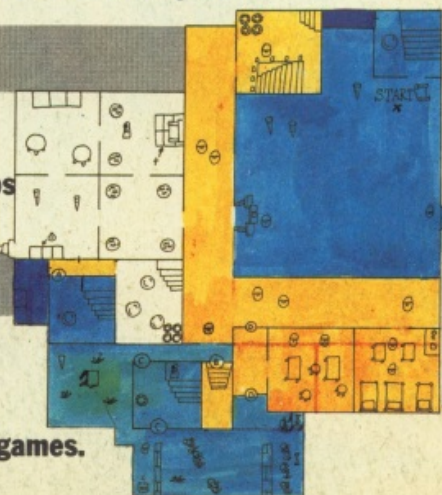
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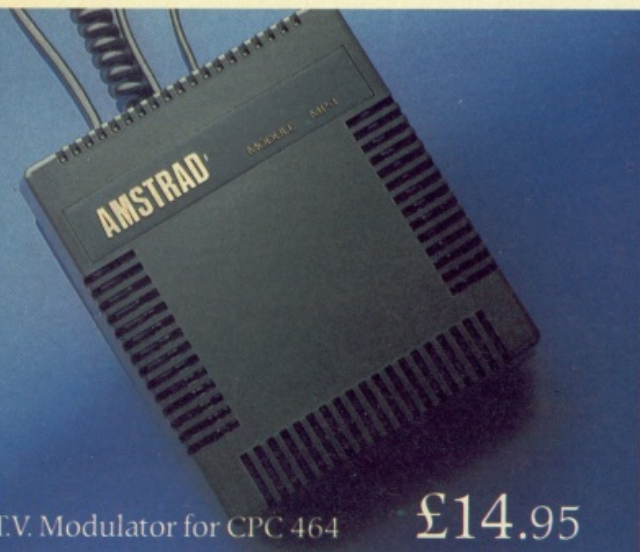
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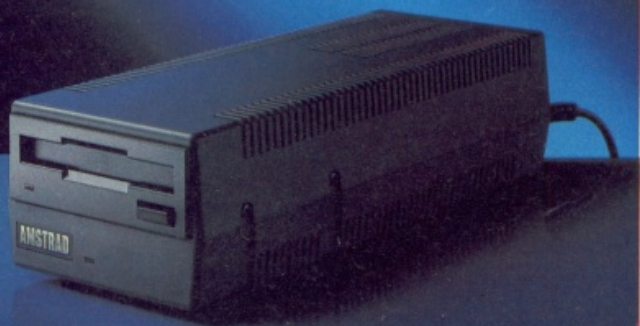
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The CPC 464 comes with built-in datacorder, and the CPC 6128 with built-in disc drive. And both have either a full colour monitor or a green screen.

But Amstrad owners can become even more attached to their computers with the simple addition of the peripherals featured here.

They'll make your Amstrad faster, harder working and more entertaining.

And they're very easy to attach. Simply plug in, and away you go, there's no need for extra interfaces.

You may of course wish to get into some even more serious computing, for which you will need the Amstrad RS 232C specialist interface. This opens the door to modems, networks, and serial printing.

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The 64k of RAM means you'll have plenty of memory to play with. And there are over 200 Amsoft games, that you

can play, many exclusive to Amstrad.

But games are only half the fun on the Amstrad CPC 464. In fact using it can also be quite an education.

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Commodore 64



Spectrum



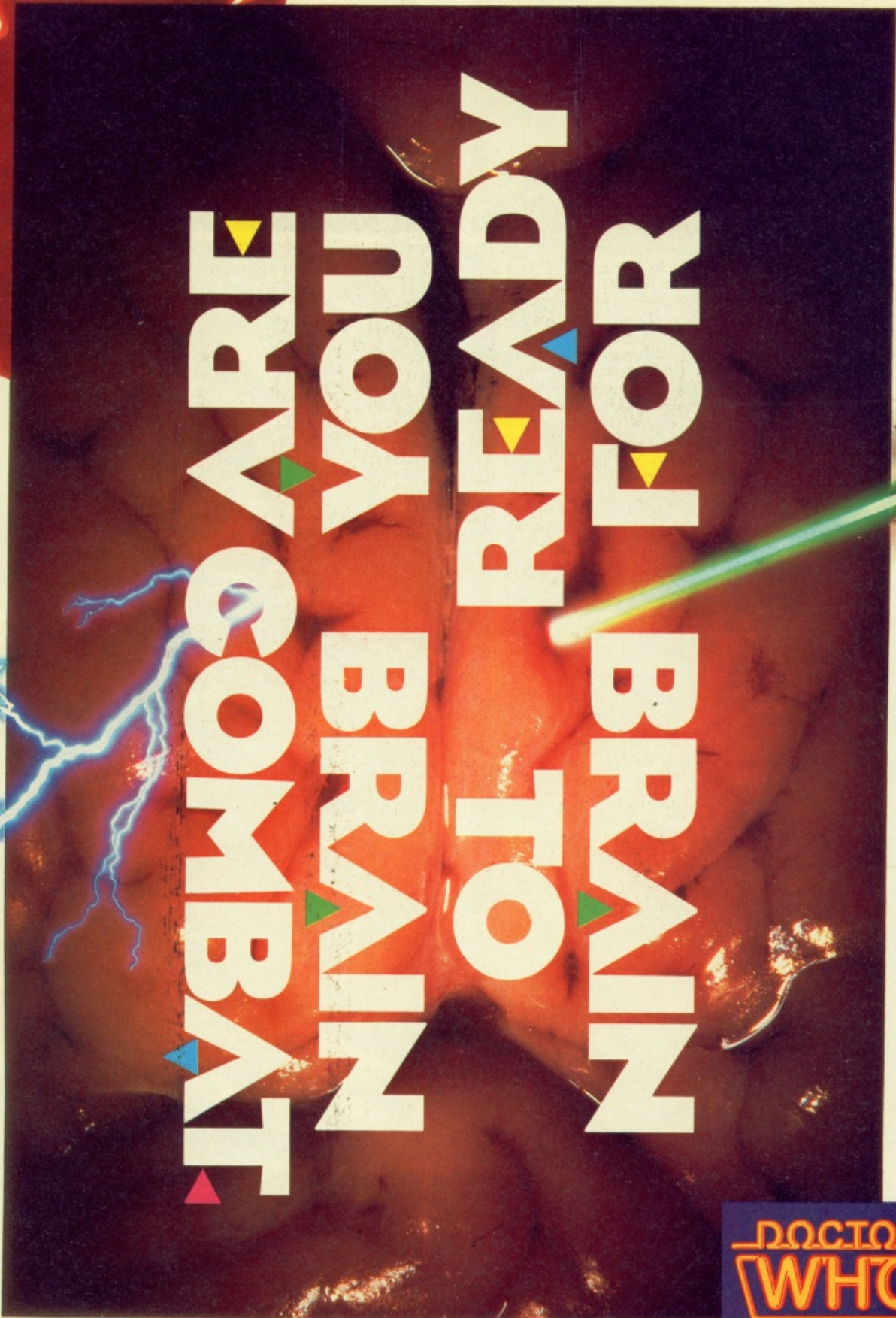
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 —robotics + techno trickery ☒ Force futile. ☒ Weapon Skills NA

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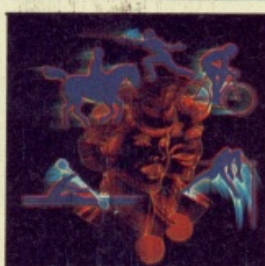
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- Individual or Team Play



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- Opening, Awards & Closing Ceremonies
- 8 different events
- Compete against Computer or Opponent(s)



IMPOSSIBLE MISSION

- 32 different rooms
- 90 different robots
- Superb Animation
- British Micro Awards "Game of the Year 1985"



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Commodore 64

son for looking forward to Winter!

GAMES

*Screens from Commodore 64 version



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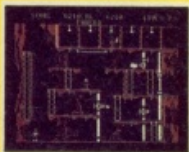
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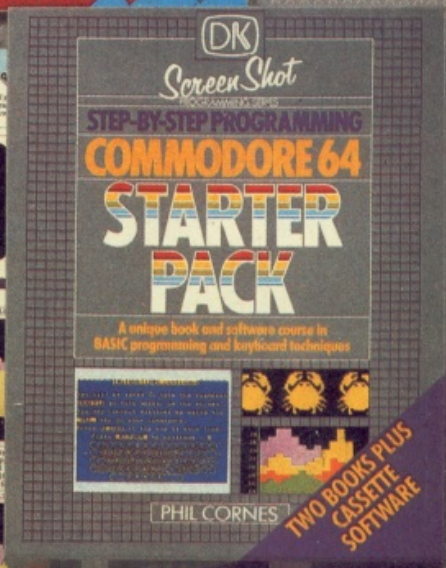
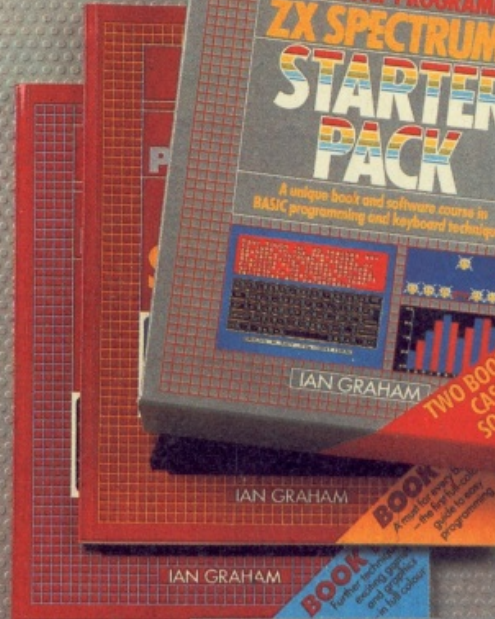
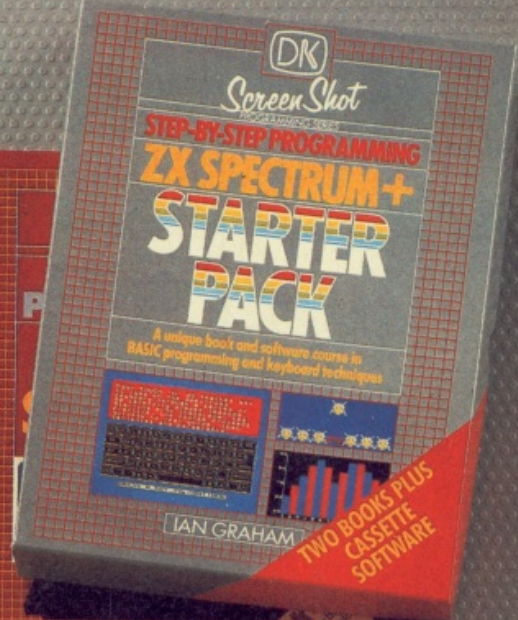
Two powerful packages of personal computing programming techniques made instantly usable by Dorling Kindersley's unique 'Screen Shot' presentation.

What you see in the pages of the books is what you get on the screen when you follow the step-by-step programming guidance in the text. The crystal-clear illustration is easy-to-follow and guaranteed free from typographic errors.

STARTER PACKS

The Starter Packs for the Commodore 64, ZX Spectrum+ and BBC Micro get you going quickly with BASIC programming.

The accompanying software offers carefully graded exercises leading to rapid keyboard familiarity.





ZX SPECTRUM

Tasword Two THE WORD PROCESSOR

TASWORD TWO for the ZX 48K Spectrum
cassette £13.90 microdrive cartridge £15.40

"Without doubt the best utility I have reviewed for the Spectrum"

HOME COMPUTING WEEKLY APRIL 1984

"If you have been looking for a word processor, then look no further"

CRASH JUNE 1984

With 64 characters per line on the screen and a host of useful features TASWORD TWO is the ideal word processing package for the Spectrum owner.

Tasprint THE STYLE WRITER

TASPRINT for the ZX 48K Spectrum
cassette £9.90 microdrive cartridge £11.40

A must for dot matrix printer owners! Print your program output and listings in a choice of five impressive print styles. TASPRINT utilises the graphics capabilities of dot matrix printers to form, with a double pass of the printhead, output in a range of five fonts varying from the futuristic Data-Run to the hand writing simulation of Palace Script. A TASPRINT gives your output originality and style. The TASPRINT fonts are shown below together with a list of compatible printers.

Tasman Printer INTERFACE

TASPRINT PRINTER INTERFACE for the
ZX Spectrum £39.90
RS232 Cable for ZX Interface 1 £14.50

Plug into your Spectrum and drive any printer fitted with the Centronics standard parallel interface. Supplied complete with ribbon cable and driving software. The user changeable interface software makes it easy to send control codes to your printer using the method so successfully pioneered with TASWORD TWO. The cassette contains fast machine code high resolution full width SCREEN COPY SOFTWARE for Epson, Mannesmann Tally, Shinwa, Star, Tandy Colour Graphic (in colour!) printers. TASCOPY shaded screen copy software for this interface (value £9.90) is INCLUDED in this package.

The TASCOPES and TASPINTS drive all Epson compatible eight pin dot-matrix printers e.g.

AMSTRAD DMP 2000	NEC PC-8023B-N	BROTHER M1009
EPSON RX-80	MANNESSMANN TALLY MT-80	BROTHER HRS
EPSON RX-80	SHINWA CP-80	SHINWA CP-80
EPSON MX-80 TYPE III	STAR DMP 501/515/5610	DATA PANTHER
	COSMOS-80	DATA PANTHER II

COMPACTA - bold and heavy, good for emphasis

DATA-RUN - a futuristic script

LECTURA LIGHT - clean and pleasing to read

MEDIAN - a serious business-like script

PALACE SCRIPT - a distinctive flowing font

TASPRINT output shown at less than half size

Tasmerge THE MAIL MERGER

TASMERGE for the
ZX 48K Spectrum
cassette £10.90

Transfer data from MASTERFILE to TASWORD TWO! Letters and forms typed on TASWORD TWO can be printed with addresses and data taken from MASTERFILE. The mail merge facility allows, for example, multiple copies of a letter to be printed, each containing a different name and address taken from your MASTERFILE data. To use TASMERGE you must have one or more microdrives as well as TASWORD TWO and MASTERFILE by Campbell Systems (version 9 or later).



Taswide THE SCREEN STRETCHER

TASWIDE for the ZX 48K Spectrum
cassette £5.50

With this machine code utility you can write your own Basic programs that will, with normal PRINT statements, print onto the screen in the compact lettering used by TASWORD TWO. With TASWIDE you can double the information shown on the screen!

AMSTRAD CPC 464-664-6128

With the exception of TASWORD 6128 all the programs described below run on all of the 464, the 664, and the 6128.

Tasword 464 THE WORD PROCESSOR

TASWORD 464 for the Amstrad CPC 464, 664, and
6128 cassette £19.95

"There is no better justification for buying a 464 than this program"

POPULAR COMPUTING WEEKLY
NOVEMBER 1984.

ZX SPECTRUM MSX-EINSTEIN

Tascopy THE SCREEN COPIER

TASCOPY for the ZX Spectrum with Interface 1
cassette £9.90 microdrive cartridge £11.40

The Spectrum TASCOPY is for use with the RS232 output on ZX Interface 1. It produces both monochrome (in a choice of two sizes) and large copies in which the different screen colours are printed as different shades. With TASCOPY you can keep a permanent and impressive record of your screen pictures and diagrams. A list of printers supported by TASCOPY is given to the left.

Tas-Diary THE ELECTRONIC DIARY

TAS-DIARY for the ZX 48K Spectrum and microdrives.
Cassette £9.90

Keep an electronic day-to-day diary on microdrive! TAS-DIARY includes a clock, calendar, and a separate screen display for every day of the year. Invaluable for reminders, appointments, and for keeping a record of your day. The data for each month is stored as a separate microdrive file so that your data for a year is only constrained by the microdrive capacity. TAS-DIARY will work for this year, next year, and every year up to 2100! Supplied on cassette for automatic transfer to microdrive.

Tas-Spell THE SPELLING CHECKER

TAS-SPELL for the Amstrad CPC 464 and 664
running TASWORD 464-D and for the CPC 6128
running TASWORD 6128
disc £16.50

TAS-SPELL checks the spelling of TASWORD 464-D and TASWORD 6128 text files. TAS-SPELL has a dictionary of well over twenty thousand words which are compared with the words in your text file. You can add your own specialised words to the TAS-SPELL dictionary. Please note that TAS-SPELL will only work with TASWORD 464-D and TASWORD 6128.

Available from good st

Tasman

SOFTWARE

Springfield House, Hyde Terrace Le

TASWORD 464-D

THE WORD PROCESSOR

TASWORD 464-D for the Amstrad CPC 464, 664, and 6128
disc £24.95

This is the new TASWORD especially developed to utilise the capabilities of the Amstrad disc drives. A major new feature is a powerful mail merge facility. TASWORD 464-D will only run on, and is only supplied on, disc.

TASWORD 6128

THE WORD PROCESSOR

TASWORD 6128 for the Amstrad CPC 6128
disc £24.95

TASWORD 6128 utilises the additional 64K of memory in the CPC 6128. This gives text files that are over 60K long. TASWORD 6128 includes mail merge and all the other features of TASWORD 464-D. With a new notepad mode and other additional capabilities TASWORD 6128 is the most powerful of the TASWORDS.



TASPRINT 464

THE STYLE WRITER

TASPRINT 464 for the Amstrad CPC 464, 664, & 6128
cassette £9.90 disc £12.90

Can be used to print AMSWORD and TASWORD text files in addition to output from your own Basic programs. Drives the Amstrad DMP-1 in addition to the printers listed on the opposite page.

PRINTER CABLE FOR AMSTRAD CPC 464, 664, and 6128 £9.90

COMMODORE 64

TASWORD 64

THE WORD PROCESSOR

TASWORD 64 for the Commodore 64
cassette £17.95 disc £19.95

Many Commodore 64 owners have asked for this product which is now available. All the well known TASWORD features plus eighty characters per line on the screen! This is the only word processor for the Commodore 64 giving eighty characters per line on the screen—so that "what you see is what you get" on eighty column printers.

TASPRINT EINSTEIN

THE STYLE WRITER

TASPRINT EINSTEIN for the Tatung Einstein
disc £14.95

Print TASWORD EINSTEIN text files in one or more of the TASPRINT fonts.

SINCLAIR QL

QL is a trademark of Sinclair Research Ltd

TASCOPY QL

THE SCREEN COPIER

TASCOPY QL for the Sinclair QL
microdrive cartridge £12.90

TASCOPY QL adds new commands to QL Superbasic. Execute these commands to print a shaded copy of the screen. Print the entire screen or just a specified window. TASCOPY QL also produces large "poster size" screen copies on more than one sheet of paper which can be cut and joined to make the poster.

TASPRINT QL

THE STYLE WRITER

TASPRINT QL for the Sinclair QL
microdrive cartridge £19.95

TASPRINT QL includes a screen editor used to modify files created by other programs, such as QUILL, or by the user from Basic. These modified files include TASPRINT control characters and may be printed, using TASPRINT, in one or more of the unique TASPRINT fonts.

MSX 64K

COMPUTERS

TASWORD MSX

THE WORD PROCESSOR

TASWORD MSX for 64K MSX computers
cassette £13.90
MSX PRINTER CABLE £8.00

With all the features of the Spectrum TASWORD TWO including the amazing sixty four character per line display. The TASWORD MSX machine code program utilises the 32K of memory not normally available to Basic allowing over five hundred lines of text to be held in memory. The cassette includes a version of the program that can be transferred to disc.



TATUNG EINSTEIN

TASWORD EINSTEIN

THE WORD PROCESSOR

TASWORD EINSTEIN for the Tatung Einstein
disc £19.95

A sixty four character line display and the ability to hold over five hundred lines of text at any time are just some of the features of this TASWORD for the Tatung Einstein. Full interaction with the disc system—e.g. TASWORD detects the presence of added drives and allows their use.

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COMMODORE

TASCOPY 464

THE SCREEN COPIER

TASCOPY 464 for the Amstrad CPC 464, 664, and 6128
cassette £9.90 disc £12.90

Adds two new Basic commands to give both a standard shaded screen copy as well as a "poster size" copy which is printed onto two or four sheets which can be cut and joined to make the poster. Drives the Amstrad DMP-1 in addition to the printers listed on the opposite page.

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Edit...

A word from the Editor

EUREKA: MICROSANS FRONTIERES

ALMOST EXACTLY FOUR years to the day that the 32K BBC model B first beeped to life, Acorn has stopped manufacturing it for the U.K. market. In contrast the excitement the machine caused when it first appeared, it has been quietly slipped out of production with Acorn reluctant to admit the fact.

Of course you'll still be able to pick up a 128K BBC Plus or the 64K Plus offered with a £30 64K upgrade.

Despite its £400 price tag, and thanks to its high performance, solid construction and the vitally important "BBC" badge, the model B became the standard computer for education. It has also kept thousands of home and professional users happy for years. Obviously the larger memory BBCs will try to satisfy those markets for the immediate future, but what is Acorn planning to do to maintain its dominance of the educational scene?

The answer may lie in Europe's Eureka project. It's difficult to be more definite than that because even the European technology ministers concerned don't seem to be too sure what Eureka is.

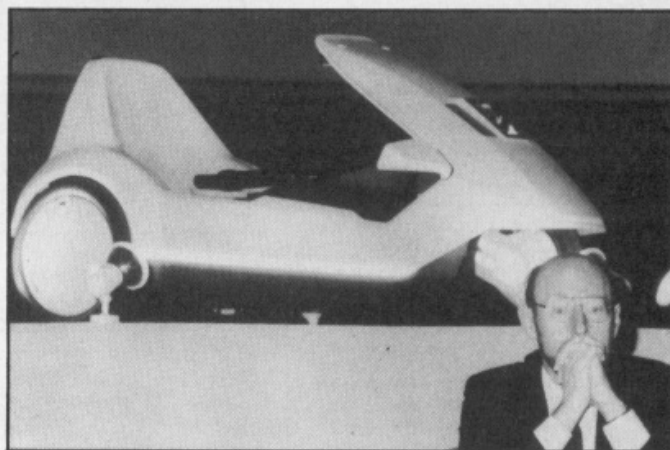
What is clear is that it's going to be some kind of scheme for high-technology cooperation. And one of the 10 projects to get the OK from the foreign and technology ministers assembled in Hanover recently is Acorn's venture with Olivetti and French electronics giant Thomson. The aim of their scheme is to develop a European standard for educational computers.

The French started the Eureka ball rolling when President Mitterrand proposed the scheme as a European antidote to President Reagan's Star Wars project.

As we reported in our October edition Eureka could lead to a joint European standard for "home information and entertainment" — the Eurohome project proposed by Britain's Department of Trade and Industry. Let's just hope that if it does come about it proves more of a threat to U.S. and Japanese markets than MSX computers.

Starring

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C5 and you've seen the lot

Just as the "official" biography of Sir Clive arrives — The Sinclair Story by Rodney Dale — the great man's tricycle company has crashed again. The holding company, TPD, which took over from Sinclair Vehicles has gone into liquidation with debts of £1 million to creditors other than Sinclair. He has lost £8 million on the C5 and other electric vehicle projects but will get first grab at the £500,000 assets of TPD.

Rodney Dale was given access to company archives when he was writing his book and the result is that he has become closely involved with his subject. He spends much of the book on Sir Clive's early life in the electronics business and the flat screen television. There is a little analysis of why someone who could single-handedly create a market for home computers in this

country should repeatedly be involved in a series of marketing and manufacturing disasters with digital watches, calculators, flat screen tellies and now the C5.

Dale confesses to being surprised at the failure of the C5. His memories of the launch day back in January at Alexander Palace are very different from those who insisted on taking the trikes out of the heated hall into the real world they were supposed to be designed for. The danger and unreliability of the C5 "bobsleigh" were immediately apparent as journalists found themselves hurtling out of control down ice slopes, almost disappearing under the wheels of lorries and having to pedal back up the hill after their motors overheated or batteries failed. A new and decidedly unofficial biography is due out soon.

New Einstein is it a Bohr?

Tatung admits that it is working on new models for next year but insists that new Z-80 machines will be "downwards compatible" with the Einstein, the 64K micro which with colour monitor and disc drive costs £400 not £500 as we said last month. New machines will have 80 column

display, stereo sound and a choice of 128, 256 or 512K memory.

Meanwhile new products on the way for the Einstein include a £30 music package and a similarly priced transformer box which will allow the Einstein to run Spectrum programs.

Hard News

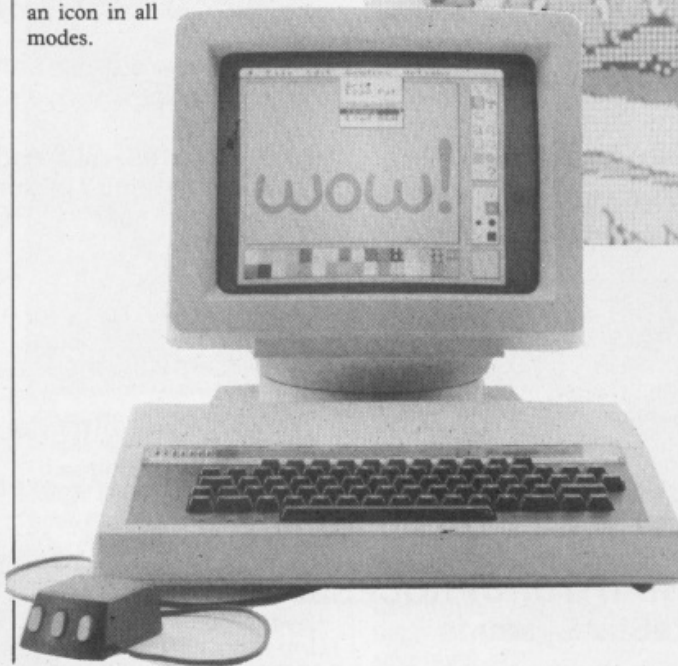
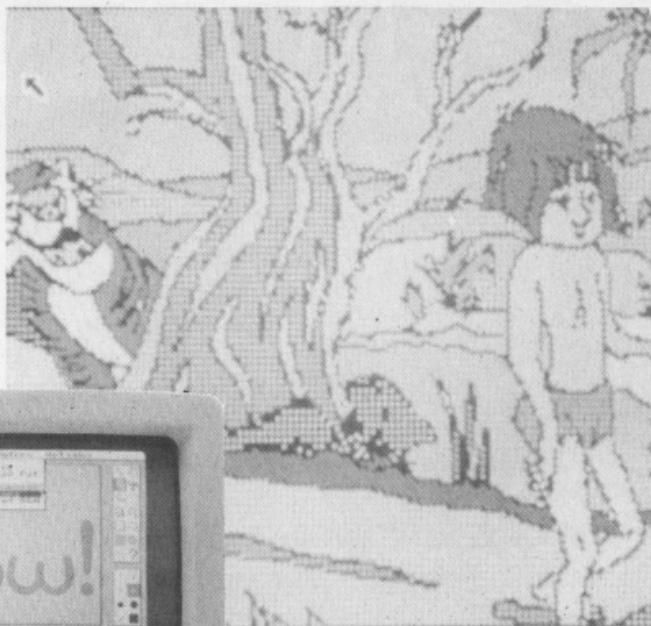
NO NEED FOR 16 BITS

Acorn is putting a brave face on its absence from the High Streets this Christmas for the first time in four years. You may find some Electrons in Dixons — part of the job lot picked up in the Summer but everyone has given up on selling the BBC Micro.

Acorn now admits that the 32K BBC B has been discontinued but against the odds it still insists on trying to sell the BBC 128 without disc drive or monitor for £500. It seems a shame that Acorn has opted out just when companies like AMS with the AMS mouse are extending the frontiers of the BBC to make it a 16-bit WIMP look-a-like.

AMS has introduced a £50 Pagemaker program which allows you to compose a complete page of a school newspaper for instance on a screen including graphics and photographs. There are 16 different founts which give a limited but interesting variation in typeface. The typesetting is crude as you would expect — it justifies but not proportionately — but effective.

Digitised pictures can be loaded and then altered on screen. Another new package for the £40 AMX mouse is the £50 Super Rom/Art program which gives the AMX mouse pull-down menus overlapping colour windows, patterns and an icon in all modes.



DIARY

Bruce's friend Sir Keith Joseph is thinking about closing Keele University which is sad. Bruce you may remember last month argued that Joseph ought to be promoting serious software which is just what the Department of Psychology, at Keele is doing as part of a three year project financed by Rowntree Trust to produced software for mentally handicapped people. The first arcade game designed for the handicapped, Mr Ugh, has already been developed and if you want to find out more about what the Keele Psychologists are up to contact John Hegarty, University of Keele, Keele, Staffordshire.

Acorn's enthusiasm for £1,000,000 order for the BBC from Canada is understandable but it is a small return on the £8 million or so which the company sank into the North American market and which directly led to its collapse and takeover by Olivetti.

Tatung is still smarting from the exposure of its no smiling

(continued on page 23)

'Amstrad piracy' — both sides claim a win

Selling tape copying equipment not unlawful

Who is winning the piracy battle between Amstrad and the British Phonographic Institute depends which paper you read. The problem for BPI which fights copyright evasion was that the double speed tape-to-tape machines sold by Amstrad were being used to copy commercial music — and computer — cassettes. Amstrad sought a declaration that they were legally in the clear but the High Court refused.

Amstrad fails to win audio approval

When Amstrad appealed at the end of October *The Times* ran its law report under the

headline "selling tape copying equipment not unlawful" while *The Guardian* went for "Amstrad fails to win audio approval". The truth seems to be that the Appeals Court ruled that selling products that could be used to infringe copyright was not illegal as such but that promotional material which encouraged breaking of copyrights could cause the crime incitement to break the law.

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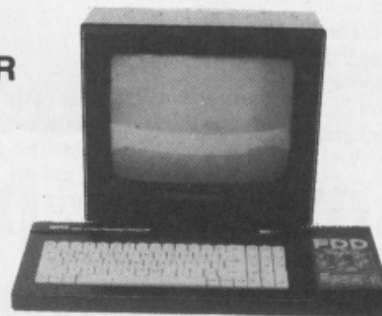
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Soft News

(continued from page 21)

or laughing policy at the Bridgnorth factory where Einstein micros are made. Now the company is saying that the Taiwanese management only meant the workforce to have a serious attitude when using dangerous machinery.

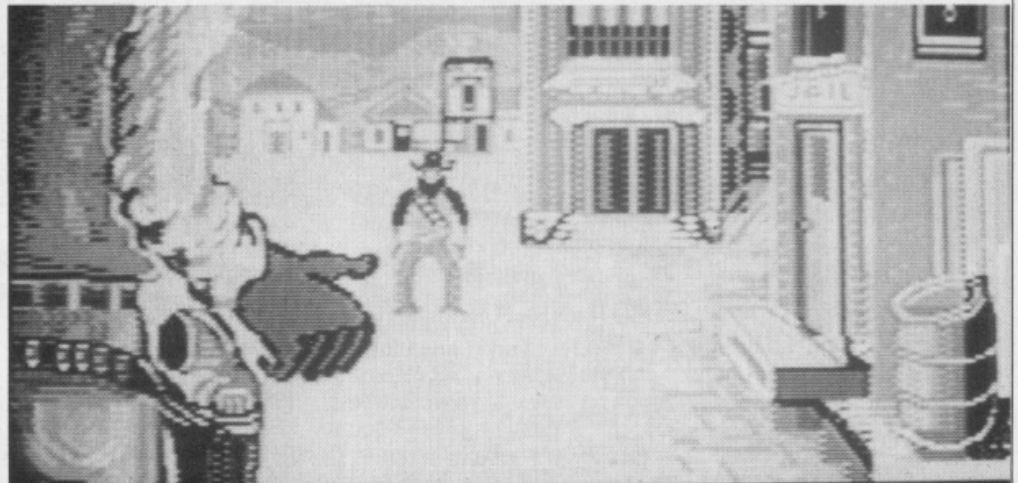
Our very own Bruce Everiss finds himself in hospital to have an overgrown pimple removed from his face. I asked around the office for suggestions for a computer game to send to keep him happy while he is in. "Wetzone" suggests one cynic "Superhuey" is another idea but most vote for "Way of the Exploding Cyst".

British Telecom's MUD may still be glorious but it is certainly going to be late. The Multi-User Dungeons were going to be officially launched at The London Dungeon — where else? — on November 5 but the blue touch paper is still smouldering because BT cannot find enough spare computer capacity at the moment. The Great MUD Challenge has now been delayed till the New Year.

The people next door are away overnight. Their cat jumps on to their television — as cats are wont to do — which is connected to the computer which is connected to a printer and a disc drive and a modem. Ever careful your neighbours have bought the Product Innovation Spider alarm which is like an octopus with sensitive tentacles that has lots three of its legs and so can safeguard a home computer system from theft. The cat meanwhile starts playing with the wire unaware that "any slight movement of the device will sound the alarm". Result — one scaredy cat and a sleepless night for you as PI reckons that the Spider will let off "an ear-piercing 98 decibel scream" for two hours.

Elsie Dee

U.S. GOLD LATEST



YOU THE MARSHALL OF THIS TWO-BIT TOWN?
WHAT'S IT TO YOU, PUNK?
YOU GOT A BURR UNDER YOUR SADDLE, BOY?
YES, SON, AND IT'S A PRETTY NICE TOWN.
YES. WHAT MAY I DO FOR YOU?

Accolade Inc is the newest bright star in the US software firmament. Founded by Alan Miller and Bob Whitehead — both former Atari and Activision pioneers — the company aims to produce high-quality graphics, lifelike games and generally knock your socks off. Thanks to US Gold, the first of these apparently revolutionary programs Hardball for the CBM-64 will be released in the UK in January 1986.

Billed as the most realistic home baseball game ever, it has large lifelike players and three-dimension field views.

US Gold puritans may run a light pencil through some parts of Accolades's raunchy Law of the West, a very funny text-and-graphics adventure.

The third prong of the Accolade assault is PSI-5 — an Elitesque space trade'n zap.

QL draw

Impressed by the graphics on Psion's QL Chess? You won't be once you have Psion's Q Draw which allows you to create images using Psion's in-house graphics program.

For £15 Q Draw includes a library of useful shapes and allows you to use "pens" of different thickness on screen. Back with Chess Psion claims that the algorithm their program is based on — written by Richard Lang — is still world champion. But Kasparov need not worry yet. Lang's algorithm can still be beaten by good club players let alone Grandmasters.

Fun house

Ozisoft does not sound like a real name — even for an Australian software house, but CRL claims to have brought Journey, an £8 treasure-hunting game for the Commodore 64, from Ozisoft. Journey features music based on Madness's House of Fun, multi-directional scrolling and hundreds of location.

Little People

Many people faced with inexplicable programming problems blame the difficulties not on their own fallibility or obscure operating system bugs but on "little people" living in the machine.

Activision is exploring the widespread belief in Gremlins with its tacky Little Computer People Discovery kit on the Commodore 64. As you would expect this is just a simple game based around a 2½ storey house. Each of the characters is different but according to

Activision's Hugh Rees Parnell — who we are assured is real and not a figment of our imaginations — "they share common attributes such as the need for care and affection, a remarkable aptitude for playing games, the ability to communicate and a love of music."

Activision obviously hopes that Little Computer People will be this year's Cabbage Patch Kids or Pet Rocks. They are giving away deeds of ownership with every hit sold.

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And don't forget Memotech's attempts to rid the shortage of software by creating — an industry first — the Speculator Rompak which allows a large base of new Spectrum hits to run on the MTX machines.

The tech. spec. of the MTX + its new prices (MTX500 — £79, MTX512 — £130, and RS128 with twin RS232 — £249 makes it worth a mention. *Avid MTX user, Lancashire.*

Dear Jeff Minter,

Whenever you appear at exhibitions you are surrounded by throngs of acolytes and groupies. They are easily recognisable by their sixties Haight Asbury appearance and by recurrent strange animal motifs. To be quite blunt you are the biggest cult in the micro industry. Now you have a new fan. Me. And I don't even like your games.

While it is fair to say that you know how to program, it is also fair to say that you couldn't market your way out of a wet paper bag. It must be infuriating to see inferior products to yours selling in much larger volumes, cult or no cult. Ariolasoft, on the other hand, probably think a stack pointer is part of a fork lift truck. This hasn't stopped them marketing themselves to the top of the software house tree in less time than it takes to format a Sinclair Microdrive cartridge.

You relationship with Ariolasoft is one of the most sensible events this industry has seen for some time. Adam Smith's

divisions of labour proven once again. Both parties benefitting from the other's abilities. True synergy where the whole is greater than the sum of the constituent parts. It is this that has made me a fan.

The Llamasoft/Ariolasoft honeymoon epitomises a trend. Success has increasingly come to those who know what they are. Either programmers or marketers. Those who try both are a lot less successful. Jack of all trades and master of none. Many who have tried to do both are, unfortunately and somewhat inevitably, no longer with us. Some, luckily, still are. These are the people who should follow your example in order to survive, never mind succeed. Prime among these people are Ultimate. If they wish to continue as a viable entity they have to decide what they are.

Tim Stamper and his gorgeous sister Louise have been the major games software trendsetters. They have produced more influential products than any other



software house. Yet their sales, large though they may have been, have never reflected the true merit of their products. Like you they have seen inferior products to theirs sell in larger volumes. Like you their weakness is not in the programming but in the marketing. They make simple mistakes like putting insufficient perceived value into their packaging, making them the most pirated out of all the software houses. It is about time they realised what they are and acted accordingly.

For a small fee I would be only to glad to put Ultimate in touch with the company best suited to market their products.

Bruce Everiss
Bruce Everiss.

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

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XMAS MICRO

I'm not often moved to writing but after reading November's *Your Computer*. I feel I must point out a few errors in Lee Paddon's article about possible micros for your Christmas stocking. For in that article he states that the Enterprise has very little software and most of them are poor conversions.

While at the time of that article being written there might not have been many available — this is something that has since changed. Saying that they are mainly poor conversions could not be further from the truth. In fact 95 per cent surpass the originals in both graphics, sound and speed. If you are wondering why so many of the

(continued on page 27)

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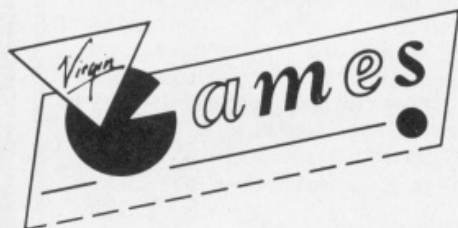
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Your letters

(continued from page 25)

titles are conversions, it is because they are so easy to transfer.

For example, the screen can be made to simulate the Spectrum screen right down to being at the same address and pixel layout. Even attribute clashing occurs if a straight dump version is made. Another point is Enterprise has never claimed that it can run MSDOS. All it has ever claimed is MSDOS file compatibility, that means reading and writing MSDOS files and not running MSDOS programs. Any claim that it will do so is a complete fallacy.

T J Box,
Independent Enterprise
User Group

DRAWER BUG

Thank you for publishing my 'Drawer' program in the November issue of *Your Computer*. I have, unfortunately recently discovered a bug in the program which causes use of the "Text" mode to corrupt the long-term store. Corrections are as follows:

```
Load the code then;
POKE 28908,191
POKE 29221,191
POKE 29222,6
POKE 29235,191 then SAVE
"DRAWCODE" CODE
25000,5512.
```

This applies only to the program as you publish it, not to the tapes which have been bought directly from myself. Apologies for the inconvenience.

P A Rhodes,
Luton,
Bedfordshire

REVIEW VIEW

I would like to make a few comments which relate to Colin Grant's letter in the September issue.

The Spectrum Microdrives are excellent and do compare with some disc drives in performance. I have never lost any data or program kept on them and a recent development project that required me to use them just re-inforced how good they are.

The original QL review stated that the hardware was the best value yet, but I was very concerned about the software. The QL hardware has been

further improved and is perfectly satisfactory, the software also still has one fundamental fault.

The saving and loading times of Basic programs are very poor when compared with the Spectrum, there should have been a routine developed by Sinclair and put in later Roms to enable saving and loading at Spectrum speeds. Although QL floppy discs are quicker, they still do not compare with the Spectrum speeds which is a great pity as virtually all the QL problems are related to this one fault.

It is helpful to see a response to the reviews, good or bad, as it enables me to continuously update the criteria I use to evaluate the machines, and it informs me of any blind spots or prejudices that I might have.

Finally, remember it is only my opinion, based on a standard set of tests that I have developed and apply to each machine reviewed. The object of the exercise is to inform the reader of any shortcomings, extra facilities and of the perceived value for money. On a low cost machine, the fact that there are omissions is not surprising and should be taken in context.

K D Peel.

AMSTRAD TALE

Just thought I would relate a tale of one computer user who is not only happy with the machine he bought but who is over the moon with the after sales back-up which is available. The machine is the Amstrad CPC 6128.

I was one of the original ZX81 owners (well I was looking for something to run my power station for me).

Even as I type this, I recall with horror the days I spent trying to get through to Sinclair's one, permanently engaged telephone line, only to be told when successful that I had got the wrong department and could I try another number...four days later I finally got through to the right number only to be told that there was nothing wrong with the Rom — perhaps I should see a psychiatrist instead — I had a perverse satisfaction when some time later they had to admit that there was a fault in

the Rom and had to replace half a billion or so that were in circulation already at their own expense. Never mind, after learning the hard way, I vowed that I would postpone upgrading to a better machine until I was certain it would be the right one.

The Spectrum passed me by as did the QL, the Acorn, the Enterprise (with the gestation period of an elephant) I congratulated my cynicism when I saw the mess the QL got into, (they only had to ask and I would have told them beforehand).

The CPC 664 arrived, oh no, could I resist...just, I bit the bullet and waited. The CPC 6128 arrived and I knew this was the one I had saved myself

for all those years. It was everything I wanted and more. I couldn't believe the price, the speed of the Basic, the manual...the everything. On top of this when I had a slight problem with running a program designed for the 464 — not a software compatibility problem but due to a rearranged keyboard configuration on the 6128 — I phoned up Amsoft, and got through first time, they put me on to Cliff Lawson one of their boffins.

He said "Oh yes there is a problem, I'll sort it out tonight at home and phone you with the solution tomorrow". And guess what....HE DID!

Steve Williams,
Twickenham,
Middlesex.

COMPUTER MAGIC-THE FACTS



I would like to set the record straight, with reference to an article on page 20 of the November issue of YC.

First, I would like it known that I am not in competition with the Magic Circle and/or with other members of the magic fraternity — of which I am a member — concerning "Computer Magic". Though it is true that is known that I am an exponent of this form of entertainment.

I would also like to point out that the name Sardi's is not a

software house. In fact it is the name of my representatives as a professional entertainer, and have no links with the computer magic aspect as was reported in *Your Computer*.

The article in question, seems to have been written without all the facts, that were an offer to the publishers. I feel strongly that it was also detrimental in any respects to both Sardi's and myself.

David Hambly,
Redbridge,
Essex

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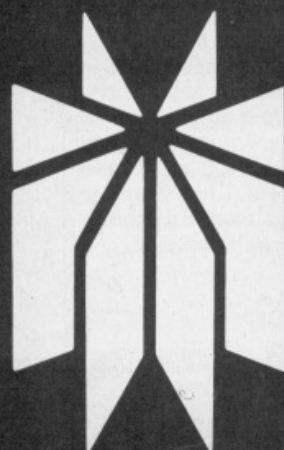
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HARDWARE HITLIST

CHALLENGER

► Opus • Disc drive • BBC • £249.95

• Challenger disc drive from Opus

A Ram disc is a popular facility in disc operating systems. This unit takes the process a stage further by giving you 256 Ram contained within the drive unit which is configured as an extra disc drive. For an extra £70 you can have a further 256K Ram disc.

You also get Opus's highly regarded DDOS. This features single and double density storage, a host of extra commands, an expanded directory arranged as a series of volumes, and it doesn't tie up any system Ram (page is set at &E00).

The most startling use of a Ram disc this size is in programs which use random access files during the execution of a program. A prime example of this is Viewstore, a new data base from Acornsoft. Using Challenger, you will not notice the program updating the disc contents. Then when



you've finished, you simply backup the Ram disc to the floppy disc and turn off.

Another application is for displaying large amounts of graphic data. The pictures can be pulled off disc virtually instantly. In strict performance terms, use of the Ram disc is around 20

times faster than most floppies.

Perhaps the only cloud on the horizon is software compatibility. Some protected programs won't load using Challenger. Challenger is available from computer dealers or direct from Opus on Redhill 65080.

HS-S1

► Amstrad • Serial Interface • Honeysoft Ltd. • £29.95

• Honeysoft's serial interface, the HS-S1

Honeysoft is a small company specialising in Amstrad add-ons. Its serial interface allows the Amstrad to be connected with serial printers or modems.

Two channels are supported over the usual range of baud rates. Word length and parity can also be set. One of the channels can use split baud rates and hardware handshaking, the other uses purely on/off protocols. The board is compact and well made with a full 25 way connector and an extension socket for further add-ons.

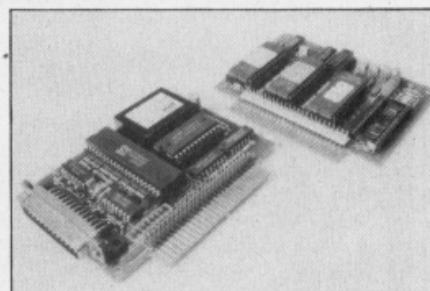
You can control the board under CP/M or by using Basic commands available on Rom, disc or cassette.

Honeysoft intend to support this board with Viewdata and Bulletin board software. Only preview copies were available with the review sample, but hopefully the final version should be available later this month. The pre-release version was easy to use, with most commands being accessed by menus overlaid on the page currently

displayed. Two screen modes are available, mode 0 uses all eight colours, but the text is rather compressed, but still legible. Mode 1 has the normal character set, but the colours have to be fudged by stippling.

Other facilities planned will be familiar to Commstar owners, with pages held in memory, screen dumps of either text or graphics, saving and loading pages, tagging pages and clock. The system will be compatible with the new Micronet downloading service.

Again this software will be available on Rom, disc or cassette for around £20. It is



hoped that future upgrades will include colour screen dumps and off-line mailbox editing. If all that is promised is delivered, then this looks like a very promising product indeed. The serial board is also compatible with Amstrad's own interface.

TR-1

► Spectrum • Printer • Saga Systems • £149.90

Printers at this end of the market are generally thermal printers using expensive paper, or rather nasty dot matrix jobs. This product represents a notable first giving real letter quality printing for under £200.

It takes plain A4 paper (but won't take continuous forms). The head consists of five

character wheels spinning past the paper. The noise level is about the same as a daisy wheel, with bi-directional printing giving a print speed of around 10 cps.

The printer has a standard Centronics interface, and can also accept serial data through unused pins on the parallel port.

The prices quoted for the Amstrad products in last month's issue were incorrect. The Rom card is £15.95. Utopia is £29.95 and Protext is £39.95 on Rom. These programs are also available on disc and cassette.

Christmas

Simon Beesley looks a cheaper buy for Christmas.

Computer prices fall every year but this Christmas brings some really outstanding bargains. In

some cases home computers are being sold for a half or even a third of their original price. For example, in January 1984 the Atari 800XL cost around £250. On top of this you needed to fork out £50 for an Atari cassette recorder. Now you can buy the machine for £100 with a cassette recorder, joystick and 10 programs thrown in for good measure.

£100, in fact, will buy you a micro with 64K Ram, colour, 3 channel sound, and a graphics resolution of at least 256 by 192. To put this price in perspective consider that in 1981 the 16K ZX81 — a machine with a bald keyboard and chunky black and white graphics — was rated a bargain at £120.

All the micros listed cost less than £180. Where the machine is sold in a package which includes a cassette recorder and joystick, the all-in price has been given. Usually it is substantially cheaper, than buying each item separately.

Computers in this price bracket are suitable for the first-time buyer who wants to use a computer mainly for recreation. If you have a more serious application in mind you would do better to look at the micros covered in last month's guide. It is certainly possible to use a Spectrum for wordprocessing or keeping your accounts; but to do this you need to add a printer and a disc drive, along with appropriate interfaces.

Deciding which computer to buy partly depends on what you intend to do with it. People tend to justify their purchase by telling themselves that they will learn to program or that it will be useful for Junior's education. A few months later nine out of ten owners use their computer solely for playing games on. Fair enough, but it is unfortunate if there is not much software available for your machine. It may be a commonplace to say that a computer is only as good as the software that runs on it, but it is worth repeating nonetheless.

If you are interested in programming, a good keyboard

and a fast, extensive version of Basic are features to look out for. Even programmers, though, need commercial software in the form of programming utilities, assemblers or other languages. So the question of software availability is important here, too.

The specifications of the 11 machines under £180 are given in the table. There is also a brief comment on each micro, which summarises its pros and cons. We have not thought it necessary to provide a list of peripherals. Printers, disc drives, modems, light pens, speech units, and other add-ons, are available for most of these machines.

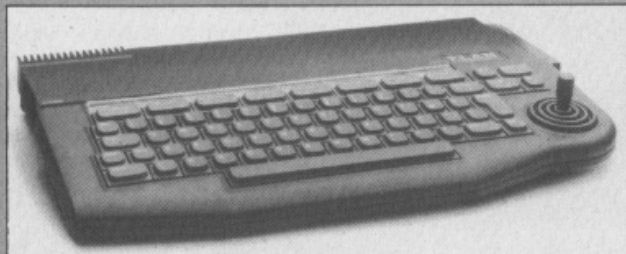
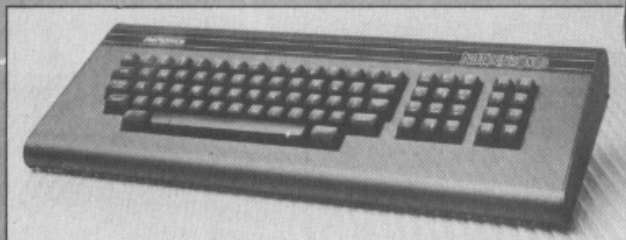
Atari 800XL: Possibly the best value of all, for its robust keyboard, superior graphics, and high quality games software. Not as many new titles are released for the Atari as for the CBM-64 or Spectrum. But since it is compatible with earlier models there is a large range of programs already available.

Atari 130XE: More memory for your money than any other micro in this price range. Memory aside, it is almost the same as the 800XL with which it is software compatible. And as the processor can only handle 64K at a time the extra memory is only a minor improvement. It is unlikely that much commercial software will take advantage of it.

Commodore 16: Why Commodore chose to introduce a new micro which could not run CBM-64 software is a total mystery. Now superseded by the CBM 128, the CBM-16 will soon sink into oblivion.

Commodore 64: Top of the table as far as games software is concerned. Only the Spectrum can boast as many titles, but the CBM-64's superb sound chip and superior graphics give it the edge quality-wise. Let down by a poor version of Basic.

Commodore Plus 4: Usefully includes four business programs, themselves not really



From the top: Memotch 500; Atari 800XL; Enterprise; JVC MSX; Spectrum +. Opposite: Canon V-20 MSX; BBC Electron.

s buys

powerful enough to make the Plus 4 a practical proposition as a business micro. It has received almost no support from third party manufacturers and software houses — and as a games machine it is a non-starter.

Electron: A crippled version of the BBC micro, the Electron suffers from insufficient memory and a shortage of ports. Its major asset is BBC Basic, although it is too slow to run most BBC software.

Enterprise: Although technically superior, the Enterprise was launched too late in the day to have much success. Limited software.

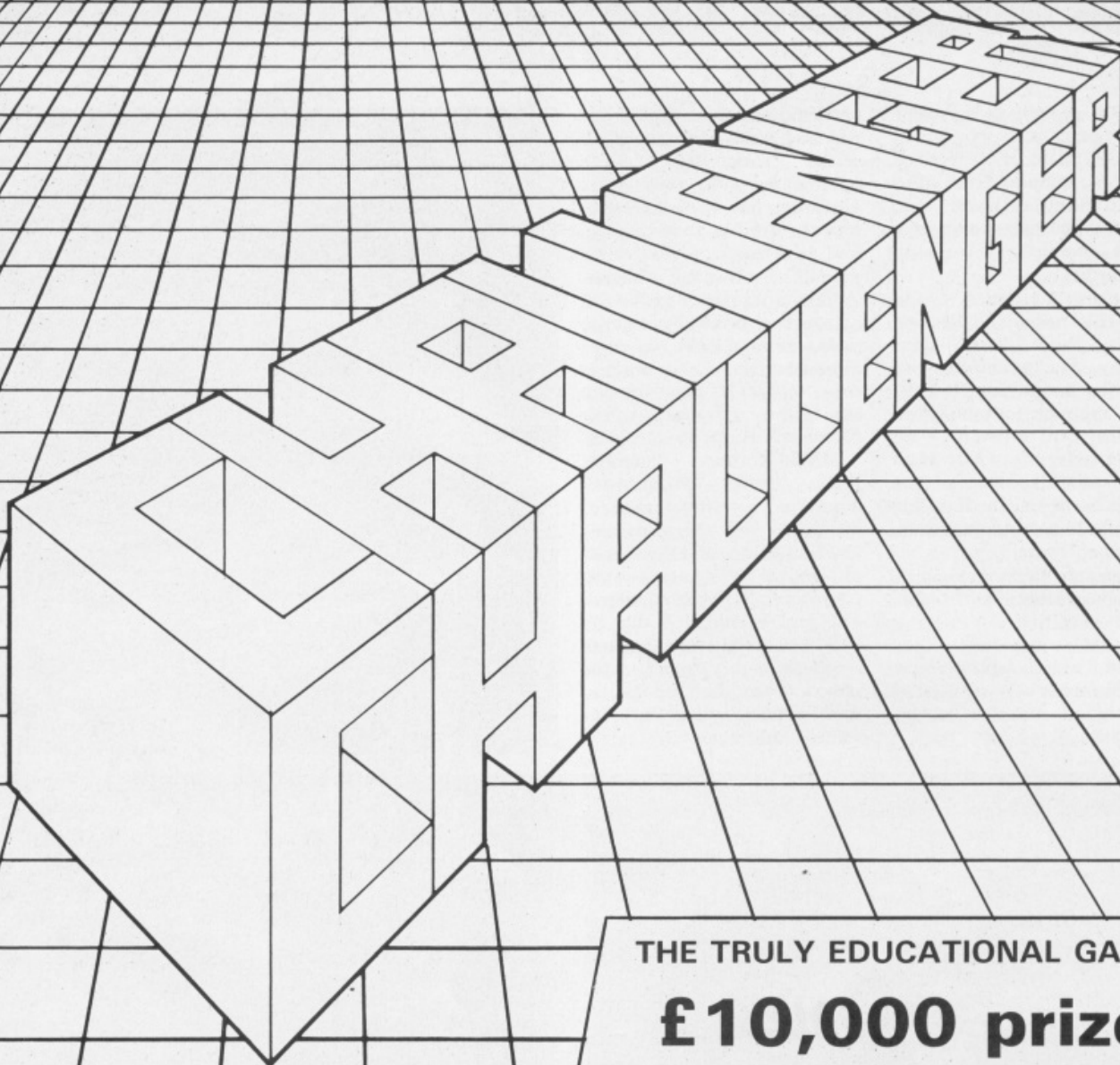
Spectrum: Tacky keyboard, poor construction, and feeble sound facility. Yet the Spectrum's popularity has ensured that a massive amount of software has been written for it. A good machine to get started on.

Memotech: Both the 500 and 512 are well made machines with remarkably high specifications for their price. Unfortunately they have not had the success they deserve, and as a result only a limited amount of software is available. Adding a disc drive to the 512 solves the problem by allowing you to run CP/M software, although most of it for business users only. If you are not interested in games the Memotech is one to consider.

MSX: Cannon, Toshiba, JVC, Sony, Mitsubishi, Yamaha, Spectravideo, in Rom, but the programs Goldstar, Sanyo and Panasonic, all make computers that conform to the MSX standard. The idea behind it is that by building computers to the same specification they can all run the same software. Too bad that the specification settled for was rather a dull one.



Cheap Micros Machine	Price	Memory & processor	Graphics	Test	Colours	Sound	Ports	Keyboard	Software	Other Features
Atari 800XL	£9.99 inc joystick + cassette +	64K RAM 24K ROM 6502 1.8MHz	320 x 192 15 other modes	40 x 24 20 x 24 20 x 12	16 5 5	4 voices envelopes	Joystick, Serial, expansion composite video	Full Travel 4 functional keys	Large range of games, some business and educational Runs 800XL software	Sprites, Cartridge slot
Atari 130XE	£119.90	128K RAM 24K ROM 6502 1.8MHz	320 x 192 10 other modes	240 x 24 4 other modes	128	4 voices envelopes	Joystick, serial, expansion, composite video	Full travel 5 function keys	Very little not compatible with CBM-64 software	Sprites
Commodore 16	£69.99 inc cassette +	16K RAM 16K ROM 4 programs 7501 1MHz	320 x 200	40 x 25	16	2 voices	Joystick, serial, expansion, user, composite video	Full travel 4 function keys	Very little not compatible with CBM-64 vast range, mainly games	Sprites
Commodore 64	£199.99 inc cassette +	64K RAM 16K ROM 6510 1MHz	320 x 200	40 x 25	16	4 voices envelopes	Joystick, Serial, expansion, user, composite video	Full travel 4 function keys	Not much at present, unlikely spreadsheet	Built-in wordprocessor, database and graph programs Built-in assembler
Commodore Plus 4	£99.99 inc cassette +	64K RAM 48K ROM	3200 x 200	40 x 25	16	2	Joystic, serial, expansion, user,	Full travel 4 function keys to improve	Games and educational	Built-in wordprocessor, database and graph programs Built-in assembler
Electron	£99.99 inc cassette +	32K RAM 32K ROM 5 programs 6502 2MHz	640 x 256 32 x 256 160 x 256	80 x 32 40 x 32 20 x 32	1 4 16	1 voice envelopes	Expansion	Full travel	Not much, may improve	Built-in wordprocessor, stereo output Built-in assembler, Logo, Noddy
Enterprise 64	£180	64K RAM 96K ROM Z80A 4MHz	675 x 512 3 other modes	84 x 56 40 x 24	2 up to 256	4 voices envelopes stereo	Expansion, RS232 Centronics, Joystick, RGB expansion	Membrane type 16 function keys	Some games and business	Built-in assembler, Logo, Noddy
Memotech 500	£79	48K RAM 24K ROM Z80A 4MHz	256 x 192	40 x 24	16	4 voices envelopes	Centronics, RS232 joystick, RGB expansion	Full travel 8 function keys numeric keypad	Some games, business, and CP/M option	Built-in assembler, Noddy, Logo
Memotech 512	£130	80K RAM 24K ROM Z80A 4MHz	256 x 192	40 x 24	16	4 voices envelopes	Centronics, RS232 joystick, expansion	Full travel 8 function keys, numeric key pad	Not a great deal at present may improve	Cartridge slot
MSX	£99.99 upwards	64K RAM 32K RAM Z80A 4MHz	256 x 192	40 x 24	16	3 voices	Centronics joysticks	Full travel 10 function keys		
Spectrum Plus	£139.99 inc joystick + cassette +	48K RAM 16K RAM Z80 3.5MHz 10 programs	256 x 176	32 x 24	8	Beep				



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The charts

TOP 30 OVERALL CHART

1	MONTY ON THE RUN	GREMLIN GRAPHICS	15	FAIRLIGHT	THE EDGE
2	WAY OF THE EXPLODING FIST	MELBOURNE HOUSE	16	CHILLER	MASTERTRONIC
3	FRANK BRUNO'S BOXING ELITE		17	BEACH HEAD	ACCESS/US GOLD
4	IMPOSSIBLE MISSION	EPYX/US GOLD	18	BORED OF THE RINGS	SILVERSOFT
5	FORMULA ONE SIMULATOR	MASTERTRONIC	19	NONTERRAQUEOUS	MASTERTRONIC
6	FINDERS KEEPERS	MASTERTRONIC	20	WORLD SERIES BASKETBALL	IMAGINE
7	DALEY THOMPSON'S SUPER TEST	OCEAN	21	NOW GAMES	VIRGIN
8	ACTION BIKER	MASTERTRONIC	22	MATCH DAY	OCEAN
9	STARQUAKE	BUBBLE BUS	23	HYPERSPORTS	IMAGINE
10	HACKER	ACTIVISION	24	VEGAS JACKPOT	MASTERTONIC
11	FIGHTING WARRIOR	MELBOURNE HOUSE	25	SUMMER GAMES 2	EPYX/US GOLD
12	BMX RACERS	MASTERTRONIC	26	PARADROID	HEWSON CONSULTANTS
13	WHO DARES WINS 2	ALLIGATA	27	ELITE	FIREBIRD
14	GRAHAM GOOCH TEST CRICKET	AUDIOGENIC	28	SHADOW OF THE UNICORN	MIKROGEN
			29	KIK START	MASTERTRONIC
			30	SPY VS SPY 2	BEYOND

TOP 10 BUBBLERS

1	WINTER GAMES		6	RAID!!	US GOLD
2	SUPER ZAXXON	U.S. GOLD	7	ASTRO CLONE	HEWSON CONSULTANTS
3	QUEST FOR THE HOLY GRAIL	MASTERTRONIC	8	SOUL OF A ROBOT	MASTERTRONIC
4	COMPUTER HITS (10)	BEAU JOLLY	9	STRIKE FORCE HARRIER	MIRRORSOFT
5	SPIKE	FIREBIRD	10	ONE MAN AND HIS DROID	MASTERTRONIC

SPECTRUM SALES

THIS	LAST	WKS	TITLE	PUBLISHER
01	NE	01	MONTY ON THE RUN	GREMLIN GRAPHICS
02	01	02	IMPOSSIBLE MISSION	US GOLD
03	02	10	WAY OF THE EXPLODING FIST	MELBOURNE HOUSE
04	03	07	DALEY THOMPSON'S SUPER TEST	OCEAN
05	NE	01	STARQUAKE	BUBBLE BUS
06	04	05	FIGHTING WARRIOR	MELBOURNE HOUSE
07	06	07	FAIRLIGHT	THE EDGE
08	08	03	GRAHAM GOOCH TEST CRICKET	AUDIOGENIC
09	NE	01	WORLD SERIES BASKET BALL	IMAGINE
10	RE	05	ACTION BIKER	MASTERTRONIC

COMMODORE SALES

THIS	LAST	WKS	TITLE	PUBLISHER
01	NE	01	MONTY ON THE RUN	GREMLIN GRAPHICS
02	01	02	WHO DARES WINS 2	ALLIGATA
03	02	10	SUMMER GAMES 2	EPYX/US GOLD
04	06	02	PARADROID	HEWSON CONSULTANTS
05	04	06	FRANK BRUNOS BOXING	ELITE
06	05	11	WAY OF THE EXPLODING FIST	MELBOURNE HOUSE
07	RE	05	KIK START	MASTERTRONIC
08	03	05	SPY VS SPY 2	BEYOND
09	09	08	BARRY MCGUIGAN WORLD CHAMPIONS	ACTIVISION
10	RE	10	BEACH HEAD 2	ACCESS/US GOLD

AMSTRAD SALES

THIS	LAST	WKS	TITLE	PUBLISHER
01	04	10	FINDERS KEEPERS	MASTERTRONIC
02	NE	01	RAID!!	US GOLD
03	10	10	FRANK BRUNOS BOXING	ELITE
04	08	02	SOUL OF A ROBOT	MASTERTRONIC
05	02	11	WAY OF THE EXPLODING FIST	MELBOURNE HOUSE
06	07	11	NONTERRAQUEOUS	MASTERTRONIC
07	01	02	FORMULA ONE SIMULATOR	MASTERTRONIC
08	03	03	GRAND PRIX 3D	SOFTWARE INVASION
09	09	11	CHILLER	MASTERTRONIC
10	06	08	LOCOMOTION	MASTERTRONIC

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 ✉ 946240 CWEASY G 19002985 PRESTEL MAILBOX 919992265

SOFTWARE SHORTLIST

FAIRLIGHT

► Spectrum • The Edge • Arcade adventure • £9.95 • Toby Wolpe

VALUE FOR MONEY

● ● ● ● ●

GRAPHICS

● ● ● ● ●

PLAYABILITY

● ● ● ● ●

SOUND

●

OVERALL RATING

● ● ● ● ●

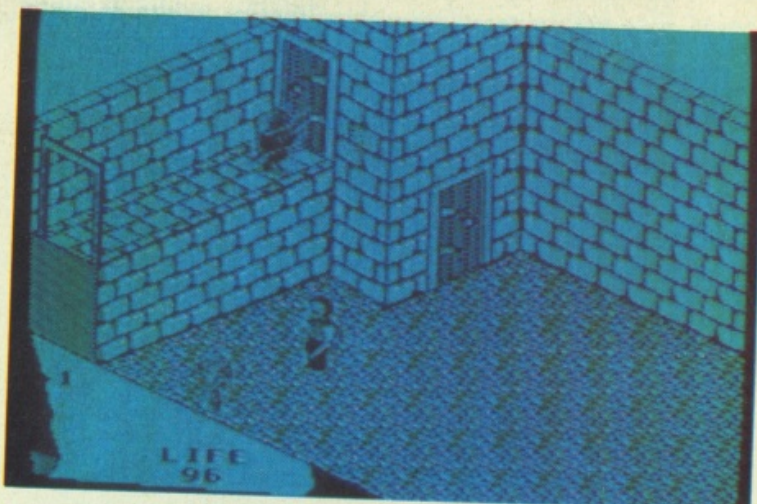
In the mythical kingdom of Covent Garden, once people by a fair race, a band of strolling software magicians, known to story-tellers as Ye Edge, conjured up a corny sub-Tolkein plot to accompany a truly wonderful arcade adventure — Fairlight.

But once you're inside the dubious-sounding Castle Avars you soon forget about background details like the land of Fairlight slipping into chaos and darkness. The graphics are excellent, better in some ways than Ultimate's latest offering Nightshade. The Edge put it down to "The 3-D Worldmaker Technique".

Whatever you want to call it, the result is good, smooth animation in two colours.

As with all the best games the idea behind it is simple. You, Isvar, must escape from the castle by finding The Book of Light. There's also the standard hooded old man of mystery who presumably gets out when you do.

The idea may be simple but escaping isn't. Collecting the right items is the only way of mapping out the castle's 80-odd ogres. Finding the objects isn't too bad — the early ones at least. The problems start



when you have to work out what to do with them.

The scroll is the sorcerer's equivalent of an ejector seat; when the going gets tough it'll plonk you down in the relative safety of the courtyard. The bag of gold is handy for bribing certain guards, while food, keys and magic potion should all be fairly self-explanatory.

To reach certain objects like the egg timer requires a lot of shoving and stacking of furniture. Addicts of Ultimate's Knight Lore and Alien 8 will really feel at home.

The booklet with the game

suggests that you examine the cover, opening screen and text for clues. To me the cover showed a wizard loosely resembling Edge boss Tim Langdell reading a radioactive *Your Computer* binder. The opening screen did however give a few hints; it gives you an aerial view of part of the castle, for example.

Apart from its graphics and complexity, it's touches like Isvar's five pocket and the weight restrictions on what you can carry that make this such a good game. Should keep you happily gnashing your teeth for hours.

SCREENS

● When the going gets tough in Fairlight a scroll will help you get going again.

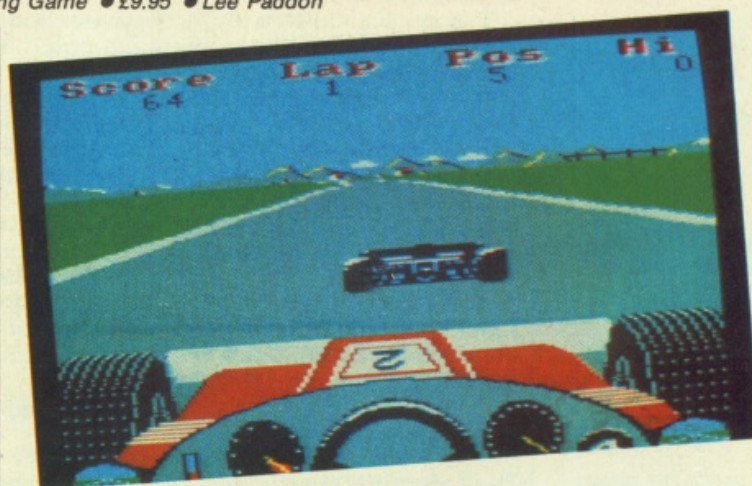
3D GRAND PRIX

► Any Amstrad • Amsoft • Racing Game • £9.95 • Lee Paddon

Well, if Nigel Mansell can win a Grand Prix, I suppose anything's possible. So perhaps a few laps of this might show you if you've got what it takes.

You get a cockpit view of the track ahead, with rev counter, speedo, temperature gauge and wing mirrors. You get eight circuits to tackle in turn. You have to finish in the top three of one race to proceed to the next. The opposition starts easy and gets tougher as you go on.

The car has four gears, accelerator, steering and brakes. The steering is of the usual digital variety, and rate of turning depends on speed. If you corner too sharply, you spin off. The usual Pole Position tactic of overtaking on the grass gets you nowhere fast, and the other



cars have a nasty habit of blocking you. The temperature gauge limits the amount of time you can go at full pelt, overheating produces a dramatic loss of speed.

As far as a simulation of a race goes, this one slots in somewhere between Pole Position and Taledaga, but that said, it is easily the best racing simulation for the Amstrad.

VALUE FOR MONEY

● ● ● ● ●

GRAPHICS

● ● ● ● ●

PLAYABILITY

● ● ● ● ●

SOUND

● ● ● ● ●

OVERALL RATING

● ● ● ● ●

SCREENS

● Clear cockpit display with Revs style wing mirror.

SOFTWARE SHORTLIST

HACKER

► CBM-64 • Activision • Hacking • £8.95 • Lee Padon

Possibly about the worst thing you can do if you want to play this game is read a review of it. After loading up, you are left with the

enigmatic message "Logon:", and that's it. No instructions, no hints, no nothing. Thus, if you read a review, you will end up knowing more about

the game than was intended, and discovery is half the fun.

What it boils down to is trudging around the world in your little gismo — or SRU if you prefer — negotiating with spies, piecing together documents and acquiring information about the network you have penetrated.

Is it a simulation of hacking? Well, yes, in as much as that is possible. It is the same combination of logic, inspired guesswork and lucky breaks. Is it fun? After all, one of the main motivations for hacking is you are doing something illegal, you don't get the same thrill with Hacker. Still, there are enough problems to solve in what might be termed an electronic adventure game to keep most would-be hackers happy and it'll keep the phone bill down.

OVERALL RATING

● ● ● ●

VALUE FOR MONEY

● ● ● ● ●
GRAPHICS
● ● ● ● ●
PLAYABILITY
● ● ● ● ●
SOUND
● ● ● ● ●

SCREENS

● The grid represents a network of secret tunnels linking cities around the world.



CRUSADE IN EUROPE

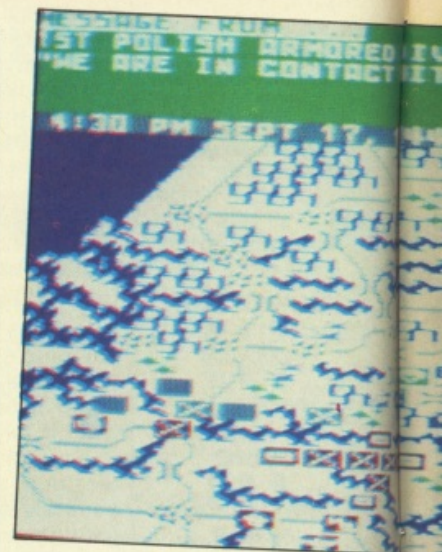
► CBM-64 • Wargame • US Gold • £23 • Lee Paddon

"All very clever, but it's not really a simulation," has until now been the stock response of tabletop wargame enthusiasts to the computerised variety. However, this game is going to set a new standard, with an outstanding combination of realism and playability.

The game simulates the campaign in North-West Europe, from the D Day landings to the Battle of the Bulge. This can either be done in a series of scenarios tackling the major battles, or as a continuous campaign covering the four months to the beginning of October. The screen shows the units involved in the battle, the terrain, any enemy units you are in contact with, a text

window for messages, and a cursor for entering commands.

To enter a command, you place the cursor over the unit, and press fire. This gives a detailed picture of the unit's current status, its strength, deployment, combat readiness and supply state. You can then proceed to give it orders. There are no separate phases for giving orders, it is all real time, you just give the orders and the units get on with it. Supply considerations take two forms, individual supply, where a check is made every day to determine whether the unit can be supplied, and overall supply, where the amount of supply used is calculated and compared



with the amount of supply flowing in. This can restrict the amount of activity possible. All this detail gives a great feel of overall command. You give the orders while remaining unencumbered by the detail, free to keep a strategic view of the whole situation.

The game can either be played against the computer, or a human opponent. It can be weighted to one side or the other, and, at the end, the computer assesses the

VALUE FOR MONEY

● ● ● ● ●
GRAPHICS
● ● ● ● ●
PLAYABILITY
● ● ● ● ●
SOUND
● ● ● ● ●

SCREENS

● Like Eastern Front Crusade's display changes colour depending on the season.

DECISION IN THE DESERT

► CBM-64 • US Gold • Wargame • £19.95 • Lee Paddon.

The sequel to Crusade in Europe, this features five scenarios covering the major battles in the Western Desert from Sidi Barrani to El Alamein. The system copes surprisingly well with the complex battles.

Microprose claims it is off

to the jungles of Indo China for the next in the series, presumably to cater to the market of Vets eager to refight the war to see what effect nuking Ho Chi Minh City would have had.

OVERALL RATING

● ● ● ● ●

VALUE FOR MONEY

● ● ● ● ●
GRAPHICS
● ● ● ● ●
PLAYABILITY
● ● ● ● ●
SOUND
● ● ● ● ●

SCHIZOPHRENIA

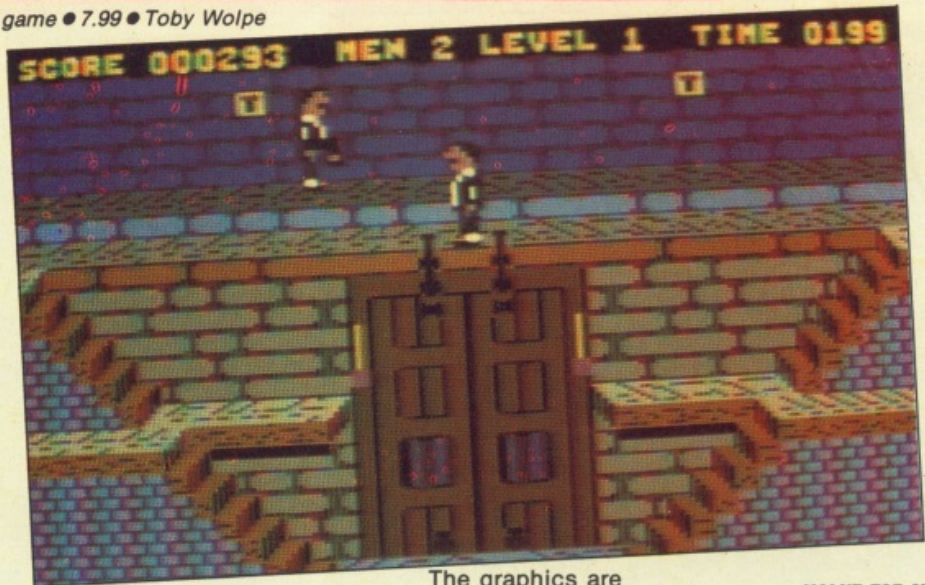
► CBM-64 • Quicksilver • Platform game • £7.99 • Toby Wolpe

This game rates as high in paranoia as it does in frustration. Why is Quicksilver out to persecute me by making it so difficult to play?

Everything you do in screen 1 of this five-screen game is quickly undone by the evil side of Alphonse T Nurd — the other half of your personality. You, the good Alphonse, are a lab cleaner. But instead of just dusting the Atomic Particle Separator, you apparently tried it out on yourself — with personality-splitting results.

The only way of becoming whole again is to make it as far as screen 5 and the Recombination Chamber.

Forgetting the frustration factor for a minute, Schizophrenia has several good original features, like the fact you have to flick two switches on the first screen to stop the timer and start



the score clock running.

The score has to be greater than the time you've taken to rack up any points. You score by drawing the four bolts on the great doors that lead to the next chamber. The catch is that your alter-ego is busy flicking the switches back again and sliding the bolts shut.

To get through the lifts and yellow boxes of screen 2 you have to follow Alphonse II around area 1, flicking switches and pulling bolts and then making a rush to the right-hand lever to open the doors.

The graphics are reasonable with a traditional platform game side-on view of the action. But the animation isn't wonderful. The characters prance around the screen like demented Morris men. Even if you're walking along a flat platform, the movement's the same as walking up stairs.

A good, original approach to mental illness which should drive you mad even if you weren't to start with. But I'm in two minds whether to recommend Schizophrenia as a great game.

OVERALL RATING

● ● ●

VALUE FOR MONEY

● ● ●
GRAPHICS

● ● ●
PLAYABILITY

● ● ●
SOUND

SCREENS

● Don't be fooled by the kitsch look of the product. Schizophrenia is really kaffesque.



overall performance of the players. It may be a steep price, but then you get a lot of game for your money, which should keep the enthusiast happy for a long time, and reflects the amount of care and historical research that has gone into this. Once again, Microprose have produced a great product with lasting appeal.

OVERALL RATING

● ● ● ● ●

WHAM — THE JUKE BOX

► ZX Spectrum • Melbourne House • Music utility • £9.95
● Tony Sacks

There used to be one inviolable certainty to cling to in these changing times — the immutable fact that the Spectrum has just one sound channel. But now even this sacrosanct truth has been rudely, and noisily, shattered by this devilish bit of software which gives the Spectrum two sound channels using the original hardware.

Wham — no connection with the George/Ridley duo, you may be relieved to hear — allows you to compose separate bass and melody lines over a four-octave range and even to include vaguely drum-like effects (but not simultaneously with the notes). Notes are entered and displayed on musical staff and, as they are being

played, the notes are depicted by dots bouncing around on a piano keyboard.

The hideously named Whampiler allows you to use the tunes you compose to enliven your own programs. The compiled music takes up less than 1K of memory, no matter how complex it is.

One snag is that all the notes have to be the same length, although rests can be inserted between notes and the tempo of a piece can be varied.

W-TJB will probably appeal most to programmers wanting to add music to their graphic masterpieces; as a stand-alone music-making package its staying power is questionable.

OVERALL RATING

● ● ●

GRAPHICS

● ● ●
SOUND

● ● ● ● ●
PLAYABILITY

● ● ● ● ●
VALUE FOR MONEY

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Electron • MSX • Spectrum 48K
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HERE & THERE WITH THE MR MEN

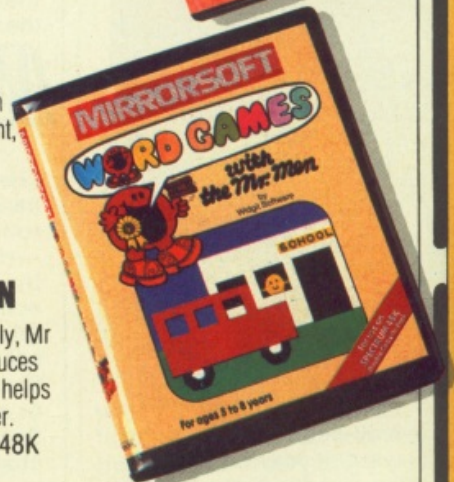
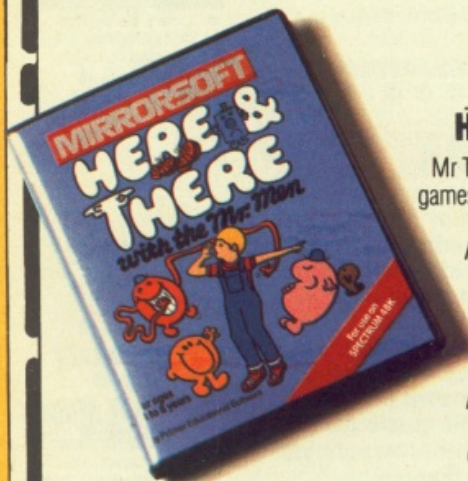
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SOFTWARE SHORTLIST

BATTLE OF BRITAIN

► Amstrad • PSS • Wargame • £9.95 • Lee Paddon



GRAPHICS

● ● ● ●
SOUND

PLAYABILITY

VALUE FOR MONEY

● ● ● ● ● ● ● ●

SCREENS

● Battle of Britain — phew against the many Hunnish hordes.

In this, the latest in PSS's wargame series, you take the part of 11 group controller, directing "The Few" against the Hunnish hordes. The display shows the position of incoming raids, any squadrons you have scrambled, as well as the position of airfields, radar

stations and towns in south-east England.

You must attempt to repel the Luftwaffe raids while maintaining the RAF in fairly good nick. In the air, you can be sure of a loss rate of about five to one, but the risk is getting caught on the ground whilst refuelling,

which will lose you half the aircraft on the field. This leaves the player with a nice dilemma of how many squadrons to commit to dealing with each raid.

As is obligatory with this PSS series, you can have arcade sequences where you fight one of the battles, as usual you are not entirely sure what you are doing and it is best to ignore it. There are three scenarios: introductory game, Blitzkrieg, and campaign game. The campaign game broadly follows the pattern of the German campaign, with initial raids on the radar system, followed up by attacks on the airfields.

At the end of each day you get a number of replacements to make your squadrons up to strength.

Definitely the best offering yet in this series, with lots of historical flavour and attention to detail.

OVERALL RATING

● ● ● ●

SATELLITE WARRIOR

► Amstrad • Amsoft • Trading Game • £7.95 • Lee Paddon

Coming close on the heels of adventure games and Star Trek, Hamurabi and its variants has a long and distinguished history; this game represents a new variation on the familiar theme.

You play either against the computer or another player, the idea is to colonise the solar system with satellites and exploit its economic resources, and thus build more satellites and so on. You are also visited by aliens who can trade you items which you don't produce, there is no direct trading

between the players.

Regretably, when two players attempt to exploit the same planet, the satellites must duel to the death.

There are three varieties of weapon for use at different ranges, and three types of defence.

The game's overall tone is light hearted, with jolly bug eyed monsters and defeated satellites falling to bits like an MoT failure in the fast lane. Victory is all about getting the bits you need to make really nasty satellites.

OVERALL RATING

● ● ● ●

OVERALL RATING

● ● ● ●

GRAPHICS

● ● ● ●
SOUND

PLAYABILITY

● ● ● ● ● ● ● ●

● ● ● ●
VALUE

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PAZAZZ

COMMODORE

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COMPUTER APPLICATIONS

COMMODORE 128
PERSONAL COMPUTER APPLICATIONS

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MULTI SOFT



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COMMODORE

SOFTWARE SHORTLIST

CODENAME MAT II

► Spectrum and CBM-64 • Domark • Shoot-em-up • £8.95 • Lee Paddon

VALUE FOR MONEY

● ● ●

GRAPHICS

● ● ●

PLAYABILITY

● ● ●

SOUND

● ● ●

After the cult status bestowed on the original, this sequel has been eagerly awaited. This time, your old adversaries, the Myons, are bent on destroying a bunch of satellites. You have to protect them by destroying wave after wave of Myons before they have time to wreak havoc.

Between waves, you get a chance to repair either the ship or some satellites. Your ship also has two droids which can make running repairs in combat. The instrumentation is complex with scanners, battle computers, status indicators and so on. Combat consists of warping towards the enemy sector, and then once there, you close in on them using your scanners, and then do a spot of dogfighting.

Damage occurs when you take hits, or collide with the enemy. There are numerous



systems all over the ship; damage affects the operation of the ship to a varying extent, and you must decide what gets priority for repair.

Despite all this fairly complex stuff, the guts of the game is shooting Myons and a pretty uninspiring bunch they are too. They come in a variety of shapes and sizes, some with

cloaking devices. But really, these days we expect our aliens to be three-dimensional and have a bit more grey matter. This game is in many ways a step backward from the original. Brewster fans were expecting a lot more.

OVERALL RATING

● ● ●

SCREENS

● Codename MAT II. Myons aren't what they used to be.

GRAPHICS

● ● ●

SOUND

● ● ●

PLAYABILITY

● ● ●

VALUE FOR MONEY

● ● ●

SCREENS

● Head-up display, target computer and air attack radar in Strike Force Harrier.

STRIKE FORCE HARRIER

► BBC B and Electron • Mirrorsoft • Flight Simulator • £9.95 • Lee Paddon

Still playing Aviator? Well at last Mirrorsoft have come to the rescue of Beeb owners still dementedly flying under bridges and shooting space invaders with their Spitfire.

This will take a bit of getting used to for the seat-of-the-pants crowd. The 'plane actually tries to help you to fly it with useful little warnings like "you are about

to hit the ground" and "someone is shooting at you". Unfortunately, most of these warnings are accompanied by some of the most ear splitting sound effects witnessed in this office for some time. Definitely one to get the neighbours hammering on the wall during late night sorties. The avionics are very nice with a full instrument

panel, Head-Up Display, target computer and air attack radar.

Unfortunately, there is a price to be paid with rather dismal graphics in the way of ground detail and enemy aircraft. The scenario is rather bizarre. You have to destroy an enemy base. In order to do so, you must move through enemy territory knocking out tanks, SAM batteries and aircraft. Having prepared the ground, you land and call up your ground staff to repair and refuel your aircraft.

This you repeat as often as necessary to reach the base. The most exciting feature is the "Viff", or vectored thrust, which is faithfully reproduced. This is not only handy for vertical takeoff and landing, it is also comes in useful in aircombat. Another nice feature is doing high-G turns on the higher levels will cause black-outs (instruments not recommended). All in all, one the flying addicts will want to add to their collection.

OVERALL RATING

● ● ● ●



ocean



SOFTWARE
PROJECTS

ULTIMATE
PLAY THE GAME

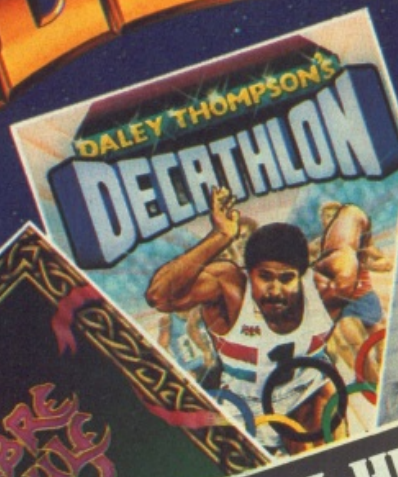


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SOFTWARE SHORTLIST

TOMAHAWK

►Spectrum • Digital Integration • Arcade Adventure £9.95 • Paul Bond

GRAPHICS
● ● ● ● ● ● ● ●
SOUND
● ● ● ● ● ● ● ●
PLAYABILITY
● ● ● ● ● ● ● ●
VALUE FOR MONEY
● ● ● ● ● ● ● ●
OVERALL RATING
● ● ● ● ● ● ● ●

SCREENS

● Tomahawk —
Flight International
likes it.

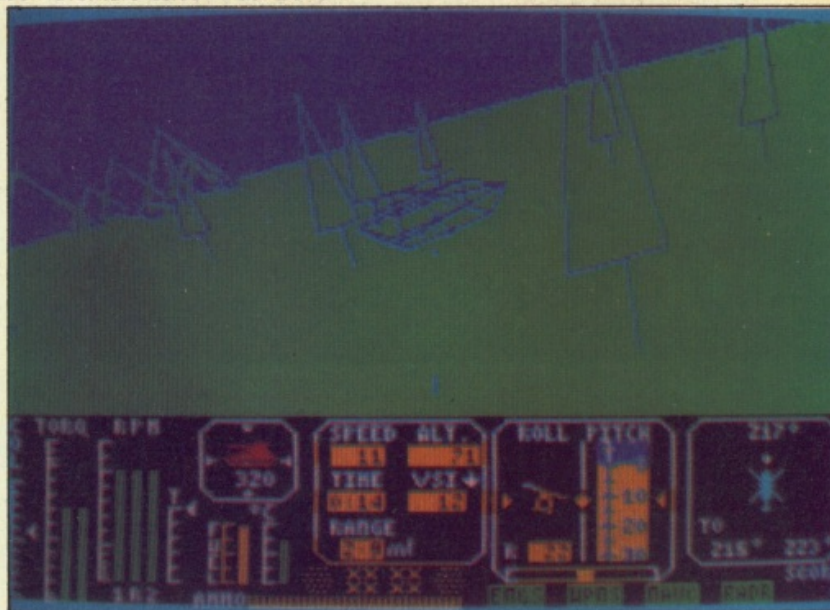
● Righth: Dave
Marshall, author of
Tomahawk.

● Below: The real
thing — an AH-64A
Apache helicopter.

Over 7,000 ground features and some of the best wire-frame 3D graphics this side of Novagen's long-awaited Mercenary, Tomahawk puts you in control of the US Army's latest attack helicopter, the Apache. Promoted by Hughes as "an extension of the pilot's will", it's appropriate that the Spectrum simulation of such a hi-tech heli marks the commercial debut of the Lenslok protection system. This, of course, is a game in itself — hours of fun to be had squinting through a plastic lens at the VDU guessing at the combinations of any two letters of the alphabet.

Once past this hurdle, you can open the throttle, ease forward on the collective, and leave the pad. As the 3D world display unreeles you will see landing pads, buildings, trees, transmission pylons, mountains, enemy tanks (moving and firing), field guns, and airborne enemy helicopters.

A number of mission scenarios are available to you: flying training or combat, with different difficulty levels, you can select a low cloudbase of a night mission. In this last you can try out the infra-red vision - same game but in red and black. The display will be familiar to aficionados of DI's Fighter Pilot, but is much more than an enhanced version. All



helicopter characteristics are faithfully reproduced; slowing down is best achieved by use of the cyclic pitch controls rather than reducing throttle

level — you tend to plummet — and you can fly sideways or backwards. Weapons include eight Hellfire missiles which automatically destroy anything in your sights plus 38 unguided rockets and a machine gun. The Target Acquisition and Designation System tells you whether your target is friend or foe — most modern military hardware has a built-in identification signal.

The system has been designed with Interface 2 in mind, so that it's possible to fly like a real helicopter pilot using one joystick for throttle control, the other for altitude control.

Much more accessible to the casual player than Fighter Pilot, what more can I say than that our fellow-journalists on Flight magazine have, over a cup of coffee, voted this one of their favourite games.



THEIR ONLY HOPE WAS YOUR
PROMISE TO BRING THEM BACK ALIVE....

BEACH-HEAD II

BEACH-HEAD II
THE DICTATOR CHECKS BACK

SCREEN 1: TOP VIEW, FILTER, OK, IN
SCREEN 2: LEVEL 1, LEVEL 2, LEVEL 3
SCREEN 3: TWO PLAYER, TWO PLAYER, PLEASE SELECT

SCREEN 4: TWO PLAYER, TWO PLAYER, PLEASE SELECT

SCREEN 5: TWO PLAYER, TWO PLAYER, PLEASE SELECT

INCREDIBLY REALISTIC
VOICE SIMULATION

ONE PLAYER PLUS TRUE
HEAD-TO-HEAD TWO
PLAYER FACILITY

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ANIMATED
GRAPHIC
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the best games
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Atlantic."
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Written by Roger & Bruce Carver • Directed by Bruce Carver • Produced by Chris J. Jones • Distributed by David L. Ashby
Illustration by Oliver Frey (Newsfield Publications) • Manufactured in the U.K. by U.S. Gold.

SOFTWARE SHORTLIST

COLOSSUS CHESS 4.0

► CBM-64 • CDS Software house • Chess • £9.95, disc £14.95

• Toby Wolpe

VALUE FOR MONEY

● ● ● ● ●
GRAPHICS

● ● ● ● ●
PLAYABILITY

● ● ● ● ●
SOUND

● ● ● ● ●
OVERALL RATING

SCREENS

• Colossus Chess 4.0 — for the budding Kasparov.

With the scalps of major chess programs like Sargon, Superchess, Cyrus and White-Knight to its name, Colossus 4.0 has the power and quality of play to keep most amateurs busy for hours.

Add to that a comprehensive list of features ranging from elapsed-time clocks to blindfold chess and you're certainly getting your money's worth.

The chess diagram-like view of the board leaves no margin for confusion although in terms of graphics sophistication it's a long way behind Psion's spectacular 3D QL Chess. You pick your move by placing the cursor line over a piece and then on to its destination.

There's also a joystick option, or if you're happier working in algebraic E2-E4s then you can just bash them in directly from the keyboard. As in all the best chess programs you can also back-step through up to 120 moves using B, or forwards

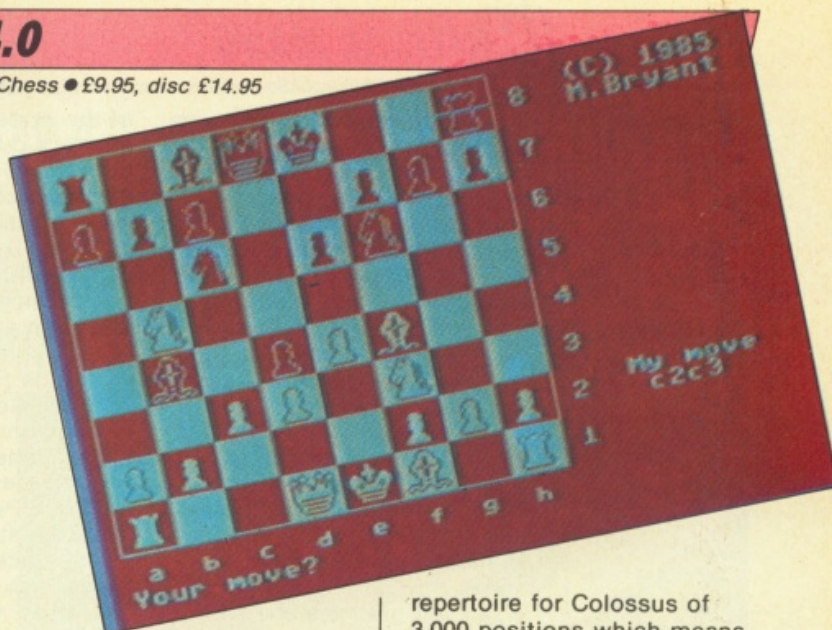
with F. A quick poke at the R key gives a full action replay.

You have six playing modes to choose from. They range from Tournament with its four time controls, through Average mode where you can pick the computer's response time, to the Equality, All-the-moves, Infinite and Problem modes. Colossus always starts off in Average mode unless you specify something else.

CDS claims an opening

repertoire for Colossus of 3,000 positions which means if there is to be any agonising about the opening moves it's you who does it.

Colossus presents you with two screens. One is text only, and gives you details of the moves played so far together with the program's thoughts on possible lines of play and times. The second screen holds the graphical picture of the board. You can flick to and fro from one screen to another with a tap of the space-bar.



MARSPORT

► Spectrum • Gargoyle • Arcade adventure • Meirion Jones

VALUE FOR MONEY

● ● ● ● ●
GRAPHICS

● ● ● ● ●
PLAYABILITY

● ● ● ● ●
SOUND

● ● ● ● ●
OVERALL RATING

SCREENS

• Marsport — you'll feel like a ninepin in a skittles alley.

If you ever wanted to know what a ninepin feels like in a skittles alley then Marsport is the game for you. There you are doing the usual Dun Darach Tir Na Nog bit clomping around like Piltown Man but this time in a space bubble on Mars rather than in some medieval marsh.

Every so often a bowl hurtles by at head height — but just for once in a computer game you don't have to duck, for these are harmless information gathering robots.

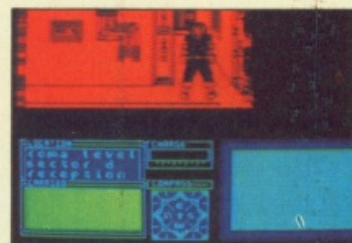
Previous Gargoyle games were a bit thin on plot, but Marsport is an intricate and well structured arcade adventure with much more going on. In the first stage of the game you — or rather Commander John Marsh of the underground Earth liberation movement Hasp — have to acquire a power

weapon and fight your way through the 10 levels of the city trying to locate the central computer.

A series of hatches in the walls open as you walk by. These can be supply units for which you sometimes need a key which give you objects to use, lockers which you can stow your objects in — because you can only carry three at a time, bins, and charge units to keep your gun loaded.

You need the gun to deal with robots and Septs — the invading life-forms which Gargoyle politely calls a hive culture but which we all know is really just a swarm of intergalactic killer bees. But then I suppose the Septs would call Commander Marsh a terrorist (Geddit?).

The most fearsome adversary in the game is a Sept Warlord — which looks just like a Victorian vacuum



cleaner and is almost as dangerous.

The robots that occasionally attack you are malfunctioning warden robots installed by your own forces long ago. If only they belonged to the other side we could call them septic tanks. Once you have reached the computer you can start your search for the original plans for the giant force field which is all that stands between the Septs and Earth and now needs strengthening. Your final challenge is to escape with the plans.

SOFTWARE SHORTLIST

CRITICAL MASS

Spectrum • Durell Software • Arcade Safari • £9.95 • Paul Bond

VALUE FOR MONEY

● ● ● ● ●

GRAPHICS

● ● ● ● ●

PLAYABILITY

● ● ● ● ●

SOUND

● ● ● ● ●

OVERALL RATING

● ● ● ● ●

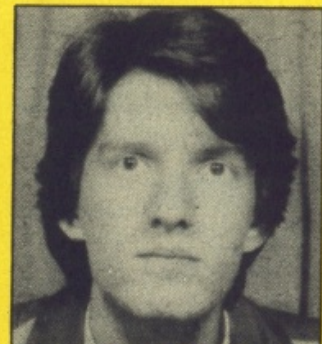
Trashed my strike craft in a rock outcrop — anybody knows what that means out here. As the wreckage bounced away from me I punched the button on my jet pack and got sky-side just as the sand-worm reared its ugly head a few feet from me. Back to the pressure-dome for a new ship — losing your no-claims bonus is bad enough but when aliens have infiltrated into your power-plant in a bid to make it meltdown the local star-system you don't worry so much about that kind of thing.

Brilliant graphics and an original enough game concept programmed by Simon Francis. Durell have a real winner here. The screen shows an aerial 3D view of a barren desert landscape, cheerful tunes play in the background (if you can hear them on your Spectrum). Fly your surface skimmer towards the right hand side

of the screen. Try not to hit any rock outcrops or UFOs otherwise you spin off like a drunken dodgem driver. Too many smashes and your ship blows up — this effect is particularly good with all the bits bouncing all over the place. An arrow at the base of the screen indicated where the nearest pressure dome is. Get into the vicinity and you are sucked in.

The dome then bifurcates and releases you in your new skimmer. Paul Atreides would be at home on this planet since giant Dune-style sandworms rear their ugly heads and reduce your energy if you bump into them. Dull it isn't. You can shoot back at attacking vehicles although many of the phenomena which assault you are indestructible and very very persistent. A swarm of diamond-shaped objects is generally the finishing element for people trying to penetrate the outer

wall of the power plant, where all the real fun with the enemy counter-attack vehicles begins. Excellent and also available for Commodore.



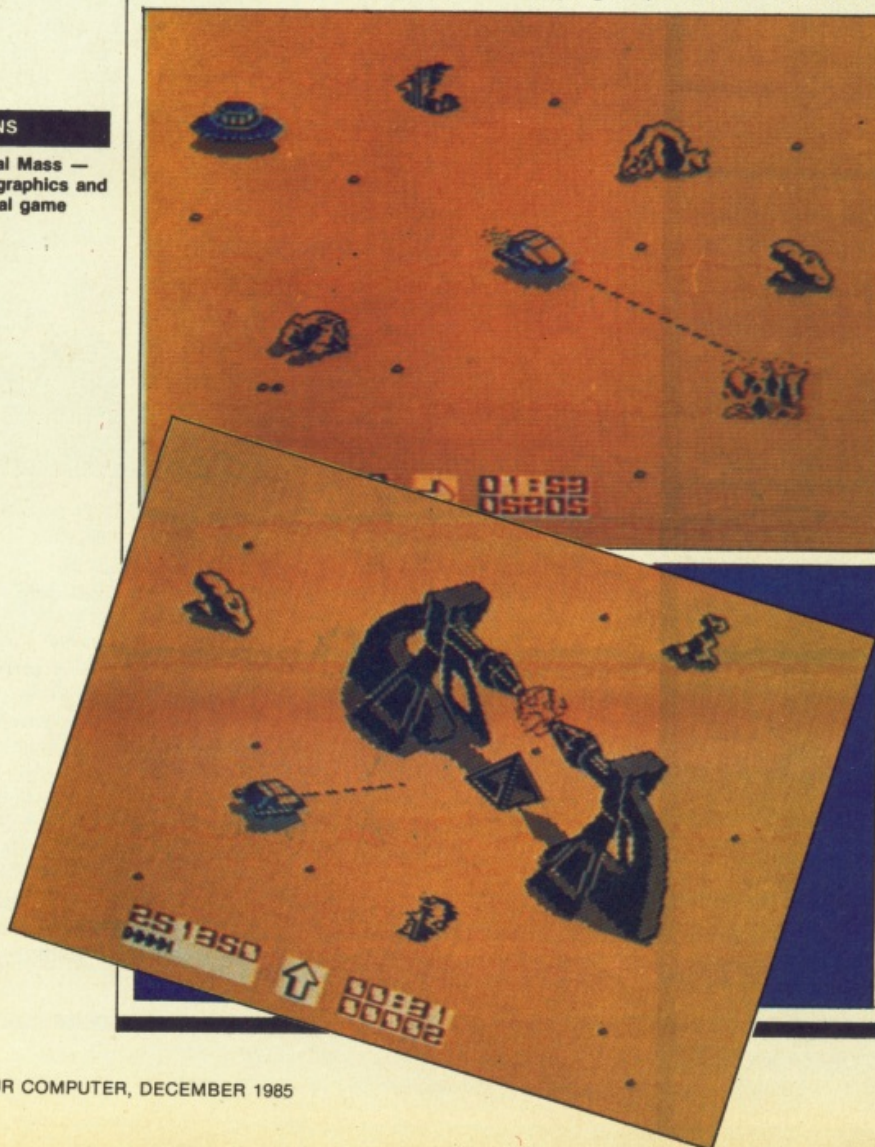
Simon Francis learned about commercial software the hard way. He wrote a couple of games for the Dragon 32, and his "friends" persuaded him to take his name out of the program. Due to the Dragon's later demise, he thought no more about it until he saw his program being marketed by a large budget software company at a *Your Computer* show. "I haven't been ripped off that much. If it had been for a really popular machine like the Spectrum or the 64 I would have lost thousands of pounds. Still, they're not my friends anymore."

There are a thousand stories like this in the software city, but this may have been a contributory factor in forcing Simon to wean himself off the 6809 processor. "I loathe the Z-80." This should give heart to hard-done-by Dragon owners everywhere. Fighting his revulsion with its CPU, Simon started the Spectrum game as a small window at the top left-hand-side of the screen, using interrupt mode 2 to print up all the characters, first in memory, then to the screen.

"When I expanded the screen up my memory dump was 6K — obviously any larger would be too much memory so I had to modify all my routines accordingly." The main core of the game is written using the latest techniques — "You can usually work out what's going on in the programming just by looking at the screen. I sometimes videorecord games, play them back at different speeds — tells you lots of things." Simon gives full credit to Durell colleagues Robert White and Dave Cummings. Julian Breeze did the music — "It would have taken me 10 years to do it."

SCREENS

● Critical Mass — Brilliant graphics and an original game concept.



The Ocean

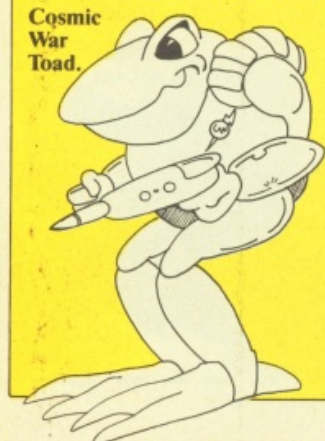
Transformers, Streethawk, Knightrider, Rambo and V — names that might make up an evening's TV/Video viewing. But as any Transformers fan will know, nothing is what it seems — thanks to Ocean all these action-packed names are turning into computer games. Along with the licenced Konami arcade games scheduled for release on Ocean's Imagine label, this adds up to a veritable tsunami of software from the three-year old company.

Does a licensed computer game necessarily make a killing? Group Chairman David Ward emphasises that it's the creative process of making software that's important. "Licensing just helps us to position the product. It's all to do with being part of contemporary society."

The Imagine label, now owned by Ocean, is at the moment releasing home computer versions of Konami arcade games — a different form of licensing from using TV or film-related ideas. "There are only about 20 original games in the whole life of the industry — rather than just plagiarise, we prefer licensing other people's ideas." Ocean plans to move beyond the arcade. The new Ocean IQ label plans to release Laser Basic and Laser Compiler for Spectrum, CBM-64 and Amstrad, along with music software, a screen designer and a Pascal.

Heavy stuff, agrees David Ward: "The IQ label is to do applications packages for the same machines that Ocean markets for. We've got to grow up with our customers at the same time as getting new ones. A different label is necessary because people are used to arcade games from Ocean. You

Cosmic War Toad.



don't expect to open a tin of Heinz beans and find condensed milk in it."

Licensing is a tricky business. Transformers — the robot toys which turn into trucks or aircraft — were an obvious chase due to the massive success of both toys and TV series around last Christmas. But at the time Ocean acquired the rights to Sylvester Stallone's Rambo movie, they didn't face much competition.

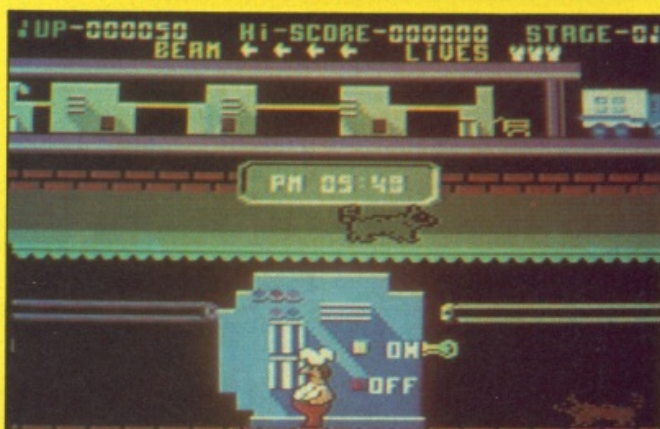
"It was before Reagan's remark about knowing what to do next time he faced a hostage situation. That made it something else", says Ocean managing director Jon Woods. "Also, in my view, there's something of a depressed market in the States. New machine formats are coming along, so not much is being developed for the Commodore 64. Rambo was a surprise success, with not much prior licensing, unlike say Goonies which attracted a lot of attention because it had Spielberg's name on it."

A silicon Rambo

The silicon Rambo is a real epic with the combined talents of Daley Thompson's Decathlon and Hunchback II programmers Tony Pomfret and Dave "I'm starting to forget all the games I've written" Collier, plus Martin Galway on music and Steve "I used to be just an ordinary person" Wahid on graphics.

Although Martin Galway has added in self-composed passages of music the original pounding bass and swooping synthesiser sounds remain and music even plays while loading. "It's not loading the whole time — there are 50 times a second when it can play music." The morse code in the loading tune is actually tapping out a real secret message, so have your note pads at the ready and you may learn something to your advantage.

Although Martin has a number of instruments at Ocean HQ in Manchester, an upright piano and a Seiko DS-320 synthesiser, his preferred machine is the Yamaha CX-5. He has also worked on the sound effects, everything from approaching helicopters to the various mortars and machine guns the deadly dogface has



festooned around his person. Remarks that the game itself resembles Alligata's Whos Dares Wins — subject to legal action from Elite (they claim it infringes their license to the arcade game Commando) — are quickly rebuffed.

"In those games you can only move upwards, and you only have a gun and hand grenade. In this you have all the weapons that Rambo has in the film." Certain sections of the game have to be completed silently. Once the first prisoner is rescued from his crucifix in the stockade

Top: Rambo. Centre: Comic Bakery. Above: Yie Ar Kung-Fu.

you can forget about the knife and the arrows and really let rip. But you've got to collect the additional weapons from around the screen, acquiring them in the same way as the morose militarist arms himself in the movie.

You can blast your way through the jungle, but a river blocks your escape. Naturally you steal a helicopter and fly back to the compound to rescue the other inmates a la Choplifter.

Paul Bond is all at sea with Ocean.

Chances are that a giant helicopter will give chase as you fly back up the screen, so it's non-stop action all the way.

When two tribes go to war there are plenty of points to be scored as Denton Designs who programmed Frankie Goes To Hollywood for Ocean well know. This Christmas it will be the two tribes of Transformers — Autobots v Decepticons — who will be fighting it out on computer screens worldwide, thanks to Denton's Tony Sanders and Ally Noble (graphics).

Collect energy pods

The goal of the game which features music from the TV show is to collect all the components parts of the Transformers' mask emblem. If the Decepticons collect the 15 pieces before you do, you lose. As one of the five Autobots, Optimus Prime (turns into a truck), Hand (turns into a jeep), Mirage (turns into a racing car), Bumblebee (turns into a VW Beetle) and Jazz (turns into a Porsche) you move around the ramps and levels on the screen, hounded by the flying Decepticons. As a vehicle you move faster across the ground, but as a robot you can fly and fire.

As you move about you must also collect energy pods, and you can use defenza-pods to switch control from one robot to another without destroying it. The five robots in existence appear icon-style at the base of the screen. "At first we were going to have a different screen for each Transformer. Then we changed it to one large scrolling map" says Tony Sanders.

It's not all licensed games that Denton are doing for Ocean as Ally Noble is quick to point out — a new game under the working title Cosmic War Toads is "sort of a Denton in-joke", she says. "We used to make up these silly ideas for a game with toads in, then we thought it might be a good idea to actually make it into a program." So you might expect the action to take place in blackest outer space, and you might be ready for one of the mini-environments to be a lily-pond — but a plate of frogs' legs in a French restaurant? Or beef sausages cooked in batter (toad-in-the-hole, geddit?)

You score Toad points by finding and killing Regellan slime-beasts — the slime master and his slime pawns. You can also delay their progress and the use of pond stones. Along with War Duck — the webbed warrior — and Porkula the cosmic vamp you are embroiled in the struggle to make the world a safer place to spawn.

Konami is a name popular amongst people who like pushing coins in slots — now courtesy of Ocean's Imagine label, you can save the wear on your wallet. Yie ar Kung Fu on Spectrum, CBM-64 and Amstrad is a colourful addition to the growing mass of martial arts simulations; along with Comic Bakery, basically a good solid platform game, and Mikie, initially on the Spectrum all these arcade hits will be available at Christmas.

Mikie is set in an American high-school — "Failure teaches success" — declaims a motto on one of the blackboards. He has to put together parts of a message whilst winning the hearts of the young co-eds; at the same time he is harassed by teachers, janitors and the muscle-bound football team. Colin Gresty and the inscrutable Joff are two of the Ocean programmers involved in the Konami work. Joff uses a Tatung Einstein to develop the Z-80-based versions of the programs. "The assembler is really brilliant, a pleasure to use."

Ocean have managed to tie up licenses for both the modern-day knights in shining armour currently tearing across TV screens around the globe — Streethawk and Knightrider. The initial game plan includes facility for synthesised speech and possibility of up to four different scenarios. The baddy in this program is SKARR, a vehicle duplicating Michael Knight's robot supercar KITT.

Built by a hostile foreign power, the vehicle is a real argument for state-subsidised free public transport, since it wants to do things like murder the El Salvadorian president whilst giving a talk in Los Angeles, nuke the New York World Trade Centre, kill the US President, and sabotage a shuttle carrying an SDI Star Wars satellite. Apart



from discouraging such boisterousness, Mr Knight and KITT have to find the smuggled Russian (oops, there I said it!) gold which is financing the operation. There will be a number of variables in the game, so it will be different each time it is played.

In Streethawk the hero and his computerised motorbike have the job of defending a female VIP from a gang of kidnappers.

The V sign to aliens

Computer games, like theatrical productions, can mutate considerably before their first night, so some ideas may be dropped and others added. At the moment the game plan for Ocean's program based on the space reptile soap opera "V" gives you the chance to totally annihilate the aliens' mothership and save humanity from becoming an interesting little item on the galactic menu.

The top two-thirds of the screen will show a scrolling network of air-vents and corridors deep within the heart of the Visitors' Mother Ship. Some of these corridors will lead into large open spaces, whilst others will lead into laboratories and storage rooms. Air-locks will lead onto the outer surface of the Mother Ship. Occasionally the player will find doorways leading to "Horizontal Lifts", or transporters.

The bottom third of the screen is used for hand-held communicator/computer and associated status information. Alternatively, the screen will show a number of icon-driven options which the player can take. The Mother Ship itself is layed out in six vertical planes as indicated by figure 1. Each plane is built from 128 different screens. Each screen will utilise eight building blocks of 8 x 6 characters.

The actual "map" of each plane will be randomly generated



Left: Steve Blower, art director of Ocean. Above: David Ward.

at the beginning of each game so there will be plenty of variety.

You, of course, are Donovan the rebel leader and only man on earth who can act with his hairline. You guide him around the mother ship armed with a gun which can kill the visitors but not the robots. The communicator/computer section of the screen has a map of the level you are currently on and can be used to confuse the aliens' central computer.

If they pump gas into your sector you'll have to grab some oxygen cylinders. And if he leaves the ship, Donovan better be wearing a helmet. Certain tasks must be performed outside the ship — mainly destroying the main water inlet or destroying the main communications centre. Other tasks to complete may include destruction of various electrical generators, disabling the air purification plant and sabotaging the central computer.

Veterans of the Starship Paradoirds will be pleased to know that the Visitor's robots are divided up into sensor robots (which can see Donovan in the dark), cleaner robots which float at head height firing lasers, security robots which bob up and down and zap, together with maintenance robots. But they are useful to Donovan, insofar as he can trick them into opening doors that he can't.

The game promises to be well within the Ocean tradition of not only integrating real elements of the licensed original, but also creating a gripping and innovative computer game. Will this policy lead to their gobbling up their rivals like Diana polishing off a hamster? We shall see.



The Commodore 128.
When you look at the facts
they do seem to weigh rather
heavily in our favour.

When you add it up, the Commodore 128 is really three computers in one.
It can run 64K, 128K and CP/M software. Giving it the largest range of computer software in the world. Making it as efficient in business as it is entertaining at home.
That's why Commodore has become the world leader in microcomputers.
And why, on balance, the Commodore 128 has no equal.



QUEST CORNER

TERRORMOLINOS

► CBM 64/Spectrum/BBC/ Electron/Amstrad • Melbourne House

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.

From the authors of Hampstead comes yet another original and hugely entertaining adventure. Let me warn you now that if you're intending to go to Spain for your holiday next year, this game is likely to make you want to change your plans.

Your objective is not to slay wicked sorcerers, duff up dragons or track down the 200 lost treasures of Trantos. No, no, those are a piece of paella compared with this game. What you are faced with here is one of the most perilous assignments known to English mankind — survive a two-week package holiday with the wife and kids in sunny Terrormolinos. And you must bring back 10 snapshots to prove it.

Before you can even set

off for the Hotel Excrucio in Terrormolinos, you must first pack, naturally. Just as in real life, things you want are never where they should be and something always goes wrong at the last minute. The taxi's waiting outside but where the heck has little Doreen got to? Where did you put that camera? And what's that white gunge seeping out of the suitcase you've just packed.

One feature that makes this text adventure even more of a giggle is that every time disaster strikes, a colour snapshot of your misfortune is displayed on screen in glorious Saucivision.

A real hoot of a game, and novel with it. If you like a good guffaw, Terrormolinos will tickle your fancy.



SWISS FAMILY ROBINSON

► Commodore 64 • Windham Classics



This one impressed me right from its opening animated sequence of windtossed ship and accompanying thunder and lightning.

The top two-thirds of the screen are used mainly for simple but effective graphical representations of each location and any objects lying around. The lower portion is used for text input and output.

The game is very user-friendly and has many innovative features. For example, it will complete in full any abbreviated commands you enter, will highlight the command only if it is relevant to the current situation and will offer help, including a list of appropriate commands and their use, when you ask for it.

You begin on board the wrecked ship. Your first task is to search for and collect suitable supplies and then to find a safe way off the ship and to the nearby tropical island for you and the rest of the family.

Your ultimate aim is to survive and be rescued from the tropical isle. Even though you should be familiar with the plot of this classic tale, you'll still need all your creative wits to survive and

reach a successful conclusion.

This is a big (over 220 locations) adventure, thoughtfully designed, with lots to do and plenty of stimulating challenges to grapple with. Highly recommended.

A HELPING HAND

Simon Wicklowson of Nottingham and Paul Bradford of Southampton are having trouble with Spiderman. Ringmaster a problem?

BONK NRUT NEHT BONK
HEUP MOOR RETN ESEY
ERUO YESO LC

Can't start the presses?
ELAC SEHT NOEL POEP
ONID ULCN IELB ISSO
PONI HTYR EVET UP

'Mrs. Pritchard of BFPO
43 is baffled in Lords Of
Time. Cavemen a problem?
(a) TIPM ORFR ORRI
MTEG

(b) SURU ASOT NORB
TARO PRIM EVAW NEHT
SEVRE LEVR W

(c) NEME VACR AENR
ORRI MPOR D

Carlo Rossi of Milan is
stymied in Zork I. Can't
open the jewelled egg?
TILA ETSF EIHT EHTT EL

THE CRYSTAL BALL

H.A.L.A. (Hints Archive for Lost Adventurers) is a new postal reference service for adventure devotees. And it's free. All they ask in return is a S.A.E. and any maps, clues, etc. for any adventure that you have already completed so that they can keep on expanding their adventure archives.

The service sounds fast and comprehensive. If you're interested, why not write to Sonia Griffiths-Glover (Keeper of the Archive) at 38 Bellfield Drive, Well Lane, Willerby, East Yorkshire HU10 6HQ.

Make it live

Last month we saw how "tree structures" can sort different conditions. If you missed that instalment, don't worry, because you'll find it quite easy to pick up the thread this month when we show you how to adapt these programming techniques for your own use.

Just to recap, we designed a tree like that shown in figure 1 to sort a number of conditions relating to a prisoner in a dungeon. If you examine the tree, you should be able to follow the logic of it, which in pseudo-Basic might be expressed as a series of If statements, like this:

```
IF (the player in the dungeon)
AND (there are rats present)
AND (the rats are hungry)
THEN PRINT "AAAAAGH!"
IF (the player is in the
dungeon) AND (there are rats
present
AND (the rats aren't hungry)
THEN PRINT "LUCKY YOU!"
IF (the player is in the
dungeon) AND (there are no
rats present)...
```

and so on. As you can see, we need quite a few If statements to sort all the connections, and a tree structure enables us to do this more economically.

We also discussed the different types of nodes which go to make up the tree, and dealt with two basic types: terminal nodes — which have no branches leading from them; and choice nodes — which test a condition and then branch accordingly.

If you look at figure 1, you can see the various nodes labelled with either a C or a T depending on their type. If we store in an array the information about each node — its typed, and, 'if it's a choice node, the condition it tests plus to nodes it jumps to we can then write a simple routine which will start at node 1 and run down through the tree. We'll see this in action in a moment.

A simple affair

The tree in figure 1, however, is a very simple affair. We want to be able to design a tree that will enable us to handle interactive character in an adventure game, or any other task we care to tackle, and for these sort of applications something rather more complex is required.

If you look at figure 2, you'll see another tree again designed,

to test conditions relating to our imaginary prisoner, but this time there are a number of differences.

First, you will notice not one, but three different types of terminal node. For example, node number 16 is just a dead-end. If the program sorting the tree were to arrive here, it would simply exit without taking any action.

Node 3, however, would result in the printing of a message on exit, and node 15 would result not only in the printing of a message, but also the carrying out of certain actions, perhaps clearing the screen, or adjusting some variables relating to the prisoner's status.

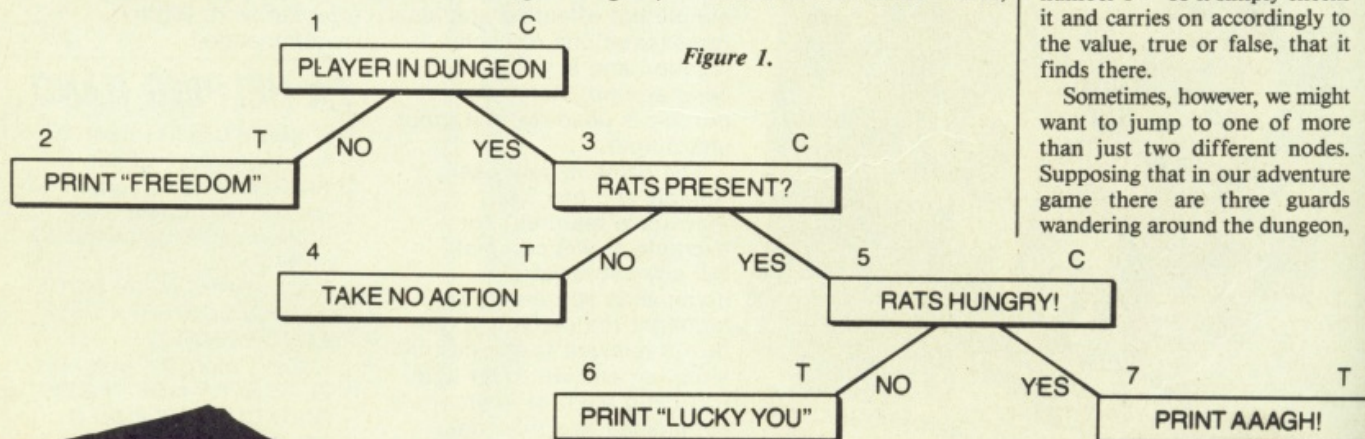
We can call these three types of terminal node a "simple" terminal node, a "message" terminal node, and an "action" terminal node. Not only are there different types of terminal node, but there are also different types of choice node.

Node number 2, needs to test a condition that in this example hasn't yet been set up, so it first needs to jump to a routine that asks the player for the necessary information. In other words,

before proceeding it has to jump out of the tree, ask a question, and then proceed accordingly. This is called a 'procedure' node.

Node number 14, on the other hand, is a simple choice node — the condition it tests has already been set up during the program and stored in a variable — in this case by the procedure node number 1 — so it simply checks it and carries on accordingly to the value, true or false, that it finds there.

Sometimes, however, we might want to jump to one of more than just two different nodes. Supposing that in our adventure game there are three guards wandering around the dungeon,



Listing 1.

```

10 REM *****
20 REM initialise arrays
30 REM *****
40 REM
50 DIM t(17,4): REM tree array - 16
  nodes each with four data items
60 DIM c(2): REM two conditions to be
  stored for testing
70 DIM m$(13): REM there are 13
  different messages
80 REM read data into tree array - four
  data items for each of 17 nodes
90 FOR n=1 TO 17: FOR d=1 TO 4: READ
  t(n,d): NEXT d: NEXT n
100 REM read messages into m$(13)
110 FOR n=1 TO 13: READ m$(n): NEXT n
120 REM
130 REM *****
```

```

140 REM sort through tree
150 REM *****
160 REM
170 n=1: REM start at node 1
180 ON t(n,1) GOTO 220,320,370,450,510,
  600,670
190 REM -----
200 REM choice nds (t(n,1)=1) jump here
210 REM -----
220 n=t(n,c(t(n,2))+3): GOTO 180: REM
  value held in t(n,2)...
230 REM ...is used to select a condition
  from the c array...
240 REM ...the value of which (true or
  false) is added to 3 to get...
250 REM ...the new node number from
  either t(n,3) or t(n,4)
260 REM ...the program then jumps back
  to line 180 to carry on down...
270 REM ...the tree
```

```

280 REM -----
290 REM .....simple terminal nodes.....
300 REM .....(t(n,1)=2) jump here.....
310 REM -----
320 END
330 REM -----
340 REM .....action terminal nodes.....
350 REM .....(t(n,1)=3) jump here.....
360 REM -----
370 GOSUB 760: REM jump to action
  routine via jumpblock
380 IF t(n,4)=0 THEN END: REM no message
  so end
390 GOSUB 1020: REM select message and
  print
400 END
410 REM -----
420 REM .....message terminal nodes....
430 REM .....(t(n,1)=4) jump here.....
440 REM -----
```


THE REMAINS OF A DEAD
NEXT TO HIM IN THE MUD
OMPUTA DROID.

a BAG OF FOOD

YOU CAN NOT GO NORTH
YOU BREATHE NORMALLY

OK

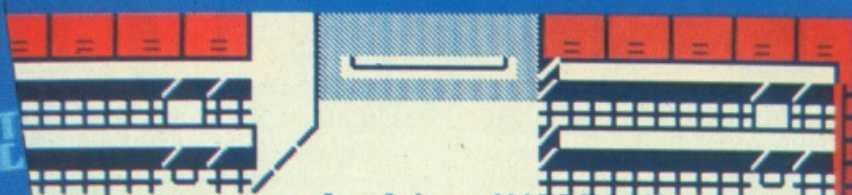
FIX a VERB FROM THE
VOCAB TABLE

W

OK

FIX DROID

I CAN'T ACCEPT THAT
FIX TRY SOMETHING
DIFFERENT



am in a cosy looking WARDROOM. There
rows and rows of bunk beds. Above me
can just see a thin SHELF. Exits lead
NORTH, SOUTH and EAST.

can also see:-

COMFY LOOKING MATTRESS

me your command.

Left: Souls of Darkon — This is a typical latter-day adventure running on the Amstrad that makes limited use of other characters. The player is accompanied by Komputa, a loyal robotic friend. Unfortunately, like so many games, the character doesn't really play much of a role, and interaction with it is virtually non-existent. Above: Subunk is one of a vast number of games that have been produced using the Quill. Unfortunately there is no provision on the Quill for introducing true interactive characters though they can be simulated. Below: Ashkeron! — This game uses an interrupt routine, similar to that used in the Hobbit, which enables events to take place in real-time. To some extent this has been used to implement

'independent' characters who move about the locations and may either capture or try to kill you. Interaction with them, at least as far as speech is concerned, is however very limited.

but they are not always all there at the same time — we might want to jump to one of three different routines according to how many guards are present. Node 9 does just this, and we can call this type of choice node a "multiple choice" node.

Numbered sequentially

Note that the three nodes it jumps to are numbered sequentially — this is because at runtime the program will test for the number of guards and calculate the node to jump to by adding that number to the lowest-node-number-to-branch-to minus one. So one guard will cause a jump to node 13 (12+1), two guards to node 14, and so on. In this particular instance there can only be a maximum of three guards.

Finally there's a random choice node number 7 which is similar to a multiple-choice node, but rather than test a condition it simply generates a



You are at the south side of a moat in
front of the Wizard's castle. All
around is forest.
Visible exits are south west east north.
Day dawns.
You wait, time passes....
You wait, time passes....
You wait, time passes....
You hear the sound of hooves and iron
shod wheels. Into view comes a horse
drawn cart. It stops outside the
castle.

(continued on page 55)

```
450 GOSUB 1020: REM select message and
print
460 END
470 REM -----
480 REM ....random branching nodes....
490 REM .....t(n,1)=5) jump here.....
500 REM -----
510 r=t(n,2): GOSUB 1030: REM get a
random number in range indicated...
520 REM ...by t(n,2)
530 n=t(n,3)+r-1: REM get new node
number by adding random offset, minus
one...
540 REM ...to base node held in t(n,3)
550 GOTO 100: REM jump back to carry on
down tree
560 REM -----
570 REM ....multiple choice nodes....
580 REM .....t(n,1)=6) jump here.....
590 REM -----
```

```
600 n=(t(n,3)-1)+c(t(n,2)): GOTO 100:
REM add value of condition...
610 REM ...held in element of c array
pointed to by t(n,2) to...
620 REM ...base node number (held in
t(n,3)) minus 1 then carry on down tree
630 REM -----
640 REM ...procedure nodes (t(n,1)=7)..
650 REM .....jump here.....
660 REM -----
670 GOSUB 840: REM jump to relevant
procedure via procedure jumpblock
680 GOTO 100: REM new node number has
already been assigned during...
690 REM ...the procedure, so return to
carry on down tree
700 REM -----
710 REM *****
720 REM action terminal node jumpblock
730 REM *****
```

```
740 REM -----
750 REM (one entry only here)
760 ON t(n,2) GOSUB 700
770 RETURN
780 CLS: RETURN
790 REM -----
800 REM *****
810 REM .....procedure jumpblock....
820 REM *****
830 REM -----
840 ON t(n,2) GOSUB 860,890,910,930,950
850 RETURN: REM jump back to carry on
down tree
860 PRINT m$(t(n,4)): INPUT i$: IF
(i%<)*Y*) AND (i%<)*Y*) THEN c(1)=0:
GOTO 880
870 c(1)=1
880 n=2: RETURN: REM jump back and carry
on down tree starting at node 2
890 PRINT m$(t(n,4)): INPUT i$: IF
```

(listing continued on page 55)

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Make it live

(continued from page 53)

random number within a particular range of integers, in this case 1 to 3. It then, adds that number to the lowest node number, here 10, minus one to determine which node to jump to next.

As you can see, there are now seven different types of node to deal with — you can see which ones are which in figure 2 as they've been labelled according to the key in the diagram. We're now going to program this tree in Basic to show you exactly how it's done — and it really couldn't be easier. Take a look at the program listing and then read through the following notes.

First we initialise three different arrays to hold data for our tree, for the conditions that will be initialised by nodes one and eight, and for the different messages that will be printed. This is done in lines 50 to 70.

Data for the tree

Next, we enter the data for our tree. The table shows the different items that need to be recorded for each node, and figure 2 shows, alongside each node, the data that needs to be entered for it. Node number 5, for example, has the figures 7,4,0,5 beside it, and if you refer to the table you can see that this means that:

- 1) This node is a "procedure node", type 7
- 2) It calls procedure number 4
- 3) It will result in the printing of message number 5.

This data is read into the array t(17,4) in line 90.

Having set up the tree array and the message array, we now proceed directly to traversing the tree. The code number is held in the variable n, and since we want to start at node 1, this is set accordingly in line 170.

Line 180 then checks the first data item for that node (t(n,1)) to find out what type of node it is — terminal, message, or whatever. The program then jumps to the correct routine. A choice node, for example, checks the value of the relevant condition in the c array which will be pointed to by t(n,2).

The program is heavily Remmed in this section to help you see what's going on, so I shan't waste space by repeating what's already there. Note, by the way, that you can delete the Rem lines if you really want to — there are no jumps to Rem lines in the program.

By checking each node in turn, the program traverses the tree, printing messages, getting inputs, and jumping to the appropriate nodes until it reaches a terminal node. If you want to see exactly what's going on, amend line 180 to read:

```
180 PRINT "I am now at node";n; ON t(n,1) GOTO 220,320,370,450,510,600,670.
```

and you'll see the program actually moving down through

the tree node by node. You can also make this amendment for debugging purposes if the program doesn't seem to be doing what you want it to.

There are a couple of other points to note about this listing. All actions and procedures called by the program are vectored via jumpblocks in lines 760 and 840. The reason for this is that when we come to design some really complex trees in the next issue for our character handler, this is the program structure we shall adopt.

The second thing to note is the way the program is carefully divided into sections. With a small tree such as the one we are dealing with here, this may seem to make the program unnecessarily long, but again, when we come to develop more complex routines, we shall be splitting up the program in a similar way.

Next month, we shall present a

complete example of the use of this method in producing a fully-fledged character handler.

A certain degree of efficiency has been sacrificed in this listing to make it compatible with a large range of micros. However, some changes will still need to be made by owners of BBC, Spectrum, and Commodore computers. These are listed here:

BBC

```
1050 R=RND(R): RETURN
```

Commodore

```
780 PRINT "<SHIFT/CLEAR>": RETURN
```

Spectrum

```
70 DIM m$(13,40)
```

```
180 RESTORE 2000: FOR x = 1 TO
```

```
t(n,1): READ y: NEXT x: GOTO y
```

```
760 GOSUB 780
```

```
840 RESTORE 2100: FOR x = 1 TO
```

```
t(n,2): READ y: NEXT x: GOTO y
```

```
1050 LET r=INT(RND*R)+1: RETURN
```

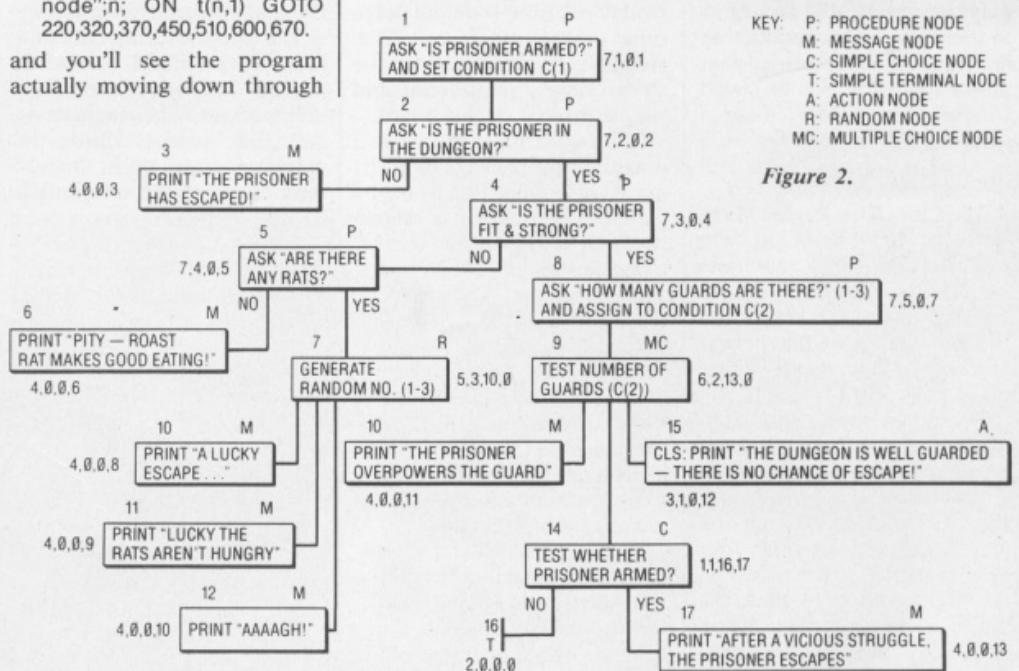
```
2000 DATA 220,320,370,450,510,600,
```

```
670
```

```
2100 DATA 860,890,910,930,950
```

KEY: P: PROCEDURE NODE
M: MESSAGE NODE
C: SIMPLE CHOICE NODE
T: SIMPLE TERMINAL NODE
A: ACTION NODE
R: RANDOM NODE
MC: MULTIPLE CHOICE NODE

Figure 2.



(listing continued from page 53)

```
(i$(C*Y*) AND (i$(C*Y*)) THEN n=3: RETURN
908 n=4: RETURN
910 PRINT m$(t(n,4)): INPUT i$: IF
(i$(C*Y*) AND (i$(C*Y*)) THEN n=5: RETURN
920 n=8: RETURN
930 PRINT m$(t(n,4)): INPUT i$: IF
(i$(C*Y*) AND (i$(C*Y*)) THEN n=6: RETURN
940 n=7: RETURN
950 PRINT m$(t(n,4)): INPUT i$: IF (i>3)
OR (i<1) THEN 950
960 c(2)=i: n=9: RETURN
970 REM
980 REM *****
990 REM subroutines
1000 REM *****
```

```
1005 REM
1010 REM...select AND PRINT a message..
1020 PRINT m$(t(n,4)): PRINT: RETURN
1030 REM ...generate a random number...
1040 REM ...in range indicated by r...
1050 R=INT(RND(1)*R)+1: RETURN
1060 REM
1070 REM *****
1080 REM .....node data.....
1090 REM *****
1100 REM
1110 DATA 7,1,0,1,7,2,0,2,4,0,0,3,7,3,
0,4,7,4,0,5,4,0,0,6,5,3,10,0
1120 DATA 7,5,0,7,6,2,13,0,4,0,0,8,4,0,
0,9,4,0,0,10,4,0,0,11,1,1,16,17
1130 DATA 3,1,0,12,2,0,0,0,4,0,0,13
1140 REM
1150 REM *****
1160 REM ..... message data.....
```

```
1170 REM *****
1180 REM
1190 DATA "Is the prisoner armed","Is
the prisoner in the dungeon"
1200 DATA "The prisoner has escaped","Is
the prisoner fit and strong"
1210 DATA "Are there any rats","Pity!
Roast rat makes good eating!"
1220 DATA "How many guards are there (1-
3)","A lucky escape from the rats!"
1230 DATA "Luckily the rats aren't
hungry!","Aaaaaaahh!! Eaten by
rats!!!"
1240 DATA "The prisoner overpowers the
guard"
1250 DATA "The dungeon is well guarded -
there is no hope of escape..."
1260 DATA "After a vicious struggle the
prisoner escapes!"
```


Chess

John Dawson checks out chess.

There's a false mythology about chess; you don't have to be a genius to play well and enjoy hours of concentrated excitement. Indeed, genius in one field is no indicator of brilliance in another. Alan Turing, probably the most brilliant mathematician involved in breaking the German ENIGMA cipher during the Second World War, is said to have been "an absolute duffer" at playing chess.

However, with the development of microcomputer chess programs and portable sensory chess sets, you don't even need a human opponent. This has the great advantage that when you are losing you can simply switch off the thing that's wiping the floor with you.

The programs and chess computers in table 1 actually play chess, generally according to the rules, and generally they are capable of beating you, unless you are a regular player with some experience. Some of the programs will offer you a good game at quite a high level of competence.

The Chess King Pocket Micro set is the only one of the four dedicated machines that does not have a "sensory" board. Instead, moves are keyed into the computer using the six keys at the bottom of the computer panel.

These keys shift automatically between the letter and the number depending upon whether you are entering the first or second co-ordinate of a piece's position. The other four keys control the level at which the machine plays LV, make the machine play the next move MO, and clear an incorrect entry CE before it is entered into the program EN.

Clearly the Chess King's input/output is greatly sim-

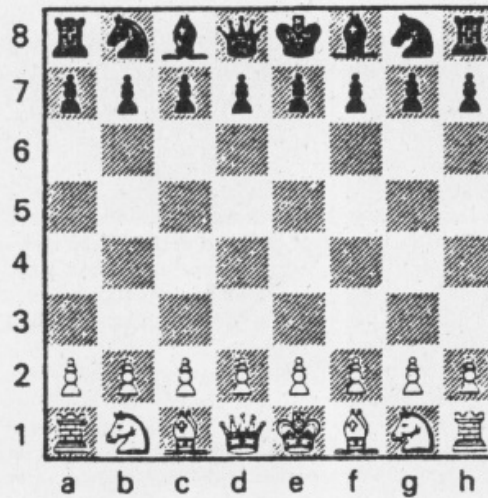


Figure 1: The opening position of all the pieces.

plified compared to the multiplexed eight column by eight row input and 16 light emitting diodes — LEDs — output in the other three machines. This simplicity is reflected in the Chess King's single chip and simple printed circuit board.

The board folds in two and makes a neat package in a soft plastic case about 19.5 by 6.5 by 2.5 cms. Battery life is said to be about 400 hours and there is a recessed on/off switch on the side of the case. The pieces on the board are punched from a strip of magnetised plastic. There are no spare pawns or Queens which makes life unnecessarily difficult if you, or the machine, succeed in promoting or exchanging a pawn for a Queen or another piece in the course of the game.

The CGL GrandMaster program was written by White and Allcock Ltd but the manual for the Chess King does not state the origin of the machine code held in the chip. It is a

limited program both by the standards of the other machines and the software for the BBC, QL and Amstrad computers.

The Chess King has only four levels of play and, while the number itself is comparatively unimportant, the highest — strongest — level allows the machine only eight to 24 seconds on average to formulate its next move.

Pawn promotion, when a pawn reaches the opponent's end of the board, is assumed to

be to a Queen while the rules permit the player to choose to promote the pawn to a Queen, Rook, Bishop or Knight. Switching the machine off erases the current game and the Chess King sets up a new game automatically when switched on.

Probably the most important failing in the Chess King is the inability to verify where all the

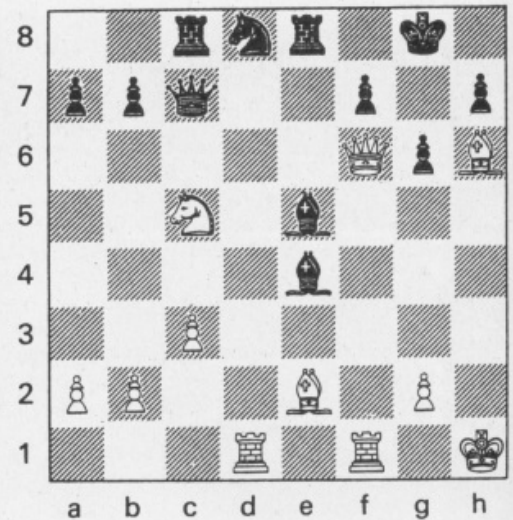


Figure 2: Part of the Chess King instruction manual.

Table 1.

Micro II
Explorer
Chess King
Grandmaster
White Knight Mk
11/12
Cyrus II
3D Voice Chess
QL-Chess
Colossus Chess
4.0

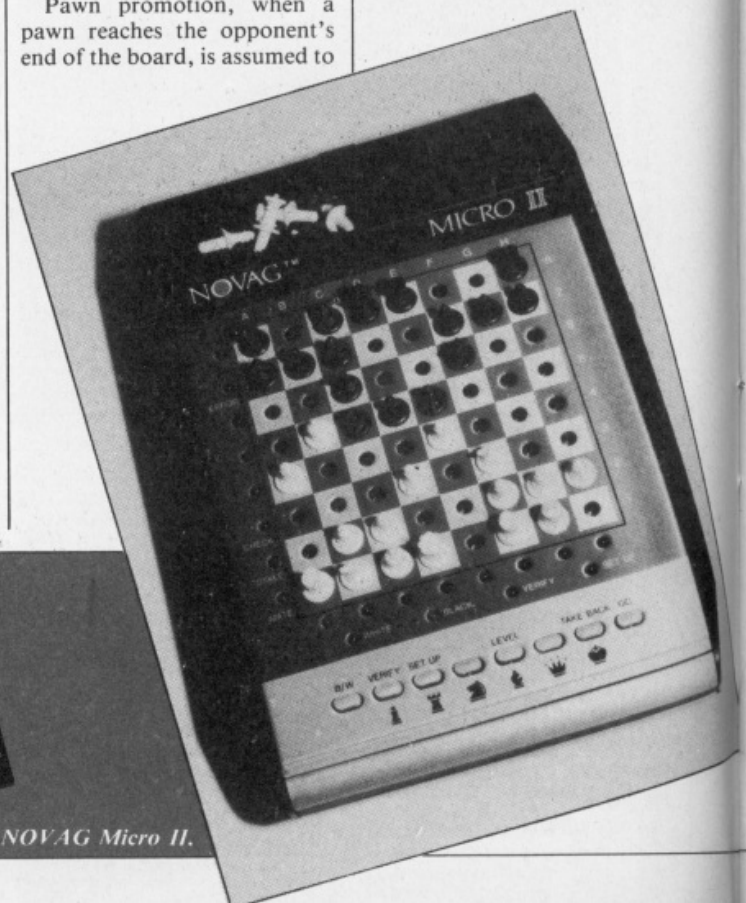
NOVAG
SciSys
Computer Games Ltd
Computer Games Ltd
BBC

Amsoft
CP Software
Psion
CDS Software Ltd

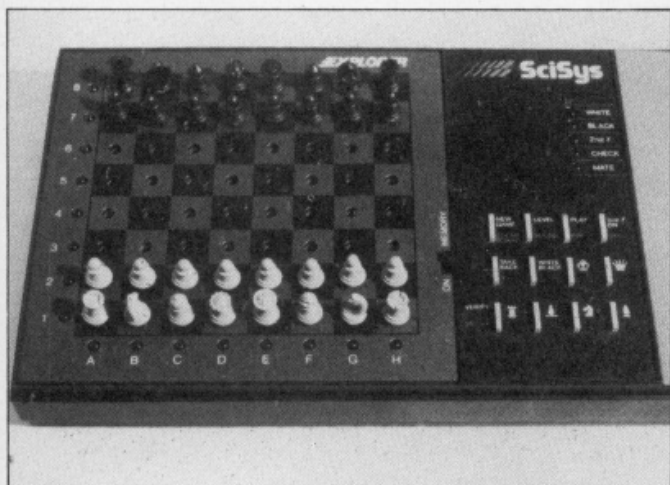
Hong Kong
Hong Kong
England
England
UK (BBC)

UK (Amstrad)
UK (Amstrad)
UK (QL)
UK (Commodore
64)

NOVAG Micro II.



check-out



pieces on the board are placed in the computer's memory. Nothing is more frustrating than setting up a devious trap only to find that the machine couldn't care less because it thinks one piece is somewhere else entirely.

There is no way to take back a move nor to review the moves that have been made other than by writing them down as you go along. However, at £22.95 in North Oxfordshire it is the cheapest dedicated machine to be found and it is very portable.

The **NOVAG Micro II** also uses a single chip to hold the program and play the game. The chip is a traditional 40 pin integrated circuit and figures 4 and 5 show the printed circuit board with the output LEDs and the two plastic membranes that form the sensory board.

A move is made on a sensory by pressing the piece into its socket until two LEDs light up to indicate the current row and column — rank and file in chess terminology — of the piece.

The piece is removed from its socket and pressed down into the new location until the computer beeps to indicate that the move has been accepted. The computer's move is indicated by lights in the same way, the position of the piece to be moved is indicated and when it has been depressed the destination co-ordinates light up.

The **NOVAG Micro II** is 7 by 5 by 1.5 ins. in size and shares several of its functions with the **SciSys Explorer** chess computer. The Explorer machine is 7.5 by

4.5 by 1.5 ins. and is the most sophisticated of the three dedicated computers. Figure 3 sets out the hardware configuration and software specification for the various machines and programs.

The **Micro II** failed to spot a potential 3 move draw when playing against the Explorer and then did not indicate that the draw had occurred while the Explorer lit up the appropriate LED to indicate a stalemate or

draw. I have taken none of the machines through the series of repetitions necessary to provoke a draw according to the 50 move rule but as all the machines are unable to take back more than four half moves at best — the Explorer can backstep through two White/Black moves at some stages of the game — it seems unlikely that any of the machines has the capacity to detect a sequence of 50 identical moves.

Indeed, the Explorer instructions say honestly: "In

Above — detail of Chess King.

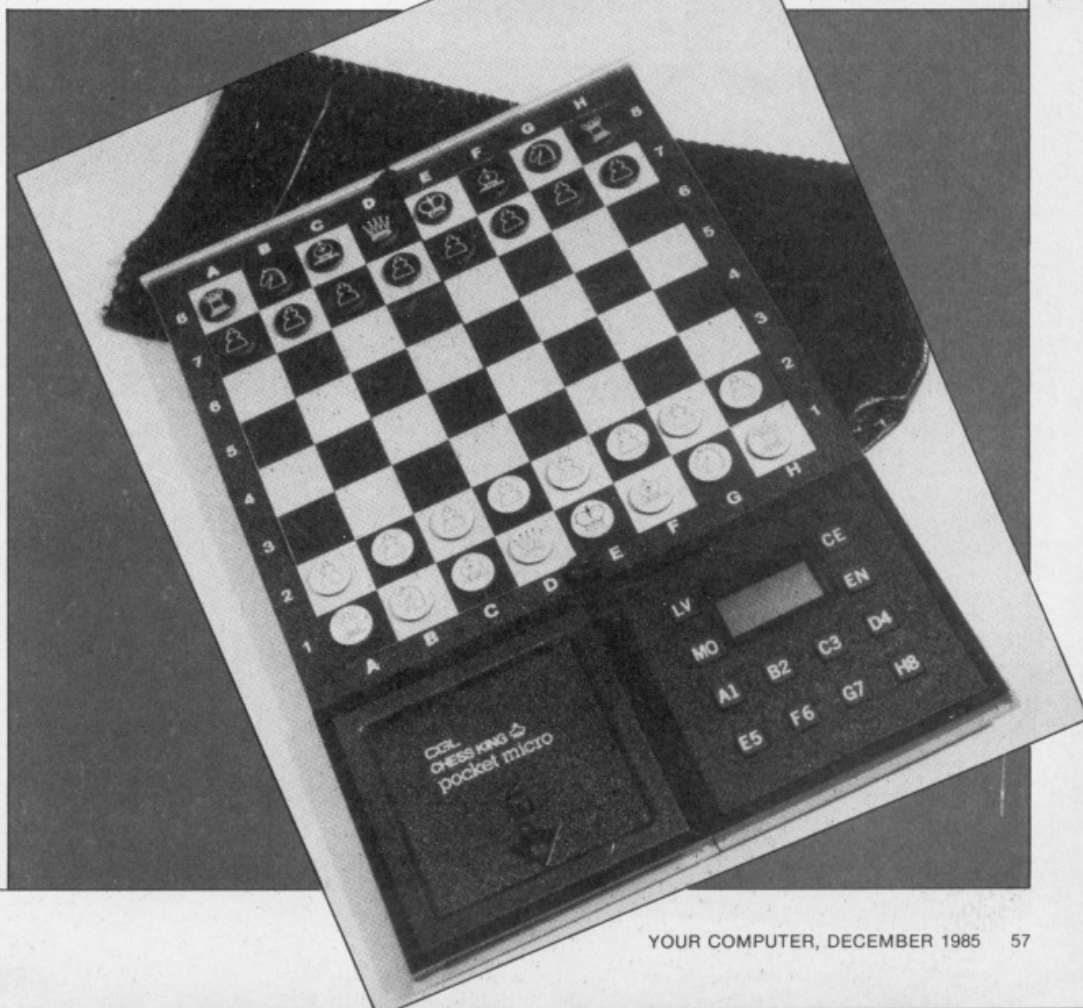
Below — Chess King

Pocket Micro. Left — SciSys Explorer.

the case of a stalemate or draw by immediate threefold repetition, only the Mate light will be turned on"; by implication excluding the possibility of a 50 move draw.

The **SciSys Explorer** has both the best program and the best design of the machines I have looked at. The Explorer predicts what your next move is likely to be and then thinks while it is waiting for you to move of

(continued on next page)



Chess check-out

(continued from previous page)

what's the best reply it can make. Neither the Micro II nor the Chess King do this and clearly it increases the power of the program considerably.

Colossus 4.0 and **QL-Chess** both think in their opponent's time and you can turn off this feature which makes the program weaker; that's to make you feel even smaller when you lose the 10th successive game. The compartment on the right hand side of the Explorer board holds the spare pieces safely, a good range of functions are given by the "function" keys, three AA cells provide more than 100 hours use and the machine will store the state of a game for up to one year when the power switch is turned to "memory".

The SciSys machine has a good set of standard opening moves — the "book" — which it plays quickly and decisively so long as your responses match its expectations. Unlike some early chess programs, the Explorer seems to have no trouble moving from its openings book to the middle game. Most chess computers are comparatively weak — by good players' standards — when the majority of pieces have been captured

and the war on the board enters the "endgame".

Martin Bryant wrote **White Knight Mk 11** and **Mk 12**, and is responsible also for the Commodore 64 program **Colossus Chess 4.0**. The instructions for the programs are very similar and clearly the architecture of the software is a progression from one program to the next.

There is an interesting series of comparisons in the back of the instructions for **Colossus Chess 4.0** between micro-computer chess programs for the Apple II, Spectrum, Atari, Dragon, Electron, Oric and ZX-81 computers. **Colossus 4.0**, running on an Apple II, beat everything in sight including both versions of **Colossus** is supplied with a number of demonstration games for tutorial purposes.

The **QL-Chess 3D** display is a lot of fun and, like Martin Bryant's programs, plays a good strong game of chess. However, the plan view provided in **Colossus 4.0** and the **White Knight** series is clear and gives unequivocal information about the state of the game.

CONCLUSIONS

The dedicated chess machines have some real advantages over either another human player or a program running on a microcomputer.

- You can learn by playing just some of the moves of a game over and over again. I have found it very instructive to see how the Explorer deals with the first 10 or a dozen moves. Very few human opponents will put up with so selfish an approach.

- The real pieces in the NOVAG and SciSys machines give a true perspective and allow you to 'walk round' the board in a way that even the best 3D programs cannot simulate yet.

- You can play chess on a train or bus, at the seaside, anywhere you like with one of the dedicated machines.

Conversely, the chess programs may suffer from being too strong for many beginners even at the lower levels of play. One form of handicapping that used to be popular was for the stronger player to give the other one or more pieces at the start of the game.

The machines and programs with a Set-up mode allow you to take away a Rook or some other piece from the computer before the game starts. **Colossus 4.0** also allows you to handicap the computer by cutting down the time available for it to compute its moves.

Either a dedicated chess computer or one of the programs could make a really long lasting Christmas present. But the machine and its instructions alone are not sufficient unless there is a good chess player in the same household.

The SciSys Explorer is the best of the sensory chess computers that I have seen. It's available from Dixons or, in a different colour scheme, from Tandy.

Figure 3.

Software/Machine	NOVAG Micro II M	SCISYS Explorer M	CGL Chess King M	CGL GrandMaster M	BBC White Knight S	AMSOF Cyrus II S	CP SOFT 3D Voice S	CDS SOFT Colossus S	PSION QL-Chess S
MACHINES	YES	YES	NO	YES					
Sensory	20 hours	100 hours	400 hours	not known			£12.95		
Battery life	YES	NO	NO	not known					
Main power	£39.95	£39.95	£22.95	£54.95	£12.95				
Price								many	22 (36)
SOFTWARE	8	9	4	not known	many			'0 secs'2 secs or less	'infinite'
Levels/Modes	'Instantly'	2 seconds	5-11 secs		'0 seconds'			very large	
Minimum time	5-20 mins	2 hours	8-24 secs		very large				
Maximum time									
Time equality									
Tournament mode	not stated	not stated	not stated	not stated	unnecessary	unnecessary	unnecessary	unnecessary	not stated
max. depth of search	YES	YES	NO	YES	YES	YES	YES	YES	YES
verify pieces	YES	YES	NO	YES	YES	YES	YES	YES (120 max)	YES (to start)
Set up pieces	NO	YES	NO	not known	YES (120 max)	NO	NO	NO	YES
Force program move	YES (2)	YES (2-4)	NO	NO	YES	YES	YES	YES	YES
Take back move	NO	NO	NO	NO	YES (Mk 12)	NO	NO	NO	YES
Analysis	NO	NO	NO	NO	NO	NO	NO	YES	YES
Clock times	NO	YES	NO	NO	YES	YES	YES	YES	YES
Save state of game	NO	NO	NO	NO	YES	YES	YES	YES	YES
Print moves	NO	NO	NO	NO	YES	YES	YES	YES	YES
Replay game	NO	NO	NO	NO	YES	YES	YES	YES	YES
Backstep game	NO	YES	NO	NO	YES	YES	YES	YES	YES
Player v Player									
3D display	real pieces	real pieces	counter pieces	real pices	2D plan view	3D display	3D display	2D display	2D/3D display
RULES									
Stalemate	YES	YES	partial	YES	YES	YES	YES	YES	YES
Draw	NO	3 move	YES	YES	YES	YES	YES	YES	YES
En passant	YES	YES	YES	YES	YES	YES	YES	YES	YES
Castling	YES	YES	NO	NO	YES	YES	YES	YES	YES
Underpromotion	YES	YES	NO	NO	NO	NO	NO	NO	NO
Lose 'on time'	NO	NO							

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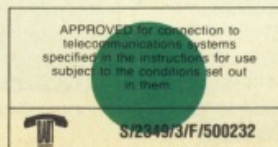
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S/2845/3/F/500232

Sampling

H N-n-n-nineteen eighty five has been the year of the sampler. Now you can imitate the effects as Tony Sacks reports.

Have you ever wanted to conduct the Berlin Philharmonic Orchestra? Or to have Mark Knopfler play for you in your living room? Well, these and a thousand other fantasies can now come true through the miracle of sampling.

All you need is a micro, a box of electronics and matching software, and you too could be producing some of the dramatic effects that pepper the works of Duran Duran, the Thompson Twins, Paul Hardcastle, and many other contemporary

segments — and hence the size of the segments. This rate is known as the sampling frequency. As a rule of thumb, the sampling frequency should be twice the highest frequency you want to hear, so that to hear a frequency of 15kHz — towards the top of the audible range — you would need to sample at 30kHz or higher.

So far, so good. But the higher the sampling frequency, the quicker your micro's limited memory is gobbled up, and the shorter the sample will last. For example, Supersoft's Microvox sampler for the Commodore 64

will give you less than a second of sampling time at its maximum sampling frequency of 42kHz.

This may be sufficient for short percussive sounds but when you want to sample a sound like a piano which may take several seconds to die away, you've got problems.

There are two possible solutions. First you can reduce the sampling frequency which means that you will lose some of the higher frequencies in the sampled sound. This may or may not be noticeable, depending on the sound, but it will give you a longer sample. The

Microvox, for example, provides a maximum sample length of 17.4 seconds at a frequency of 2kHz.

The second approach is to sample at a high frequency but to use some nifty software to doctor the playback. If, immediately after reading the sampled sound out of memory, all or part of the sample is re-read, you can give the impression of an extended sound. This trick, called looping, can be repeated to give a continuous sound. Some samplers will even decrease the amplitude of the output gradually to give the impression of a sound dying away

You may not be aware of it, but many of the percussion sounds on recent rock records are the work, not of sweating musicians but of electronic "drum boxes" pumping out sampled sounds.

Percussive sounds are ideal for sampling because they tend (with some notable exceptions) to be rather short-lived and to have limited bandwidths. Individual sounds can thus be squeezed into relatively small chunks of memory and several different sounds can co-exist in a micro's memory.

It is not surprising therefore that among the first batch of sampling products for micros are two drum

simulators. What is more surprising is that whereas dedicated drum machines cost several hundred pounds each, the two micro-based packages, for the Commodore 64 and the Spectrum, cost just £65.00 and £29.95 respectively, and yet produce stunningly realistic and powerful sounds.

As with the other sampling systems described on these pages, the sounds produced by these drum simulators are digital recordings of real sounds. Their quality bears no relation to the types of sounds you are used to from your micro's internal sound system. They have to be heard to be believed.

But unlike the other sampling systems, these packages do not allow users to produce their own samples. Instead the suppliers provide ready-sampled sounds on disc or cassette together with the software to combine these sounds rhythmically, and a relatively simple digital-to-analogue hardware decoder.

The Commodore drum machine, called the Syntron Digidrum, was developed in the Netherlands and is being distributed in Britain by Syndromic Music. The Spectrum package, dubbed the Specdrum, is a home-grown product from Cheetah Marketing and is being sold only by Boots. An Amstrad

version, expected to sell for around £35.

Although the two drum simulators are not strictly rivals — unless you don't own either a Spectrum or a Commodore — it is interesting to compare the approaches adopted by the two design teams.

In many ways the two systems are very alike. Both squeeze eight different percussive sounds into the sampling memory. Both allow up to three of these sounds to be played back simultaneously but restrict the choice to one sound from each of three groups. Both provide a grid display for the user to construct rhythm patterns, and both allow

musicians.

The theory of sampling is simple. You take a sound — either from a microphone or directly from your hi-fi or an electronic instrument — and chop it into lots of tiny segments, each usually lasting less than one-thousandth of a second. These segments are then digitised and tucked away in the recesses of your micro's memory.

When you want to play back the sound you squeeze the digitised data back through a digital-to-analogue converter to reconstitute the sound and send the signal to an amplifier. All being equal, you should get a recognisable rendition of your original sound blasting out of the loudspeaker.

If the hardware is well designed, the quality of a sampled sound is determined largely by the rate at which the original sound was chopped into

Above right: Muzix-81, Microvox, SFX and DMS.

Below: SFX in greater detail



samplers

naturally.

Looping is just one of many ways in which the sampled sound can be manipulated once it is in a micro's memory. The most obvious of these is to change the read-out frequency. If you read out the data at twice the sampling frequency you will get the same sound an octave higher — and lasting half as long. Similarly, halving the read-out frequency will drop the sound by an octave. Intermediate frequencies produce intermediate notes.

Most samplers allow you to select limited portions of the sampled sound for playback or manipulation. Using this facility, you can pick out the



butch — or, if you prefer, give yourself a falsetto. It is even possible to perform a duet with yourself.

The £249.95 ZX-81 sampler, called **Muzix-81**, was developed

segments of sound during a looping operation to make the joins almost inconspicuous.

Where the Muzix-81 does fall down is in the diabolical keyboard and limited graphics capabilities of the ZX-81. The

analogue control system in which an increase in one volt would produce a one octave rise in pitch. The Muzix-81 is designed to be driven by such a synthesiser which you could probably pick up fairly cheaply on the second-hand market, but

series of these patterns to be linked together to form "songs".

However, there are distinct differences between the two systems. The Digidrum has been designed to maximise the amount of memory available for sample storage, sometimes at the expense of user-friendliness.

The Spectrum designers have devoted a greater proportion of the micro's memory to the control program, with the result that it is easier to use and slightly more versatile than the Digidrum. The price they pay is slightly inferior, but still perfectly acceptable, drum sounds.

One particular attraction

of the Spectrum not available on the Digidrum, is the option of real-time programming. Both systems allow you to enter drum patterns, in your own time, as points on a time-v-instrument grid, but, at present, only the Spectrum allows you to tape out the rhythms on the computer keyboard and have these entered automatically on the grid. For many people, this more intuitive approach is preferable. The Digidrum designers are said to be working on a real-time version of their system.

There are differences too on the hardware front. The Digidrum has a socket which pumps out timing pulses for external devices such as

synthesizers and dedicated drum machines suitably equipped to follow its timing instructions.

The Spectrum prefers to take its orders from the outside world and will synchronise its activities with signals fed through the EAR socket of the Spectrum. This allows it to stay in time with instruments recorded on different tracks of a multi-track tape recorder, for example.

Sampling systems such as the Spectrum and Digidrum are only as good as the sampled sounds supplied for them. Both systems come with a useful assortment of sounds — the Spectrum having a basic "kit" of eight

and two alternative sounds; the Digidrum having two full kits, one conventional, the other made up of tinkly, butt effective, glass sounds.

Both also include a variety of rhythm patterns and "songs", which serve the dual roles of demonstration pieces and instructive examples of the programming art.

Sooner or later you will probably tire of the original set of sounds, so both suppliers are wisely planning to support their systems with further sampled sounds on disc and/or cassette. The first back-up set of more than 40 new sounds for the Digidrum is already available at a cost of £16.50.

solo flute sound in the middle of a sampled orchestral flourish, for example. It also means that part of a sample can be repeated several times to give Paul Hardcastle's stuttering "n-n-n-nineteen" effect.

Some samplers provide real-time effects to produce doctored versions of the original sound almost instantaneously. For example, by playing back a sound just after it has been fed into the sampler, a variety of effects such as echoes and reverberation can be generated, depending on the length of the delay.

Another popular real-time effect is to shift the pitch of the playback sound. If you treat your voice in this way, you can make yourself sound incredibly

by a pair of Hungarian musician-boffins and is being distributed in the UK by Vulcan Electronics. It turns out that the ZX-81's relatively simple internal architecture lends itself to sampling although its memory has to be boosted by the addition of a 64K Rampack. This gives it a 1.6 second maximum sample length at a very respectable 37kHz sampling frequency.

The quality of the sounds produced, and the facilities offered by the Muzix-81 rival those of the best of the Commodore-based systems. Indeed it has one very useful command not offered on the CBM samplers. This automatically looks for matching

graphics limitations are especially apparent when the Muzix-81 tries to produce an oscilloscope-type display of the sampled sound.

These displays, common to all of the sampling packages, help the user to visualise the sound and to select looping points. Not surprisingly, the Commodore-based samplers do a much better job than the ZX-81. These relatively minor problems should be overcome in a Spectrum version of the Muzix-81, due soon.

Another possible drawback to the Muzix-81 is that it has to be controlled by an analogue synthesiser. Before the digital age dawned with synthesisers commonly used as all recent

electronic musical equipment is geared to MIDI, this seems a retrograde step.

One sampler which does allow for control from a MIDI keyboard is Supersoft's £225 **Microvox** package for the Commodore 64. This is a well thought-out sampler with a wealth of facilities — as its price would indicate.

In addition to versatile and easy-to-use sample-taking and manipulating controls, the Microvox includes a real-time delay effects section and a "sequencer". This allows you to record, and subsequently edit, a series of single notes played on a MIDI keyboard in real time. These notes can be

(continued on next page)

Sampling samplers

(continued from previous page)

stored as up to 24 different "pattern" which can be linked together to form a "song".

The sampler allows you to store simultaneously up to 16 different sampled sounds, or "voices", provided that there is enough memory. The sequencer can be instructed to play different notes using different voices, thus adding to the richness and the variety of the output. It can, for example, be used to simulate a set of percussion instruments, and a "kit" of sampled drum sounds is provided as part of the Microvox software.

The Microvox's almost total reliance on MIDI for control is both a strength and a weakness. The main drawback is for would-be users who do not possess a MIDI keyboard and cannot afford the £500-plus cost of a keyboard and sampler.

For such people a slightly cheaper alternative exists in the form of the £199 **Digital Music System** — DMS — from Microsound. In addition to MIDI, this system also offers the options of controlling the sampler either from the Qwerty keyboard — possibly using a clip-on miniature musical keyboard such as those from Commodore or Siel — or from

the company's own £99 full-size, four-octave musical keyboard.

The DMS allows the user to select a sample rate of between 4kHz — which gives 8s of barely recognisable sound — and 33kHz — which produces 1s of high quality sound. It does not offer any real-time effects, but does include a modulation source which can be used to tinker with the sampled sound to produce interesting effects. It also provides an envelope function with variable attack, decay and sustain characteristics to shape the sampled sound.

The DMS and Microvox samplers are aimed, both in quality and price, at the serious musician. But a pair of Commodore-based samplers at a more accessible price for the less dedicated experimenter, should be on the market by the time you read this.

The first of these is from Commodore itself. It is a product of the company's collaboration with Music Sales which has resulted in sophisticated software for the SID chip and the £100 Sound Expander synthesizer add-on for the CBM-64/128.

The £69.99 **Commodore Sound Sampler** comes complete with a microphone and plugs into the cartridge port of the 64

or 128. A useful option not provided with other samplers is the possibility of playing back the sampled sounds through a television speaker; the other systems rely on you having an amplifier close to your micro. An optional £24.99 MIDI adaptor can be plugged into the Commodore sampler module to give MIDI control of the sampled sounds.

The Commodore software is based on easy-to-use pull-down menus. In addition to straight sampling, it offers two types of real-time effect: delays from 20 milliseconds to 2 seconds; and pitch transposition of up to an octave above or below the original sound.

Four different short sounds can be stored simultaneously and played back using a very rudimentary sequencer. As with Supersoft's Microvox, this facility is used to simulate a drum machine and two four-instrument sampled drum kits are provided as part of the software. Unfortunately, the Commodore's 16-note "sequencer" is such a basic affair that it is little more than a gimmick.

Although the Commodore sampler does offer very good value for money, it is clear that some corners have been cut to achieve this. For example, there is no choice of sampling frequency, the fixed rate being at 20kHz, providing samples up to 1.4 seconds long. The resulting sounds, although good, are not quite up to the standard of the sampler's more expensive rivals.

Even cheaper than Commodore's sampler is the £49.99 **Digital Sound Sampler** from Datel. Earlier this year Datel brought out a sampler for the Spectrum which was little more than a toy, producing sampled sounds of rather poor quality and offering a minimum of functions. The company claims that the Commodore version is a vast improvement, with better designed electronics and software written in machine code, not Basic as was used of the Spectrum version.

The Datel sampler, which was not yet available for review as we went to press, provides a variety of real-time effects and includes a step-time sequencer.



It is designed to be controlled from the Qwerty keyboard, possibly using a clip-on musical overlay.

The possibility of MIDI control was looked at but discarded on cost grounds. But as a spin-off, Datel plans to produce a separate MIDI interface which will be sold as a package with MIDI real-time and step-time recorders at the remarkable price of £39.95 — less than half the price of some existing CBM-64 MIDI interfaces!

In many respects, the DS:3 for the Apple II is like its less costly counterparts, but it does have one significant advantage. Whereas the other samplers we have looked at are all monophonic — only one sound can be played back at a time — the DS:3 is polyphonic, allowing up to four notes to sound simultaneously.

Sampler suppliers.

Cheetah Marketing, 1 Willowbrook Science Park, Crickhowell Road, St. Mellons, Cardiff (0222-777337)

Commodore Business Machines, Corby, Northamptonshire NN17 1BR (0536-205252)

Datel Electronics, Unit 8, Fenton Industrial Estate, Dewsbury Road, Fenton, Stoke-on-Trent (0782-273815)

Greengate Productions, Unit D, Happy Valley Industrial Park, Primrose Hill, Kings Langley, Hertfordshire WD4 8HZ (09277-69149)

Microsound, PO Box 14, Petersfield, Hampshire GU32 1HS (0703-87403)

Supersoft, Winchester House, Canning Road, Wealdstone, Harrow HA3 7SJ (01-861 1166)

Syndromic Music, 35A Grove Avenue, London N10 2AS (01-883 1335)

Vulcan Electronics, 200 Brent Street, London NW4 1BY (01-203 6366)



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Interrupt-driven

Many popular video games nowadays have music ringing in the background during play. The Amstrad CPC-464 computer has some excellent facilities for sound generation but attempting to add background music to a Basic program using the Every instruction generally gives poor results with the game being slowed down considerably.

The assembly language program presented here allows interrupt driven background music to be added to Basic programs through the use of some simple RSX-Resident System extension-commands. It also allows the use of one, two or all three sound channels.

The following commands are provided. Note that each one

must be preceded by a vertical bar (Shift '@') symbol. A parameter enclosed in square brackets is optional.

(1). **MUSICON** t, a1 (a2) (a3) — turn on music, where t is the tempo (the length in fiftieths of a second, of the shortest available note) and a1,a2 and a3 are two less than the addresses of the data for channels 1,2 and 3 respectively.

(2). **MUSICOFF** — turn off music.

(3). **VOLUME** v,1 (v2) (v3) — set for channel(s), where v1, v2 and v3 are the respective amplitudes of channels 1,2 and 3.

(4). **PAUSE** — stop playing music.

(5). **CONTINUE** — continue playing music after pausing.

To enter the program, you

can either enter and assemble the source code — listing 1 — using an assembler. I have used Devpac but any good one should do. Or if you do not have an assembler I have provided a Basic loader program — listing 2 — which should be typed in and Run to store the code in memory.

Once the code is in memory, it can be saved on tape (or disc) using the command **SAVE "MUSIC",B,&A000,&2A0** (enter)

To make the computer recognise the new commands the instruction **CALL &A1C5** should be given. At this point the program can be tested by entering and Running listing 3 which tells the computer to repeatedly play all the notes available until a Musicoff

command is given.

Any program using the extension commands should include the following line to load the code and log-on the commands **MEMORY &9FFF: LOAD "MUSIC":CALL&A1C5**

The data for the music to be played through a channel is arranged as follows:- byte 1 — duration of note 1 (1-127), byte 2 (upper nybble) — note 1 octave (0-5), byte 2 (lower nybble) — note 1 number (0-11), byte 3 — duration of note 2, byte 4 (upper nybble) — note 2 octave, byte 4 (lower nybble) — note 2 number....., 0

Once the music playing routine discovers the 0 in place of a duration number it then loops back to the beginning again. If bit 7 of the duration number is

Listing 1.

```

10 : Amstrad background music
20 : (c) 1985 Miles Dunlop
30 :
40 : ORG &A000
50 : TICKER: DDFS 6
60 : ERLOCK: DEFS 7
70 : POINTR: DEFS 6
80 : DELAY: DEFS 5
90 : DATA: DDFS 6
100 : MON2H: DEFS 5
110 : TEMPO: DDFW 0
120 : VOLUME: DEFS 6
130 : DEL: DDFW 0
140 : MUSIC: CALL RESMP
150 : CALL RESSND
160 : LD D,0
170 : LD A,7
180 : CALL &BD34
190 : LD HL,1:BLOCK
200 : LD B,129
210 : LD DE,MUSIC
220 : CALL &BCF
230 : LD HL,TICKER
240 : LD DE,30
250 : LD BC,(TEMPO:
260 : CALL &BCE)
270 : RET
280 : MUSOFF: LD HL,TICKER
290 : CALL &BD0A
300 : CALL &BCEC
310 : RESSND: LD D,3
320 : RESSND2: LD A,7
330 : ADD A,D
340 : LD C,0
350 : CALL &BD34
360 : DEC D
370 : JR NZ,RESSND2
380 : RET
390 : RESMP: LD HL,(DATA)
400 : LD (POINTR),HL
410 : LD HL,(DATA+2)
420 : LD (POINTR+2),HL
430 : LD HL,(DATA+4)
440 : LD (POINTR+4),HL
450 : LD A,1
460 : LD (DELAY),A
470 : LD (DELAY+1),A
480 : LD (DELAY+2),A
490 : RET
500 : MUSIC: LD HL,DELAY
510 : LD BC,DATA
520 : LD DE,POINTR
530 : XOR A
540 : CALL MUSIC2
550 : LD A,(NCHAN)
560 : CP 1
570 : RET Z
580 : LD A,1
590 : INC HL
600 : INC BC
610 : INC BC
620 : INC DE
630 : INC DE
640 : CALL MUSIC2
650 : LD A,(NCHAN)
660 : CP 2
670 : RET Z
680 : LD A,2
690 : INC HL
700 : INC BC
710 : INC BC
720 : INC DE
730 : INC DE
740 : CALL MUSIC2
750 : RET
760 : MUSIC2: DEC (HL)
770 : RET NZ
780 : PUSH HL
790 : PUSH BC
800 : PUSH DE
810 : PUSH AF
820 : LD (DEL),HL
830 : LD A,(DE)
840 : LD L,A
850 : INC DE
860 : LD A,(DE)
870 : LD H,A
880 : INC HL
890 : INC HL
900 : LD A,H
910 : LD (DE),A
920 : DEC DE
930 : LD A,L
940 : LD (DE),A
950 : LD A,(HL)
960 : CP 0
970 : JR NZ,MUSIC3
980 : LD A,(BC)
990 : LD (DE),A
1000 : INC DE
1010 : INC BC
1020 : LD A,(BC)
1030 : LD (DE),A
1040 : LD A,1
1050 : LD HL,(DEL)
1060 : LD (HL),A
1070 : MUSIC6: POP AF
1080 : PUSH AF
1090 : ADD A,8
1100 : LD C,0
1110 : CALL &BD34
1120 : MUSIC4: POP AF
1130 : POP DE
1140 : POP BC
1150 : POP HL
1160 : RET
1170 : MUSIC3: BIT 7,A
1180 : JR Z,MUSIC5
1190 : RES 7,A
1200 : LD BC,(DEL)
1210 : LD (BC),A
1220 : JR MUSIC6
1230 : MUSIC5: LD BC,(DEL)
1240 : LD (BC),A
1250 : INC HL
1260 : PUSH HL
1270 : LD A,(HL)
1280 : AND 240
1290 : SRL A
1300 : LD E,A
1310 : SLA A,E
1320 : ADD A,E
1330 : LD E,A
1340 : LD D,0
1350 : LD HL,NOTDAT
1360 : ADD HL,DE
1370 : LD B,H
1380 : LD C,L
1390 : POP HL
1400 : LD A,(HL)
1410 : AND 15
1420 : LD E,A
1430 : SLA E
1440 : LD H,B
1450 : LD L,C
1460 : ADD HL,DE
1470 : POP AF
1480 : PUSH AF
1490 : SLA A
1500 : PUSH AF
1510 : LD C,(HL)
1520 : CALL &BD34
1530 : POP AF
1540 : INC A
1550 : INC HL
1560 : LD C,(HL)
1570 : CALL &BD34
1580 : POP AF
1590 : PUSH AF
1600 : LD HL,VOLUME
1610 : LD E,A
1620 : LD D,0
1630 : ADD HL,DE
1640 : ADD A,B
1650 : LD C,(HL)
1660 : CALL &BD34
1670 : JR MUSIC4
1680 : NOTDAT: DFW &0777,&070C
1690 : DFW &06A7,&0647
1700 : DFW &05ED,&059B
1710 : DFW &0547,&054C
1720 : DFW &04D4,&0470
1730 : DFW &0431,&03F4
1740 :
1750 : DFW &03DC,&0386
1760 : DFW &0353,&0324
1770 : DFW &02F6,&02CC
1780 : DFW &02A4,&027E
1790 : DFW &025A,&0238
1800 : DFW &0218,&01FA
1810 :
1820 : DFW &1DE,&1C3
1830 : DFW &1AA,&192
1840 : DFW &17B,&166
1850 : DFW &152,&13F
1860 : DFW &12D,&11C
1870 : DFW &10C,&FDF
1880 :
1890 : DFW &EF,&E1
1900 : DFW &ED,&C9
1910 : DFW &EB,&B3
1920 : DFW &EA,&9F
1930 : DFW &E9,&8E
1940 : DFW &E8,&7F
1950 :
1960 : DFW &E7,&71
1970 : DFW &E6A,&E4
1980 : DFW &E5F,&E9
1990 : DFW &E54,&E0
2000 : DFW &E4B,&E47
2010 : DFW &E43,&E3F
2020 :
2030 : DFW &E3C,&E38
2040 : DFW &E35,&E32
2050 : DFW &E2F,&E2D
2060 : DFW &E2A,&E28
2070 : DFW &E26,&E24
2080 : DFW &E22,&E20
2090 :
2100 : add extension commands
2110 :
2120 : LOGRSX: LD BC,COMTAB
2130 : LD HL,SPACE
2140 : CALL &BCD1
2150 : RET
2160 : SPACE: DEFS 4
2170 : COMTAB: DFW NTABLE
2180 : JP MUSOFF
2190 : JP PAUSE
2200 : JP CONT
2210 : JP VOLRSX
2220 : JP VOLRSX
2230 : NTABLE: DFW "MUSI"
2240 : DFW "C","D","N"+128
2250 : DFW "MUSI"
2260 : DFW "C","D","F","F"+128
2270 : DFW "PAUS"
2280 : DFW "E"+128
2290 : DFW "CONT"
2300 : DFW "I","N","U","E"+128
2310 : DFW "VOLUME"
2320 : DFW "M","E"+128
2330 : DFW 0
2340 :
2350 : MUSIC-ON
2360 :
2370 : MONRSX: PUSH AF
2380 : PUSH IX
2390 : CALL MUSOFF
2400 : POP IX
2410 : POP AF
2420 : CP 2
2430 : RET C
2440 : CP 5
2450 : RET NC
2460 : CP 2
2470 : JR Z,MON5
2480 : CP 3
2490 : JR Z,MON4
2500 : LD A,3
2510 : LD (NCHAN),A
2520 : LD L,(IX)
2530 : LD H,(IX+1)
2540 : LD (DATA+4),HL
2550 : INC IX
2560 : INC IX
2570 : LD L,(IX)
2580 : LD H,(IX+1)
2590 : LD (DATA+2),HL
2600 : INC IX
2610 : INC IX
2620 : MON2: LD L,(IX)
2630 : LD H,(IX+1)
2640 : LD (DATA),HL
2650 : INC IX
2660 : INC IX
2670 : LD A,(IX)
2680 : LD (TEMPO),A
2690 : CALL MUSICON
2700 : RET
2710 : MON4: LD A,2
2720 : LD (NCHAN),A
2730 : JR MON3
2740 : MON5: LD A,1
2750 : LD (NCHAN),A
2760 : JR MON2
2770 :
2780 : PAUSE
2790 :
2800 : PAUSE: CALL RESSND
2810 : LD HL,&BD0A
2820 : CALL &BD0A
2830 : RET
2840 :
2850 : CONTINUE
2860 :
2870 : CONT: XOR A
2880 : LD (EBLOCK+2),A
2890 : RET
2900 :
2910 : VOLUME
2920 :
2930 : VOLRSX: CP 0
2940 : RET Z
2950 : CP 4
2960 : RET NC
2970 : CP 1
2980 : JR Z,VOL2
2990 : CP 2
3000 : JR Z,VOL3
3010 : LD A,(IX)
3020 : LD (VOLUME+2),A
3030 : INC IX
3040 : INC IX
3050 : VOL3: LD A,(IX)
3060 : LD (VOLUME+1),A
3070 : INC IX
3080 : INC IX
3090 : VOL2: LD A,(IX)
3100 : LD (VOLUME),A
3110 : RET

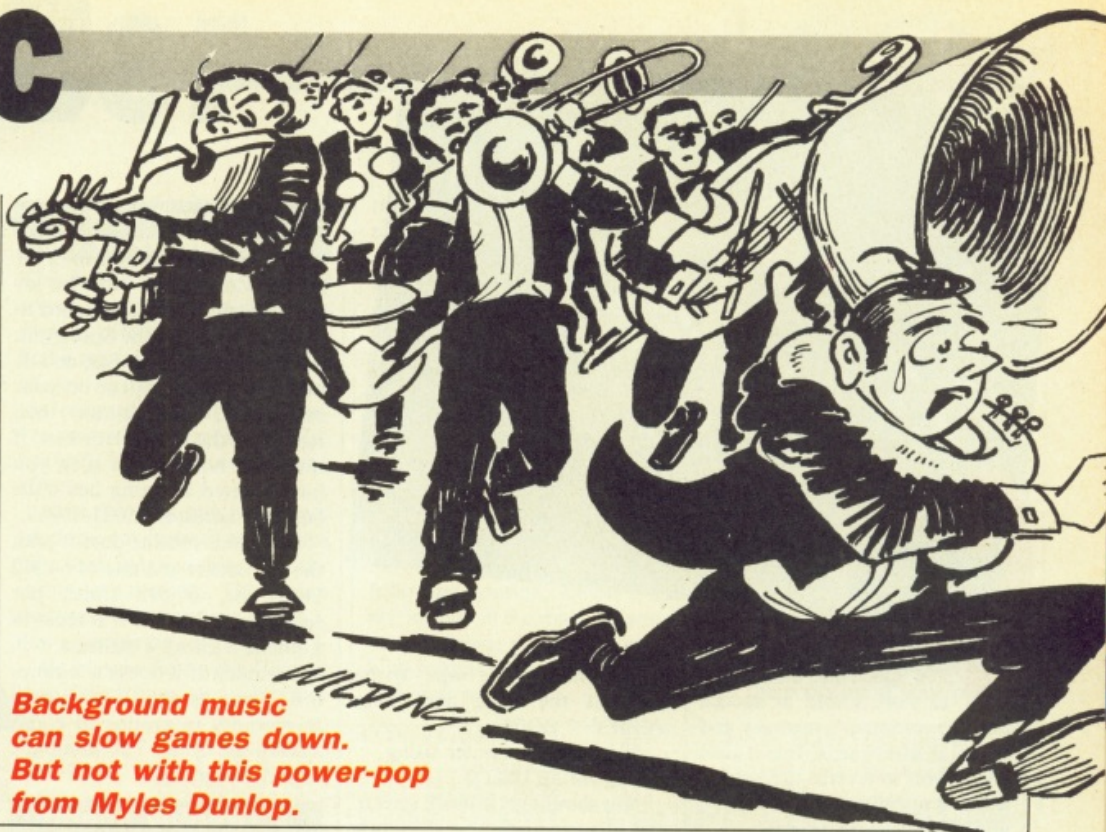
```


music

set (just add 128), then the note is a rest otherwise 1 is the shortest note available, 2 is twice as long, 3 is three times as long etc. The octaves available correspond to octaves -2 to +3 shown in the CPC-464 manual appendix VII and in the firmware manual appendix VIII. e.g. bytes 2,52 define a note of duration 2, octave 3, note 4; 129, 0 define a rest of duration 1. A simple formula for working out the second byte of a note is therefore:

byte stored = $16 \times \text{octave} + \text{note}$

If you do not wish to type in the program I can supply copies of it on cassette for £4 each. Please include a 24 pence SAE. Write to: M.B.L. Dunlop, 19 Droridge, Dartington, Totnes, Devon, TQ9 6JG.



**Background music
can slow games down.
But not with this power-pop
from Myles Dunlop.**

```
10 REM ** background music demo **
20 REM ** By Myles Dunlop **
30 REM
35 CLS:PRINT"Please wait..."
40 MEMORY &9FFF:LOAD "!",&A000:CALL &A1C5
50 a=&A300:GOSUB 1000
60 a=&A380:GOSUB 1000
70 !VOLUME,15,15
80 !MUSICON,10,&A300-2,&A380-2
90 MODE 2:LIST
1000 READ b:IF b=-1 THEN RETURN
1010 POKE a,b:a=a+1:GOTO 1000
1020 REM
1030 REM channel 1 data
1040 DATA 152,0,3,&37,131,0,134,0,3,&37,136,0,1,&37,3,&40,1,&3b,1,&39,1,&3b
1050 DATA 2,&40,4,&37,3,&40,1,&3b,1,&39,1,&3b,2,&40,4,&37,3,&40,1,&3b,1,&39
1060 DATA 1,&3b,2,&40,3,&37,141,0,0,-1
1070 REM
1080 REM channel 2 data
1090 DATA 3,&34,3,&32,6,&30,3,&34,3,&32,6,&30,131,0,3,&35,6,&34,131,0,3,&35
1100 DATA 5,&34,129,0,3,&34,3,&32,6,&30,3,&34,3,&32,6,&30,3,&34,3,&32,3,&30
1110 DATA 130,0,1,&35,3,&34,3,&32,6,&30,0,-1
```

```
10 REM ** music test prog **
20 MEMORY &8FFF
30 a=&9000
40 FOR octave=0 TO 5
50 FOR note=0 TO 11
60 PUKE a,1
70 POKE a+1,16*octave+note
80 a=a+2:NEXT note,octave
90 POKE a,0
100 !VOLUME,15
110 !MUSICON,15,&9000-2
```

Listing 3.

Demo program.

Listing 2.

```
10 REM machine code loader
20 check=0
30 FOR I=&A000 to &A2A0
40 READ J:check=check+J
50 NEXT
1000 DATA 0,0,0,0,0,0,0,0
1010 DATA 0,0,0,0,0,0,0,0
1020 DATA 0,0,0,0,0,0,0,0
1030 DATA 0,0,0,0,0,0,0,0
1040 DATA 0,0,0,0,0,0,0,205
1050 DATA 100,160,205,86,160,14,60,62
1060 DATA 7,205,52,189,33,6,160,6
1070 DATA 129,17,130,160,205,239,188,33
1080 DATA 0,160,17,30,0,237,75,29
1090 DATA 160,205,233,188,201,33,0,160
1100 DATA 205,10,189,205,236,188,22,3
1110 DATA 62,7,130,14,0,205,52,189
1120 DATA 21,32,245,201,42,22,160,34
1130 DATA 13,160,42,24,160,34,15,160
1140 DATA 42,26,160,34,17,160,62,1
1150 DATA 50,19,160,50,20,160,50,21
1160 DATA 160,201,33,19,160,1,22,160
1170 DATA 17,13,160,175,205,176,160,58
1180 DATA 28,160,254,1,200,62,1,35
1190 DATA 3,3,19,19,205,176,160,58
1200 DATA 28,160,254,2,200,62,2,35
1210 DATA 3,3,19,19,205,176,160,201
1220 DATA 53,192,229,197,213,245,34,37
1230 DATA 160,26,111,19,26,103,35,35
```

```
1240 DATA 124,18,27,125,18,126,254,0
1250 DATA 32,26,10,18,19,3,10,18
1260 DATA 62,1,42,37,160,119,241,245
1270 DATA 198,8,14,0,205,52,189,241
1280 DATA 209,193,225,201,203,127,40,9
1290 DATA 203,191,237,75,37,160,2,24
1300 DATA 229,237,75,37,160,2,35,229
1310 DATA 126,230,240,203,63,95,203,39
1320 DATA 131,95,22,0,33,53,161,25
1330 DATA 68,77,225,126,230,15,95,203
1340 DATA 35,96,105,25,241,245,203,39
1350 DATA 245,78,205,52,189,241,60,35
1360 DATA 78,205,52,189,241,245,33,31
1370 DATA 160,95,22,0,25,198,8,78
1380 DATA 205,52,189,24,170,119,7,12
1390 DATA 7,167,6,71,6,237,5,152
1400 DATA 5,71,5,252,4,212,4,112
1410 DATA 4,49,4,244,3,220,3,134
1420 DATA 3,89,3,36,3,246,2,204
1430 DATA 2,164,2,126,2,90,2,56
1440 DATA 2,24,2,250,1,222,1,195
1450 DATA 1,170,1,146,1,123,1,102
1460 DATA 1,82,1,63,1,45,1,28
1470 DATA 1,12,1,253,0,239,0,225
1480 DATA 0,213,0,201,0,190,0,179
1490 DATA 0,169,0,159,0,150,0,142
1500 DATA 0,134,0,127,0,119,0,113
1510 DATA 0,106,0,100,0,95,0,89
1520 DATA 0,84,0,80,0,75,0,71
1530 DATA 0,67,0,63,0,60,0,56
1540 DATA 0,53,0,50,0,47,0,45
```

```
1550 DATA 0,42,0,40,0,38,0,36
1560 DATA 0,34,0,32,0,30,0,28
1570 DATA 33,207,161,205,209,188,201,0
1580 DATA 0,0,0,228,161,195,7,162
1590 DATA 195,77,160,195,98,162,195,108
1600 DATA 162,195,113,162,77,85,83,73
1610 DATA 67,79,206,77,85,83,73,67
1620 DATA 79,70,198,80,65,85,83,197
1630 DATA 67,79,78,84,73,78,85,197
1640 DATA 86,79,76,85,77,197,0,245
1650 DATA 221,229,205,77,160,221,225,241
1660 DATA 254,2,216,254,5,208,254,2
1670 DATA 40,65,254,3,40,54,62,3
1680 DATA 50,28,160,221,110,0,221,102
1690 DATA 1,34,26,160,221,35,221,35
1700 DATA 221,110,0,221,102,1,34,24
1710 DATA 160,221,35,221,35,221,110,0
1720 DATA 221,102,1,34,22,160,221,35
1730 DATA 221,35,221,126,0,50,29,160
1740 DATA 205,39,160,201,62,2,50,28
1750 DATA 160,24,213,62,1,50,28,160
1760 DATA 24,219,205,86,160,33,6,160
1770 DATA 205,10,189,201,175,50,8,160
1780 DATA 201,254,0,200,254,4,208,254
1790 DATA 1,40,24,254,2,40,10,221
1800 DATA 126,0,50,33,160,221,35,221
1810 DATA 35,221,126,0,50,32,160,221
1820 DATA 35,221,35,221,126,0,50,31
1830 DATA 160,201,0,0,0,0,0,0
3000 IF check() &0526 THEN PRINT"
error in data"
```




ound Master, for the 48K ZX Spectrum, allows you to store sound or speech into the computer's memory and replay it afterwards. But it also allows you to reverse the sound, replay it at eight different speeds, and with varying echoes.

The program itself is not very large, about 4K of Basic and 2.5K of machine code, but the enormous chunk of memory used to store the speech — almost 32K for four seconds — caters for 48K users only. I will give a detailed explanation of the use of the program later. First let me tell you how to get the program in your computer in the first place.

Enter program 1, make sure everything is keyed in exactly as in the listing. Save it using SAVE "SM" LINE 1 and start the tape recorder. Press Enter. Enter program 2. When it runs perfectly Save the machine code using SAVE "code 1" CODE 65025,224 and verify it. This is very important. Repeat the process with program 3 and Save the machine code with SAVE "code 2" CODE 30000, 1835. Start the tape recorder, press record and play together, and

then press enter.

Now rewind the tape to the start of the code and press **VERIFY "CODE"**

Clear the computer using
RANDOMIZE USR 0

You should get a black screen, red lines and the Sinclair copyright message, as if you just switched the computer on. Spectrum Plus owners can do this by simply pressing the little switch on the left-hand side of the machine.

Enter the Basic listing — program 4 — starting with 1 CLEAR 29999: LET spd=7. Never attempt to Run it or to press Go To (line number) since a crash will always be the result and you would have to start all over again.

Check everything carefully,
then
SAVE "BASIC" LINE 1.
and verify.

Clear the computer as described then rewind the tape and enter Load "", no spaces. Sound Master should now load normally.

The first thing you see when the program has loaded is the blue menu screen. You're presented with 10 options, numbered 0-9. They are:

1. Record sound

This option allows you to enter sound via a tape recorder or microphone which is attached to the Ear socket of the Spectrum. After about four seconds, an OK message should appear on your screen and the program then returns to the menu. However, if this does not happen then you have entered a wrong hex code between addresses 65025-65052.

What this routine does is scan the Ear socket at a rate of 64,512 Hertz or, 64,512 times per second, for a noise. If it receives a noise, a click, it stores a 1 in its memory. If it doesn't, it stores a 0. These 1s and 0s are stored in memory in groups of eight, known as bytes. The analogue sound is digitised.

2. Replay sound

This option replays the sound you stored in the computer. It is, in fact, the reverse of option 1. It converts the 1s and 0s from memory to clicks and no-clicks.

This reproduces a sound which is quite recognisable. But because of the slow speed at which actions take place, and the Spectrum's limited speaker some ambiguity is unavoidable. Fantastic, clear sound is produced at a 17 mHertz rate, while ours is produced at 64 kHertz. This is due to the speed of the Z-80 microprocessor found in the Spectrum. It is, in fact, quite a fast eight-bit processor, but for our purposes not fast enough to produce a sound that is free from disturbing noise. Using a Dolby cassette deck would help in filtering out these noises though.

If we wanted a clear, solid sound for four seconds, then we would need a computer with 256 times more memory than the

Spectrum, and which runs at least 256 times faster! Perhaps a Cray-1 will do. If you have any problems here, check your bytes between 65053 and 65085.

3. Change speed

The program allows you to replay the sound at eight different speeds. Speed 1 is superfast — you'll need megaeears to understand any of it — and speed eight is the slowest. Speed 7 is the one at which sound is always recorded.

4. Disappearing Echo

It is impossible to do any magic with the Spectrum's sound speaker's volume under software control. So I present you with a disappearing echo instead of a fading one. Echo-steps may be controlled by the user. Echoing is done at the current speed, set at option 3. This is initially 7.

5. Appearing echo

Which is, of course, the opposite of option 4.

4. Fastening echo

This produces an echo which starts at the current speed and repeats, faster and faster, until it reaches speed 1. If, for example, the current speed is 5, then the speeds at which the program echoes are 5, 4, 3, 2, 1. If the current speed is 8, the speeds are 8, 7, 6, etc. This option has no effect whatsoever on the current speed at which sound is replayed in option 2.

7. Slowing echo

The echo starts at the current speed and slows down until it reaches speed 8. Again, this command has no effect on the current sound speed.

Listing 1.

```

1 REM Sound Master VII/2.0
  By Roy Dictus 1985
10 CLEAR 29999:CLS:LOAD ""C
ODE
15 INPUT "Is your Spectrum Ise

```

Listing 2.

```

1 CLEAR 65024
2 DEF FN a(a$)=CODE a$+48-7*(
a$="9")-32*(a$="Z") DEF FN h(a$
)=FN a(a$)*16+FN a(a$(2))
3 FOR t=0 TO 10
4   READ a$: LET t=t+1
5   LET a$=a$(t) IF LEN a$=0
6   GOTO "Length error in line "X;
7   INT (LEN a$/2) THEN PRINT a$
8   TOP
9   40 POKE a, FN h(a$): LET t=t-1

```

```

08 27 (A/N)";A$
18 IF A$="Y" OR A$="y" THEN GO
TO 120
20 POKE 65162,190
30 POKE 65170,189
40 POKE 65178,187
50 POKE 65186,185
60 POKE 65203,175

```

```

70 POKE 65207,175
80 POKE 65215,183
90 POKE 65223,187
100 POKE 65231,189
110 POKE 65239,190
120 LOAD ""CODE
130 LOAD ""

```

[illegible][illegible]

sampler



8. Load file

Use to Load a file previously saved using this program. You'll be asked for a filename but if you can't remember the name of the file you want to load, just press Enter. This command will only accept sound master-files.

9. Save file

When you have successfully sampled sound you may wish to Save it to tape. Enter the filename, start the tape recording and then press any key. Remember that 32,258 bytes have to be saved so saving might take

as long as 2.5 minutes.

10. Reverse sound

This handy routine reverses the sound stored in the micro. This means, effectively, that if you had a recording in your memory of you saying "computer" then the reversed version would say "retupmoc". Intonation is also reversed. This produces smashing effects.

Note that this option does not produce any sound, yet swaps bits and bytes around in the computer's memory. This means that every other option, except 1, now operates on reversed sound.

If you now Save your file and load it back later, you will notice

that the sound is still in its reversed form. To restore it to normal, just use option 0 again. Any troubles in reversing your sound? Check your bytes 65108-65150.

Trouble with the main menu screen has to do with wrong coding in locations 30000-300014. If you spot trouble, again check your hex codes.

For the technically-minded; speech is stored between addresses 32768 and 65024. Using the following routine, which I did not include in the main program, you can Invert the sound, that is, high sounds become low sounds and vice versa:

LD HL,32768
L1 LD A,(HL)
CPL
LD (HL),A
INC HL

LD A,H
CP 254
JR NZ, L1
RET

The program has been tested on Spectrum + and Spectrum issues 2 and 3. Program 1 includes the pokes necessary to adapt the program to run on Spectrum + and Spectrum issue 3.

If you would like a copy of Sound Master but find it rather tedious to key in the listings and machine code, simply send £2 to: Sound Master Offer, Roy Dicus, Apostelster, 8,2000 Antwerp, Belgium. You will receive a copy of the program in your postbox.

Listing 3.

```
1 CLEAR 29999
2 DEF FN A(a$)=CODE a$-48-7*(
a$>"0")-32*(a$>"Z"): DEF FN H(h$)
=FN A(a$(1))+16*FN A(a$(2))
10 RESTORE : LET a=30000: FOR
x=100 TO 320 STEP 10
20 READ a$: LET t=VAL a$( TO 5
): LET a$=a$(6 TO ): IF LEN a$>2
<>INT (LEN a$/2) THEN PRINT AT 1
6,0:"Length error in line ";x: S
TOP
40 POKE a, FN H(a$): LET t=t-PE
EK a: LET a=a+1
50 LET a$=a$(3 TO ): IF a$>" "
THEN GO TO 40
60 IF t THEN PRINT AT 16,0:"Er
ror in line ";x: STOP
70 PRINT AT 16,0:"Line ";x: O
K
80 NEXT x
100 DATA "06078c33b757ef00c8d7
2318f8a9f323c5c2100583e4f77110158
015f00e0b021c5475dc3375c916010113
01160101534f554e44204d4153544552
205244353520534f554e44204d415354
45521603055b315d"
110 DATA "04904205245434f524420
534f554e441605055b325d205245504c
415920534f554e441607055b335d2043
48414e47452053504545441609055b34
520444953415050454152494e472045
43484f150b55b35"
120 DATA "049125204150504545152
494e47204543484f150d055b365d2046
415354454e494e47204543484f160f05
5b375d20534c4f57494e47204543484f
1611055b385d204c4f1442046494c45
1613055b395d2053"
130 DATA "083374156452046494c45
1615055b305d20524556455253452053
4f554e4400a323c5c4d45f2e1c976cd
3375c9a323c5c4d45f2e1c976cd3375
c9a323c5c4d45f2e1c976cd3375c9a3
323c5c4d45f2e1c976cd3375c9a323c
5c4d45f2e1c976cd3375c9a323c5c4d
45f2e1c976cd3375c9a323c5c4d45f2e
21b79cd3375c9a323c5c4d45f2e1c976
7acd3375c9a323c5c4d45f2e1c976acd
3375c9a323c5c4d45f2e1c976acd3375
150 DATA "0615745fe21537bcd3375
c913011601035245434f524420534f55
4e44202d2d204f5054494f4e20311604
0157852061726520676f696e6720746f
```

Listing 4

```
1 CLEAR 29999: LET spd=7
10 PAPER 5: BORDER 5: INK 0: B
RIGHT 1: CLS : RANDOMIZE USR 300
00: BEEP .01,20
500 LET a=USR 65151: GO TO a
1000 CLS : RANDOMIZE USR 30269
1001 GO SUB 9000
1002 RANDOMIZE USR 65025: PRINT
AT 14,14:"OK": BEEP 1,30: CLS
GO TO 10
1100 CLS : RANDOMIZE USR 30283
1101 PRINT AT 6,28:spd: GO SUB 9
000
1102 POKE 65053,spd: RANDOMIZE U
SR 65053: PAUSE 10: GO TO 10
1200 CLS : RANDOMIZE USR 30297:
PRINT AT 4,22:spd
1201 INPUT "Speed ? [1-8]"+CHR$
64>:spd: IF spd>8 OR spd<1 THE
N GO TO 1201
1202 PRINT AT 4,22:spd: BEEP 1,3
0: GO TO 10
1300 CLS : RANDOMIZE USR 30311:
GO SUB 9010: GO SUB 9000
```

```
2073746f726520736f756e6420696e16
060174686520636f"
160 DATA "067416d70757465722773
206d655d6f72792e20204d4616b651608
017375726520746865206361626c6573
2061726520626f745820636f6e2d160a
016e655374656420746f204541522c20
7374617274207461"
170 DATA "0587870652074686556e16
0c10707265737320616e79206b55792e
0013011601045245504c415920534f55
4e44202d2d204f5054494f4e20321604
015265706c617920736f756e64207374
6f72655420696e20"
180 DATA "06016536f6d70752d1606
017465722e2020548865206375727265
6e7420737065566420697320202e1608
01507265737320616e79206b55792077
68656e2072656164792e001301160104
4346414e47452053"
190 DATA "059015045454202d2d20
4f5054494f4e20331604015468652063
757272656e7420737065566420697320
202e1606015370655664732064757374
20626520696e207468652072616e6765
1608015b31202866"
200 DATA "054426173746573742920
2d20382028736cf677657374295d2e16
0a01466f726d616e1027370556642069
73207372e0013011601044553415050
454152494e47204543484f202d204f50
54494f4e20341604"
210 DATA "064370144697361707065
6172656e672065536865f206174206375
7272656e741606017370655664207768
69636820697320202e160c0150726573
7320616e79206b557920746f20737461
72742e0013011601"
220 DATA "059050341505045415249
4e47204543484f202d204f5054494f4e
2035160401417070656172696e672065
63686f2061742063757272656e741606
01737065566420776869636820697320
202e160c01507265"
230 DATA "06044737320616e79206b
657920746f2073746172742e00130116
010346415354454e494e47204543484f
202d2d204f5054494f4e203616040146
617374656e696e67206556686f206174
2063757272656e74"
240 DATA "054001606017370655664
20776869636820697320202e16100150
```

```
7265737320616e79206b557920746f20
73746172742e001301160104534c4f57
494e47204543484f202d2d204f505449
4f4e203716040153"
250 DATA "062526c6f77696e672065
63686f2061742063757272656e741606
01737065566420776869636820697320
202e161001507265737320616e79206b
657920746f2073746172742e00130116
01054c4f41442046"
260 DATA "05852494c45202d2d2d20
4f5054494f4e20381606014c4f414420
66696c652028736f756e64292e160801
52656d656d65657220492077696ec6c20
6f686f73204c4f4144160a01746865520
636f727265537420"
270 DATA "058650534d2066696c6573
2e150c014c6f6164598e672074696d65
206c6974746c65206c6f756e64292e160e
017468616e20332e320668696e757465
732e001301160105534156452046494c
45202d2d2d20204f50"
280 DATA "0630654494f4e20391606
01534156452066696c652e1608015468
6520736f756e64206d656d6f72792077
696c6c6c206e6f77206265160a01736176
656420666f72206c6174657220757365
2e20204974207461"
290 DATA "057156b6573160c01616c
6d6f7374203324b3a20736176696e67
2074696d65652061626f7574160e01332e
35206d696e67575465732e001301160103
5245564552534520534f554e44202d2d
2d204f5054494f4e"
300 DATA "0667720301606015765520
77696c6c207265765572736520746865
20736f756e6416080173746f72656420
696e206d656d6f72792e2020415c6c20
736f756e64160a0177696ec6c2066726f
63206e6f72206f5e"
310 DATA "067712062656720666179
656420696e160c017265765270766572
2020546869732063616e206769766520
616d617a696e67160e0165666865374
732e202045468520726f7574696e6520
69732073656c6e6d"
320 DATA "06391161001696e766572
74696e673a20746869673206d656e73
206279207573696e6716120169742074
776963652c2074686520736f756e6420
77696ec6c2062651614016e6f726d616c
206167"
1700 CLS : RANDOMIZE USR 30367
1701 INPUT "Filename ? >": LINE
a$: IF LEN a$>10 THEN GO TO 1701
1702 LOAD a$CODE 32768,32256: GO
TO 10
1800 CLS : RANDOMIZE USR 30381:
GO SUB 9000
1801 INPUT "Filename ? >": LINE
a$: IF a$="" OR LEN a$>10 THEN
GO TO 1801
1802 SAVE a$CODE 32768,32256
1803 INPUT "Verify ? (y/n) >": L
INE b$: IF b$(1)="y" OR b$(1)="Y"
THEN VERIFY a$CODE 32768,32256
1804 GO TO 10
1900 CLS : RANDOMIZE USR 30395:
RANDOMIZE USR 65108: PRINT AT 21
0: PAPER 2: INK 7: BRIGHT 1: FL
ASH 1:"Any key": GO SUB 9000: PR
INT AT 21,0:"Sound reversed": B
EEP 1,30: BEEP 1,32: GO TO 10
9999 STOP
9000 IF INKEY$="" THEN GO TO 900
0
9001 RETURN
9010 PRINT AT 6,16:spd: RETURN
```


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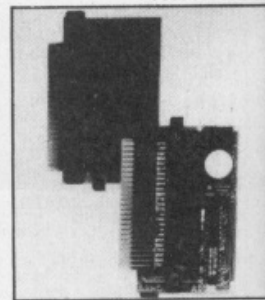
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- The names of the winners will be printed in the February issue of *Your Computer*.
- All entries must arrive at the *Your Computer* offices by the last working day in December 1985.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
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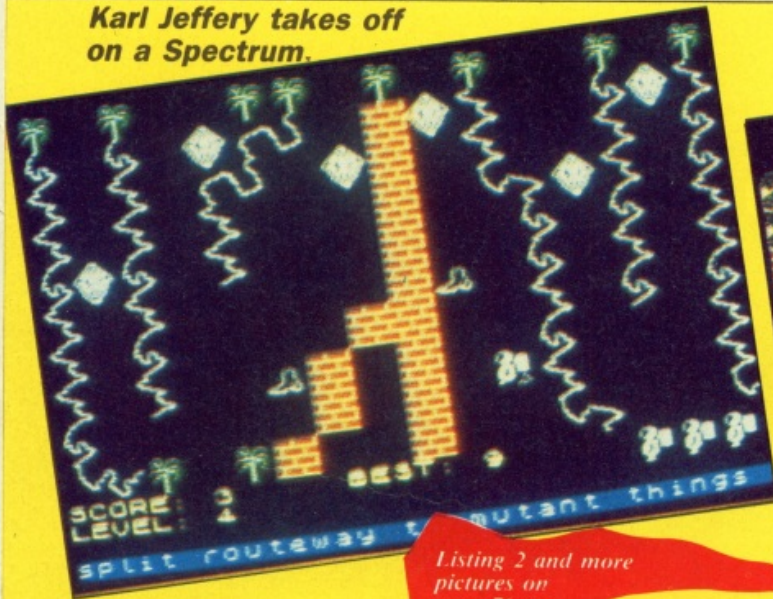
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Mike

Karl Jeffery takes off on a Spectrum.



Listing 2 and more pictures on page 76



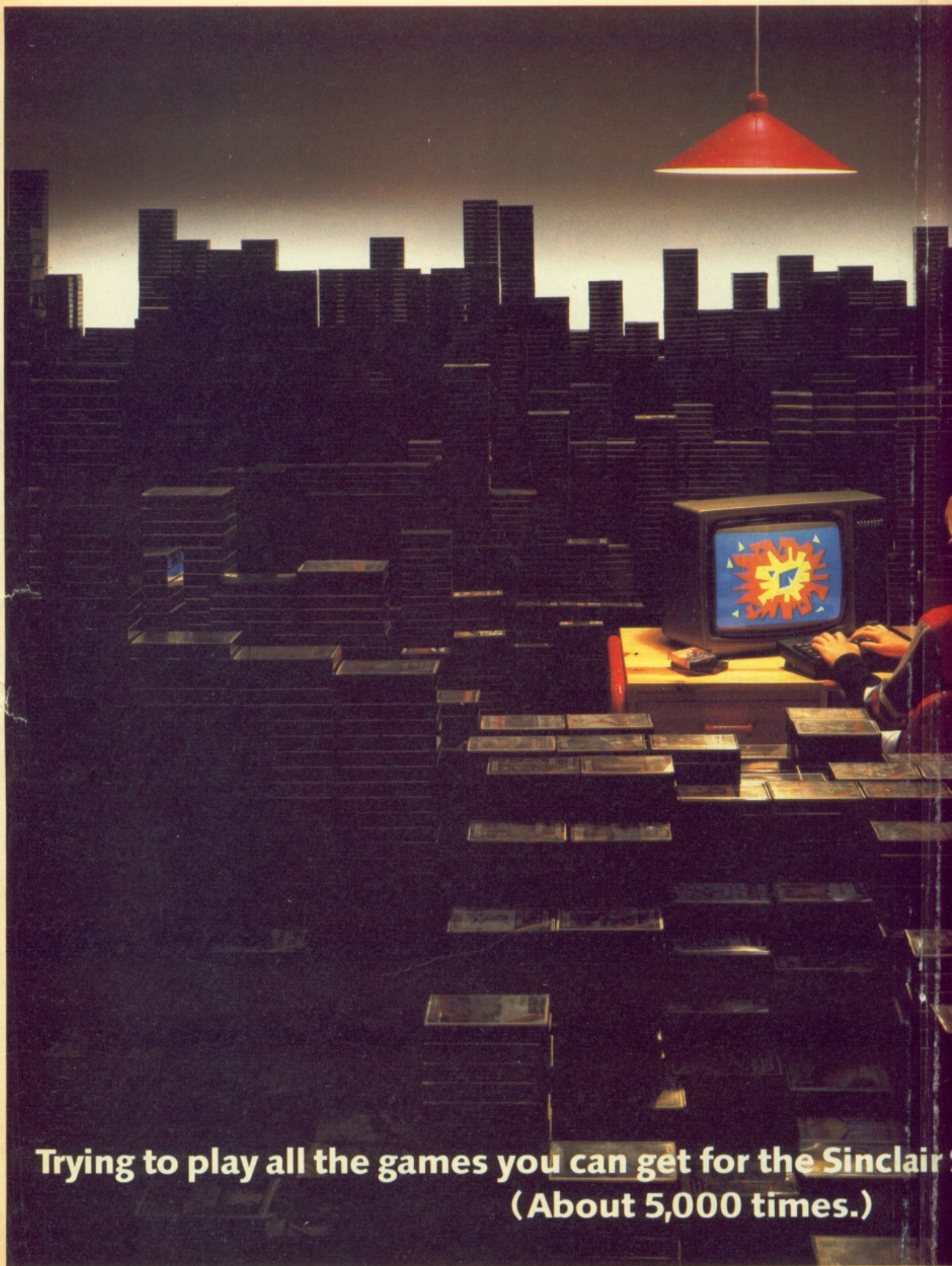
This program is available on the Telsoft service.



```
6028c8d0a09010080808000000000107
0d0926170a121020100000000000080c0
6020c8d0a09010081000000000000207
0d0906370a121020100000000000080c0
6020c0d8a09010e0"
340 DATA "027290000000000000307
0d2926170a12100e00000000000000c0
6028c8d0a0901008100000000000003
0307050f0e0607030300000000000000
80c060e0c0c080800000000000000000
03070d1f1e0e0f07"
350 DATA "05700030000000000000000
80e070f8f8f0e0c0000000000000001
070f193f3e1e0f070000000000000000
c0e020e0e0e0c080000000000000030f
1f1f393f3e1e1f0f07070000000000c0
f0f038f8f8f8f0e0"
360 DATA "02218c08000000000000000
010101010638613f0000000000000a0
50101010082814e43800000000000101
0101010638613f0000000000000a05010
1010082814e438000000000000000000
01010101063861"
370 DATA "038363f0000000000000a0
50101010082814e43800000000000000
0000010101010638613f000000000000
00a050101010082814e43800000071f1d
3838190f0e1e37381e1f070000f0fc0c
8e8ecc78383cf68e"
380 DATA "065263cfcf00000071f1f
3838190f0e1e3f381e1f070000f0fcfc
8e8ecc78383cfe8e3cfcf00000030f1f
3c38190f0f0e1f181f0f030000e0f8fc
9e8ecc787838f0c7cf8e00000071f1f
3838190f0e1e3f38"
390 DATA "072851e1f070000f0fcfc
8e8ecc78383cfe8e3cfcf000000071d
367f00547f007f2b1e0700000000e0b8
ecfe0092fe00fe6cb8e000000000071d
367f0054007f2b1e070000000000e0b8
ecfe009200fe6cb8"
400 DATA "05913e00000000000071d
367f00547f007f2b1e0700000000e0b8
ecfe0092fe00fe6cb8e000000000071d
367f007f54007f2b1e0700000000e0b8
ecfe00fe9200fe6cb8e0000000000000
00300e013f3f3f1f"
410 DATA "061211f0f070000787878
787818d858c0b87ceccc840000000000
0000001f3f3f3f1f0f070000787878
787818d858c0b87ceccc840000000000
00300e013f3f3f1f0f070000787878
787818d858c0b87c"
```

```
420 DATA "06613eccc840000000010
080402013f3f3f1f0f070000787878
787818d858c0b87ceccc84000030797a
3a3a3e3f1f1f1f1f1f1f1b0000048e5e
5c5c7cfcf8f8f8f8f8f8f86800000717a
3a3a3e3f1f1f1f1f"
430 DATA "078151f1f1b0000008c5e
5c5c7cfcf8f8f8f8f8f8f86800000217a
7a7a3e3f3f3f1f1f1f1b12000000804c
5e5e7efcfcfcf8f8f8f86848000000112
3a7a3e3f3f3f1f1f1f1b12000000804c
5e5e7efcfcfcf8f8f"
440 DATA "04786f86848000000107
2d1a101d2f04060301000000000c0f0
daac845cfa903060c08000000000107
2d18121d2f04060301000000000c0f0
d88e445ef8903060c08000000000107
2d1a101d2f040603"
450 DATA "05125010000000000c0f0
daac845cfa903060c08000000000107
0d38123d0f04060301000000000c0f0
da8ca45cfa903060c0800000000010
393810000000000081c080000001c0880
c0000246e2e04000"
460 DATA "0230000040e0000206024
0e0e040020020700103810000000081c
08004000103838100286020000071238
3810020622702040e24700000100440
644e04200024707020040c0000440018
3c19000210393913"
470 DATA "04842014861000040e440
4016020220048c0803012000000030f
177f7d1f0708101000000000000f2da
7cdc7cf8e0102020000000000003
0f177f7d1f0708100800000000002f2
da7cdc7cf8e01020"
480 DATA "039362000000000000000
00030f177f7d1f070810100000000000
02f2da7cdc7cf8e0102020000000000
030f177f7d1f070810100000000002
f2da7cdc7cf8e01020100000003c1818
180c0c0c0c0e06"
490 DATA "048760607070000783030
3070706060e0e0c0c0c000000706060
703030301818181e0607070000381818
38303030606060e0c0c0c00000383030
381818180c0c0c0e06070700001c0c0c
1c181818303030f0"
500 DATA "01761c0c0c00000786030
30303818180c0c0c0c060700001e060c
0c0c1c18183030303060e00000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000"
```

```
510 DATA "0250300000000000000000
00000000000000000000000020202020
20202074686520737461727420636176
65726e2020202020202020200000111c
1c1c151a001a151c1c1c1c000f1100
0000150000001500"
520 DATA "010891c1c630c0f0d1100
00000000000000001c1c000b0c631100
0000000000000000631c000c0b01100
00171717000000001c0000c0c000000
12141717170000001c1c000b0b000012
6300000017171717"
530 DATA "023931c1c000b0b001214
14141300000017171700000c0c000000
00000000000000000000000000000a0a
0a090a0909090a090a090a0d00000510
2f6002002ee02f60000152908f3000ff
52309f3000ff3e30"
540 DATA "036059f3000ff3e0000000
00000000000000000000000000000000
000000000000000000000000000000746865
206275696c64696e6720736974652864
696e6b79206b6f6e6729202017171717
0017171717171700"
550 DATA "0099700171717000000000
000000000000000000000000000001a1a
1a15001a150000001213000000000000
00150063150000121414130000001515
631500151500121414141400001a1a1a
1a1a1a1a001100"
560 DATA "0132300001100000000000
000000000000110063001100001a1a1a
1a1a631a1a1a10000001100000000000
0000000000001100000000001a1a1a1a
1a1a1a1a000f0a090a090a00005d0
2f30000132102f70"
570 DATA "04208010032904f80ff00
32109f3000ff32509f50010032000000
00000000000000000000000000000000
000000000000000000000000000020746865
2063617665726e206f6620616c69656e
207065617264726f"
580 DATA "0110370732020001919000
19191919190000191900001219190000
00000016000000000000001419630000
0000016000000000000121411111100
001a1a16001b1b000012141400001111
0000016000000000"
590 DATA "0095200000000000006311
000001600001b0016000000000001111
000001600001b000016630000111100
001a1a160000000000160011110000
000001663001b000000001611171717
0017171617171b00"
```

**Trying to play all the games you can get for the Sinclair
(About 5,000 times.)**



clair Spectrum could kill you.

How would you like to be blasted out of the sky by anti-aircraft guns?

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Or eaten for breakfast by mutant rats.

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Because there are more games available for the Spectrum + than any other home computer.

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Not all of which lead to such sticky ends, we might add.

You may, for instance, rather battle it out on the chess board with a Russian grand master. Or cross swords with Nick Faldo on the golf course.

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You'll get first shot at the new ones too. Because most of them become available for the Spectrum + before anything else.

And because there are so many other Spectrum owners there are more books and magazines and clubs to join.

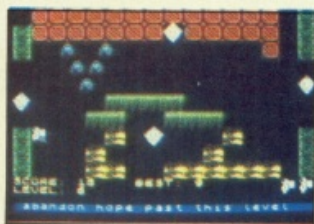
So if you get a Spectrum +, you may well end up in a Grand Prix pile-up.

And your chances of being killed by Gremlins are very high.

But you'll never die of boredom.

sinclair

A screenshot from the video game 'Cavern of Haunting Spirits'. The game is displayed on a dark screen with a blue border. The level is a maze-like environment with various platforms and obstacles. The platforms are made of different materials: some are blue with a white cross-hatch pattern, some are green with a white cross-hatch pattern, and some are brown with a white cross-hatch pattern. There are several enemies, including white, bat-like creatures and small, white, cube-like creatures. A player character, a small white figure, is visible on one of the platforms. At the bottom of the screen, there is a score display showing 'SCORE LEVEL: 00' and 'BEST: 24'. Below the score display, the text 'cavern of haunting spirits' is written in a stylized font.



```

1 REM rocket 2
2 DEF FN a(s)=CODE a$-48-7*
a$-9)-32*(a$-Z-); DEF FN h(a
)=FN a$(11)*16+FN a$(2):
10 LET a=54001: FOR x=100 TO
60 STEP 10
20 READ a$: LET t=VAL a$ ( TO
): LET a$=a$(6 TO ): IF LEN a$ /
<INT (LEN a$ /2) THEN PRINT a$
6,0: "Length error in line " : x :
TOP
40 POKE a, FN h(a$): LET t=t-
EK a: LET a=a+1
50 LET a$=a$(3 TO ): IF a$ <>
THEN GO TO 40
60 IF t THEN PRINT AT 16,0: "E
rror in line " : x: STOP
70 PRINT AT 16,0: "Line " : x: (
K'
80 NEXT x: PRINT AT 16,0: "All
OK": REM Now save the code with
SAVE "CODE" CODE 50000,8500
100 DATA "043241717100000005409
7900ff22f06f60f9e0022807f4000ff2
902ff3e00013a0b7f4002ff2200000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
20726f575465f7765
110 DATA "027657920746f206d757
61674207466f96e66773201800018000
181801800018000018000180c-006
0f000011630b00000c-630b000b000
000631100000000b000b-0b00b000
00000011000e1063"
120 DATA "005100b000c-0c-630c-000
0000001100000c-000b-000b000b000
000001100000c-000b00b00b000-000
000011100000b000c-000c-000b000
00011001100000c-000000b0c-0000000
0011001100000000"
130 DATA "0266100000b000918001
1100001100000c-1000000c=000005906
00000ff3e906f5000ff3e906f5000ff3
502f5000013e502f5000013e0000000
0000000000000000000000000000000
0000000000000000000000000000000
140 DATA "034200000002020696e
61265372756d626c-792073616e64737
6f6e6502761765262020130000001
13000012141414141300012190000026
19000000191919191956319190000000
1900000000001900"
150 DATA "01010001919160000000
1900191963191900630016000000001
19000191900191900190000000000001
190000000000001900000016000001
001919190000000190001619000190
630000001919019"
160 DATA "02505000019190011000
01000000110000110011010011000
11110011000110001100110000005107
3002ff0f3e603f1001003a0e7f4000ff3
608f4001004fe0608f4001004e0000000
0000000000000000000000000000000
170 DATA "03638000000000000000
0000000000000000000000000000000
0000000000000000000000000000000
646f6e20686f706520706173207406
6973206c6576656c202020001c1c1c
1c1c1c1c1c1c1c1c1c1c1c1c1c1c1c1c

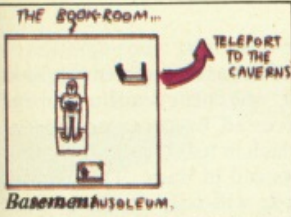
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[illegible]

```

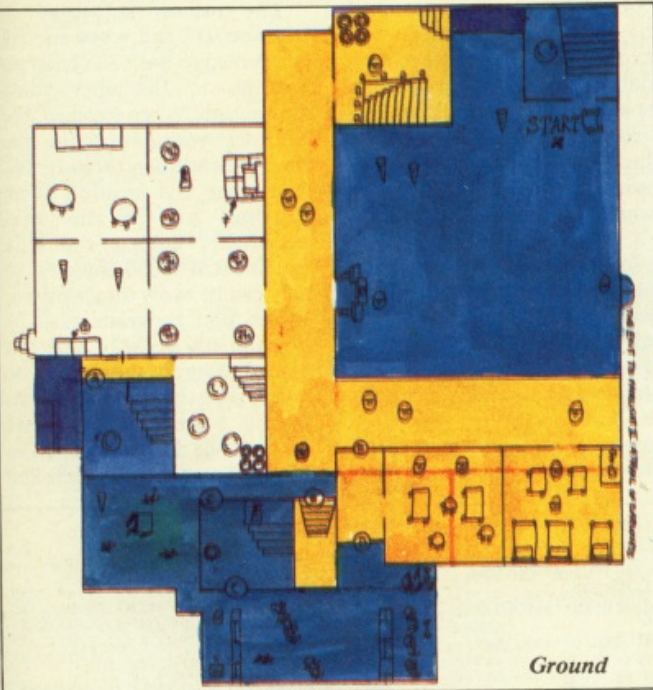
00000262626200000002620000005504f
2001005504f2001000000504f20010055
504f2001005504f200100550000000000
0000000000000000000000000000000000
0000000000000000000000000000000000
300 DATA 0349600000002020746865
206261636fe2070726f3657373696e
6720786c616674202020200000000000
1214141300062006200000000001214
14141414141362006200000000120000
001500000000001413
310 DATA 0123111111100000140015
0015001500001414100110000110015
0063001500001414001111111100000
lala151a00156315001111000000000
0000631500000001500111100lala1a
lala1a00lala1a00
320 DATA 0261100000111100000000
000000000000001500011110000lala
lala1a1a00lala1a00lala1a0005102f
9001005a04f50ff0005a08f4000f5f5a
0008f2001015a008f2001015a00000000
00000000000000000000000000000000
330 DATA 027300000000000000000000
00000000000000000000000000a23400a1
0231007a023400a10231007a02340058
032700ff702260026032900c40345006a
0614001105190060403220058034a0011
051900ff03200058
340 DATA 03335032700260353007a
023400a10231007a023400a10231007a
02340058032700ff702260026032900c4
0345006a06140011051900c403220058
034a0011051900603290058032700c4
0345007a023400a1
350 DATA 034570231007a023400a1
0231007a02340058032700ff702260026
032900c40345006a06140011051900c4
03220058034a0011051900ff03200058
032700c4032700ff023400a10231007a
023400a10231007a
360 DATA 0306602340058032700ff7
022b0026032900c40345006a06140011
051900c403220058034a001105190026
03290058032700c40345005803270026
03290026032900c40322e00f0266003e
041e005a0237007a
370 DATA 03610023400cb0255000c7
041b007a023400cb022e002603530011
051900cb022e002603290058034a0011
051900ff03200058032700580327007a
0234007a023400a10231007a023400a1
0231007a0234007a
380 DATA 03651022e007a023400cb
022e007a023400a10231007a023400cb
022e007a023400cb022e007a023400cb
0231007a02340058032700ff7022b0026
032900c40345006a06140011051900c4
03220058034a0011
390 DATA 0348501900ff03200058
032700260353007a023400a10231007a
023400a10231007a02340058032700ff7
022b0026032900c40345006a06140011
051900c403220058034a0011051900c4
032700260353007a
400 DATA 03730023400a10231007a
023400a1023100cb022e0058032700ff7
022b0026032900c40345006a06140011
051900c403220058034a001105190026
03290058032700c40345005803270026
032900cb022e007a
410 DATA 046810260030e041e0054
0237007a023400cb025500c47041b007a
023400cb022e002603530011051900cb
022e002603290058039060000000c4d5a0
06870e9831cdcd6df096df0683e06cd
6d9f06770e903a1e
420 DATA 05286cd6d9fcd8c9f1301
007f11021500002045a5445520544f
20504c415920524f34454542044314e
204d494b452e0130011001615001004
636f70797269678742031393835c2c
6279206b61726c20
430 DATA 099056a566666572792e
007fffd2180964d6e00dd23d6600dd
23d5d00dd23d5600dd237c28e4dd
53c5e503dde101febdf78cb4520ab4
1fcb6f120d206b728cde4b69a03a61a
b8c043a26a0b930
440 DATA 069940ed4360a0af3265
a0328d45c369a0326a03268a005c32
67a03e80326a0326da021a0bc060f3e
3c506a0eb2002361d10108f09160009
c110ee21a08c1600060f3e1cd506a0be
2001142310f90160
450 DATA 082930009c110eff7a326a
a0cd45a03a67a0000fe0eff53e01cd6d
9f79d6184ff13d20f23e01cd0116dc8
9f160010011011007ffaf326a032700d
326fa03c326a03e04326a0ad4b6da0f
ed4371a036a8a067
460 DATA 07904e200111800c190620
7ed2310fb22549d22f59a25d906af
0e007eb72807e5c5cd6d9fcd1e1379c6
104fd20ee78d61047e0ff0e62323206
0a110000dd2176a07e23dd77037e23dd
77047e23dd7707e2
470 DATA 0717232dd77007e23dd77
071e23dd7705afd77063cd7707d77
10d63e3cd00116cd8c9f100613011614
0053432f524534cd4c4565443c1a614
007fed4b69a0cd1bacd8c9f161057ff
3a6803ac0604fcd
480 DATA 096441bacd8c9f16140d
42455343a20ffed69a0cd1bacd1fabf
45fe028021e0001fefed785701febfe
ed78a2f6m03c2002cbe301fefeed78e6
16f7f60a5701fe778e6f16ff6f15a2e
cb4b2004fe1f2811
490 DATA 075053a6fa03d3dfec28
08326fa03e013264a07cf615677fd60a
a4cb432004fe1f2811a6fa03c3cfe04
2808326fa03e053264a0afcc328143a
5fa03d282b3e01325fa03263a03d326f
a0181d325fa00fe1f
500 DATA 09486fbcd785701fedfed
78a2e6f1eeff3eff2004cb5b28023e01
3270a0ad4b6da0cd47cd499d78d60f47
cd499497c960ff4cd499d78c60ff47cd4
9d78feaf200f3a68a03c3268a03c273
6ea0c3369aef1f20
510 DATA 094070f3a68a03d3268a0
3a7326e0a3369a326m03a63a0b720
05e04326a030f0240063a7a0a03262a0
3a6fa0573a6da0824f3a6ea047cde19d
79c60ff4cde19d78d60f47cde19d79d6
4fcd4cde19d79f1f20
520 DATA 09098380afefa3ef30001
afcd39a0326da0cd4b6da03a63a0b73a
64a05f280a36a0cd60183c6d2180a79
cb3c3fcb3fcb3fcb0183c6d69fdd2176a0
c063273a0cd6601dd6e00d7c52857ff4
dd8603dd770347c7e
530 DATA 090518d8604dd7704474d
3406dd7e02dd6e020107ced44dd7701
7ded44d7700af2d77063a6a0dd8605
cd69f3a6da0cd60dddb033
```


Hot Shots



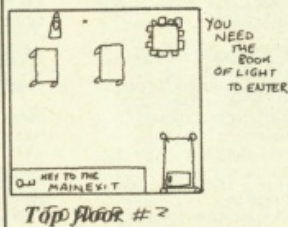
MAP OF FAIRLIGHT

by Mischa Welsh
and Stephen Hill

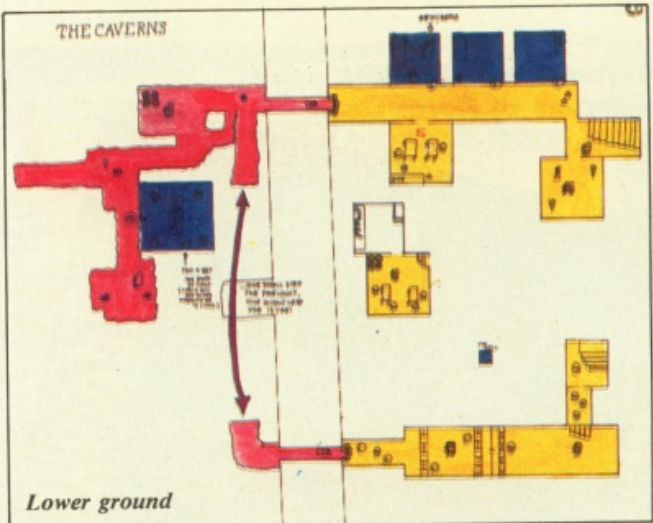


Ground

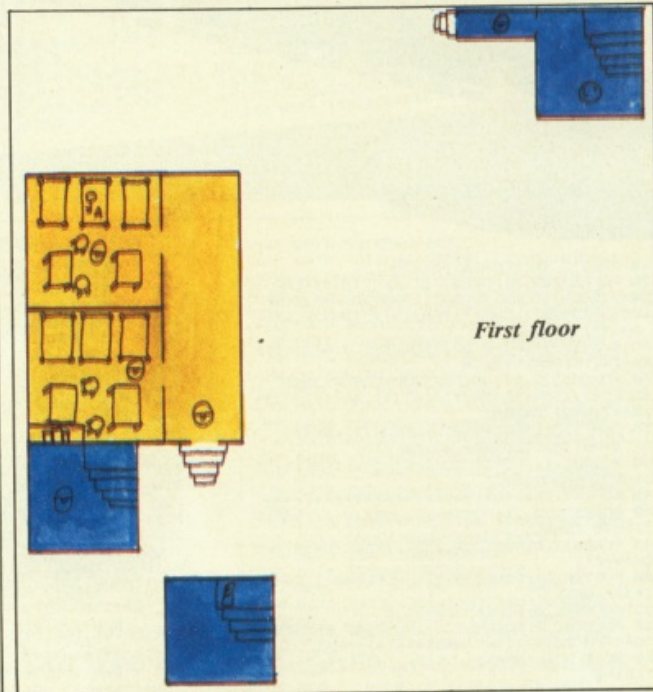
It's the dead of night — no one can hear you scream. No one, that is, except David Williams. Call him on 041-770 9599 after 9pm for help with your adventure problems.



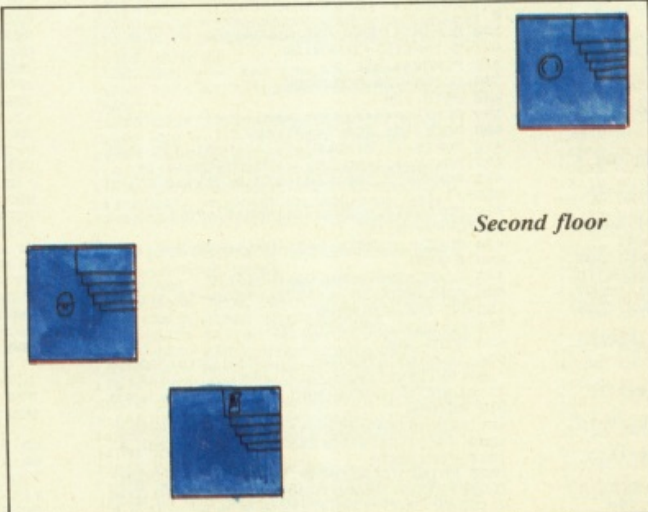
Top floor #2



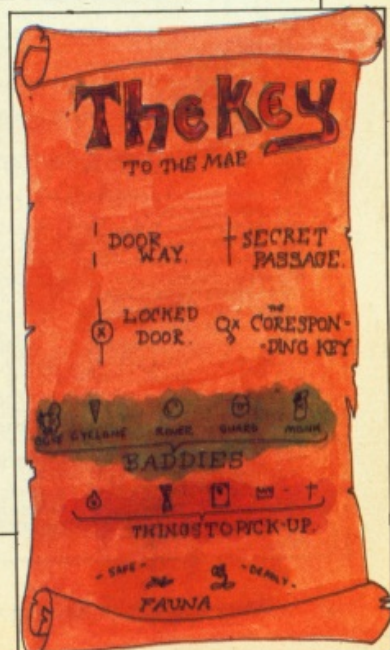
Lower ground



First floor



Second floor



Telsoft

The programs given here will enable Spectrum, BBC, and CBM-64 owners to download via *Your Computer's Telsoft* service. Each month for each machine we transmit least one — and usually two — of the main programs appearing in the current issue. Also available is the full user to user communica-

tions program Dialsoft.

So far OE LTD's Telemod 2 and the VTX 5000 modems have been tested with the BBC and Spectrum but the service also works with a number of other makes. For the CBM-64 it will initially only be available with the OEL Comms pack together with the Telemod 2 or similar modem; later we hope to

adapt the service to work with Commodore's modem.

Hexloader

To enter the download program first type in the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. Once the program has been saved you can run it by entering CALL

&6000 on the BBC, SYS 51000 on the CBM 64, RANDOMIZE USR 60000 on the Spectrum.

To find out what is available 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 bits/ services.

When a program you want to

Figure 1. CBM-64.

```
5 REM HEX LOADER FOR CBM 64 FIG.1
6 REM
10 FOR I=680 TO 727:READ:POKEI,A:T=T+A
20 NEXT I: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 300
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#B:NEXT GOTO 150
300 E#D=D: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"="
550 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#=(H#*34)
810 PRINT PRINT" TO RECORD 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. CBM-64.

```
51000 ? A9068D21D08D2D00=3E2
51008 ? A90F8D600A90E20=2E4
51016 ? D2FFA9008D15D0A9=4DD
51024 ? FF8D8A02B8E92CE=510
51032 ? 20C4C920C7C820F8=4D5
51040 ? C8AD80CE931F023=532
51048 ? C935F814C936D06=43F
51056 ? 208EC74C5BC7A914=410
51064 ? 202FF202FCB0D0B=52E
51072 ? 203FC8A9202D2FF=45E
51080 ? 4C93C94C4AC82063=411
51088 ? CC2022CD95885FD=4F1
51096 ? A9CE85FE202CD0A=547
51104 ? 002095CC022FCBC9=404
51112 ? 44F008C954D0ED20=4E1
51120 ? D2FFA9008D15D0A9=4DD
51128 ? 202FFA90885BA20=4B9
51136 ? 25CD908C007A944=6A3
51144 ? B085F8A9C085FEA0=4A0
51152 ? 002095CC0225CD=383
51160 ? 95CC9648A0048C3=44C
51168 ? CE2D08C968A0205=4C4
51176 ? CD2095CC9848A906=4C5
51184 ? 8D83CE20D0C9AD7F=5E3
51192 ? CE85F8AD80CE85FC=6EA
51200 ? 68A82060C8A9185=38A
51208 ? B885B998A920A0C=539
51216 ? C0E8DFA9A9CEA0A=567
51224 ? 208D0001C8205CD=479
51232 ? A9FB20D8FF20F1C=579
51240 ? 6020D9CC90D000B=3FE
51248 ? A90085C7A92020D=3E9
51256 ? FFA90D20D2FF60A9=4E7
51264 ? 0D2029C8A90D20D=306
51272 ? FF602063C0A000A9=43F
51280 ? FF9993CEC8D0FA20=5FB
51288 ? D2CB90FB20D2CB00=5ED
51296 ? FB8D72CEA0008C7C=4D0
51304 ? CE8C7DCE202ECCAD=4D4
51312 ? 72CE29FC98D00E4=5C6
51320 ? 20D2CB0DA9973CE=599
51328 ? C8202ECC009D00A=4E8
51336 ? A000AD76CE2000D0=492
51344 ? 0FA52B85F1B18A52C=3D8
51352 ? 6D75CE85FC4AC808=507
51360 ? AD78CE85FB0D79CE=607
51368 ? 85FC20D2CB0A820=55E
51376 ? D9CC20D2FFC8D09=607
51384 ? CC202ECC019D00EA=528
51392 ? A920D02FFAD75CE=56A
51400 ? 202ECCD20D2CB007=4D7
51408 ? CD7CCEFB08A9520=503
51416 ? D2FF2030C84C57C=52D
51424 ? 20D2CB0F8CD7CE=65D
51432 ? D0E8BD75CE8A993=687
51440 ? CED00E2030C8A91=4EE
51448 ? 20D2FF4C7FC94C5=51F
```

```
51456 ? C8A0008C70CE8C7D=447
51464 ? CE20D2CB0F091FB=5BF
51472 ? 202ECC8CC77CED0=4D3
51480 ? F020D2CB0E9C7C=59E
51488 ? CE008A95820D2FF=4D8
51496 ? 4C57C820D2CB00CE=4CE
51504 ? CD7DCEFB034C23C9=473
51512 ? 20ACCB2030C8AD75=409
51520 ? CE8A9009993CEAD=506
51528 ? 84CE902D02520C0=436
51536 ? CBA9C820F3C8A955=568
51544 ? 2016CDA95020F3C=432
51552 ? 20C7CBA9C73CE888=54F
51560 ? B993CED0239D0F7=5D4
51568 ? 4C58C7A9552016C=3DF
51576 ? 20F1C84C63C9AC77=4EF
51584 ? C20D2CB08D0FA20=57D
51592 ? D2CB20D2CB4C7C9=53E
51600 ? 4C5CC8A952B85FA=4F5
51608 ? 2C85FCA000B1FB99=52A
51616 ? 2200C8B1FB8523F0=44C
51624 ? 08A52285FBA82385=447
51632 ? FC4C9BC918A5FB69=57D
51640 ? 02852D85E8531A5=37B
51648 ? FC690085E853085=412
51656 ? 32602063C0A902D=3E1
51664 ? 84CEA908D02DE0A=4A3
51672 ? 8E81CE8C82CEA20=533
51680 ? A9098DCECE202FCB=4D4
51688 ? C914F916C90DF051=4E2
51696 ? C924D01920D2FFB0=544
51704 ? C3CE84CE5C9E000=64B
51712 ? D0E3E000F0DF20D=554
51720 ? FFC4CCE5C9C93090=554
51728 ? D4C93A901548ADC3=444
51736 ? CEC924F004684CE5=460
51744 ? C968C941908FC947=48A
51752 ? B08B20D2FF38E930=4D5
51760 ? C90A9002E907E05=36A
51768 ? F0A89DC3CE84CE5=61A
51776 ? C9E000FA00A01D0=52A
51784 ? 07ADC3CE924F095=44F
51792 ? A920D02FFA99FFD=54F
51800 ? C3CEA2008CEFCBE=54E
51808 ? D0CE8ED1CE8ED2CE=559
51816 ? AD3CE924D006A9=519
51824 ? 0F8DCCCE88DCCCE=5D0
51832 ? C9FF01D20C0CA08=582
51840 ? 3418DC3CE6DCFC=524
51848 ? 8DCEFC9A006DD0CE=566
51856 ? 8DD0CE8020E84C75=534
51864 ? C8ADCEFC8C3CE99=640
51872 ? A3CE8ADDD0CE99A=652
51880 ? CEC8188C83CEA82=561
51888 ? CEAE81CE60205D=4ED
51896 ? A2008D41CE921F0=500
51904 ? 0720D2FFC8B1FDC9=570
51912 ? 4CDEC9ADCCE8DCE=65E
```

```
51920 ? CEADCFCE8DD1CEAD=4C1
51928 ? D0CE8DD2CE18ADD1=63A
51936 ? CE6DCFC8DCEAD=68F
51944 ? D2CE6DD0CE8DD0CE=6BE
51952 ? B085CECECEDE660=625
51960 ? 2063C8A90F8D602=414
51968 ? A95185F8A9C8D5FE=575
51976 ? A000209DCC2025CD=343
51984 ? 20D0C209DCC209D=3DF
51992 ? CC2022CD20A9CC20=3A8
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52008 ? 202FCB20D2FF608E=421
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52160 ? DEA9128D00DE60A9=4CD
52168 ? 538D00DEA9528D00=40E
52176 ? DE60A996188D07CE=547
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52192 ? CC20ECCCCE87CED0=677
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52208 ? 60A9FA8C82CEA820=597
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52224 ? 602004CC8A82A8CA=3EE
52232 ? D0FDA92069CC6020=454
52240 ? 25CDA90220A8CC20=364
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52256 ? A920D02FFA90320=3A6
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52296 ? 108D7DCE2E70CE2E=3D5
52304 ? 7DCEAD0E160A000=516
52312 ? A9009900D4C0C18=40E
52320 ? D0F660A99320D2FF=583
52328 ? 6048A9A2290FD01F=37E
52336 ? AD548A8A22910F0=4A1
52344 ? A5A9A44C80CC920=42B
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52360 ? 9D20D2FF6885D468=53F
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52376 ? 21D0F6C0802025CD=489
```

```
52384 ? A90C20A8CC2095CC=46D
52392 ? 60A9058E81CEA9A9=4E6
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52784 ? 284D415820313620=1E5
52792 ? 4348415227532020=219
52800 ? 21124E4F54205641=21B
52808 ? 4C944942C205452=285
52816 ? 5920414741494E20=249
52824 ? 3A2021444954320=216
52832 ? 4F52205441504520=268
52840 ? 282042F54202920=1E0
52848 ? 3F21000000000000=000
```


A reminder of how to use the Telsoft service.

download is on line, make sure your modem is set up and dial the number appropriate to its 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 are 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.

Option 6 for CBM-64

Note that CBM-64 owners will need to use Option 6 if machine code is to be saved.



Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HIMEM=&69FF
20 CLS:PRINT
30 INPUT "START ADDRESS (Hex)":A$
40 A=VAL("&"+A$)
50 IF A>&6F87 THEN 200
60 IF A<&2A00 OR A>&6FE7 THEN 200
70 PRINT "A"
80 INPUT ":" B$,C$
90 IF LEN(B$) <> 16 THEN 50
100 T=0
```

Figure 2. BBC.

```
6000 :A9CB8FA20120F4,4C6
6001 :FF20616C20406DC0,30A
6002 :131F00B9C3F0E9C9,4C0
6003 :135F00B9C3F0E9C9,4C0
6004 :6AA98C20E3FFA9E9,4B2
6005 :A000A2FF206FFA9F,200
6006 :03A20020FFA9A02,363
6007 :A20220FFA9A02,363
6008 :FEA20020FFA9A02,363
6009 :0C20E3FF206FFA9F,439
6010 :15A20120FFA9A02,363
6011 :A9FF009905F0D0A,507
6012 :A915A20120FFA9F,200
6013 :0C6C70F0206C6C0,394
6014 :79B470A7B0578E2,300
6015 :05A00572F08C90,489
6016 :D0E2206C6C00099,460
6017 :100C8200506C009,364
6018 :D0F000005742908,422
6019 :D000A01C057610A5,354
6020 :1D65730577F08C6,209
6021 :000520E3F7C8205,524
6022 :00A100F0A057320,439
6023 :B26D200C6C000A0,33C
6024 :17AF000A95020E3FF,478
6025 :120E7FFAC76A200,34F
6026 :16C000C3F080A9,48A
6027 :5020E3FF206FFA9F,439
6028 :16AA0573A089056,43C
6029 :00E20E20FFA9A02,363
6030 :E3FFAC3B64C676A,507
6031 :A000047A047B200C,2C9
```

Figure 1. Spectrum.

```
5 REM SPECTRUM 40k
10 REM Hex Code Loader
15 CLEAR 50000
20 POKE 23650,0:CLS:PRINT
30 INPUT "Start Address":A$
40 IF A>&1135 THEN GO TO 200
60 IF A<&0000 THEN GO TO 20
70 PRINT A$
```

Figure 2. Spectrum.

```
60000 :C015EDC307ECDD15,4C7
60001 :EDCD36ECC066EBCD,631
60002 :50EDCD47EE30FBCD,5AF
60003 :00EDFE31CA99EAFE,69A
60004 :15ED3EACD04EDCD,5FD
60005 :15ED3EACD04EDCD,5FD
60006 :EACD66D11E5E06,5BC
60007 :EACD66D11E5E06,5BC
60008 :15E111C0EE06173E,302
60009 :20121311C0E01FED,3DA
60010 :30F00C05EDCD1FED,50B
60011 :30F00C05EDCD1FED,50B
60012 :30F00C05EDCD1FED,50B
60013 :30F00C05EDCD1FED,50B
60014 :30F00C05EDCD1FED,50B
60015 :30F00C05EDCD1FED,50B
60016 :30F00C05EDCD1FED,50B
60017 :30F00C05EDCD1FED,50B
60018 :30F00C05EDCD1FED,50B
60019 :30F00C05EDCD1FED,50B
60020 :30F00C05EDCD1FED,50B
```

```
110 FOR N=0 TO 7
120 X$=MID$(B$,2*N+1,1):GOSUB 300
130 IF E=1 THEN 260
140 X$=MID$(B$,2*N+2,1):GOSUB 300
150 IF E=1 THEN 260
160 B=EVAL("&"+MID$(B$,2*N+1,2))
170 "A=B: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=EVAL("&"+C$) THEN 500
240 PRINT "CHECKSUM ERROR !"
250 A=A-8:GOTO 50
260 PRINT "TYPING ERROR !"
270 A=B*(A DIV 8):GOTO 50
280 "SAVE "DOWNLOAD" 6A00 6F87
290 END
300 E=0:IF ASC(X$)<48 THEN E=1:RETURN
310 IF ASC(X$)<58 THEN RETURN
320 IF ASC(X$)<65 THEN E=1:RETURN
330 IF ASC(X$)>71 THEN E=1
340 RETURN
```

```
6000 :496CC8F0D02380,374
6001 :A5BAC902D0062079,369
6002 :E0B0EC6A0A991A201,447
6003 :20F4FF9BA47E80DF,35C
6004 :600A2D2C0EACD0E,5AA
6005 :F00A95020E3FFAC,447
6006 :1676A20C76B20E7FF,429
6007 :A573A0A90079B56F,3F6
6008 :A5BAC902D0062079,369
6009 :600A95020E3FFAC,447
6010 :20E3FF20A0A90A,3E4
6011 :20006EA90795B2A9,2F0
6012 :16F5B3A00020F6C9,39C
6013 :20156DC941F00BC9,370
6014 :42F011C943F0174C,3A2
6015 :16C6A900A20120F4,4C6
6016 :FFAC87F6CA90A203,3C4
6017 :A20A20F4FFFE68A5,4C6
6018 :7C20E3FFA47E20A0,460
6019 :F00A95020E3FFAC,447
6020 :1676A20C76B20E7FF,429
6021 :A573A0A90079B56F,3F6
6022 :A5BAC902D0062079,369
6023 :600A95020E3FFAC,447
6024 :20E3FF20A0A90A,3E4
6025 :20006EA90795B2A9,2F0
6026 :16F5B3A00020F6C9,39C
6027 :20156DC941F00BC9,370
6028 :42F011C943F0174C,3A2
6029 :16C6A900A20120F4,4C6
6030 :FFAC87F6CA90A203,3C4
6031 :A20A20F4FFFE68A5,4C6
6032 :7C20E3FFA47E20A0,460
6033 :F00A95020E3FFAC,447
6034 :20E3FF20A0A90A,3E4
6035 :20006EA90795B2A9,2F0
6036 :16F5B3A00020F6C9,39C
6037 :20156DC941F00BC9,370
6038 :42F011C943F0174C,3A2
6039 :16C6A900A20120F4,4C6
6040 :FFAC87F6CA90A203,3C4
```

```
6041 :A90C20E3FF20A0A9,3E4
6042 :A90720006EA99A05,306
6043 :B2A96E05B3A00020,361
6044 :F00A95020E3FFAC,447
6045 :20E3FF20A0A90A,3E4
6046 :600A95020E3FFAC,447
6047 :600A95020E3FFAC,447
6048 :600A95020E3FFAC,447
6049 :A90720006EA99A05,306
6050 :600A95020E3FFAC,447
6051 :600A95020E3FFAC,447
6052 :600A95020E3FFAC,447
6053 :600A95020E3FFAC,447
6054 :600A95020E3FFAC,447
6055 :600A95020E3FFAC,447
6056 :600A95020E3FFAC,447
6057 :600A95020E3FFAC,447
6058 :600A95020E3FFAC,447
6059 :600A95020E3FFAC,447
6060 :600A95020E3FFAC,447
```

```
80 INPUT "i":i$
85 IF B$="END" THEN GO TO 200
90 IF LEN B$<20 THEN GO TO 260
100 LET t=A-256*INT (A/256)
110 FOR N=0 TO 7
120 LET X$=MID$(B$,2*N+1,1)
125 GO SUB 300:LET Y$=X$
130 IF E=1 THEN GO TO 260
140 LET X$=MID$(B$,2*N+2,1)
145 GO SUB 300:LET Y$=Y$+X$
150 IF E=1 THEN GO TO 260
170 POKE A+1,Y$:LET A=A+1
180 LET T=T+Y$:NEXT N:LET Y=0
190 FOR M=1 TO 3
200 LET X$=MID$(T,M,1)
205 GO SUB 300:LET Y$=Y$+X$
210 IF E=1 THEN LET A=A+1:GO TO 260
220 NEXT M
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=B*(A DIV 8):GO TO 50
280 SAVE "download"CODE 6000,1136
290 POKE 23650,0:STOP
300 LET E=0:LET X$=CODE X$-40*(X$ DIV 16)
310 IF X$<0 OR X$>15 THEN LET E=1
320 RETURN
```

```
60000 :D73E00D7F1E1D1C1,640
60001 :6FEFCB1623C81680,350
60002 :19F0E0C214F0E0B2,300
60003 :10F0E0C214F0E0B2,300
60004 :00F0E0C214F0E0B2,300
60005 :00F0E0C214F0E0B2,300
60006 :00F0E0C214F0E0B2,300
60007 :00F0E0C214F0E0B2,300
60008 :00F0E0C214F0E0B2,300
60009 :00F0E0C214F0E0B2,300
60010 :00F0E0C214F0E0B2,300
60011 :00F0E0C214F0E0B2,300
60012 :00F0E0C214F0E0B2,300
60013 :00F0E0C214F0E0B2,300
60014 :00F0E0C214F0E0B2,300
60015 :00F0E0C214F0E0B2,300
60016 :00F0E0C214F0E0B2,300
60017 :00F0E0C214F0E0B2,300
60018 :00F0E0C214F0E0B2,300
60019 :00F0E0C214F0E0B2,300
60020 :00F0E0C214F0E0B2,300
```


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(continued on next page)
Listing 1

**Jason Charlesworth
hazes bugs.**

A screenshot from the Super Mario Bros. game. The scene is set in a dark, cave-like environment. Mario is positioned in the lower center, standing on a stack of four blue blocks. A snail is on the block directly above Mario. The level is populated with numerous mushrooms: many are red with white spots, and a few are green. The bottom of the screen displays the game's status: 'LIVES' followed by three 'A's, a small icon of Mario, and 'SCORE' followed by five '0's.

YOUR COMPUTER, DECEMBER 1985 83

Maggot Splat

(continued from previous page)

of them are a bit vicious. Never mind you think, you can use your world famous Haze gun — Hurt and Zap 'Em — on them and rid your beautiful garden of all those horrible creepy crawlies.

So the scene is set for an epic show down of man against bugs in this game for the Amstrad. In the game you control the laser base at the bottom of the screen and may move in all directions in your efforts to remove the maggot from the garden. The maggot is however incredibly thick and even though you shoot it, it doesn't realise it's dead but instead splits up and each segment has its own life. Thus you must shoot each section of the maggot. This task is hampered by the other creatures in the garden. There are also spiders, fleas, and snails.

Shots worth 50 points

Fleas simply drop from above and if they encounter a mushroom, they jump over it. Spiders generally stay away from the laser base but if they hit a mushroom, they poison it so when a maggot hits it the maggot plumes down dead. The touch of any of these creatures is deadly.

For each snail shot you get 50 points, each spider is worth 50, each flea is worth 30 and each section of the maggot is worth 20. Mushrooms may be shot and each section of mushroom is worth 1 point.

This game is written in machine code and so features very smooth graphics which in the case of the laser base is interrupt driven to give an extra smoothness. The game may be played with either keyboard or joystick.

To set the game, type in listing 2 and save it to tape with SAVE "MAGGOTS"

Next type in listing 1 and run it. If an error is found, correct the error and re-run the program. Repeat this until no errors are found and then save machine code to tape directly after "Maggots with SAVE 'CODE',b,30000,4000

The game may now be run and loaded from the tape with RUN "MAGGOTS"



Listing 2.

```

10 ENV 5,15,1,1
20 ENV 1,5,3,1,5,-2,1,1,0,4,5,-1,1
30 ENV 2,5,3,1,5,-3,2
40 ENV 4,5,3,1,5,-2,1,5,-1,2
50 ENV 3,5,1,1,3,3,1,3,-3,1,5,-1,1
60 DIM n$(6),n(6):FOR a=1 TO 6:READ n$(a),n(a):NEXT
70 MEMORY 29999
80 PEN 1:MODE 0:PRINT" PLEASE WAIT":LOAD "!"
90 INK 0,0:INK 1,26:INK 2,20:INK 3,6:INK 4,21: BORDER 0
100 PEN 1:MODE 0:PRINT" MAGGOT SPLAT":PRINT:PEN 2:PRIN
T" By J.Charlesworth"
110 PEN 3:LOCATE 8,8:PRINT"0 Abort"
120 PEN 4:LOCATE 8,10:PRINT"Q Up":LOCATE 8,12:PRINT"A D
own"
130 LOCATE 8,14:PRINT"O Left":LOCATE 8,16:PRINT"P Right
"
140 PEN 2:LOCATE 4,18:PRINT"Space Fire"
150 PEN 1:LOCATE 4,20:PRINT"Or use joystick"
160 PEN 4:LOCATE 4,23:PRINT"Press J for Joystick or K
for Keys"
170 a$=INKEY$:IF a$="j"OR a$="J" THEN POKE 32704,72:POKE
32712,73:POKE 32728,74:POKE 32720,75:POKE 31355,76:GOTO 2
00
180 IF a$="k"OR a$="K" THEN POKE 32704,67:POKE 32712,69:P
OKE 32728,34:POKE 32720,27:POKE 31355,47:GOTO 200
190 GOTO 170
200 CALL 30633:sc=PEEK(32973)+256*PEEK(32974)
210 FOR A=0 TO 50:a$=INKEY$:NEXT
220 FOR a=1 TO 6:IF sc>n(a) THEN GOTO 280
230 NEXT a
240 MODE 0:PEN 2:PRINT" Hi Score Table":FOR a=1 TO 6:LO
CATE 2,4+2*a:PEN a+1
250 PRINT n$(a):LOCATE 13,4+a*2:PRINT n(a):NEXT a
260 FOR a=0 TO 2500:IF INKEY$="" THEN NEXT a
270 GOTO 90
280 IF a<>6 THEN FOR b=5 TO a STEP -1:n$(b+1)=n$(b):n(b+1
)=n(b):NEXT b
290 n(a)=sc:LOCATE 1,25:PRINT" ";:LOCAT
E 1,25:INPUT "Name ";n$(a)
300 GOTO 240
310 DATA Jetman,1000,Hippo,800,Shaggy,600,Scooby,400,Gree
n Sofa,200,Zarquon,100

```


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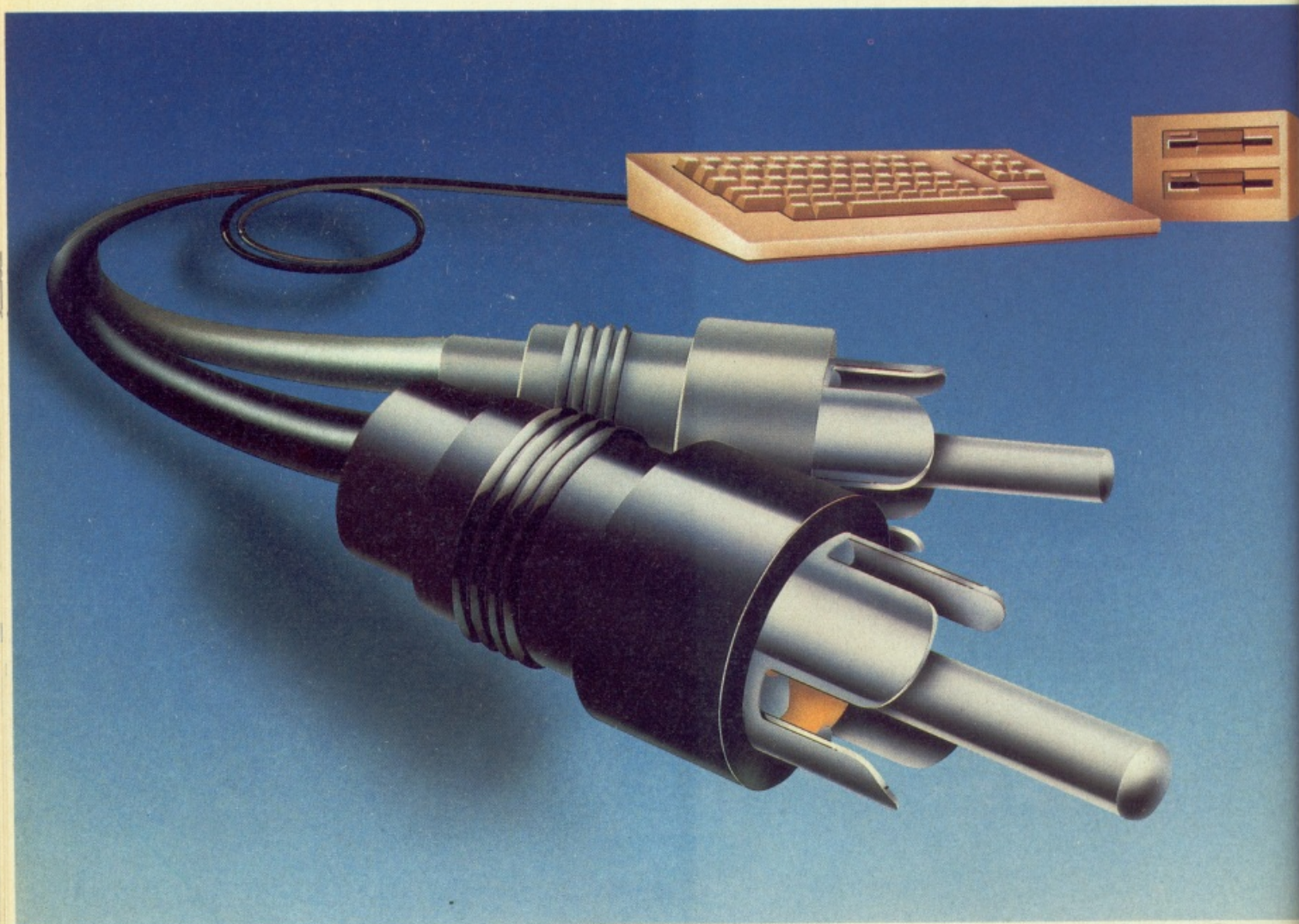
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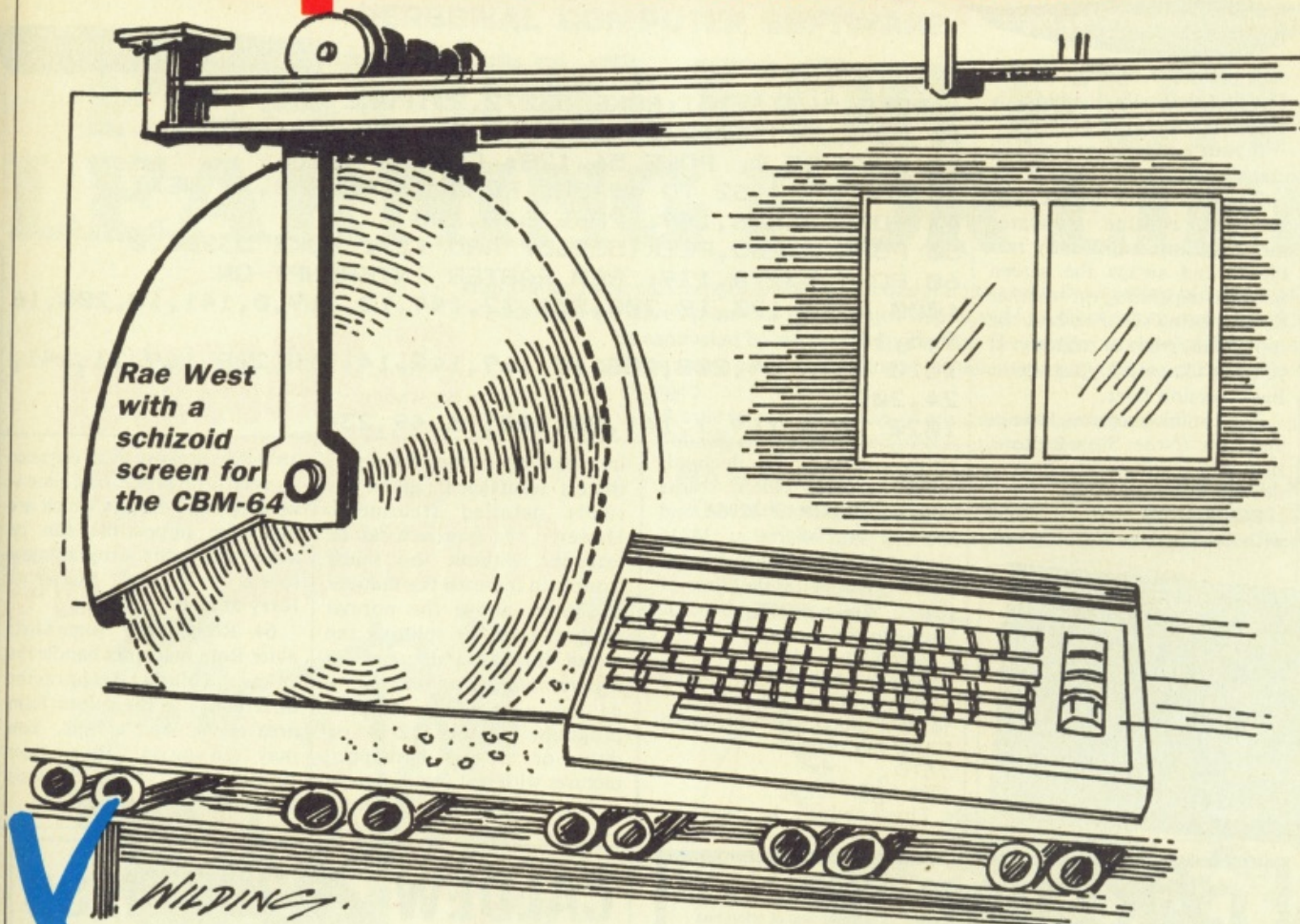


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Split-screen



You've probably seen adventure games with scrolling text in a few lines at the bottom of the screen, and some sort of picture at the top. Often this effect is produced by dividing the screen horizontally in two parts, with the screen taking part of its information from one display, ordinary text in our example game, and part from another — bitmapped or user-defined graphics characters.

We're not talking here about windows or pop-up menus; these have to be programmed by moving stored-up portions of Ram into the screen, and the overwritten parts have to be stored elsewhere or reprinted. Nor are we discussing the simpler effects where, typically, the border of the screen appears as erratic colored bands, and true interrupts aren't used.

Splitscreen graphics rely on the fact that the screen is

scanned from top to bottom 50 times a second or so; the computer is fast enough to be able to take time off its normal tasks to alter the screen's parameters regularly at every scan.

Raster interrupts

Raster interrupts: VIC-II is a chip controlling TV output. These are the relevant locations for us:

D013's high bit is bit 8 of the raster scan line.

D012 = 8 lower bits of the scan line; so the maximum range is 0-511. When read, these registers show which screen line is being processed; writing to them sets an interrupt point.

D01A sets various Interrupts and clears the corresponding flags after an interrupt. We're interested in bit 0; setting this high will cause an interrupt to occur when the TV scan line matches the value put into the two registers above.

D019's bit 0 must be cleared if we wish to cause further interrupts.

Interrupts are used by the 64 to read the keyboard; we'll have

to add our own routines. This sort of thing is typical: (i) in Basic, we use POKE 56333,127 to turn off the ordinary, time-controlled interrupts.

POKE 788,0: POKE 789,192 redirects interrupts to \$C000 (49152), the 64's free area of Ram. Then, after adding a routine at \$C000, POKE 53274,129 turns raster interrupts on.

"Your Computer", June '85, has my article listing all screen positions available on the 64. They are controlled by the contents of DD00 (56576), D018 (53272) and \$288 (648). To keep things simple, we'll use two screens, one starting at 32768, the other at 38912. These positions, unlike most others, allow VIC-II to use the inbuilt character set without the need to move it around in memory. However, we do have to poke the top of Basic to prevent it overwriting the screens.

Another actor in the drama is colour Ram: a single block of memory (D800-DBE7) which controls the principal colour in

Assembly language listing.

INT	C000	LDA	D012	;Read raster line
	C003	CMP	#\$50	;Comparison decides whether
				top or bottom
	C005	BCC	TOP	;Branch if at top of screen
	C007	LDA	#\$00	
	C009	STA	D012	;Next interrupt will be at scan
				line 0
	C00C	LDA	#\$05	;Reset screen to start at 32768
	C00E	STA	D018	;Exit
	C011	BNE	EXIT	
TOP	C013	LDA	#\$91	;Next interrupt at line 145 —
	C015	STA	D012	about midscreen
	C018	LDA	#\$15	;Reset screen to start at 34816
	C01A	STA	D018	
	C01D	LDA	#\$01	
EXIT	C01F	STA	D019	
	C022	JMP	EA31	Exit to normal keyboard
				reading routine

(continued on next page)

Split-screen

(continued from previous page)

Demo program

each character of 8 by 8 dots. The fact that only one block is available can cause problems.

If you've experienced in 6510 machine language, you'll be able to follow how the interrupt handling routine separates incoming interrupts into two types, and swaps the screen position depending on whether the line being scanned is at the top of the screen or midway. If you don't know ML, just try the Basic version later.

Type in this program, Save it, and Run. (Note: Stop-Restore, then Run 1, will get you back to normal in emergency).

POKE 56576, 149 combined with the interrupt's pokes into

```
0 GOTO 10
1 POKE 56576,151:POKE 53272,23:POKE 648,4:END
10 POKE 56333,127: POKE 788,0: POKE 789,192
20 POKE 55,0: POKE 56,128: CLR
30 FOR J=49152 TO 49188: READ X: POKE J,X: NEXT
40 POKE 56576,149: POKE 648,128
50 POKE 53265,PEEK(53265) AND 127: POKE 53266,0
60 POKE 53274,129: REM RASTER INTERRUPT ON
1000 DATA 173,18,208,201,72,144,12,169,0,141,18,208,16
9,5,141
1010 DATA 24,208,208,10,169,145,141,18,208,169,21,141,
24,208
1020 DATA 169,1,141,25,208,76,49,234
```

D018 (=53272 in decimal) make the screen switch, so the bottom half starts at 32768, and the top half starts at 34816. Now, POKE 648,128 causes Basic to write to the first of these, while POKE 648,132 writes to the second.

```
0 GOTO 10
1 POKE 56576,151: POKE 53272,23: POKE 648,4: END
10 POKE 56333,127: POKE 788,0: POKE 789,192:
...ETC...
```

```
1020 DATA 169,1,...
```

This article is just an

introduction to the technique: there's insufficient space for really detailed treatment. However, the approach can be extended without too much trouble to increase the number of sprites above the normal meagre, eight by splitting the screen into several zones — *Programming the Commodore 64* has a specimen 32-sprite program, number 12-34 on disc), or to mix bitmapped pictures with text (on disc too).

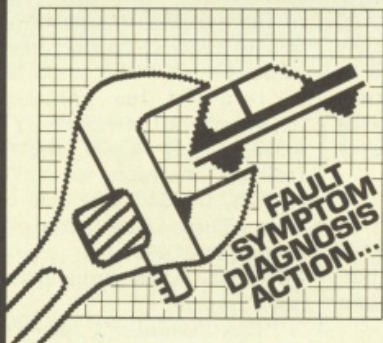
The technique is quite

attractive because of its elegance — very little processing time is used up, and effects which are otherwise impossible can be achieved. Some programmers love it — like Jeff Minter of furry animals fame.

64 Roms vary somewhat: older Rom machines handle the space (blank) character differently, so the colour Ram area shows odd effects. You may find you 64, with an older Rom, doesn't run the Basic program very successfully.

Rae West has written a 600 page reference book. *Programming the Commodore 64*, recently published by level Ltd. It is obtainable from Biblos Distribution, Star Road, Partridge Green, Nr Horsham, W. Sussex at £14.90 plus £1 post.

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Disc Cat

I was mildly embarrassed recently when a friend offered me some non-copyright programs. Instead of the usual muddle of discs they were neatly arranged and numbered in a box on a shelf. What was intriguing was that he had a card index itemising each file and the disc it could be found upon.

The embarrassment came a few weeks later when he returned the visit. Offering to repay the programs in kind I performed my usual scramble through the pile of discs on my shelf and madly started to *Cat them hunting for the file I was looking for.

Card indexes are not for me, the main reason being that I cannot organise myself efficiently enough to update them. But possibly more importantly I don't possess massive stocks of computer equipment for it to sit idly by while I fill out forms.

The specification for this program came from this experience. what I wanted was a program which would allow me to insert the discs one at a

Fintan Culwin sorts out BBC discs



This program is available on the Telsoft service.

time. After inserting the disc I would have the option of rejecting some of the files. The remainder would be filed somehow. When all the discs had been processed, it would be possible to produce a printed listing of the information.

Considering the problem further, it would have to be possible to add to this list as my collection of discs grew, rather than recatalogue the entire file. If a file grew, for example the new information would have to overwrite the old information rather than have it entered as a

separate entry.

To accommodate this I would have to give each disc in my collection a name and a number. The first part of the printout would be an ordered list of the discs and their titles. The second part would be a list of the files in alphabetical order, together with the number of the disc that they could be found upon and the filing system information contained upon them.

This seemed simple enough for me to manage. So, satisfied that I could accommodate my ways to the system and that the

system would satisfy my needs, I started the detailed planning stage.

The first and simplest problem concerned the storage of the information. With even a moderate collection of full discs it would probably be impossible to hold all the information in the computer's memory and manipulate the information at the same time. So the information would have to be filed on disc and manipulated there.

The second problem was how

Listing 1.

```
10REM FILE CAT VERSION 1
20PROC initialise
30REPEAT
40PROC catalogue
50UNTIL done
60PROC printout
70STOP
80DEF PROC initialise
90CLOSE #0
100IN code% 100
110REM space for machine code routine
120IN data% 1240
130REM space for result of *INFO call
140channel = OPENUP("filecat")
150IF channel = 0 THEN channel = FN_make_file
160CLOSE channel
170OSCLI = $FFFF
180FX 4,1
190PROC assemble
200done = FALSE
210ENDPROC
220DEF FN_make_file
230REM produce file with default header
240LOCAL channel
250channel = OPENUP("filecat")
260FOR loop = 1 TO 66
270PUT channel, 660
280NEXT loop
290PTR # channel = 2
300PUT channel, 0: BPUT # channel, 0: BPUT # channel, 0
310REM first disc number null, null, null & No. of rec
320PTR channel = 0: BPUT channel, 66: BPUT channel, 66
330REM first disc title pointer null
340PTR channel = 33
350PUT # channel, 66: BPUT # channel, 66
360REM first filename pointer null
370 channel
380DEF PROC assemble
390FOR opt = 0 TO 3 STEP 2
400% = code%
410 OPT opt
420LDA #data% MOD 256
430STA 671
440LDA #data% DIV 256
450STA 672
460 base address for characters returned
470LDA 620E
480STA 620E
490LDA 620F
500STA 620F + 1
510 preserve original vector
520LDA #revec MOD 256
530STA 620E
540LDA #revec DIV 256
550STA 620F
560 install new vector
570LDA #star_drive MOD 256
580LDA #star_drive DIV 256
590JSR OSCLI
600 *DRIVE command
```

```
610LDA #star_info MOD 256
620LDA #star_info DIV 256
630JSR OSCLI
640 *INFO command
650LDA 620E
660STA 620E
670LDA 620F + 1
680STA 620F
690RTS
700 restore original vector and return
710 orvec NOP: NOP
720 star_drive
730
740% = "DRIVE 0"
750drive% = % + 6
760% = % + 8
770 OPT opt
780 star_info
790
800% = "INFO *."
810% = % + 10
820 OPT opt
830 revec
840 vectored code starts here
850STA 670
860STA 670
870STA 670
880LDA 670
890LDA 670
900 preserve and zero Y register
910STA 671,Y
920 store character at address in 671/2
930INC 671
940% no need
950INC 672
960 increment address in 671/2
970 no need
980PLA
990TAY
1000LDA 670
1010RTS
1020 restore Y and return
1030
1040NEXT opt
1050ENDPROC
1060DEF PROC catalogue
1070CLS
1080FOR line% = 0 TO 1
1090PRINTAB(16,0,line%):CHR$(141)"Disc Cat"
110PRINTAB(16,3,line%):CHR$(141)"Drive : "
111PRINTAB(16,5,line%):CHR$(141)"Disc No. : "
112PRINTAB(16,7,line%):CHR$(141)"Disc Title : "
113NEXT line%
114REM format screen
115%disc% = FN_getin(13,4,1.TRUE)
116%disc_no% = FN_getin(13,6,3.TRUE)
117%disc_title% = FN_getin(13,8,24.FALSE)
118IF LEN(%disc_no%) < 3 THEN %disc_no% = STRING$(3-L
EN(%disc_no%), "0") + %disc_no%
119IF %disc_no% = "999" THEN done = TRUE: ENDPROC
120REPEAT
121IF VAL(%disc%) > 3 THEN %disc% = FN_getin(13,4,1.TR
UE)
```

```
122UNTIL VAL(%disc%) < 4
123%drive% = ASC(%disc%)
124PROC change
125REM get and verify users inputs
126CALL code%
127REM activate machine code routine
128no_files = FN_display_all
129REM display filenames
130PROC change
131PROC select(no_files-1)
132REM select files to be excluded
133CLS
134PROC fileit
135REM file information
136ENDPROC
137DEF FN_getin(x,y,len,num%)
138REM routine to accept keyboard input
139REM in double height: x,y position
140REM len = maximum length, num% = numbers only file
141temp% = STRING$(len," ")
142PRINTAB(x,y-1,temp%)
143PRINTAB(x,y,temp%)
144PRINTAB(x,y,temp%)
145get = 0
146get% = 0
147REM blank out screen and get ready
148REPEAT
149key = GET
150valid = FN_check(key,num%)
151IF key = 127 AND got < 0 THEN PROC_delt
152UNTIL key = 13
153%get =
154DEF PROC_delt
155REM double height delete
156got = got - 1
157%get% = LEFT$(%get%,got)
158VDU127,11,32,10,0
159ENDPROC
160DEF FN_check(key,num%)
161REM check key press against flag and length
162IF key = 127 OR (got = len AND key < 13) THEN =
FALSE
163lower = 47: upper = 123
164IF num% THEN upper = 58
165valid = FALSE
166IF key > lower AND key < upper THEN got = got + 1
: valid = TRUE
167IF valid THEN VDUkey,11,0,key,10: %get% = %get%+CHR
$(key)
168IF key = 32 AND NOT(num%) THEN VDU32:got = got +
1: %get% = %get% + " "
169 valid
170DEF FN_display_all
171REM display filenames from *INFO call
172%top_data = 7471 + 256*7472
173REM top of list provided by machine code section
174no_files = (%top_data - data%)/40
175REM 40 characters per filename
```

(continued on page 93)

(continued on page 93)

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Disc Cat



(continued from page 91)

to extract the information about the catalogue from the disc. Perusing my copies of the BBC's OS guides it seemed possible but tedious to obtain the information by making a series of system calls — the first to obtain the disc catalogue and subsequent calls for each file in the catalogue. The official way however is not always the most elegant. One official call, *Info*, would yield the required information but display too much of the information on the screen, and with a full directory overflow one full screen.

It is here where the wonderful flexibility of the BBC's operating system came to the

rescue. Issue the *Info call and trap the information returned before it gets to the screen. Specifically direct it to a reserved area of memory, where the filenames can be extracted for display on the screen and the rest of the information held available for filing. It is possible to do this as most operating system routines are vectored through the user Ram, allowing them to be trapped.

Having written and tested this part of the program, I then started to consider in more detail the structure of the file which would contain the information. As the size of the file was indeterminate, and the information had to be presented in a certain order, it seemed

sensible to maintain an ordered file.

There are two choices when doing this. The most obvious way would be to hold an ordered list of disc titles, followed by an ordered list of filenames. Simple to understand but difficult to implement.

If a new disc or filename had to be added to the list it would

result in a great deal of shuffling of information on the disc. The second method of storing an ordered list is more difficult to understand and code but much easier to implement on a filing system.

The information is physically stored in the sequence it is collected in. Associated with

Figure 1. Details of a double entwined linked list (a) before addition of file BBBBBBBB

Record number	Pointer	Information
1	3	dummy (start of titles list)
2	4	dummy (start of filenames list)
3	7	title of disc # 1
4	5	filename AAAAAAA
5	8	filename CCCCCC
7	0	title of disc # 2 (and end of list)
8	0	filename DDDDDDD (and end of list)

(b) after addition of file BBBBBBBB

Record number	Pointer	Information
1	3	dummy (start of titles list)
2	4	dummy (start of filenames list)
3	7	title of disc # 1
4	9	filename AAAAAAA
5	8	filename CCCCCC
7	0	title of disc # 2 (and end of list)
8	0	filename DDDDDDD (and end of list)
9	5	filename BBBBBBB

(continued on next page)

(listing continued from page 91)

```

1760FOR loop = 0 TO no_files-1
1770filenames$ = FN_get_name(loop)
1780y = (loop DIV 3) + 10
1790x = 3 + (loop MOD 3) * 13
1800PRINTTAB(x,y)filenames$
1810REM formatted three across
1820NEXT loop
1830= no_files
1840DEF FN_get_name(ordinal)
1850REM return filename from memory
1860address = data$ + (ordinal) * 40
1870len = 0 : temp$ = ""
1880REPEAT
1890temp$ = temp$ + CHR$(7address)
1900len = len + 1
1910address = address + 1
1920UNTIL len = 10 OR 7(address) = 32
1930= temp$
1940DEF PROC_change
1950PRINTTAB(0,23)CHR$(136)"CHANGE DISC - PRESS SPACE
TO CONTINUE":
1960REPEAT
1970key = GET
1980UNTIL key = 32
1990PRINTTAB(0,23)STRING$(39," ")
2000ENDPROC
2010DEF PROC_select(max)
2020REM selects files from list for inclusion/exclusion
on
2030pos = 0
2040on$ = "" : off$ = ""
2050PRINTTAB(1,10)on$
2060PRINTTAB(14,10)off$
2070REM start with first filename
2080REPEAT
2090key = GET
2100IF key = 139 THEN PROC_MOVE(-1)
2110IF key = 138 THEN PROC_MOVE(1)
2120REM up/down arrow keys
2130IF key = 127 THEN PROC_sudge(pos)
2140REM delete key
2150UNTIL key = 13
2160ENDPROC
2170DEF PROC_MOVE(dir)
2180REM move from one file to next
2190IF (dir = -1 AND pos = 0) OR (dir = 1 AND pos = max) THEN ENDPROC
2200y = (pos DIV 3) + 10
2210x = 1 + (pos MOD 3) * 13
2220PRINTTAB(x,y) : PRINTTAB(x+12,y) :
2230REM unmark current file
2240pos = pos+dir
2250y = (pos DIV 3) + 10
2260x = 1 + (pos MOD 3) * 13
2270PRINTTAB(x,y)on$ : PRINTTAB(x+12,y)off$
2280REM mark next file
2290ENDPROC
2300DEF PROC_sudge(pos)
2310REM mark a file as excluded/included
2320address = data$ + pos*40
2330REM first character fo filename
2340y = (pos DIV 3) + 10

```

```

2350x = 2 + (pos MOD 3) * 13
2360IF (7address AND &80) = 0 THEN PROC_remove(42,42)
ELSE PROC_remove(32,32)
2370REM flagged-by high bit, either mark for exclusio
n or remove marks
23807address = 7address EOR &80
2390REM change flag
2400ENDPROC
2410DEF PROC_remove(on,off)
2420REM sets or removes deleted markers
2430PRINTTAB(x,y)CHR$(on) : PRINTTAB(x+10,y)CHR$(off)
2440ENDPROC
2450DEF PROC_fileit
2460REM file disc title and files from call
2470channel = OPENUP("filecat")
2480PROC_filename
2490REM title
2500PROC_filenames
2510REM files
2520CLOSE #channel
2530ENDPROC
2540DEF PROC_filename
2550REM file disc title
2560extent = FN_extent
2570REM returns length of file
2580ptr = 0 : old_ptr = ptr
2590REPEAT
2600last_ptr = old_ptr
2610old_ptr = ptr
2620PTR #channel = ptr
2630ptr = BGET #channel + 256 * BGET #channel
2640REM follow chain of pointers
2650this_no$ = CHR$(BGET#channel)+CHR$(BGET#channel)+
CHR$(BGET#channel)
2660this_title$ = "" : len = 0
2670REPEAT
2680byte = BGET #channel
2690IF byte <> &FF THEN this_title$ = this_title$ + C
H$(byte) : len = len + 1
2700UNTIL byte = &FF
2710REM recover information
2720UNTIL disc_no$ <= this_no$ OR ptr = &FFFF
2730REM either disc number exceeded or chain ended
2740IF this_no$ = disc_no$ THEN PROC_no_change
2750IF disc_pos > this_no$ THEN PROC_append ELSE PROC
-insert
2760ENDPROC
2770DEF FN_extent
2780REM returns length of file in characters
2790PTR #channel = 5
2800records = BGET#channel + 256*BGET #channel
2810= 33 records
2820DEF PROC_no_change
2830REM disc numbers match
2840IF this_title$ = disc_title$ THEN ENDPROC
2850PTR #channel = ptr+5
2860FOR loop = 1 TO LEN(disc_name$)
2870PTR #channel,ASC(MID$(disc_name$,loop,1))
2880NEXT loop
2890PTR #channel, &FF
2900REM overwrite title and end marker
2910ENDPROC
2920DEF PROC_insert
2930REM insert disc title into chain
2940PTR #channel = last_ptr
2950BPUT #channel, extent MOD 256

```

```

2960BPUT #channel, extent DIV 256
2970REM set last pointer to current eof
2980PTR #channel = extent
2990BPUT #channel,old_ptr# DIV 256
3000BPUT #channel,old_ptr# DIV 256
3010REM at current eof write existing pointer
3020PROC_store_name
3030REM followed by rest of info
3040ENDPROC
3050DEF PROC_append
3060REM append title to list
3070PTR #channel = old_ptr#
3080BPUT #channel,extent MOD 256
3090BPUT #channel,extent DIV 256
3100REM set last pointer to eof
3110PTR #channel = extent
3120BPUT #channel,&FF
3130BPUT #channel,&FF
3140REM at current eof write nulls
3150PROC_store_name
3160REM followed by new information
3170ENDPROC
3180DEF PROC_store_name
3190REM store new disc title
3200temp$ = disc_no$+disc_title$+CHR$(&FF)
3210FOR loop = 1 TO LEN(temp$)
3220BPUT #channel,ASC(MID$(temp$,loop,1))
3230NEXT loop
3240PROC_added.1
3250REM increase no of records
3260ENDPROC
3270DEF PROC_added.1
3280REM increment record counter on file
3290PTR #channel = 5
3300BPUT #channel, (records+1) MOD 256
3310BPUT #channel, (records + 1) DIV 256
3320ENDPROC
3330DEF PROC_filenames
3340REM process filenames from the disc
3350VDU 15
3360REM ensure screen can scroll
3370f_ptr = data$
3380REPEAT
3390IF (7f_ptr AND &80) = 0 THEN PROC_do_one
3400REM ignore files with first high bit set
3410f_ptr = f_ptr+40
3420UNTIL f_ptr >= top_data
3430ENDPROC
3440DEF PROC_do_one
3450REM process one filename
3460full_name$ = ""
3470FOR loop = 0 TO 9
3480full_name$ = full_name$ + CHR$(f_ptr#loop)
3490NEXT loop
3500full_name$ = full_name$ + disc_no$
3510FOR loop = 14 TO 34
3520chark = CHR$(f_ptr#loop)
3530IF chark <> " " THEN full_name$ = full_name$ + ch
ar$
3540NEXT loop
3550small_name$ = MID$(full_name$,3,8)
3560REM full_name$ includes #.ABCDEFG plus disc numbe

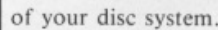
```

(listing continued on next page)

(continued from previous page)

Using this idea, the program keeps a 33-byte record. The first two bytes are the record pointer. For a disc title the next three characters indicate the disc number in Ascii, and the disc title follows terminated by &FF. Following the pointer there is the filename. This is always nine bytes long padded out by spaces if necessary. The filename is followed by its disc number as above and 12 further bytes giving the load address.

When all is to your satisfaction press Return to start filing the details. As each file is processed its name is shown on the screen. A side-product of this program should be a testing



The print routine starts by asking for a catalogue title and a date reference. To skip the printout, enter "none" as the catalogue name. The catalogue will be presented as a list of discs and titles in numeric order, followed by the list of filenames in alphabetic order. The list is paged with headings, footings and a page count. Two printer control codes can give details.

The printout routine can be

One final and rather important point. As new files are added the catalogue file Filecat has to grow. To avoid "can't extend" errors, and preserve your data in case of filing system accidents, take a blank disc, copy the Filecat program and the current Filecat file to it, in that order.

```

plus %INFO details
3570REM small_name% = $.ABCDEFG
3580mid_name% = MID$(full_name%,1,3)
3590REM mid_name% includes $.ABCEFG plus disc number

3600choice = FN_one_filename
3610PRINT " doing "mid_name%;TAB(28)"...."
3620PROC file.(choice)
3630ENDPROC
3640DEF FN_one_filename
3650REM decide what to do with filename
3660ptr% = 33 : old_ptr% = ptr%
3670un_decided = TRUE : matched = FALSE
3680extent = FN_extent
3690REPEAT
3700last_ptr% = old_ptr%
3710old_ptr% = ptr%
3720PTR %channel = ptr%
3730ptr% = BGET %channel + 256 * BGET %channel
3740REM follow chain of pointers
3750this_full% = FN_this_full%
3760FOR loop = 1 TO 31
3770this_full% = this_full% + CHR$(BGET %channel)
3780NEXT loop
3790this_small% = MID$(this_full%,3,8)
3800this_mid% = MID$(this_full%,1,10)
3810REM full, mid and small correspond to above
3820this_disc% = MID$(this_full%,10,3)
3830un_decided = FN_decide
3840REM finished yet ???
3850UNTIL NOT(un_decided)
3860un_decided
3870DEF FN_decide
3880IF ptr% = &FFFF THEN = 1 : REM append
3890IF this_full% = full_name% THEN = 2 : REM do nothing
3900IF this_mid% = mid_name% THEN = 3 : REM overwrite
3910IF small_name% < this_small% THEN = 4 : REM insert
3920IF small_name% = this_small% AND ASC(full_name%) < ASC(this_full%) THEN = 4 : REM insert
3930IF this_full% = full_name% AND ASC(this_full%) < ASC(full_name%) THEN = 4 : REM insert
3940IF = this_small% AND disc_no% < this_disc% THEN = 4
3940: TRUE : REM continue testing
3950REM see text for explanation !!!!
3960DEF PROC_file.(disc_decision)
3970REM take action after disc decision
3980IF decision = 1 THEN PROC_append_file
3990IF decision = 3 THEN PROC_over_file
4000IF decision = 4 THEN PROC_insert_file
4010ENDPROC
4020DEF PROC_append_file
4030PTR %c% "w" = old_ptr%
4040BPUT %channel, extent MOD 256
4050BPUT %channel, extent DIV 256
4060REM set last pointer to current eof
4070PTR %channel = extent
4080BPUT %channel, %c%
4090BPUT %channel, &FF
4100REM set end pointer at current eof to null
4110PROC_filing_file
4120REM then add details at end
4130ENDPROC
4140DEF PROC_insert_file
4150PTR %channel = last_ptr%
4160BPUT %channel, extent MOD 256
4170BPUT %channel, extent DIV 256

```

```

4108REM set ptr to pointer to current eof
4109PTR #channel = extent
4200$PUT #channel, old_ptr% MOD 256
4210$PUT #channel, old_ptr% DIV 256
4220REM and pointer at current eof to existing link
4230$PROC filing file
4240REM then add details at end
4250$ENDPROC
4260DEF PROC filing file
4270REM add full details to current eof
4280FOR loop = 1 TO 31
4290$PUT #channel,ASC(MID$(full_name$,loop,1))
4300NEXT loop
4310$PROC added_1
4320REM increment record counter
4330$ENDPROC
4340DEF PROC printout
4350REM print out filed details
4360n = 14
4370off = 0
4380REM emphasised printer commands
4390page = 1
4400REM page number
4410$PROC printin
4420REM get input from user
4430IF titles = "none" THEN $ENDPROC
4440$VDU,21
4450REM printer on screen off
4460channel = OPENUP("filecat")
4470$PROC index
4480REM write index
4490$PROC titles
4500REM write titles
4510$VDU,6
4520REM printer off screen on
4530CLOSE #0
4540$ENDPROC
4550DEF PROC printin
4560REM get users titles for printout
4570CLS
4580FOR loop = 0 TO 1
4590$PRINTTAB(0,5,loop)CHR$(141)"Disc_cat printout"
4600$PRINTTAB(0,5,loop)CHR$(141)"Title":
4610$PRINTTAB(0,5,loop)CHR$(141)"Date":
4620NEXT loop
4630REM format screen
4640titles = FN_getin(0,4,20,FALSE)
4650date# = FN_getin(0,6,20,FALSE)
4660REM get users input
4670$ENDPROC
4680DEF PROC index
4690REM printout index
4700line = FN_head
4710REM start with page header
4720PTR #channel = 0
4730PTR = $GET#channel + 256 + $GET#channel
4740$REPEAT
4750PTR #channel = ptr%
4760ptr = $GET#channel + 256 + $GET#channel
4770REM for loop chain of pointers
4780n = CHR$( $GET#channel ) + CHR$( $GET#channel ) + CHR$(
($GET#channel)
4790$close# = ""
4800$REPEAT
4810chr = $GET#channel

```

```

4822IF chr < AFF THEN disc# = disc# + CHR#(chr)
4830UNTIL chr = AFF
4840REM retrieve details
4850PRINTTAB(15);VDU1.on:PRINTnum#;"          ";disc#;VD
U1.off
4860line = line#1
4870IF line = 55 AND ptr# < AFFFF THEN PROC_footing
4880REM page full
4890UNTIL ptr# = AFFFF
4900PROC_footer
4910REM print footer ready for new page
4920ENDPROC
4930DEF FN_heading
4940REM header of page
4950PRINT"TAB(25);VDU1.on:PRINT"INDEX" titles: V
DU1.off
4960PRINT""
4970 6
4980DEF PROC_footing
4990REM print footer and header of next page
5000PROC_footer
5010line = FN_heading
5020ENDPROC
5030DEF PROC_footer
5040REM print footer only
5050REPEAT
5060PRINT
5070line = line#1
5080UNTIL line = 65
5090REM goto end of page
5100PRINTTAB(5);VDU1.on:PRINT"page";STR#(TAB(
25))date#;VDU1.off
5110page = page + 1
5120ENDPROC
5130DEF PROC_titles
5140REM printout filenames
5150line = FN_heading
5160REM start with header
5170PTR #channel = 33
5180PTR# = BGET #channel + 256 * BGOT#channel
5190REPEAT
5200PTR #channel = ptr#
5210ptr# = BGOT#channel + 256 * BGOT#channel
5220REM follow chain of pointers
5230num# = 1
5240FOR loop = 1 TO 10
5250num# = num# + CHR#(BGOT#channel)
5260NEXT loop
5270line = CHR#(BGOT#channel) + CHR#(BGOT#channel) +
CHR#(BGOT#channel)
5280num18 = CHR#(BGOT#channel) + CHR#(BGOT#channel) +
CHR#(BGOT#channel) + CHR#(BGOT#channel)
5290num24 = CHR#(BGOT#channel) + CHR#(BGOT#channel) +
CHR#(BGOT#channel) + CHR#(BGOT#channel)
5300num38 = CHR#(BGOT#channel) + CHR#(BGOT#channel) +
CHR#(BGOT#channel) + CHR#(BGOT#channel)
5310REM recover information
5320PRINTTAB(20)num#;" num#:";num18;" ; num2#
";num38
5330REM and print it out
5340line = line#1
5350IF ptr# line = 55 AND ptr# < AFFFF THEN PROC_footing
5360REM page full
5370UNTIL ptr# = AFFFF
5380PROC_footer
5390REM finish off
5400ENDPROC

```


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Laskys.
S. GLAMORGAN CARDIFF
South World Computers.
S. YORKSHIRE DONCASTER
Danum Computer Systems.
S. YORKSHIRE ROTHERHAM
Rotherham Computer Centre.
S. YORKSHIRE SHEFFIELD
Just Micro.
S. YORKSHIRE SHEFFIELD
Laskys.
STAFFS. STOKE-ON-TRENT
Lewis Ltd (Sound & Vision).
STAFFS. STOKE-ON-TRENT
Town Computers.
STRATHCLYDE GLASGOW
Laskys.
STRATHCLYDE GLASGOW
Lewis Ltd (Sound & Vision).
STATHCLYDE GLASGOW
Unitsoft.
SUFFOLK SUDBURY
Sudbury Microsystems.
SURREY CROYDON
Laskys.
SURREY FARNHAM
Farnham Computers.
SURREY GUILDFORD
Laskys.
SURREY KINGSTON
Laskys.

SURREY LEATHERHEAD
Evergreen Ltd.
SUSSEX BRIGHTON
Brighton Computer Exchange.
SUSSEX BRIGHTON
Brighton Computer Centre.
SUSSEX BRIGHTON
Laskys.
SUSSEX CRAWLEY
Laskys.
SUSSEX WORTHING
Data Direct.
TAYSIDE DUNDEE
Cursor Keys.
TAYSIDE DUNDEE
Micromania.
TAYSIDE PERTH
VICS.
TYNE AND WEAR GATESHEAD
Currie & Maughn.
TYNE AND WEAR
NEWCASTLE UPON TYNE
Laskys.
WARWICKS LEAMINGTON SPA
Spa Computer Centre.
WARWICKS NUNEATON
Micro City.
WARWICKS NUNEATON
Warwick Computers.
W. MIDLANDS BIRMINGHAM
Lewis Ltd (Sound & Vision).
W. MIDLANDS BIRMINGHAM
Software Express.
W. MIDLANDS BIRMINGHAM
Laskys.
W. MIDLANDS BIRMINGHAM
Lee Computers.
W. MIDLANDS COVENTRY
Coventry Micro Centre.

W. MIDLANDS COVENTRY
Laskys.
W. MIDLANDS DUDLEY
Central Computers.
W. MIDLANDS
WOLVERHAMPTON
Laskys.
W. MIDLANDS
WOLVERHAMPTON
Micro Business Centre.
WORCS KIDDERMINSTER
Central Computers.
WORCS REDDITCH
Ampower Video and Computers.
W. GLAMORGAN SWANSEA
Bucon Ltd.
WEST LOTHIAN
LIVINGSTONE
Computer Centre.
W. YORKSHIRE BRADFORD
CNA Computing.
W. YORKSHIRE HALIFAX
Abacus Computers.
W. YORKSHIRE
HECKMONDWICK
Thought & Crosses.
W. YORKSHIRE
HUDDERSFIELD
Microworld.
W. YORKSHIRE LEEDS 12
Farnella.
W. YORKSHIRE LEEDS 6
Interface Engineering Ltd.
W. YORKSHIRE LEEDS
Lewis Ltd (Sound & Vision).
W. YORKSHIRE LEEDS
Laskys.
W. YORKSHIRE LEEDS
Micropower.

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Megamon

Megamon is a sophisticated disassembler/monitor which will work on the complete range of Amstrad machines. Among its many features are an intelligent move memory facility, control over the lower Rom state, machine code trace, read or write object code to tape or disc, full memory dump to the printer, and a disassembly that will even understand all of the 102 undocumented Z-80 instructions. All of the controls are accessed through single key-presses so Megamon is easy to understand and simple to use.

Listing 1 is the short loader program for Megamon. Type this in and save it as the first thing on your tape as "MEGAMON". Listing 2 is the standard hex-loader program which pokes in the hex code from DATA statements. When all the bytes have been successfully entered then the loader program will prompt you to hit any key when ready to save the code. Ensure your tape is positioned after the megamon Basic loader.

To run the program rewind the tape and type RUN "MEGAMON".

When the program has loaded the little screen will appear and you will be asked for an address at which to load Megamon. This can be any address from 4000H up to 9000H. Obviously the monitor will not work if loaded underneath the lower Rom.

Once the address has been entered the object code for Megamon is loaded and you will be presented with Megamon's Front Panel screen display:

Laurie Sinnett's monitor takes you places you've no right to see in your Amstrad.

Z80 Registers — The top right of the screen shows the Z80 registers AF,BC,DE,HL,IX,IY together with the stack pointer (SP) and the program counter (PC). The register contents are shown (at start-up these are always zero) and then the contents of the memory location addressed by that register. There is also the register cursor ("I"), which points to AF on start-up. Its use will be discussed shortly.

Lower Rom State — Below the register display the state of the lower rom is shown, either Enabled or Disabled.

Memory Display — The memory display occupies the bottom of the screen and its purpose is to display the bytes around the memory pointer, indicated by "I". The bytes can be displayed either as hex or as ascii.

PC Instruction — The instruction at the Program Counter is constantly displayed above and to the left of the Memory Display.

List Display — The left of the screen above the Memory Display is taken up by the List Display. At start-up this display will be blank, but if you are eager to see it in action then for the moment press L followed by a full-stop. You will see the 14 instructions from address zero disassembled for your perusal.

Unfortunately, space does not permit a detailed discussion of the undocumented instructions, needless to say their use is becoming much more frequent in many of today's top games. Disassemblers that can cope with them are rare and the format for displaying them varies. For example, look at the instruction: ADD A,IXL

This means "Add A to the low-byte of IX, the 'L' tagged on to indicate the low-byte. Alternatively, you can use. ADD A,IXH

This means 'Add A to the high byte of IX i.e. add A to I. Megamon would display the two instructions above as follows:

- i) ADD A,IX
- ii) ADD A,IX

The letter in capitals indicates which byte of the register pair is being operated upon. The same applies to all undocumented instructions that use the IY register pair.

There now follows a list of the Megamon keys and a full explanation of their usage.

The Four Cursor Keys: The four cursor keys above the function pad are used to move the Memory Pointer ">" within the Memory Display in the appropriate direction, enabling you to step up or down through the memory, in steps of one or eight bytes at a time.

The Full Stop Key: Pressing the full stop will advance the Register Cursor ">" onto the next register pair in the Register Display.

B — Return to Basic: Pressing this key will produce the prompt

**TOP SECRET
Z-80 CODES**



"Are you Sure?". In response to this press "Y" if you wish to leave Megamon and return to Basic. Any other key press will return you back to Megamon itself. When Megamon returns to Basic it restores the Roms to whatever they were at start-up.

C — Clear List Window: The List Window can be cleared at any time by pressing the "C" key.

D — Display Memory: This allows you to change the address around which the Memory Display works. You will be asked for a new address for the Memory Pointer — this must be entered as a hex number terminated by a Return. If, instead of a hex number, you

Listing 1.

```
10 MODE 1
20 LOCATE 9,1:PRINT"LAJ Proudly present"
30 LOCATE 14,3:PRINT"MEGAMON"
40 LOCATE 9,5:PRINT"Copyright LAJ 1985"
50 LOCATE 1,7:INPUT "Load address";m:OPENOUT"d"
70 MEMORY m-1
80 CLOSEOUT:LOCATE 1,9:PRINT"Please wait...loading MEGA
MON V. 1.2":LOAD "MEGAMON.bin",M
100 CALL m
```

Listing 2.

```
100 REM **** HEX LOADER ****
110 ADDR=32768:LIN=1000:MEMORY ADDR-1
120 SUM=0:READ A$,CHECKSUM
130 IF A$="END" THEN 200
140 FOR N=1 TO LEN (A$)-1 STEP 2:X=VAL ("&"+MID$(A$,N,
2))
150 POKE ADDR,X:SUM=SUM+X:ADDR=ADDR+1
160 NEXT
170 IF SUM<>CHECKSUM THEN PRINT "ERROR IN ";LIN ELSE
LIN=LIN+10:GOTO 120
```

```
200 PRINT "DATA CORRECT";CHR$(13);"READY TAPE AND PRES
S A KEY"
210 SAVE "MEGAMON.BIN",B,32768,6127
220 END
1000 DATA 3EC93200C0F3CD00C03B3BE1FB11F7FF19116614EB1
9E5DDE1DD6E00DD66017CB528182319E5FDE1FD6E00FD66, 5866
1010 DATA 0119FD7500FD7401DD23DD2318DE3A920C8332920C3
2AB0CC60432B20C3EC312215300220100ED73E30E31AA16, 4014
1020 DATA CDE50ECD65BCCD00B9328E14CD1008CD210FCD03BBC
D440DCD770BCD6B0FCD070BCD1C0BCD18BBCD9B003E03CD, 4882
1030 DATA B4BBCD6CBBCD11BC28CF3E01CD0EBCCD100818C521B
500011700FE613802D620EDB1C00909095E2356D52A7E14, 4586
1040 DATA C9424345D0D1D2D32E495258464D444C53544750484
14F57FF1360132D13F712AC12970F69107010FA00860DC8, 4362
1050 DATA 0D190E460E4F0E740E7D0E8A0E8D0E950E900E9D0EA
B0EB40E3E0FCD630CC5DDE13007C8DD2A801418062004DD, 3665
1060 DATA 2A7C14AF3288143E00CDB4BBCD6CBB060EDD228014C
D290110F7C9DDE5D1CD130C3A88143D202A3E09CD9702DD, 4729
1070 DATA E5C5CD921241DD7E00DD23CD400C10F679FE0428053
E09CD97023E20CD9702C1DDE118053E08CD6FBB3E01328C, 4805
1080 DATA 14C5AF329014DD7E00FDE22005CD53041843FEFD200
A3E01329014CD53041835FECB2005CDD506182CFED2005, 4557
1090 DATA CDE3051823FE403809FE80300ACD17031816CD0E031
811FEC03005CDE7021808E607114303CD26033A8914B720, 3828
1100 DATA 23CDC70278FE202811CDEA0179FE2028093E2CCD970
279CDEA013E0DCD97023E0ACD9702DD23C1C9FE513821FE, 5016
1110 DATA 592009C5ED4B901481C11810FE6028F3FE5B3808C5E
```


press the full stop key then the Memory Pointer will be set to whatever address the Program Counter currently holds.

The address is displayed, along with its contents. You can either enter a new hex number for this location or press Esc to exit the memory change. When a new number is entered the memory pointer is advanced to the next location and your options are the same again. At any time during the input of a number you can press the Esc key to abort and leave the Memory Pointer unchanged.

E — Toggle Lower Rom State: Press the "E" key and the Lower Rom will be toggled between Enabled and Disabled.

F — Fill Memory: The prompt "Fill>" appears and the number entered here will be the start address for the program to use. You are then asked for the address at which the program will end its fill, and finally the byte to fill the memory with. For example, if you enter 8000 in response to "Fill >", 8100 in response to "To >", and FF in response to "With >", the memory between 8000 hex and 8100 hex will be filled with FF (255 decimal).

G — Go: This allows you to execute the object code currently under examination with the use of 'breakpoints, i.e., places at which the object code is stopped in its tracks and control returned to the monitor for you to examine the registers etc.

The address which you enter in response to 'Go>' will be the address at which the monitor starts execution of the object code. As usual with all prompts, if you press the Esc key then the

operation will be aborted. You are then asked for an address — "To >" — at which control will be returned to Megamon i.e. the address at which you wish your breakpoint to be inserted.

When you have entered this address Megamon will go off and execute the code. When the breakpoint has been reached, assuming that the code has not caused a fatal crash, a small line will be displayed on the screen and this means that Megamon is waiting for you to press any key before updating all of its displays.

H — Search For String: The prompt "Search For >" is displayed. You can now enter a sequence of up to 255 bytes which will form the string which Megamon will search for. Each number should be entered by pressing Return and by pressing Return on its own you will terminate the string.

At this stage, assuming the string can be found, Megamon will update the Memory Display and the Memory Pointer > will be pointing to the second byte of the input string. Also see the explanation of the next instruction, "A".

A — Find Next Occurrence: Pressing the "A" key will tell Megamon to find the next occurrence of a string you have searched for using H.

I — Toggle between Ascii and Hex: By pressing the "I" key you can toggle the Memory Display Memory so that it shows either Hex or the Ascii equivalents.

L — List: You can enter a new address from which the disassembler will list its 14 instructions. However, there are two other alternatives to entering

a new address. If you press the full-stop key in response to List> then the disassembly will begin from the address currently held in the Program Counter.

Alternatively you can press Return in response to the prompt and the disassembly will continue from where it left off.

M — Move a Block of Memory: The prompt move > will be displayed and the address you enter will be the start of the memory block you wish to move. The prompt "End.," asks you for the end address of the memory block and the prompt "To >" asks you for the destination address for this block. The routine is "intelligent" so that if your destination address lies within the limits of the block you wish to move Megamon takes this into account and performs the move correctly.

O — Read Object Code: This reads a block of object code from in from tape or disc, depending on which system is in use. You are prompted to enter a filename and then an address at which the code will be loaded. Needless to say, you should take care not to overwrite Megamon.

P — Printer Disassembly: With this option you can produce a disassembly of any length to your printer, you could even list the Amstrad Rom. Then first address you enter, in response to "Print," is the start address for the disassembly, and the second address is the end. Assuming the printer is connected a disassembly will now appear on the printer which can be aborted at any time by pressing the Esc key.

R — Change Register: By

pressing the "R" key you can change the value of the register pair currently pointed to by the register cursor >. The register pair will take on the value you enter at the keyboard.

S — Single Step: Megamon will execute the current instruction at the Program Counter when you press the "S" key, allowing you to examine the effects of the code upon the registers and memory. This function will also single-step through a Call instruction.

T — Trace: If you press the "T" key Megamon will execute the instruction at the Program Counter in the same way as the "S" function above, except that using "T" allows you to execute a Call instruction automatically.

W — Write Object Code: This writes a block of code to tape or disc under a given filename. You are prompted to enter the filename and then the first and last (inclusive) addresses of the block you wish to write.

X — Toggle Alternative Registers: Pressing the "X" key will toggle the Register Display between AF,BC,DE, HL and the alternate registers AF',BC',DE',HE'. You are advised to leave the values in the alternate register set unchanged as these are in constant use by the firmware (for further details see the *Amstrad Firmware Specification* — Soft 158, Appendix XI).

If the sight of all those hex bytes is enough to put you off then copies of Megamon, recorded on quality blank tapes, are available at a cost of £3.50 each, including postage, from Laurie Sinnett, 20 Autumn Street, Burley, Leeds LS3.

D4B90148181C1CD410FC9FE183006C61ECD410FC920193A, 4978
1120 DATA 8C14A720077BC60CD9702C90E203E23CD97027BCD4
00CC9FE19200B0E203E23CD9702CD130CC9FE1A20133E28, 4093
1130 DATA CD97023E23CD9702CD130C3E29CD9702C9FE1B20143
E28CD97023E23CD97027BCD4000C3E29CD9702C9FE1C2020, 4371
1140 DATA 3E28CD97023A9014C659CD410F3E2BCD97023E23CD9
7027CCD400C3E29CD9702C9F53A88143D2806F1CD5ABBA7, 4695
1150 DATA C9F1D55FC5CD2BBDF5E53E42CD1EBB2009E1F1C17B3
0ECD1A7C9AF32881431AA16C36000E57DCD410F3A8814B7, 6041
1160 DATA 20043E0F180C3D20073E09CD9702E1C93E06CD6FBBE
1C90F0F0FE607C6396FDD7E00CDF607DD7E00FE90300406, 4357
1170 DATA 07180DFEA03006FE98380218F2410E20C9E60711330
3CD2603C9FE762E100120208052E11CDF607C9876F2600, 3859
1180 DATA 197E2366FDD7E00E90807CB076E07BE07A507AD07B
107EA070504D4030F04820322046303260444040D061B06, 2977
1190 DATA 2A06390653065E0670069106CB5F200C2E58CD02087
8FE0BC00651C92E4D0619DD5E01DD5602DD23DD23C9FEC3, 4067
1200 DATA 200F2E4D0619DD5E01DD5602DD23DD23C9FED320082
E53061B0E07180AFEDB200C2E5406070E1BDD5E01DD23C9, 3735
1210 DATA FEE320072E55060F0E0AC9FEEB20072E5506090E0AC
9012020FEF320032E56C92E57C9CB5F200C2E50CD020878, 3863
1220 DATA FE0BC00651C9FEC901202020032E4CC9FED920032E5
2C9FEE920052E4D060EC92E11060B0E0AC92E4CCD630778, 4184
1230 DATA C61047C92E4DCD63070E19DD5E01DD5602DD23DD231
8E02E4E18EB0F0F0FE607C6396F06070E18DD5E01DD23FE, 4260
1240 DATA 3B2004410E20C9FE3DD818F7E6382E4F5F06180E203
E01328C14C9DD7E01FECB2020DD7E03E607FE06DD23C29F, 4590

1250 DATA 05DD23CDD5063E06B920040E1C1802061CDD66FFC9F
E40D24205DD23E607CA9F05FE07CA9F05FE01201ADD7E00, 4600
1260 DATA CDCB073E0AB9280AB82809DD2BDD2BC39F05E59065
9C9FE022023DD7E00FE222011061A0E592E11DD5E01DD56, 4069
1270 DATA 02DD23DD23C9FE2AC29F050E1A065918E8FE032017D
D7E00FE2320072E1206590E20C9FE2BC29F052E1318F2FE, 4393
1280 DATA 04201EDD7E00CDA50778FE04DA9F05FE07CA9F05CDA
A0578FE1CC0DD6601DD23C9FE052008DD7E00CAD0718DC, 5207
1290 DATA DD7E00FE26200C065B2E110E18DD5E01DD23C9FE2E2
004065C18EEFE36C29F05061CDD23DD660018E0FE803014, 4327
1300 DATA DD7E01FE76DD23CA9F05CD1703CDA05DD6600C9FEC
0300CDD23CDE702CDA05DD6600C9DD23FEE120072E5006, 5487
1310 DATA 590E20C9FEE520042E5818F3FEE920062E4D066018E
BFEE320072E55060F0E59C9FEF920072E11060B0E59C92E, 4213
1320 DATA 5F012018DD2BDD5E00C9260079FE062005DD230E1CC
978FE062005061CDD23C978FE043809FE063005C6574726, 3945
1330 DATA 0179FE043809FE063005C6574F26017CA7C0E1C39F0
5DD23DD7E00FE00381321D406011000EDB3929F0579C662, 4753
1340 DATA 6F012020C9FE40DA9F05E607115303CD2603C92E54C
DF6070E7278FE06C00673C92E53CDF60748067279FE06CA, 4036
1350 DATA 9F05C92E3CCB5F28022E3ACD020848060AC92E11CD0
2080E1ADD5E01DD5602DDCB005EDD23DD23C078A14FC92E, 4095
1360 DATA 74012020FE44C8C09F05012020FE4520032E75C92E7
6FE4DC8C39F05AF328C14DD7E002E770120181E00FE46C8, 4411
1370 DATA 1CFE56C81CFE5EC83E01328C14C39F052E110E07FE4
720030678C9FE4F20030679C90607FE57200C78C9FE5F, 4316

(continued on next page)

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01F137C9E1D1C1F1A7C93E01326D143E05CDB4BB210101, 5820
1880 DATA CD75BBAFCAD410FCD06B9F5CD0CB9F1CB573E01CA410
FAF32BD143E02C35AFEDF73BC123CE7ACD630C308CED84B, 5192
1890 DATA 7C1418062004ED4B7C145C3E7DCD630C309C91CB8E5
D4B7C1418062004ED4B7C145C3E7DC156610010300EDB0E1, 4198
1900 DATA 36CD011110Z3712370FD3D9ED436410ED53621022601
0D908F5E1225E1008C1EDB7A14C5ED737A14316614F1C1, 4886
1910 DATA D1E1D90BF1C1D1E1DD1FE1DE1ED7B7A14FBC9E32B2B2
B2Z7C14C5D5116610E0610300EDB0D1C1E1F3ED737A1431, 6549
1920 DATA 7A14F4DES5DE5E5D5F5E5D5E5D0F8508ED7B8C1
22A5E10E5F1082A6D10ED5B6210ED4B6410DF9FB35FCD9F, 6445
1930 DATA 02CD18BBC9G0000000000000000000000003E01328F141
80A4F326F14F3D9C5D5E5D908F50E0C8DA1008F108D9E1D1, 4155
1940 DATA C1D9FBC9CDBE12ED5B7C14ED738C12213D1E15E06043
6002310FBEBD10600ED80227C14DD213DD77E0BF76CA, 5209
1950 DATA 5911215F12M10900EDB1AC5E11010900EDB1ACAA110
10900EDB1AC8511010600EDB1CAD11010000EDB1ACAD212, 4118
1960 DATA FEESPACB11FDD200BDD7001FE9ECAC611DD7E00FE
D200BDD7E01FE9SPACB11FDD7E00FEED7E01D7E01FE4520, 6429
1970 DATA 0BDD3600C9DD360100C38511FE4D200BDD3600C9DD3
60100C38511316614F1C1D1E1D908F1C1D1E1DE1FDE1ED, 5872
1980 DATA 7B7A14000000000F3ED737A14317A14F4DES5DE5D5C
5F5D9E5D5C5D908F508ED7B8C12C93A8F14A7C22811CD49, 5979
1990 DATA 12282A1221741100302C382B1E12A7C14E52A0A122
27C14ED737A141BD4D7E00FEC92810F6C2E6FA219C11DD, 4880
2000 DATA 7700C50E12C3821ED7B7A14E1227C14ED737A1418A
FCD49122280121B911CD5012C328112A8812277C141898, 4096
2010 DATA 2A741418082A761418032A7814227C14C3591DD7E0
14F179F47A7C1409228812D7E0020A6E14E5FE10282CFE, 3497
2020 DATA 382810E5F302812FE202814FE2B2816E1C3B91F13BF
AC35911F130FAC35911F12EE035911F12E8EC35911ED4B, 5416
2030 DATA 7014F105F5E1226E14ED43701420D4C359112A7C14E
D7B7A14E5ED737A1421561241042310FD4EED437C14AC359, 4724
2040 DATA 11DD669D2BD6E91C9D7402DD7501C9383028208100
8000DCFCDD4CDBC4F4ECE4CCADFAC2C3F22EAEEAC90DF806, 6819
2050 DATA C0F0E080C8383020281810C7CPD7DFEF7FF7F00000
00000000DD27C141DDE53E01328914CD6401C1C5DDE5E1A7, 5785
2060 DATA ED424DDDE1AF328914CD941C937E0CD630CC5DDE13007C0D
D2A801418062004DD2A7C143E7DCD6308C80DE5E1ED42, 5592
2070 DATA 2801D0ED43F5123E01328814CD2901DDE5E1ED4F5E1
ZED4228F238F05C02BBD4F328814C900003E7FCDD630C, 4061
2080 DATA DB8CDD0219214DD360000079328B14301328A143E08C
0630C3003C818142BF4DD23DD710030A8A143C328A1420E6, 4133
2090 DATA 3238A143A8A14AB7C82A7E14E10FFFF3A8B14EDB1C0C
5E5DD2193143A8A143D280C47DD7E00BE200BDD232310F5, 4769
2100 DATA E1C1227E1439E1C118D83E82CD9F13D8C5E83CD630
CD138222820C5215214421100A9CD77BCF5047DBCF1E130, 5705
2110 DATA 11CD83BCF5D47DBCF13007CTABCCD6CBCB92100002
R7CB520FB18F2F5E30C34DABCBC6BBF1CD410F381CD41, 6122
2120 DATA 0F2152141600CD18BBFFEC2836FE0E2837DFE2038F1F
F803DEFDFE7F2017141528E52B153E06CD5ABB3E20CD5ABB, 4738
2130 DATA 3E08CD5ABB18D74F7AF61E1428CC7179CD5ABB231418C
C36CB837C9D5C6CBCB1A793C984CD630CDB8C5E7DCD, 6040
2140 DATA 630C38382836C5E85C630C382D282BC53E86C9DF9F1
38222152141100A9CDB8CB301B3E02C1E1D15A7ED52EB, 4629
2150 DATA E1CD98BC300ECD8FBCDD63CBC9E1E1E1C9E1E1E1CD9
BCCD6CBCB9000000000000000000000000000000000000000, 4860
2160 DATA 0000540057005A00600630069006F720075000780
97B0001009600B00B100CF000100D300D500D700D900DB, 3254
2170 DATA 00D0D0D0F00E100E300E500E700E900E00E00E00E0F00F
00F300F500F700F900006010E011201200123012C012F01, 3731
2180 DATA 37013D014601520815701660168017501800183018C0
9501A201A701B001B701BA01BD01C301CB01D501D901DE, 3364
2190 DATA 01E013F4010502B00215021B0224022C02302C023
0249024E02510256026002650269026E0278027B028002, 1930
2200 DATA 85028A028E0292029802BE02C102C402C902C02D0
6903F202100313032302323033403360338033A033C033E, 2777
2210 DATA 03403043203440343460348034A034B034C034E03500352035
03560358035A035C035D035E0360036036303640367110463046804, 1878
2220 DATA 7C049204A104C704E404F204F804FD0400051405360
4D05500553005605630E05F40510060609060F061D, 2756
2230 DATA 06260632063B05065066D0671068E06BF06D06E06F
060C071B0741074B077407A707B307C507D7307DA0771108, 2931
2240 DATA 150B180B2B0B3B0B3E0B410B460B540B590B610B730
7D0BB0B9B00B9B0B9E0B0A10B7A0B8A0B9F0BB20BB50BB8, 2906
2250 DATA 0C0B0C0CB05E0B630BEA0BA0F0BF0D0E020C0D0C15
0C1F0C340C390C4F0C5E0C6A0C6F0C750C7B0C7E0C810C, 2926
2260 DATA 870C80CB9C9C4CC0CC0C10CDB0C260D40F503D0S0
580ED7207A0D80080F0930D960D420DA050DA0AE0DB3, 3653
2270 DATA 08D60B900CD30CADA026D050DD0ED730D1B0E230E2
0E460E4B0E510E550E580E5F0E650E680E740E790E7D0E, 3133
2280 DATA 080E860E990E9D0EA20EBB0ED80EDF0EE50EE0EF40
F70EFA0E080F0E0F120F150F1A0F1D0F240F450F590F6B, 3304
2290 DATA 0F7C0F8F0F8F0F90F980F9F0FA0FAC0FB20FB0F0C
90F9FD40FDE0FE20FE50FE0CF02FFF70FFA0FAC0101510, 4204
2300 DATA 1A1028102B103
```


ATARI

ST

520ST

POWER WITHOUT THE PRICE

THE NEW ATARI 520ST

Under the new leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), Atari Corporation have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan 'Power Without the Price' has been implemented in the manufacture of the new 512K Atari 520ST colour computer which offers the user amazingly high performance at an incredibly low price. Launched as a work-station, this new system incorporates seven software packages as well as the 520ST computer with 512K RAM, mouse controller, high resolution monochrome monitor (640x400), 95 key keyboard (with 18 key numeric keypad), MIDI interface, GEM and a 500K 3 1/2 inch disk drive, all for the package price of only £651.30 (+VAT = £749). Dubbed the 'Mac beater' and the 'Jackintosh' (after Atari's Chief, Jack Tramiel), Atari's new machine has been directly compared with the Apple Macintosh RRP £2595 (+VAT = £2985) which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact in this country as a sophisticated alternative to an IBM PC, APRICOT or APPLE MACINTOSH. Unlike its overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour brings out the full potential of graphics packages such as GEM.

USER FRIENDLY GEM OPERATING SYSTEM

The power of the ST is harnessed and made user friendly by the new operating system 'GEM' from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or B/W graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of moveable resizable windows, icons to represent objects such as disks and disk drives, and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM has now been implemented for the Acorn, ACT, Atari, IBM, ICL, Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software.

FREE SOFTWARE AND FUTURE EXPANSION

The Atari 520ST comes supplied with seven free software packages as listed below: 1) TOS - Tramiel Operating System based on CP/M 86K; 2) GEM Graphics Environment Manager by Digital Research (DR) giving a WIMP (Window, Icon, Mouse, Pull down menu) environment; 3) DR GEM Paint for creating graphics masterpieces; 4) DR GEM Write for word processing; 5) Logo learning language to enable you to write your own programs easily using turtle graphics; 6) DR Personal Basic a powerful user friendly version of the Basic programming language; 7) DOS operating system giving you access to dozens of business applications packages already available on the market. Designed with future expansion in mind, the ST also features a host of different interfaces to the outside world and an impressive list of accessories is planned. Atari will soon be releasing a 1000K (1MB) 3 1/2 inch disk drive, and a 15MB hard disk storage system as well as a mass storage compact disk (CD) player capable of storing an entire 20 volume encyclopedia on one disk. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. With its unbeatable graphics, speed and software at a price which is far below that of any comparable personal computer currently on the market, the ST is all set to do battle with the competition. To receive further details of the ST from Silica Shop, just fill in the coupon below with your name and address details and post it to us.

Silica Shop Price: £651.30 + £97.70 VAT = £749.00 This price includes:

- ★ 512K RAM
- ★ B/W MONITOR
- ★ MOUSE
- ★ 500K 3.5" DISK DRIVE
- ★ GEM
- ★ KEYBOARD (95 KEYS)

ST

ATARI 520ST SPECIFICATION

MEMORY

512K RAM (524,288 bytes)
18K ROM expandable to 320K
Port for addl 128K plug-in ROM cartridges
300K TOS operating system

GRAPHICS

Individually addressable 32K bit-mapped screen with 3 screen graphics modes
300,000 pixels in 16 colours (low resolution)
640,000 pixels in 16 colours (med resolution)
640,000 pixels in monochrome (high res)
16 shades of gray in low res mode
512 colours available in low/medium res
8 levels of each in red, green and blue

ARCHITECTURE

4 custom designed chips
68000 Chip - MMU Memory Mgrment Unit
DMA Controller - Graphics Processing Unit
16/32 bit Motorola 68000 processor at 8MHz
eight 32 bit data registers
eight 32 bit address registers
7 levels of interrupt/56 instructions
14 addressing modes/5 data types

DATA STORAGE

High speed hard disk interface
Direct memory access 1.33 Mbytes per second
CD (Compact Disc) interface
Built in cartridge access
Dedicated floppy disk controller

DISK DRIVE

500K (unformatted) 5 1/4 inch 3 1/2" floppy drive
384K (formatted) storage capacity

SOUND AND MUSIC

Sound Generator
Frequency control from 30Hz to above audible
3 voices (channels) in wave shaping sound in addition to a noise generator
Separate frequency and volume controls
Dynamic envelope controls
ADSR (Attack, Decay, Sustain, Release)
Noise generator
MIDI interface for external music synthesizers

KEYBOARD

Separate keyboard microprocessor
Standard QWERTY typewriter styling
Ergonomic angle and height
95 keys including 10 function keys
Numeric keypad - 18 keys including ENTER
One touch cursor control keypad

MONITOR

12" screen - high res monochrome monitor
640x400 monochrome resolution
Note: Some of the above specifications are pre-release and may therefore be subject to change

VIDEO PORTS

Display - Low Resolution - 40 columns
Med/High Res - 40/80 plus cols
Medium res RGB (Red-Green-Blue) output
High resolution monochrome (Black & White)

COMMUNICATIONS

Bi-directional centronics parallel interface for printers, or modems capable of input/output
RS232C serial modem/printer interface
VT52 Terminal Emulation Software
Maximum Baud Rate up to 19,200
High speed hard disk interface
Floppy disk controller (Western Digital)
2 joystick ports (one for 2 button mouse)
MIDI interface for external music synthesizers

GEM WIMP ENVIRONMENT

WIMP - Window Icon Mouse Pop-down menus
Two button mouse controller
Icons/Pull down menus/Windows
GEM VDI - Virtual Device Interface
GEM AES - Application Environment Services
GEM BBT - Bit Block Transfer
Real time clock & calendar

SOFTWARE

GEM environment
With user friendly Macintosh style operation
TOS - Tramiel Operating System
Atari's own system based on CP/M 86K with hierarchical directory & file structure plus a host of MS DOS & UNIX command structures
DOS - Business Operating System
To run any standard DOS business programs
GEM desktop
with GEM PAINT graphics mgmt system and GEM WRITE word processor
Personal BASIC and DR Logo
Originally written by Digital Research (DR)
Very much like those on other machines except for the extensive use of pull down menus, mouse control and windows

VARIOUS

Dimensions: 470mmx240mmx100mm
Replaceable external power supplies
Expansion: 3 1/2" floppy disk drives 500K/1,000K (two drives can be connected)
3 1/2" (5MB) hard disk
CD (compact disc) interface
Dot matrix & d'wheel prints (black)
Thermal dot matrix (colour)
RGB & monochrome monitors

LANGUAGES

BASIC & LOGO supplied
Many others will soon be available, including: Assembly, FORTRAN, C, Cobol, Compiled Basic, Lisp, Modula-2 and Pascal.

MACINTOSH v F16 v 520ST

"Imagine a Fat Mac - the 512K Apple Macintosh - but with a bigger screen, a far bigger keyboard with numeric keypad, cursor and function keys, and colour. That gives you some idea of what the Atari 520ST is like, except for two important things. First the Atari seems faster. Second the Atari system is about one third of the price."

June 1985 - Jack Schofield - PRACTICAL COMPUTING

FEATURES OF BASIC SYSTEM	APPLE MACINTOSH	APRICOT F16	ATARI 520ST
Price includes B/W Monitor	YES	NO - extra £200	YES
Keyboard size mm (LxDxH)	330x147x50	450x167x26	470x240x60
Keyboard size ins (LxDxH)	13.0x5.8x2	17.7x6.6x1	18.5x9.4x2.4
3 1/2" D/Drive (Unformatted)	500K	500K	500K
3 1/2" D/Drive (Formatted)	399K	315K	348K
WIMP (Window, Icon, Mouse...)	Apple	ACT - Activity	GEM
Real-time Clock	YES	YES	YES
Polyphonic Sound Generator	YES	NO	YES
RS232C Serial Port	YES	YES	YES
Centronics Parallel Printer Port	NO	YES	YES
Dedicated Floppy Disk Controller	NO	YES	YES
Hard Disk DMA Interface	NO	YES	YES
Full stroke keyboard	YES	YES	YES
Number of keys on keyboard	59	92	95
Numeric Keypad	NO	YES (16 Keys)	YES (16 keys)
Cursor Control Keypad	NO	YES	YES
Function keys	NO	10	10
16-bit processor	68000	Intel 8086	68000
Processor running speed	8MHz	4.77MHz	8MHz
RAM size	512K	256K	512K
Number of graphics modes	1	4	3
Number of colours	Monochrome	16	512
Max Screen Resolution (pixels)	512 x 342	640 x 256	640 x 400
Mouse included	Single Button	NO - extra £95	Two Button
Replaceable External Power Pack	NO	NO	YES
Cartridge Socket	NO	NO	YES
Joystick Ports	NO	NO	YES (two)
MIDI Synthesiser Interface	NO	NO	YES
Monitor Size	9"	9" - extra £200	12"
RGB Video Output	NO	YES	YES

System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive	Price	Price	Price
Price of basic system (excl VAT)	£2595-VAT	£395-VAT	£652-VAT
"Mouse"	Included	Included	Included
"Monochrome Monitor"	Included	£200-VAT	Included
"Expansion to 512K RAM"	Included	£295-VAT	Included
Price of complete system (excl VAT)	£2595-VAT	£1185-VAT	£652-VAT
PRICE rounded down including VAT	£2,984	£1,362	£749

PRESS COMMENT

"The new Atari ST computers truly represent to the consumer what Jack Tramiel is saying - easy-to-use computing power without the price." March 1985 ANALOG COMPUTING

"It (the ST) uses the most modern technology that is affordable, in a package that gives a professional impression." May 25th 1985 POPULAR COMPUTING WEEKLY

"The Atari ST is one of the most elegant designs I have seen... Atari has used an original and elegant method of memory management which should make the ST faster than any other PC on the market - in any price bracket... The £4K dollar question is would I go out and spend money for one? To which the only answer is 'Try and stop me!'" John Lambert July 1985 ELECTRONICS & COMPUTING

"The 520ST is technically excellent... The 520ST hardware is the new standard by which others will be judged." July 1985 YOUR COMPUTER

"This machine is significantly more powerful than an IBM PC... it is possible to design a sure-fire winning machine, this is it." May 11th 1985 PERSONAL COMPUTER NEWS

"...the use of GEM makes the new range of Atari computers so similar to the Macintosh (with the added attraction of colour), that they are already being called 'Jackintoshes'." May 2nd 1985 COMPUTING

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SEND FOR FREE ATARI ST LITERATURE

To: Silica Shop Ltd, Dept YC 1285, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

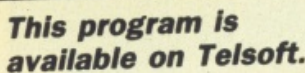
PLEASE SEND ME FREE LITERATURE ON THE NEW ATARI 520ST COMPUTER

Mr/Mrs/Ms: Initials: Surname:

Address:

Postcode:

Do you already own a computer? If so, which one do you own?



What the program does is provide you with a Basic-keyword editor with which you can modify or alter any of the Commodore 64's 76 Basic commands, operators and functions. For example you could change the End statement to Terminate, the Goto statement to Jump, the For and Next commands to Loop and Endloop, the + and - operators to Plus and Minus, or the Len function to Length.

[illegible]

The only limitations on the new keywords are that they

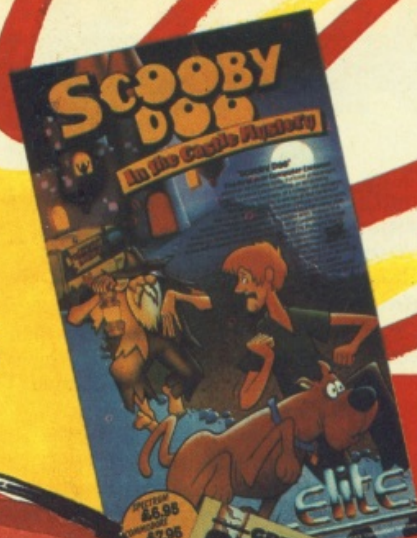
When the program is run you will see the list of Basic keywords on the screen under a heading Old. This list shows the original Commodore keywords for reference while editing. This list is repeated under another heading New. The New list represents your redefined

You may use the delete key for any mistakes. After typing

[illegible][illegible]

Remember to use your new version of the `Poke` command if you have changed it. The

Seconds out for the
challenge of the season,
guess this month's
mystery Microgamer and
you too could win a super
prize!



'Knock
every



"My two top contenders"

1. *Scooby Doo*

by Elite

In the red corner we have Scooby Doo – a real heavyweight when it comes to catching criminals, ghosts and other things that go bump in the night.

2. *Super Sleuth*

by Gremlin Graphics

And in the blue corner another Super Sleuth. Which one will come out tops? Hard to say, Harry, but both are champs in my book.

THORN EMI Computer Software

International Micro Software Division

"Take a ringside seat and sample the excitement"

CLIFF HANGER

by New Generation

This fighter doesn't use his fists, man, — but everything else in sight! Cannons, boulders, boomerangs and bombs all come in handy for Cliff who has to do something to stop the bandit shooting up the canyon.

Spectrum 48K

£4.95

GRUMPY GUMPHREY SUPERSLEUTH

by Gremlin Graphics

Keep your eye on the clock and look sharp! All your best moves have to be executed on time or you're in big trouble. Catch the shop thieves and above all keep the Manager happy — my motto exactly!

Spectrum 48K

£7.95

MINI MOFFICE

by Database

Comprising word processor — for writing letters and reports, a database — for storing addresses, and a spreadsheet — for storing complicated numbers. Pretty high-powered stuff, don't you think?

BBC

£5.95

MAD DOCTOR

by Creative Sparks

As Mad Doctor, in this blood-curdingly evil game, the player must create new life out of freshly killed body parts. If he arouses the villagers' suspicions, they'll kill him. A light touch on the scalpel is required.

Commodore 64

£8.95

Checkout games for fans
anywhere'

MARSPORT

by Gargoyle Games

Box your way out of this one! The World needs a Champion (what about me?) Yes, but *you* can be the champ here. That is if you sneak the defence plans from the doomed city and reinforce the force sphere. Not easy, with aliens attacking your every move.

Spectrum 48K and Amstrad

£9.95

DYNAMITE DAN

by Mirrorsoft

Count to ten and concentrate. You think you can win on points? Well I tell you this game will have you reeling! He may not be a Jumbo or a Bonecrusher, but one thing is certain, Dynamite Dan is hard to beat.

Spectrum 48K

£6.95

Amstrad and Commodore 64

£8.95

"Games to keep you on your toes".

RED ARROWS

by Database

These guys can sure move. But their game is a non-contact sport, if you get my drift. You can try your hand at formation flying, looping the loop and all the other tricks. Duck, dive, dodge, swerve and break — only don't hit anyone here.

Versions for most machines.

Cassette

£8.95

Disk

£11.95 & £12.95

SPOT THE BALL

by Creative Sparks

Two sports classics in one pack, but you only play one at a time, OK? There's soccer and snooker. Both need skill and timing as well as a joystick and 32K ram. Go to it!

Atari 32K

£8.95

SCOOPY DOO

by Elite

Slippery customers throw in the towel when this ace detective is around. With your help he can track down and solve the mystery that haunts his friends. Join the elite band and pit your wits against the spooks.

Spectrum 48K

£6.95

Commodore 64

£7.95

Amstrad

£8.95

SPARKLERS SPECIAL

by Sparklers

A fist full of games at a fantastic price. And nobody is pulling punches here. These games really are the greatest — anyone who disagrees will have me to reckon with! Not to mention Slurpy, Orc Attack, River Rescue and Black Hawk.

Spectrum 48K and Commodore 64

4 games for £7.50

"Non-stop thrills from start to finish"

WHO DARES WINS II

by Alligata

Only the brave survive (and the lucky). Upper cuts and left hooks are no good to you here. You need to find the ammunition dumps to knock the stuffing out of the enemy and free your friends.

Commodore 64

£7.95

Amstrad, Spectrum and Commodore 128 versions available soon.

Win



Spot this month's mystery microgamer and win a fantastic prize. Ten 2-pack program prizes must be won plus single game prizes for the first 100 runners up.

If you think you now the answer, send this coupon to us, no later than 14 December 1985. The first ten correct entries will each receive SCOOPY DOO and SUPER SLEUTH. 100 runners up will each receive a super game for their machine type.

I say the Mystery Microgamer is:

Send me your latest full list of software programs.

Name

Machine

Address

Postcode

YC4

Send to: THORN EMI Computer Software Mystery Microgamer Competition, Thomson House, 296 Farnborough Road, Farnborough, Hants GU14 7NU

Last month's
Mystery
Microgamer
was
Ian McCaskill.
Prizes are
on their way.

Prizewinners
Andrew James,
Swansea
Bobby Earl,
Birkenhead
Mark Johnson,
Knottingley
Stephen Hirst,
Castleford
Barry Cheeseman,
Swindon
Graham Langlands,
Dundee
Tim Walter,
Bristol
Paul Cooke,
Blackpool
Robert Wooley,
Peterborough
John Baxter,
Coventry



All games featured above are available from Laskys, WH Smith and other good software stores.

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plus VAT and
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SYNDROMIC MUSIC

Whether you want to play along to it, do demo's and record with it, sing along and dance to it or just enjoy programming it — The Syntron Digidrum — Get It!

The Syntron Digidrum comes complete with a hardware user port connector, audio out, trigger out, easy to follow user's guide, software with the first eight digital samples including Crash Cymbal, Snare Drum, Bass Drum, Floor Tom, Hi Tom, Med Tom, Open Hi Hat, Closed Hi Hat and programming functions. The software contains a complete set of demonstration patterns and songs — All this for just **£65.00 Inc VAT.**

There is already a new sound sample set in preparation which will contain over 40 new samples including Syn Drums, Latin percussion, Hand Claps and many more for only **£16.50!** All purchasers of the Syntron Digidrum will receive details of the new sound samples as they become available plus a FREE subscription to the SYNDROMIC USERBASE which includes a membership card and a FREE quarterly newspaper on computer music and computer musicians written by leading music and computer journalists. Please fill out and return the coupon below.

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The Syntron Digidrum is an exciting professional digital drumcomputer designed to operate with the Commodore 64.

Using 'live' digital sound samples which are encoded onto software the user has a programmable drum machine with a sound quality many times the price.

Easy visual grid programming, hear the sounds you enter, 51 patterns available in memory plus 10 songs linking 100 patterns together are possible with full copy, insert and delete functions.

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☐ I would like to order my Syntron Digidrum(s)

NAME

ADDRESS

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digi ever hear such a sound?



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 favourite phrase with which experts love to bluff the sucker is "historical reasons". Read on, and learn what to say when such bullies kick bytes in your face.

When I played with government computers, there was an interesting hierarchy. At the top came the almost godlike Cray supercomputer, fed by a lowly IBM 370, running an operating system designed to imitate something 10 years out of date, and up at the sharp end in my office there was an electromechanical teletype.

Clatter, clatter. Deciphering the manuals, I discovered that what I wanted to do required one punched card at the start of my Fortran program. (Yes, they used punched cards. And we edited them by sticking bits of foil over unwanted holes. Men were men in those days.) Or, for *historical reasons*, I could pick the handy alternative of substituting 17 different cards for that single one. Lucky me!

Compatibility was the idea. Somewhere in this research establishment were thick, cobwebbed decks of cards, three operating systems old, which couldn't be let go out of date — so the new system was taught to read the old cards. If historical reasons were the same in education as in computers, we'd all have to cope with English, Latin and Anglo-Saxon ...

History brought us the Qwerty layout: once

supposedly devised to slow typists to the pace of clumsy machines, it seems established forever. Early computer terminals tended to have plain typewriter keyboards with a very few special keys like Control and Escape: the effects are still entrenched in software.

For example, in days before arrow keys, the writers of programs like WordStar wanted to let people move a cursor round the screen. They used Control plus letter keys. Anyone accustomed to typing without staring at the keyboard would have thought that, obviously, you'd press Control and U to move up, Control and L to go left, and so on. The programmers, though, were apparently one-finger typists, and picked the E, S, D and X keys, presumably because they were bunched together and easy to find by eye. Just remember that E stands for Up and D for Right ...

Now everyone has arrow keys. But word-processors get bad reviews unless they also support the old, not particularly logical key combinations — because reviewers grew up with WordStar and like its keyboard for (ahem) historical reasons. We've likewise grown up with a ridiculously American-slanted 7-bit Ascii character set: each new British computer offers an exciting challenge, as you try to work out where they've put the pound sign.

To be purged with pity and terror, look at the MS-DOS Edlin and MicroSoft Basic line editors. You can't use the arrow keys at all. You can't alter anything which has appeared on the screen: instead, editing is done by a devious process of copying characters from a "template" line. Slowly the truth dawns. On what sort of clattering display is there no way to change a once-printed line ...? Historical reasons strike again: although they've somehow invaded microcomputers, these editors were written for use with teletypes.

The backward-looking trend continues with Apricot's "Xen", a super-fast machine which can be specially downgraded to run slothful IBM software. Will IBM compatibility be a curse on new computers, unto the fifth generation?

Santayana said "those who cannot remember the past are condemned to repeat it" — but I remember it all too well and *still* have to repeat it, every time a program insists on my hitting Control-G instead of the perfectly good Delete key ...

Dave Langford

I COULD DO THAT

As the climax to our competition series — arcade classic re-written in Basic — this month we are asking for a version of Pacman. Once again, the rule is make it short: no more than 20 Basic program lines. You may have to make do with only one ghost and a reduced board layout.

The winner of October's competition, S. Cartwright, 21 Maelog Place, Gabalfas, Cardiff CF4 3ED, shows here how to approach the task.

```

100 REM PACMAN
101 REM S. CARTWRIGHT
102 REM
103 REM BOARD LAYOUT
104 REM
105 REM 0 = EMPTY SPACE
106 REM 1 = WALL
107 REM 2 = PELLET
108 REM 3 = GHOST
109 REM 4 = PACMAN
110 REM
111 REM INITIALISE
112 REM
113 REM SET UP BOARD
114 REM
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```


THE LANGUAGE OF "C"

(continued from previous page)

It's not a language where you struggle to express your thoughts — like assembler or old Basic with no control flow; or modern Basic, Forth, Prolog, Logo, Fortran with no data structures. Nor is it a language which hems you in with theories like Pascal or Ada.

C has a reputation for speed which rests on two things. First, it is a compiled language — one where programs are translated into machine code by a compiler before being run. This makes C programs much faster than those run by an interpreter, where each line in the program is translated into machine code over and over again as the program runs.

Secondly, the facilities of the C language were designed to match the abilities of real computers — so that efficient pieces of machine code can be generated for each line in the program. This is in contrast with some languages which are waiting for new types of computer to run them efficiently.

C can be used to write many different kinds of programs in a very natural way. The chief key is the flexibility of C's data structures. It is simple to write out the data blocks needed to control a graphics chip, a sound envelope, or a disc file-control-block; then the program that uses them just follows on.

As well as the expressive power built-in to C, more power flows from the vast range of library functions available. These are functions — or subroutines — which do useful jobs and can be used freely in your own programs. For example there is a function "qsort" which sorts data into order: it's very flexible and can be used to sort many different kinds of data at the drop of a hat. There are typically well over a hundred such functions supplied with a compiler.

C has come a long way from its origins on UNIX and is now very widely available. HiSoft sell a C compiler on a wide range of home micros — the Spectrum, all the Amstrad models including

the new PCW8256, MSX disc models, the Tatung Einstein, and many other computers running the CP/M operating system. There are a multitude of compilers available for the IBM PC and MSDOS computers, and almost every mini and mainframe has a C compiler.

It is usually quick and easy to move a program from one to another, although differences do exist. For this reason business programs, and even operating systems, are now often written in C rather than machine code itself. The key here is UNIX which provides an effective standard to compare versions.

HiSoft can be found at 180 High Street North, Dunstable, Beds (telephone (0582) 696421) and will be pleased to help you with questions about C. The Kernighan and Ritchie book is entitled *The C Programming Language* and published by Prentice-Hall (ISBN 0-13-110163-3): it should whet your appetite for C further, though there are lots of other good books to choose from.

Dave Howarth

MACHINE CODE

In an interview with an American computer magazine Bill Atkinson, the author of the Macintosh's drawing program, MacDraw, was at pains to point out that he had written the entire program in "hand-crafted code". In other words, he had written it in machine code. This pride may come as a surprise to commercial games programmers, who

have been writing hand-crafted code all along.

The point of Bill Atkinson's remark, however, was that nowadays a program that has been written entirely in machine code, using an assembler, is something of a rarity. Operating systems and business application programs are increasingly written in a high level language such as C and then compiled. Even in 1981, when the BBC operating system was being developed, most of it was programmed in BCPL.

As memory prices fall, processors speed up, and compilers become more efficient, it makes more and more sense to develop software in this way. Unless a piece of code has to be particularly compact or fast, there is no need to write it in assembler. It takes longer to write and is less easy to convert for other machines.

But for home computer

owners the situation is slightly different. There are several good reasons why you should at least pick up a smattering of machine code. For one thing, it will give you a much better understanding of the way your machine works. It will also allow you to access those parts of the computer that Basic cannot reach. Interrupt-driven routines, for example, can only be implemented in machine code.

More important, though, is the fact that machine code is much faster than Basic. Take, for example, the problem of moving or animating shapes on screen. It is easy enough in Basic to move a character across the screen a character space at a time. But for smooth animation shapes need to be shifted only one or two pixels at a time. For this Basic is just too slow.

The speed advantages of machine code are very substantial indeed.



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... innovative mix of ideas and excellent graphics ...

Variety is certainly the key word in this highly unusual game which has surely gone far beyond what anyone ever expected.



... a beautiful program, an adventure of great imagination, with some superb programming techniques ...



It's nice to see a game that can match the quality and the style of the group.

— action and strategy — and there are a number of slick touches that will keep you on your toes.

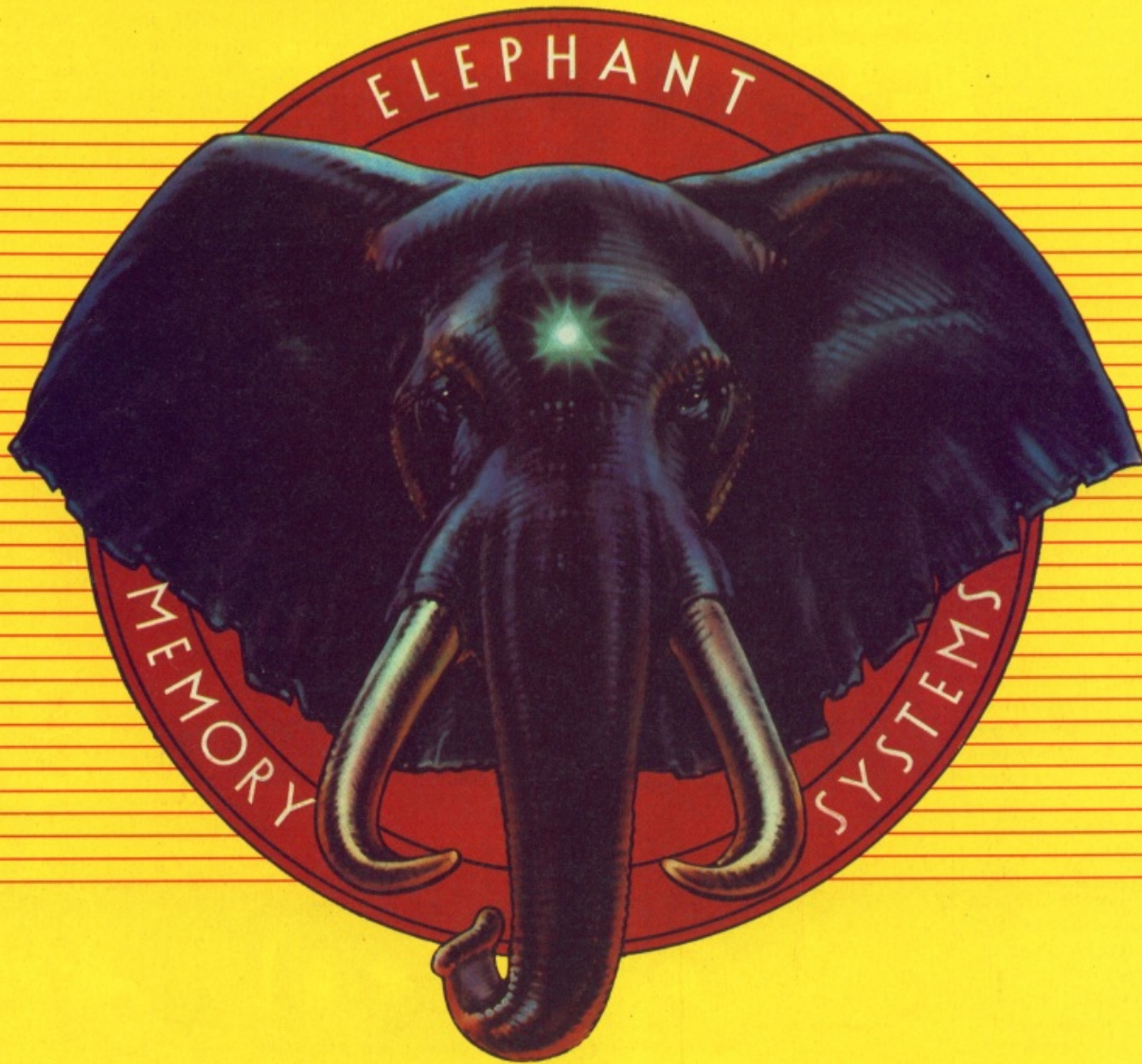
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Competition results

CBM-128

Anyone who has ever spent much time hooked on one game is bound to consider ways in which the game could be improved. So it is not surprising that our August competition tapped a rich vein of suggestions, along with critical analyses and outbursts of frustration. The prize was a CBM-128. To be in the running you had to send in an idea for a new screen, room, or feature in your favourite game.

The most common and dullest idea was that the combatants in *Way of the Exploding Fist* should be equipped with weapons. Others were more imaginative and came up with such

improvements as a welly throwing event for Decathlon, an option to do a dirty foul in International Soccer and be sent off, an asteroid belt for *Elite*, and — from S. Barron — the inspired idea of rewriting *Hunchback* in the style of *Ant Attack*.

Best of all, we thought, was the detailed proposal for a sado-

therapeutic dwarf bashing location in the adventure game *Knights Quest*. This wins Neil Thraves, 153A, Fullwell Ave., Barkingside, Ilford, Essex, the prize. In his entry he explained that he was maddened by being repetitively told, first, "A dwarf is with you" and then — after an attempt to kill the blighter: "he dodges your blows easily

and laughs". He supplied a sample text from the new location. It included such exchanges as:

SWING DWARF

The dwarf swings to and fro, trailing small sparks from his blazing beard and waving his stubby little arms.

CUT ROPE WITH SWORD

The dwarf plunges headfirst into the stone floor, and then begins to sing feebly about gold.

We also asked you to name your Top Ten commercial games.

The full results in the form of a list of the all-time top 50 games will be given in *Your Computer's Top 100*, to be published separately in December. For the time being see table 1 for the top 10, as computed from nearly 9,000 nominations:

Table 1.

1. <i>Way of the Exploding Fist</i>	Melbourne House
2. <i>Knightlore</i>	Ultimate
3. <i>Ghostbusters</i>	Activision
4. <i>Elite</i>	Acornsoft/Firebird
5. <i>Hobbit</i>	Melbourne House
6. <i>Impossible Mission</i>	US Gold
7. <i>Daley Thompson's Decathlon</i>	Ocean
8. <i>Raid over Moscow</i>	US Gold
9. <i>Dambusters</i>	US Gold
10. <i>Pitstop 2</i>	CBS

AMSTRAD 6128

"Put yourself in the place of someone writing a book entitled '1001 uses of a disc drive'. Now dream up an entry for it". So ran our intro to September's Amstrad 6128 competition.

In response you sent in a number of highly sensible and constructive suggestions together with...a lot of very silly ones. Many of the latter were in the same vein as the recent story about the secretary who made back-up copies of her wordprocessing files by photocopying her discs. Since had been told that the drive ran double-sided discs she took care to photocopy both sides.

A fair number of the entries seemed preoccupied with food. Along with suggestions for using a drive as a toaster we received outlines for a Disc Drive Pizza Machine, the Bisk Drive, totally compatible with lemon curd and smooth peanut butter, and a recipe for making Ramcakes, either 40 or 80 tracks.

Other ideas included J. Higgs's explanation of how to convert a drive into a Spectrum coolant fan, and G. Pearce's Abrazor disc. With its abrasive razor surface, the Abrazor ensures that "application of beard area systematically to drive aperture activates

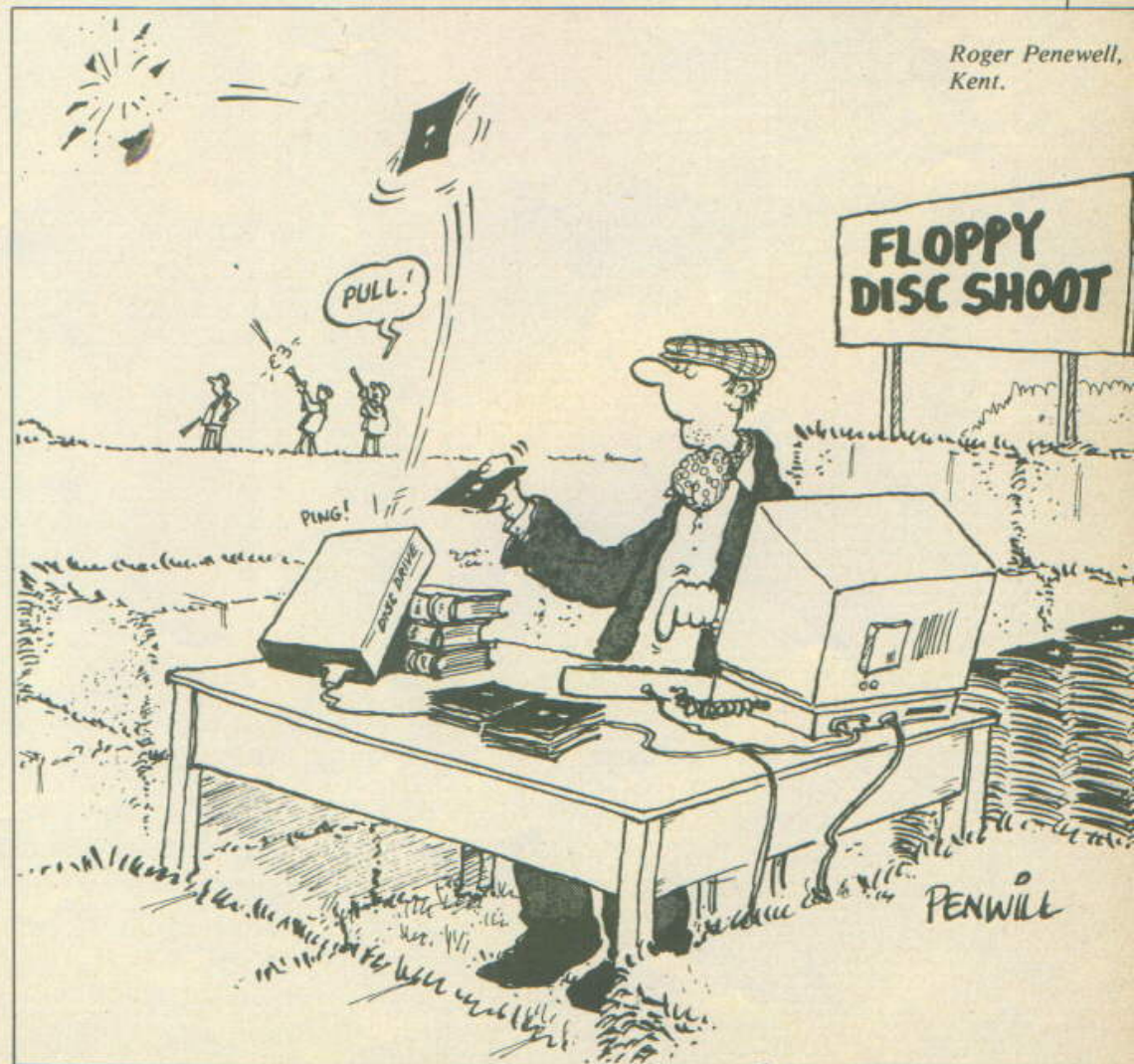
simultaneous chin-scan and de-whisker operation".

Several other entries hit on an even more novel application:

clay disc shooting. The best of these was neatly illustrated by Roger Penwill, 127 Penenden, New Ash Green, Kent DA3 8LT

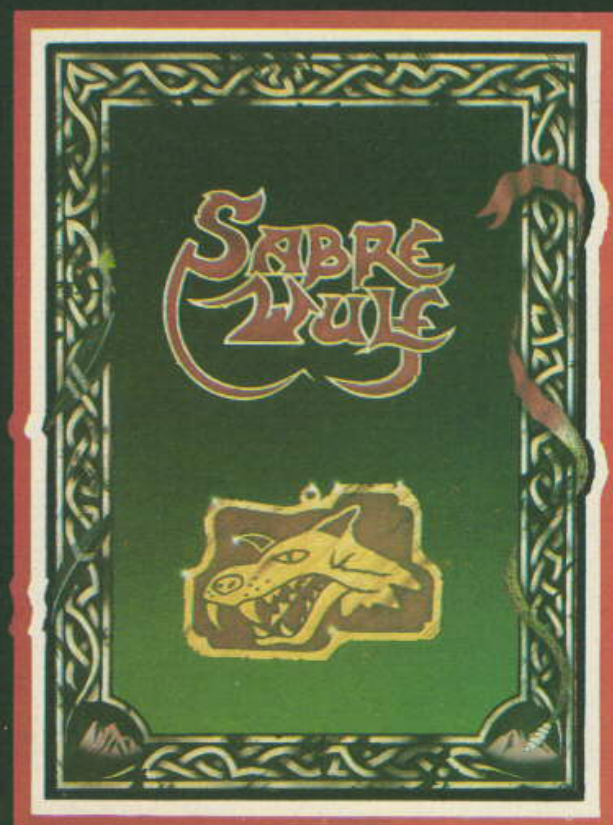
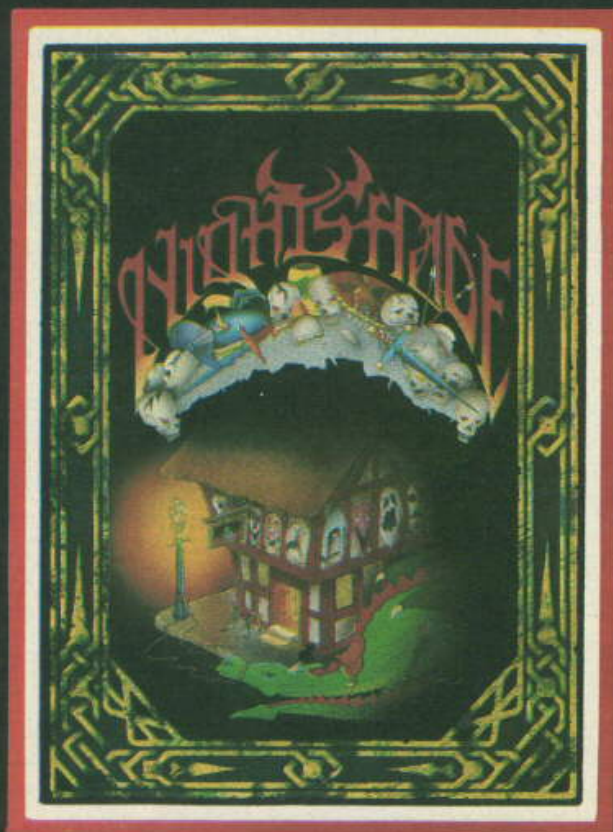
and wins him the Amstrad 6128.

September's Philips monitor and Mud competitions will be judged next month.



Roger Penwill,
Kent.

AMSTRAD CPC 464



"NIGHTSHADE", "KNIGHT LORE", "ALIEN EIGHT"
recommended retail price £9.95 inc VAT.

"SABRE WULF" recommended retail price £7.95 inc VAT

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Access

RESPONSE FRAME

COMMODORE 64 OR AMSTRAD?

Do you have a problem related to your micro? Our team will do their 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?

● I am thinking of buying my first micro but I can't decide between CBM-64 and Amstrad CPC-464.
Ali Imran, Lahore, Pakistan.

One of the main factors to consider before choosing between either machine is that they are both being superceded by superior machines built by the same manufacturers. Because of the relentless competition between manufacturers, in a few months time it should be

possible to buy both the CBM-64 and the Amstrad CPC-464 at very much reduced prices.

Access to more computing power

Both the BBC and the Amstrad give access to more computing power because of their superior Basic programming languages and graphics capabilities. However, the CBM-64 should not be over-looked as a first machine especially for the purpose you mention. The 64

has a huge software base and is capable of some fairly impressive feats.

What you must decide between, therefore, is the Commodore's impressive software support and the Amstrad's convenience with its built-in cassette unit and monitor.

But remember, both Commodore and Amstrad are releasing new, more powerful machines at prices similar to their predecessors.

Irwan Owen.

DETECTING A SPECIFIC CHARACTER

● Could you please tell me if there is a way on the Commodore 64 of detecting the specific character involved in a sprite-to-data collision e.g. in a game of Blitz, the blitz plane is a sprite, the buildings are redefined characters, and there are stars scattered above the buildings, which themselves are redefined characters. How can you tell if the sprite plane is colliding with the buildings and not the stars?

Martin Wicks, Southampton, Hampshire.

Unfortunately, the CBM-64

does not have a built in method for determining which screen characters a sprite has collided with.

The simple solution to your problem would be to print all the stars above the top of the line of buildings. It would then be a case of interpreting the Y-position of the sprite to decide what it must have collided with.

A more complicated approach is to convert the standard hires coordinates the sprite into character positions. This is done as

follows taking into account the X and Y offsets at the edge of the screen.

```
x_char = INT((x - 24)/8)
y_char = INT((y - 50)/8)
```

These give x and y values of 1-24 and 1-40 respectively. These values can then be used in conjunction with a look-up table in the machines memory to find the address of the character square in the top left corner of the sprite. The contents of this address can then be accessed and identified.
Irwan Owen.

INSTANTANEOUS SCREENS

● Could you explain to me how I should go about making screens appear instantaneously in machine code and also how to work it so as a loading screen can be made to appear after loading Basic.

Hadyn Seak, Finsbury Park, London

A quick way to make a screen is to load it higher up in the memory than usual and then dump it to screen via an ldir routine.

For example,
CLEAR 49150:LOAD""CODE
49151

```
then poke these values into
any part of the memory.
33,0,229 LD HL,SOURCE
17,0,64 LD DE, DESTINATION
1,0,27 LD BC,NO OF BYTES
(6912)
237,176 LDIR
201 RET
RANDOMIZE USR (START OF
ROUTINE)
```

The only thing about this is that it takes the same time to load, although more spectacular, and if you intend to write a game using full screens you'll waste previous memory.

By making a loading screen appear from Basic I assume you mean as in the case of Chuckie Egg and Wheelie, where the screen is hidden in the Basic.

The best way, I find, to do this is to tack an ldir routine on the front of a screen and count the number of bytes (should be 6924). Next set up a Rem statement and put in the same amount of spaces (understand?).

For example:

```
10 REM ... etc
then make the next line as
follows:
20 FOR N = 23755 TO XXXXX:
PRINT N,PEEK N: NEXT N.
(Where XXXXX = any high
number).
```

As soon as you spot a "32" code number then write the address down. Delete line 20 and load the ldir/screen into that address. Hopefully it will appear if you make lines 20/30 as follows:
20 BORDER X: INK X: PAPER X:
RANDOMIZE USR START
ADDRESS.
30 ... Continue with program.

A slightly more efficient way to do it is to get yourself a screen compressor program and load your screen into it. The compressed program that emerges will be self contained and you can load it back to any part of the memory you wish, including the basic. A quick Rand USR et voila!

Craig Rawston.

TOP TIPS

With this program for the BBC or Electron you can display letters at any angle on the screen either slightly smaller than normal or up to ten times larger. The program starts by asking for the word you wish to print, followed by the new size and angle.

L. Edmond.

```
10 MODE1:INPUT "WORD":W$
20 INPUT "SIZE (0.68-10)":SI
30 INPUT "ANGLE (-8 TO 8)":SI
35 CLS:PRINTTAB(0,0),W$
40 IN=32*LEN(W$)
45 Q=(1279-IN*SI)/2
50 PROC1:titlar:END
60 DEFPROC1:titlar
70 FOR H=1 TO IN STEP 4
80 ANG=ANG+DE
90 FOR G=994 TO 1023 STEP 4
100 X=H*SI+Q:Y=G*SI+ANG-SI*1000
+300
105 GCOL0,2
110 IF POINT(H,G)<>0 GCOL0,2:DR
AN X,Y:ELSE GCOL0,0:MOVE X,Y
120 NEXT G,H:ENDPROC
```


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Devpac	14.00	21.95	19.95	39.95	19.95
C	25.00	34.95		*	(MON QL)
Ultrakit	9.45				
Font64/MSX		7.95	9.95		(Font designer)
The Knife		12.95			(CP/M disc editor)
The Torch		12.95			(CP/M disc Tutorial)
The Colt	12.95				(Fast integer BASIC compiler)

All prices in £ sterling. *Coming soon!

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Our Customers:

- C "more addictive than any arcade game"
R. Walker
- Devpac80 "a brilliant piece of software" A. Brown
- Ultrakit "a great acquisition" J. Le Page

The Press:

- Pascal "if you wish to teach yourself Pascal ... you won't go far wrong to buy HiSoft's Pascal" PCF 1/84
- Devpac "it is impossible to recommend any other development package for the Spectrum" ECM 4/84
- C "the most welcome addition to the Spectrum catalogue since Sinclair introduced the Microdrives" Sinc. User 12/84
- Font64 "the manual is clear ... very simple to use" PCT 7/85

These are only a few of the glowing comments that we have on file showing that user and critic alike find HiSoft software offers a refreshing change of style.

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Software File

PRO SYNTH

► *Andrew Parker • CBM-64 • Warrington, Cheshire*

This program allows you to use the keyboard as a sort of musical instrument. The keyboard is from Z to / and from Q to *. This gives a span of three octaves.

Sharps are
S,D,G,H,J,L,.,2,3,4,6,7,9,0,+.

When the program is running, a sprite "hand" is visible. This is moved by a joystick in port 2. Placing the finger on the hand over a plus or minus sign causes the connected value to change by +1 or -1 respectively. This works with the Envelope and Pulse Width Resolution (PWR). With the Oscillator 3 frequency, pressing the fire button allows the function keys to alter the frequency. This is because the frequency can be between 0 and 65535 Hz.

Programs for Software File should be fairly compact and sent on a cassette. Please include clear instructions and say what computer it's for. We pay between £6 and £36 for programs published. They must be double-checked and submitted to *Your Computer* exclusively.

Therefore, the function keys either add (+) or subtract (-) the following values:

F1 = ± 1 F3 = ± 10 F = ± 100 F7 = ± 1000 (Hz)

This allows rapid changes of the frequency. When the required frequency is set, pressing Inst/Del returns to the keyboard. This frequency only applies when ring modulation or synchronization is working.

Waveforms are selected by placing the finger on the required waveform and pressing the button. Reversed characters shown

correct selection. Ring modulation and synchronization (RM and SY) are selected in the same way. To turn off, repeat the process. Note that if one is selected while the other is still on, it will be turned off.

Oscillator control shows which voices are working, either voice one voice or both.

ADSR: Attack, Decay, Sustain, Release. The four parts of a standard envelope generator. The note rises to a peak, decays to a sustain level, then dies away.

MODULATION:

Application of a control voltage, for example a low frequency oscillator (LFO) to control an element in the shaping of a sound. In other words, the use of one control to influence or alter the effects of another.

RING MODULATION: As MODULATION, producing an output equal to the sum and difference of the two input frequencies.

Produces some bell sounds.

SYNCHRONIZATION:
Combining two notes
without altering their pitch.

Listing 1.

```

5 DIMNO(70,2):PRINTCHR$(14)
10 POKE53280,6:POKE53281,0
70 FORDE=1TO4000:NEXT
150 PRINT"(CLR) (SH E)NVELOPE":PRINT"(PUR) (C=A) (SH
*)(C=R) (SH *) (C=R) (SH *) (C=S)"
160 PRINT"(HOME) (DOWN)":FORL=1TO16:PRINT"(PUR) (C=Q)
(SH +) (SH +) (SH +) (C=W)":NEXT
170 PRINT"(HOME) (DOWN) (DOWN) 15 (DOWN) (DOWN) (DOWN)
(DOWN) (LEFT) (LEFT) 10 (DOWN) (DOWN) (DOWN) (DOWN) (DOWN)
(DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (LEFT) 0"
180 PRINT" (SH -> (SH A) (SH -> (SH D) (SH -> (SH S) (SH ->
(SH R) (SH ->)"
190 PRINT" (C=Q) (SH *) (SH +) (SH *) (SH +) (SH *) (SH +) (SH
*) (C=W) (DOWN) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (L
EFT) (LEFT) (LEFT) (SH -> (SH -> (SH -> (SH -> (SH -> (SH -> (DOWN)
(N) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT)
(C=Q) (SH *) (SH +) (SH *) (SH +) (SH *) (SH +) (SH *) (C=W)
";
195 PRINT"(DOWN) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (L
EFT) (LEFT) (LEFT) (SH -> (SH -> (SH -> (SH -> (SH -> (SH -> (DOWN)
(N) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT)
(C=Z) (SH *) (C=E) (SH *) (C=E) (SH *) (C=E) (SH *) (C=X)"
200 PRINT"(HOME) "SPC(12) " (SH W) AVEFORM (SH C) ONTROL
(SH P) (SH W) (SH R) "
210 PRINTSPC(35) " (GRN) (C=A) (SH *) (C=S)"
215 PRINTSPC(12) " (GRN) (C=A) (SH *) (SH *) (C=R) (SH *) (SH
*) (C=R) (SH *) (SH *) (C=R) (SH *) (SH *) (C=S) (C=A) (SH *)
(SH *) (SH *) (SH *) (SH *) (C=R) (C=W) + (SH ->)"
220 PRINTSPC(12) " (GRN) (SH -> (WHT) (SH T) R (GRN) (SH -> (YE
L) (SH S) A (GRN) (SH -> (CYN) (SH P) U (GRN) (SH -> (PUR) (SH N)
O (GRN) (SH -> (SH -> % (SH -> (C=Q) (SH *) (C=W)"
225 PRINTSPC(12) " (GRN) (C=Z) (SH *) (SH *) (C=E) (SH *) (SH
*) (C=R) (C=R) (C=E) (SH *) (SH *) (C=X) (C=Z) (SH *) (SH
*) (C=R) (C=R) (SH *) (C=E) (C=W) - (SH ->)"
230 PRINTSPC(12) " (GRN) (SH -> (C=Z) (SH *) (SH *) (S
H *) (SH *) (SH *) (SH *) (SH *) (SH *) (SH *) (SH *) (C=X) (SH
-> (C=Z) (SH *) (C=X)"
235 PRINTSPC(12) " (GRN) (C=Z) (SH *) (SH *) (SH *) (S
H *) (SH *) (SH *) (SH *) (SH *) (SH *) (SH *) (SH *) (SH *) (C
=X)"
240 PRINT"(HOME) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (D
OWN) (DOWN) (DOWN) "SPC(12) " (SH C) ONTROL (SH O) SC. 3 (
SH F) REQ"
250 PRINTSPC(12) " (YEL) (C=A) (SH *) (SH *) (C=R) (SH *) (SH
*) (C=S) (C=A) (SH *) (SH *) (SH *) (SH *) (SH *) (SH *) (S
H *) (SH *) (SH *) (SH *) (C=R) (C=R) (SH *) (C=S)"

```

```

255 PRINTSPC(12)" (YEL) (SH -) (WHT) (SH R) (SH M) (YEL) (SH
-) (GRN) (SH S) (SH Y) (YEL) (SH -) (SH -) (SH H) Z
(SH -) (SH -) (SH -)"
260 PRINTSPC(12)" (YEL) (C=Z) (SH *) (C=R) (C=E) (C=R) (SH
*) (C=X) (C=Z) (SH *) (SH *) (SH *) (C=R) (SH *) (C=R) (SH *)
(SH *) (SH *) (C=E) (SH +) (SH *) (C=W)"
265 PRINTSPC(12)" (YEL) (SH -) (C=Z) (SH *) (SH *) (SH *)
(SH *) (SH *) (SH *) (SH *) (SH *) (SH *) (C=X) (SH -) (
SH -) (SH -)"
270 PRINTSPC(12)" (YEL) (C=Z) (SH *) (SH *) (SH *) (SH *)
(SH *) (SH *) (SH *) (SH *) (SH *) (SH *) (SH *) (SH *)
(C=X) (C=Z) (SH *) (C=X)"
280 PRINT:PRINT:PRINT
290 PRINTSPC(12)" (SH O) SCILLATOR (SH C) ONTROL"
295 PRINTSPC(12)" (PUR) (C=A) (SH *) (SH *) (SH *) (C=R) (
SH *) (SH *) (SH *) (C=S)"
300 PRINTSPC(12)" (PUR) (SH -) (WHT) (SH O) NE (PUR) (SH -
) (YEL) (SH T) WO (PUR) (SH -)"
305 PRINTSPC(12)" (PUR) (C=Z) (SH *) (SH *) (SH *) (C=E) (
SH *) (SH *) (SH *) (C=X)"
400 DATA 3,0,0,7,128,0,3,192,224,1,225,224,0,241,192,0,
121,192,0,127,192,3,255
405 DATA 192,7,255,192,7,207,192,1,243,192,15,253,224,1
5,254,224,15,159,216
410 DATA 1,239,184,7,247,112,7,254,224,7,253,192,0,11,1
28,0,7,0,0,0
415 POKE 2040,13
420 FOR L=0 TO 62: READ A: POKE 832+L, A: NEXT
430 V1=53248: V2=54272
440 POKE V1+21,1: POKE V1+39,1
500 DATA 12,4,48,23,4,180,20,5,71,31,5,152,28,6,71,39,7
,12,36,7,233,47,8,97
505 DATA 44,9,104,55,10,143,62,11,48,9,12,143,14,14,24,
17,15,210,22,16,195,25
510 DATA 18,209,30,21,31,33,22,96,38,25,30,41,28,49,46,
31,165,49,33,135,13,4,112
520 DATA 11,14,239,19,17,195,24,19,239,32,23,181,35,26,
156,40,29,223,42,8,225
525 DATA 18,4,251,59,11,218,8,13,78,26,5,237,29,6,167,3
4,7,119,45,9,247,-1,-1,-1
530 READ A,B,C
535 IFA=-1 AND B=-1 AND C=-1 THEN 600
540 NO(A,1)=B: NO(A,2)=C: GOT O 530
600 S=54272: POKES+24,15
610 X=152: Y=214
620 AT=10: DE=8: SU=10: RE=9

```

(continued on next page)

(continued from previous page)

```
0135 PRINT "HOME" (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN)  
DOWN> DOWN> DOWN> DOWN> DOWN> DOWN> WHT": SPC(A2) STR$(OF)  
3140 RETURN  
4000 POKE198,0:L=PEEK(56320)  
4005 IFL=111THEN5000  
4010 IFL=119ANDX<311THENX=X+8  
4020 IFL=126ANDY>8THENY=Y-8  
4030 IFL=123ANDX>8THENX=X-8  
4040 IFL=125ANDY<247THENY=Y+8  
4050 HX=INT(X/256):LX=X-(256*HX):HY=Y  
4060 POKEV1+16,HX:POKEV1,LX:POKEV1+1,HY  
4070 GOTOT50  
5000 REM * HAND ROUTINES *  
5005 IFHY>20BANDLX<100ANDHX=0THEN5200  
5010 IFHY>208THEN5300  
5020 IFHY>136ANDHY<146ANDHX=0THEN5400  
5025 IFHY>72ANDHY<82ANDLX<210THEN5500  
5030 IFHY>64ANDHY<90ANDLX<50THEN5600  
5035 IFHY>136ANDHY<162ANDLX>43ANDLX<51ANDHX=1THEN5700  
5200 REM ** ADSR **  
5205 IFHY>208ANDHY<218THEN5215  
5210 IFHY>224ANDHY<234THEN5255  
5212 GOTOT60  
5215 IFAT=15THEN5225  
5220 IFLX>42ANDLX<50THENPRINT"(HOME)"SPC(3)LEFT$(D$,17  
-AT)"(UP)<(LEFT)<(WHT)<(SH *)":AT=AT+1  
5225 IFDE=15THEN5235  
5230 IFLX>56ANDLX<66THENPRINT"(HOME)"SPC(5)LEFT$(D$,17  
-DE)"(UP)<(LEFT)<(WHT)<(SH *)":DE=DE+1  
5235 IFSU=15THEN5245  
5240 IFLX>72ANDLX<82THENPRINT"(HOME)"SPC(7)LEFT$(D$,17  
-SU)"(UP)<(LEFT)<(WHT)<(SH *)":SU=SU+1  
5245 IFRE=15THEN5255  
5250 IFLX>88ANDLX<98THENPRINT"(HOME)"SPC(9)LEFT$(D$,17  
-RE)"(UP)<(LEFT)<(WHT)<(SH *)":RE=RE+1  
5253 GOTOT700  
5255 IFAT=0THEN5265  
5260 IFLX>42ANDLX<50THENPRINT"(HOME)"SPC(3)LEFT$(D$,17  
-AT)"(DOWN)<(LEFT)<(WHT)<(SH *)":AT=AT-1  
5265 IFDE=0THEN5275  
5270 IFLX>56ANDLX<66THENPRINT"(HOME)"SPC(5)LEFT$(D$,17  
-DE)"(DOWN)<(LEFT)<(WHT)<(SH *)":DE=DE-1  
5275 IFSU=0THEN5285  
5280 IFLX>72ANDLX<82THENPRINT"(HOME)"SPC(7)LEFT$(D$,17  
-SU)"(DOWN)<(LEFT)<(WHT)<(SH *)":SU=SU-1  
5285 IFRE=0THEN5295  
5290 IFLX>88ANDLX<98THENPRINT"(HOME)"SPC(9)LEFT$(D$,17  
-RE)"(DOWN)<(LEFT)<(WHT)<(SH *)":RE=RE-1  
5295 GOTOT60  
5300 REM ** VOICES **  
5305 IFLX>146ANDLX<170THEN5360  
5310 IFLX>202THEN700  
5313 IFS2=0THENS2=1:GOTO700  
5320 IFS2=1THENS2=0:GOTO700  
5360 IFS1=1THENS1=0:GOTO700  
5370 IFS1=0THENS1=1:GOTO700  
5400 REM ** RM AND SY **  
5405 IFLX>152ANDLX<170THEN5430  
5410 IFLX>130ANDLX<146THEN5420  
5415 GOTOT700  
5420 IFRM=1 THENRM=0:GOTO5440  
5425 IFRM=0 THENRM=1:SY=0:GOTO5440  
5430 IFSY=1 THENSY=0:GOTO5440  
5435 IFSY=0 THENSY=1:RM=0  
5440 IFWA$="T"ANDRM=1 THENWA=21  
5443 IFWA$="T"ANDSY=1 THENWA=19  
5445 IFWA$="S"ANDRM=1 THENWA=37  
5448 IFWA$="S"ANDSY=1 THENWA=35  
5450 IFWA$="P"ANDRM=1 THENWA=69  
5453 IFWA$="P"ANDSY=1 THENWA=67  
5455 IFWA$="N"ANDRM=1 THENWA=133  
5458 IFWA$="N"ANDSY=1 THENWA=131  
5460 IFWA$="T"ANDRM=0ANDSY=0 THENWA=17  
5465 IFWA$="S"ANDRM=0ANDSY=0 THENWA=33  
5470 IFWA$="P"ANDRM=0ANDSY=0 THENWA=65  
5475 IFWA$="N"ANDRM=0ANDSY=0 THENWA=129  
5480 GOTOT60  
5500 REM ** WAVEFORMS **  
5510 IFHY>72ANDHY<82THEN5520  
5515 GOTOT700  
5520 IFLX>122ANDLX<136THENWA=17:RM=0:SY=0:WA$="T"  
5525 IFLX>146ANDLX<162THENWA=33:RM=0:SY=0:WA$="S"  
5535 IFLX>170ANDLX<186THENWA=65:RM=0:SY=0:WA$="P"  
5545 IFLX>194ANDLX<210THENWA=129:RM=0:SY=0:WA$="N"  
5550 GOTOT700  
5600 REM ** PWR **  
5610 IFLX>50ANDLX<60THEN5620  
5615 GOTOT700  
5620 IFHY>64ANDHY<74ANDPW<100THENPW=PW+1
```


(continued from page 116)

```
5625 IFHY>80ANDHY<90ANDPW>0THENPW=PW-1
5630 GOSUB3000
5650 IFPEEK(56320)=111THEN5620
5660 GOTO700
5700 REM ** OSC.3 FREQ **
5710 IFHY>152ANDHY<162THEN5800
5715 IFHY>136ANDHY<146THEN5725
5720 GOTO700
5725 K1=PEEK(197)
5730 IFK1=4ANDOF<65534THENOF=OF+1
5735 IFK1=5ANDOF<65524THENOF=OF+10
5740 IFK1=6ANDOF<65434THENOF=OF+100
5745 IFK1=3ANDOF<64534THENOF=OF+1000
5750 IFK1=0THEN5800
5755 GOSUB3100
5760 GOTO5725
5800 K1=PEEK(197)
5805 IFK1=4ANDOF>1THENOF=OF-1
5810 IFK1=5ANDOF>10THENOF=OF-10
5815 IFK1=6ANDOF>100THENOF=OF-100
5820 IFK1=3ANDOF>1000THENOF=OF-1000
5830 IFK1=0THEN5900
5835 GOSUB3100
5840 GOTO5800
5900 IFOF>255THEN5950
5905 LF=OF:HF=0:GOTO700
5950 LF=255:IM=OF-255:HF=IM/256
5955 GOTO760
```

ULTRALIST

►Mark Franklin • Spectrum
• 69 The Heights, Northolt,
Middlesex

This program allows you to produce decent looking listings on an RS-232 printer, connected to the Interface I. It indents the lines so that the only things which can be seen in the left hand column are the line numbers. It also prints up page numbers for printers using single

sheets of paper, and allows any number of characters per row. It lets you list out a particular range of line numbers from a program, so that there is no need to waste paper printing unwanted lines.

To enter the program, run the machine code loader given. Once you get the message "DATA OK", the loader gives you a chance to customise it to the size of your own printer. Once this is done save it to microdrive using

the command:
SAVE*"m";1;"ULTRALIST"C-
ODE 64000,1000

The program requires four parameters in a special order. However, if only two are given, the other two will be given an assumed value. Similarly, if none are given, all four will be assumed. They are specified in a Rem statement in line 9999.

The order they are given is: Start line No, finish line no, start page no, listing width-5. They should be written with spaces between them. The last one, listing width, is the number of characters printed per line, and can be adjusted to allow room for comments on the right hand side. If this is not specified, it will be set to the printer width value. The start page number is included so that individual pages can be printed, if only a small alteration is made to what that page previously read.

One the parameters have been entered, type
RANDOMISE USR 64000

It will now begin printing. When it reaches the bottom of the sheet of paper, the boarder will go red. This is a signal that

you can set up the next sheet of paper and press any key to resume the listing.

If, at any time you wish to abort the listing, press the "A" key until the border goes blue. It will now finish printing the current line.

The program was written with the Brother EP-22 printer in mind. The pound symbol code on this printer is different to that of the Spectrum. If your printer is not like this, then POKE 64557,0 and POKE 64558,0.

Also, all graphics are printed as "?". I have included a demo program and a listing which if produced itself show the main features.

To change the operating BAUD rating, initially set at 300 Bd. Type in the following instructions:
FORMAT "t"; Baud rate.
POKE 64212, PEEK 23747
POKE 64213, PEEK 23748

I will be pleased to answer any inquiries about the program if an SAE is sent to Mark Franklin, 69 The Heights, Northolt, Middlesex, UB5 4BP. I can also supply a ready made copy on tape for £2.00 and on Microdrive for £3.50.

Listing 1.

```
10 PAPER 0: INK 7: BRIGHT 1: BORDER 0: CLS
15 PRINT AT 0,11: INK 5:"ULTRALIST"
30 PRINT " INK 6:"Example of parameters"
40 PRINT " Start line 10"
50 PRINT " Finish line 1033"
60 PRINT " Page no. 34"
70 PRINT " Page width 50"
100 PRINT " 9999 REM 10 1033 34 50"
1000 FOR f=USR "a" TO USR "e"-1: READ a: POK
E f,a: NEXT f
1010 DATA 16,40,40,69,69,130,130,130,130,128
,128,128,128,0,0,0,64,160,160,16,16,8,43,72,
72,72,106,72,72,64,64,64
1020 PRINT AT 18,25: " :TAB 25; "
1030 RANDOMIZE USR 64000
9999 REM 10 1033 34 50
```

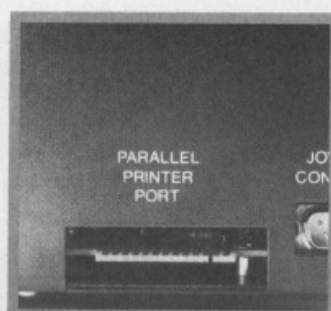
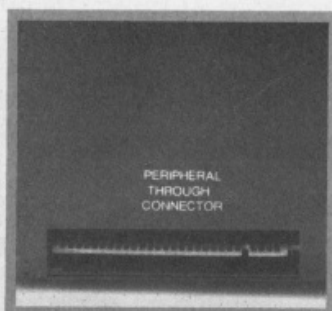
Listing 2.

```
0>REM
1985, Mark Franklin
10 CLEAR 63999
15 POKE 23692,255
20 FOR f=64000 TO 64991 STEP 16
25 LET c=0
30 FOR g=f TO f+15
40 READ a
45 IF a>500 THEN GO TO 200
50 LET c=c+a
60 POKE g,a
70 NEXT g
80 READ a
90 IF c<>a THEN GO TO 200
95 PRINT (f-64000)/16*10+1000;"
OK"
100 NEXT f
```

```
110 PRINT " FLASH 1:"DATA OK"
130 INPUT "Enter no. of rows per li
ne on your printer...";l
140 POKE 64167,1-4: POKE 64775,1-5
150 INPUT "Enter no. of rows to be
printed per page....";r
160 POKE 64442,r
190 STOP
200 PRINT FLASH 1:"ERROR AT ";(f-6
4000)/16*10+1000: STOP
1000 DATA 237,91,123,92,33,190,253,3
4,123,92,33,114,253,6,76,126,1876
1010 DATA 35,215,16,251,237,83,123,9
2,42,75,92,43,43,126,254,13,1740
1020 DATA 32,250,35,126,254,39,40,9,
43,43,43,126,254,39,194,82,1609
1030 DATA 253,35,126,254,15,194,82,2
53,35,35,126,254,234,194,82,2207
1040 DATA 253,205,20,253,237,83,227,
253,56,33,205,20,253,237,83,229,2647
1050 DATA 253,56,43,205,20,253,123,5
0,226,253,56,48,205,20,253,123,2187
1060 DATA 50,224,253,126,254,13,40,5
0,195,82,253,205,223,252,11,17,2248
1070 DATA 14,39,237,83,229,253,205,0
,253,205,6,253,24,45,205,223,2274
1080 DATA 252,205,234,252,205,0,253,
205,6,253,24,31,205,223,252,205,2005
1090 DATA 234,252,205,12,253,205,6,2
53,24,17,205,223,252,205,234,252,283
2
1100 DATA 205,12,253,58,224,253,254,
71,210,82,253,55,63,205,84,253,2535
1110 DATA 229,42,229,253,34,227,253,
205,84,253,32,7,35,35,94,35,2047
```

```
1120 DATA 86,35,25,34,229,253,225,34
,227,253,175,50,225,253,103,111,2318
1130 DATA 34,222,253,33,190,1,34,195
,92,42,227,253,62,253,219,254,2364
1140 DATA 230,1,32,14,58,72,92,230,5
6,203,63,203,63,203,63,211,1794
1150 DATA 254,201,229,58,224,253,71,
5,5,197,62,32,207,30,193,16,2037
1160 DATA 248,62,80,207,30,62,97,207
,30,62,103,207,30,62,101,207,1795
1170 DATA 30,62,32,207,30,58,226,253
,79,6,0,205,248,251,62,13,1762
1180 DATA 207,30,225,62,0,50,222,253
,58,222,253,203,127,40,6,62,2020
1190 DATA 0,50,198,92,201,229,86,35,
94,35,205,231,251,62,32,229,2030
1200 DATA 207,30,225,94,35,86,213,62
,253,219,254,230,1,32,12,229,2182
1210 DATA 33,222,253,203,254,225,62,
1,50,198,92,35,34,231,253,126,2272
1220 DATA 254,58,40,6,254,203,40,2,2
4,7,229,33,222,253,203,206,2034
1230 DATA 225,254,96,202,45,252,254,
165,210,55,252,254,128,48,100,254,27
94
1240 DATA 32,210,47,252,254,13,40,11
,254,14,32,187,35,35,35,1486
1250 DATA 35,24,180,205,155,252,33,2
22,253,203,134,209,225,19,19,19,2187
1260 DATA 19,25,237,91,229,253,122,6
1,188,48,4,123,61,189,216,229,2095
1270 DATA 33,223,253,54,0,35,35,52,1
26,254,60,56,34,54,0,35,1304
```

(continued on page 121)



TECHNICAL DETAILS

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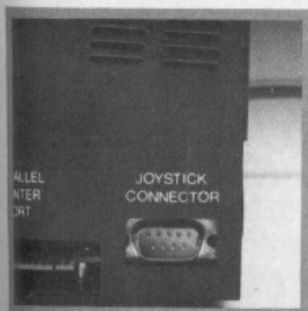
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(continued from page 117)

```
1280 DATA 52,62,2,211,254,175,219,25
4,230,31,254,31,40,247,58,72,2192
1290 DATA 92,230,56,203,63,203,63,20
3,63,211,254,225,195,220,250,225,275
6
1300 DATA 195,40,251,62,63,24,72,229
,235,1,24,252,205,7,252,1,1913
1310 DATA 156,255,205,7,252,229,193,
225,229,197,225,1,246,255,205,7,2887
1320 DATA 252,125,205,24,252,225,201
,175,9,60,56,252,237,66,61,40,2240
1330 DATA 12,229,33,222,253,203,198,
225,30,48,131,24,11,229,33,222,2103
1340 DATA 253,203,70,225,32,242,62,3
2,229,207,30,225,201,62,156,229,2458
1350 DATA 205,155,252,225,195,71,251
,229,245,214,165,17,149,0,205,65,264
3
1360 DATA 12,241,245,254,206,56,9,33
,222,253,203,78,32,61,24,12,1941
1370 DATA 254,202,48,55,254,199,48,4
,254,197,48,47,26,230,127,205,2198
```

```
1380 DATA 133,252,26,19,135,48,245,2
41,254,213,48,40,254,211,48,12,2179
1390 DATA 254,202,48,32,254,199,48,4
,254,168,48,24,33,222,253,203,2246
1400 DATA 142,225,195,71,251,213,205
,155,252,209,201,62,32,213,205,155,2
786
1410 DATA 252,209,24,200,62,32,205,1
55,252,24,225,207,30,33,223,253,2386
1420 DATA 126,35,60,190,32,35,35,52,
42,231,253,62,14,35,190,204,1596
1430 DATA 205,252,62,13,190,40,17,43
,190,40,13,35,207,30,6,5,1348
1440 DATA 197,62,32,207,30,193,16,24
8,175,50,223,253,201,35,35,35,1992
1450 DATA 35,35,35,201,55,63,229,197
,225,237,82,56,117,225,201,237,2230
1460 DATA 91,227,253,1,14,39,205,212
,252,201,237,75,229,253,237,91,2617
1470 DATA 227,253,205,212,252,237,91
,229,253,1,14,39,205,212,252,201,288
3
1480 DATA 62,1,50,226,253,201,62,70,
50,224,253,201,58,226,253,254,2444
1490 DATA 100,48,63,201,17,0,0,35,12
```

```
6,254,32,40,250,254,13,40,1473
1500 DATA 42,205,27,45,56,44,6,9,229
,213,225,25,16,253,209,26,1630
1510 DATA 213,214,48,95,22,0,25,235,
225,35,126,254,13,40,7,254,1806
1520 DATA 32,32,222,55,63,201,62,1,5
0,222,253,58,222,253,254,1,1981
1530 DATA 55,201,207,25,42,83,92,70,
35,78,35,94,35,86,35,229,1402
1540 DATA 42,227,253,237,66,225,56,5
,40,3,25,24,234,43,43,43,1566
1550 DATA 43,201,16,5,19,1,17,0,32,3
2,32,32,32,32,32,558
1560 DATA 32,32,32,85,76,84,82,65,76
,73,83,84,32,32,32,32,932
1570 DATA 32,32,32,32,32,32,16,5,144
,146,16,7,32,32,32,32,654
1580 DATA 32,32,32,127,32,32,77,97,1
14,107,32,70,114,97,110,107,1212
1590 DATA 108,105,110,32,32,32,32,32
,32,32,16,6,145,147,16,40,917
1600 DATA 40,69,69,130,130,130,130,1
28,128,128,128,0,0,0,64,160,1434
1610 DATA 160,16,16,8,43,72,72,72,10
6,72,72,64,64,64,0,0,901
```

SCREEN DUMP

► Nick Godwin • Amstrad • Eyemouth, Berwickshire

Since I obtained a Brother M-10009 printer I have, of course, been plugging-in various routines to try and fully utilise its capabilities. However, because for some reason beyond my comprehension the Amstrad CPC-464 does not send bit 7 to the printer, some 50 per cent of the excellent printer characters are unavailable to me. In fact, I can't even get the printer's £-sign!

I therefore quickly became interested in the idea of a screen-dump, and have been plugging in every such program that I have been able to find.

However, I was unable to find one that satisfied my needs, so I decided to knuckle down and write my own.

This screen dump is different from most in that it is designed for A4 size paper, somewhat wider than usual. Also, rather than dumping the whole screen, it dumps one line only, which is selected by sending a parameter — the line-number — to the machine-code. The whole screen can thereby be dumped from Basic, if required, or any line or set of lines that you may happen to require. The parameter can be either a constant or a variable.

In order to make up the additional width, I have arranged for the four horizontal bits that must

be interpreted from the display to be translated into six bits to be set to the printer. In order to retain squareness, I matched this vertically, so that each printed character is in fact twelve bits high rather than the usual eight. This has resulted in a "chunky" look which I find rather nice. Line-drawings, such as circles and squares, are therefore true in shape.

The Basic Loader enables the machine code to be placed anywhere in Ram above Himen — space is reserved if necessary. The complete code and variables occupies 253 bytes. Provision is also made for printers with a minimum line-feed unit of 1/36", instead of the 1/72" that is

available to me — in fact, the M-10009 has a minimum line-feed capability of 1/216", but I do not use that in this routine.

Because the printer has to make two passes for each line of print, the net printing speed is reduced accordingly, but this is more than compensated for by the additional graphics capability. In fact, anything that can be displayed on the screen can be copied to the printer. Note, however, that the graphics origin must be 0,0 before the machine code is called.

The machine code does not assume ink 0 to be the paper ink, but tests to see what ink the paper is set to. That is the only colour not printed — all other inks are dumped.

Listing 1.

```
10 DATA DD,6E,0,7D,FE,1A,D0,3E,1A,95,21,8,0,1,10,0,3D,28,3,9,18,FA,E
5,3E,1B,CD,x1,0,3E,40,CD,x1,0,3E,1B,CD,x1,0,3E,41,CD,x1,0,3E,6,CD,x1
,0,CD,x2,0,E1,1,8,0,A7,ED,42,CD,x2,0,3E,1B,CD,x1,0,3E,40,C3,x1,0,6,4
,3E,20,CD,x1,0,10,F9,3E,1B,CD,x1,0,3E,4C,CD,x1,0
20 DATA 3E,20,CD,x1,0,3E,3,CD,x1,0,1,80,2,11,0,0,C5,D5,E5,3E,0,32,x4
,0,3C,32,x3,0,6,4,C5,E5,D5,CD,99,BB,4F,C5,CD,F0,BB,C1,D1,E1,B9,23,23
,28,B,3A,x3,0,4F,3A,x4,0,81,32,x4,0,3A,x3,0,CB,27,32,x3,0,C1,10,D7,3
A,x4,0,E,0,FE,0,28,28,FE,F,20,4,E,3F,18,20,CB,47
30 DATA 28,4,CB,C1,CB,C9,CB,4F,28,4,CB,C9,CB,D1,CB,57,28,4,CB,D9,CB,
E1,CB,5F,28,4,CB,E1,CB,E9,79,32,x4,0,CD,x1,0,E1,D1,C1,CB,43,28,A,CB,
4B,28,6,3A,x4,0,CD,x1,0,13,B,78,B1,C2,x5,0,3E,A,CD,2E,BD,38,FB,C3,31
,BD,0,0
40 DATA xxx
50 CLS:PRINT"EPSON-TYPE SCREEN DUMP by Nick Godwin":PRINT:PRINT:INPU
T"Start address (max 43651)";address:IF address >43651 OR address=0
THEN address=43651
```

(continued on next page)

File

(continued from previous page)

```

60 PRINT:PRINT"Address =";address:MEMORY address-1:FOR j=address TO
address+252:READ a$:IF ASC(a$)=120 THEN GOSUB 130:GOTO 80
70 POKE j,VAL("&"+a$)
80 NEXT j
90 PRINT:PRINT"Select the minimum line feed quantity","available on
your EPSON COMPATIBLE","printer:":PRINT:PRINT"1 ... 1/72":PRINT:PRIN
T"2 ... 1/36":PRINT
100 INPUT a:IF a=2 THEN POKE (address+44),3
110 PRINT:PRINT"SCREEN DUMP is now loaded.":PRINT:PRINT"To operate:
CALL";address;"line":PRINT:PRINT'" is CTRL H
120 END
130 IF a$="x1" THEN a=address+243
140 IF a$="x2" THEN a=address+71
150 IF a$="x3" THEN a=address+252
160 IF a$="x4" THEN a=address+251
170 IF a$="x5" THEN a=address+106
180 POKE(j+1),INT(a/256):POKE j,(a-256*INT(PEEK(j+1))):j=j+1:READ a$
:RETURN
190 n=0
200 READ a$:IF a$="xxx" THEN END ELSE n=n+1:GOTO 200

```

SCROLLS

▶ *T A Bratley • Spectrum • Grimsby, South Humberside*
Here is a set of eight versatile, easily used and interesting scroll routines which can be added to your Basic programs to clear all or part of a screen in one of 8 directions.

The routines scroll one character square at a time in the following compass directions.

N, S, E, W, NE, NEW, SE, SW.

The old character square is blanked out and its attribute is replaced with one of your choice.

The difference between these and previously published routines is that any section of the screen can be scrolled in any direction and leave any colour attribute behind. This includes the bottom two lines.

There are only five parameters you have to supply in order to define the section of the screen to be scrolled, and below are the addresses you need to poke for both 16K and 48K machines. (16 in brackets)

POKE 64000, (31232), h.
(1 to 24)

POKE 64001, (31233), w.
(1 to 32)

POKE 64002, (31234), r.
(0 to 23)

POKE 64003, (31235), c.
(0 to 31)

POKE 64004, (31236), a
(attribute)

This defines a box of height h, width w, with a top left-hand corner at r,c (where r and c are the normal PRINT AT coordinates), to be replaced with a new attribute a.

Height and width must always be at least one because a box must have two dimensions, and care must be taken to see that the box does not exceed the screen limits.

The attribute is calculated in the usual way by multiplying the paper colour by eight and then adding the ink value. If bright is required add a further 64 to the total so far, and finally if Flash is required add a further 128.

After poking the values for machine code routines to use you will then have to select whichever scroll direction you require.

The table below gives you the addresses for both machines

DIRECTION	16 K	48 K
N	31241	64009
S	31253	64021

E	31265	64033
W	31277	64045
NE	31289	64057
SE	31303	64071
SW	31317	64085
NW	31331	64099

These routines use the values r,c (row, column) to calculate the actual memory address of the top left-hand corner of the box and its corresponding attribute address. They then take the width and height of the box and use the lower of these two values as a loop counter within the machine code to repeatedly call the appropriate routines until the box is cleared. This saves using a For Next loop in Basic and therefore speeds up the scrolling. However, this has a slight disadvantage in that very small boxes are scrolled off so fast that the effect is lost.

Because the machine code is not relocatable I have given two decimal dumps for the for the 16K and 48K machine. The 16K version is entered at 31232 and the 48K version at 64000, and both are 654 bytes in length.

To enter the code use the decimal loader in Program 1. There is a checksum at the end to

make sure no data entry errors have been made.
16K Checksum = 73333
48K Checksum = 83923

You can obtain a printout of the decimal dump by typing GOTO 1000, if an error has been made. If you have no printer change the LPrint statements to Print statements and check it on the screen. When you are sure everything is OK then save the code by typing:
16K SAVE "Scrolls" Code 31232, 654
48K SAVE "Scrolls" Code 64000, 654

To load the code CLEAR 31231 for a 16K or 63999 for a 48K, then Load "" ' code.

I have written a demonstration program which runs through all the routines with different size boxes to give you some idea of what the routines can do.

A good idea is to set up the parameters of the box first then load a Screen\$ from a commercial game and finally run a routine to clear part of the screen. This gives you a very interesting effect, especially the diagonal scrolls.

(continued on page 125)

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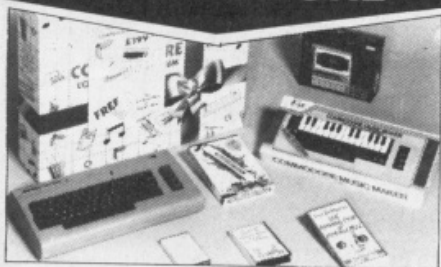
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- DK Tronics Dual Port Interface(s) **£9.95**
- DK Tronics Keyboard(s) **£25.00**
- Quickshot II(s) **£6.95**
- 3" Diskettes CF2(s) **£3.25**

I enclose a cheque/Postal Order for

Please debit my Visa/Access Barclaycard Account No.

Signature _____

Name _____ BLOCK CAPITALS PLEASE

Address _____

ALBANY COMPUTERS

Albany Works, Queens Road, Thames Ditton, Surrey. Tel: (01) 398 8055

DK TRONICS

SINGLE PORT INTERFACE

The best selling single port interface for your Spectrum, suitable for all games and all Atari type joysticks. R.R.P. £9.95

£5.95

DUAL PORT INTERFACE

This interface allows two joysticks to be used at the same time and has the same characteristics as the single port. R.R.P. £13.00

£9.95

KEYBOARD

for Spectrum, with spacebar. R.R.P. £29.95

£25.00

For Spectrum

QUICKSHOT II

The worlds most popular joystick with auto fire option. R.R.P. £11.95

£6.95



3" DISKETTES

Suitable for AMSTRAD.

£3.25

Offers subject to availability

All prices include VAT, P&P ALLOW 14 DAYS DELIVERY

File

Hex loader.

```

10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2)
)-48-(7 AND h$(2)>"9")
19 REM hfdhd
20 INPUT "Start ";s
30 INPUT "Finish ";f
39 REM fd
40 FOR n=s TO f STEP 8
50 LET tot=0: PRINT n;": ";
60 INPUT h$: PRINT h$;
70 LET x=0
80 FOR b=1 TO LEN h$ STEP 2
90 LET z=FN h(h$): LET tot=tot
+z
100 POKE n+x,z
110 LET h$=h$(3 TO ): LET x=x+1
120 NEXT b
130 PRINT " = ";: INPUT t: PRIN
T t
140 IF tot<>t THEN PRINT "inpu
t error - try again": GO TO 50
150 NEXT n
160 REM enter STOP to stop

```

Listing 1. 16K

```

31232: 182000000000000000 = 56
31240: 003A007A47C5CD7C = 777
31248: 7AC110F9C93A007A = 961
31256: 47C5CD897AC110F9 = 1190
31264: C93A017A47C5CD96 = 1005
31272: 7AC110F9C93A017A = 962
31280: 47C5CDA37AC110F9 = 1216
31288: C9CD717AC5CD7C7A = 1289
31296: CD967AC110F6C9CD = 1338
31304: 717AC5CD897ACD96 = 1251
31312: 7AC110F6C9CD717A = 1218
31320: C5CD897ACDA37AC1 = 1344
31328: 10F6C9CD717AC5CD = 1305
31336: 7C7ACDA37AC110F6 = 1191
31344: C93A007A473A017A = 633
31352: B8D047C9CDD47ACD = 1408
31360: B07ACD0F7CCD4F7B = 1049
31368: C9CDD97ACDB57ACD = 1458
31376: 437CCD797BC9CDD4 = 1258
31384: 7ACDB07ACDD77BCD = 1373
31392: 017BC9CDD47ACDB0 = 1245
31400: 7ACDA57BCD2C7BC9 = 1188
31408: 3A027A18093A007A = 395
31416: 3D4F3A027A812100 = 484
31424: 58A7280747112000 = 422
31432: 1910FD3A037A856F = 721
31440: 22077AC93A027A18 = 570

```

```

31448: 093A007A3D4F3A02 = 389
31456: 7A81210040A72810 = 571
31464: 47112000197DFE20 = 556
31472: 30047CC6076710F4 = 744
31480: 3A037A856F22057A = 588
31488: C92A077A2B3A017A = 596
31496: 5F1600193A007A47 = 393
31504: C5E5E5D12B06003A = 971
31512: 017A3D4FEDB8233A = 777
31520: 047A77E111200019 = 544
31528: C110E5C92A077A3A = 868
31536: 007A47C5E5E5D123 = 1092
31544: 06003A017A4F0DED = 516
31552: B02B3A047A77E111 = 764
31560: 200019C110E5C92A = 738
31568: 077A3A007A3D473A = 499
31576: 017AC5E511200019 = 623
31584: D1E506004FEDB0E1 = 1161
31592: C110EFE5D1133D4F = 1045
31600: 06003A047A77EDB0 = 722
31608: C92A077A3A007A3D = 613
31616: 473A017AC5E5A711 = 862
31624: 2000ED52D1E50600 = 795
31632: 4FEDB0E1C110EDE5 = 1392
31640: D1133D4F06003A04 = 436
31648: 7A77EDB0C92A057A = 1024
31656: 3A007A47C5E50600 = 691
31664: C5E5E5D12306003A = 963
31672: 017A3D4FEDB02BAF = 894
31680: 77E124C110EAE17D = 1173
31688: C6206FFE2030047C = 803
31696: C60867C110D6C92A = 975
31704: 057A3A017A3D856F = 613
31712: 3A007A47C5E50600 = 691
31720: C5E5E5D12B06003A = 971
31728: 017A3D4FEDB823AF = 894
31736: 77E124C110EAE17D = 1173
31744: C6206FFE2030047C = 803
31752: C60867C110D6C92A = 975
31760: 057A3A007A3D47C5 = 636
31768: EB627BC6206FFE20 = 1083
31776: 30047CC60867E506 = 720
31784: 08C5E5D506003A01 = 712
31792: 7A4FEDB0D1E11424 = 1104
31800: C110EEE1C110D8CD = 1302
31808: 777CC92A057A3A00 = 671
31816: 7A3D47C5EB627BD6 = 1121
31824: 206FFEE038047CD6 = 1019
31832: 0867E50608C5E5D5 = 993
31840: 06003A017A4FEDB0 = 679
31848: D1E11424C110EEE1 = 1162
31856: C110D8CD777CC906 = 1080
31864: 08C5E5E5D1133A01 = 950
31872: 7A3D4FAF4777EDB0 = 1040
31880: E124C110ECC900 = 907

```


File

Listing 2. 48K

```

64000: 182000000000000000 = 56
64008: 003A00FA47C5CD7C = 905
64016: FAC110F9C93A00FA = 1217
64024: 47C5CD89FAC110F9 = 1318
64032: C93A01FA47C5CD96 = 1133
64040: FAC110F9C93A01FA = 1218
64048: 47C5CDA3FAC110F9 = 1344
64056: C9CD71FAC5CD7CFA = 1545
64064: CD96FAC110F6C9CD = 1466
64072: 71FAC5CD89FACD96 = 1507
64080: FAC110F6C9CD71FA = 1474
64088: C5CD89FACDA3FAC1 = 1600
64096: 10F6C9CD71FAC5CD = 1433
64104: 7CFACDA3FAC110F6 = 1447
64112: C93A00FA473A01FA = 889
64120: B8D047C9CDD4FACD = 1536
64128: B0FACD0FFCCD4FFB = 1433
64136: C9CDD9FACDB5FACD = 1714
64144: 43FCCD79FBC9CDD4 = 1514
64152: FACDB0FACDD7FBCD = 1757
64160: 01FBC9CDD4FACDB0 = 1501
64168: FACDA5FBCD2CFBC9 = 1572
64176: 3A02FA18093A00FA = 651
64184: 3D4F3A02FA812100 = 612
64192: 58A7280747112000 = 422
64200: 1910FD3A03FA856F = 849
64208: 2207FAC93A02FA18 = 826
64216: 093A00FA3D4F3A02 = 517
64224: FA81210040A72810 = 699
64232: 47112000197DFE20 = 556
64240: 30047CC6076710F4 = 744
64248: 3A03FA856F2205FA = 844
64256: C92A07FA2B3A01FA = 852
64264: 5F1600193A00FA47 = 521
64272: C5E5E5D12B06003A = 971
64280: 01FA3D4FEDB8233A = 905
64288: 04FA77E111200019 = 672
64296: C110E5C92A07FA3A = 996
64304: 00FA47C5E5E5D123 = 1220
64312: 06003A01FA4F0DED = 644

```

```

64320: B02B3A04FA77E111 = 892
64328: 200019C110E5C92A = 738
64336: 07FA3A00FA3D473A = 755
64344: 01FAC5E511200019 = 751
64352: D1E506004FEDB0E1 = 1161
64360: C110EFE5D1133D4F = 1045
64368: 06003A04FA77EDB0 = 850
64376: C92A07FA3A00FA3D = 869
64384: 473A01FAC5E5A711 = 990
64392: 2000ED52D1E50600 = 795
64400: 4FEDB0E1C110EDE5 = 1392
64408: D1133D4F06003A04 = 436
64416: FA77EDB0C92A05FA = 1280
64424: 3A00FA47C5E50608 = 819
64432: C5E5E5D12306003A = 963
64440: 01FA3D4FEDB02BAF = 1022
64448: 77E124C110EAE17D = 1173
64456: C6206FFE2030047C = 803
64464: C60867C110D6C92A = 975
64472: 05FA3A01FA3D856F = 869
64480: 3A00FA47C5E50608 = 819
64488: C5E5E5D12B06003A = 971
64496: 01FA3D4FEDB823AF = 1022
64504: 77E124C110EAE17D = 1173
64512: C6206FFE2030047C = 803
64520: C60867C110D6C92A = 975
64528: 05FA3A00FA3D47C5 = 892
64536: EB627BC6206FFE20 = 1083
64544: 30047CC60867E506 = 720
64552: 08C5E5D506003A01 = 712
64560: FA4FEDB0D1E11424 = 1232
64568: C110EEE1C110D8CD = 1302
64576: 77FCC92A05FA3A00 = 927
64584: FA3D47C5EB627BD6 = 1249
64592: 206FFEE038047CD6 = 1019
64600: 0867E50608C5E5D5 = 993
64608: 06003A01FA4FEDB0 = 807
64616: D1E11424C110EEE1 = 1162
64624: C110D8CD77FCC906 = 1208
64632: 08C5E5E5D1133A01 = 950
64640: FA3D4FAF4777EDB0 = 1168
64648: E124C110ECC900 = 907

```

LUCIFER

►Olaf Astrand • Spectrum • Sweden
First enter the Basic program and save it by using
Save "Lucifer" Linc 0
Restart your Spectrum and enter code loader run it and enter Main Code when you have done that Enter (Stop) and save code

with
Save "MC" Code 46000,950
Then run code loader and enter Sprite Code. Address 40074 — 40840
Save it:
Save "SPRITES" Code 40000,850 Restart/Rewind and load all parts.
Controls Are:
Q=DROP
A=TAKE
N=LEFT
M=RIGHT
SPACE=JUMP.

```

6 LOAD ""CODE : LOAD ""CODE
7 INK 7: PAPER 0: BORDER 0: CLS
8 POKE 60000,2: POKE 60001,27: POKE 60003,208: POKE 60004,156
9 RANDOMIZE USR 46640: PRINT AT 3,28;"0"
10 LET DEPTH=44*8
11 LET Z=47*8+3
12 LET OX=INT ((Z-DEPTH)/8)
13 LET OY=(Z-DEPTH-OX*8)*3
14 LET OX=OX*3
15 LET Q=1
16 LET BOULDER=0

```

(continued on page 127)

(continued from page 126)

```

17 PRINT AT 17,26;"TIME"
18 LET MAP=45000
19 LET INKEY=3060
20 LET TIME=2500
22 RANDOMIZE USR 46522
60 GO SUB 7500
70 GO SUB 7000
100 REM Loop
110: LET A$=INKEY$: GO SUB 7700
112 IF CODE A$=96 THEN LET A$=CHR$(CODE A$-32)
115: IF A$=" " THEN GO TO 110
120: IF A$="A" THEN GO SUB 2000
130: IF A$="B" THEN GO SUB 3000
140: IF A$="M" THEN GO SUB 4000
150: IF A$="Q" THEN GO SUB 1000
160: IF A$="-" THEN GO SUB 5000
170: GO SUB 7000
180: GO SUB 6000
185: GO SUB 7700
190 GO TO 100
1020 IF PEEK (MAP+Z-8)<0 THEN GO TO 110
1030 IF BOULDER=0 THEN RETURN
1040 LET BOULDER=BOULDER-1
1046 PRINT AT 3,28;BOULDER
1050 POKE MAP+Z,2
1060 LET Z=Z-6 GO SUB 7000
1070 IF OX-15 TH. RETURN
1080 POKE 60000,(Ox
1090 POKE 60001,OY
1100 POKE 60003,208
1110 POKE 60004,156
1120 RANDOMIZE USR 46440
1130 RETURN
1020 IF PEEK (MAP+Z+8)<2 THEN GO TO 110
1030 IF BOULDER=0 THEN RETURN
1040 LET BOULDER=BOULDER+1
1046 PRINT AT 3,28;BOULDER
1050 LET Z=Z+8
1060 POKE MAP+Z,0
1080 RETURN
1070 IF Q=1 THEN LET Q=-1; RETURN
1040 IF PEEK (MAP+Z-1)<0 THEN RETURN
1060 LET Z=Z-1
1080 RETURN
1020 IF Q=-1 THEN LET Q=1; RETURN

```

```

4030 IF PEEK (MAP*2+1)<0 THEN          GO TO 8000
4040 IF PEEK (MAP*2+1)<0 THEN RETURN
4060 LET Z=2+1
4080 RETURN
5020 IF PEEK (MAP*2-8)<0 THEN GO TO 110
5030 IF PEEK (MAP*2+Q)<0 THEN LET Z=2-8; GO SUB
      7000 : GO TO INKEY
5040 IF PEEK (MAP*Q+2-8)<0 THEN LET Z=2-8;
      GO SUB 7000: GO TO INKEY
4080
5050 LET Z=2-8+Q
5055 GO SUB 7000
5060 LET AS=INKEYS
5070 IF CODE AS<96 THEN LET AS=CHR$
      (CODE AS-32)
5080 IF AS="Q" THEN IF BOULDER>0 THEN
      GO SUB 1000: LET A=0: RETURN
5090 LET A=0
5100 IF PEEK (MAP*8+Q+Z)<0 THEN IF PEEK
      (MAP*Q+Z)<0 THEN LET Z=8+Q: RETI
5110 IF PEEK (MAP*Q+Z-8)<0 THEN LET Z=Z+Q
5130 RETURN
6020 IF PEEK (MAP*2+8)<0 THEN RETURN
6040 LET AS=INKEYS
6050 IF CODE AS<96 THEN LET AS=CHR$ (CODE AS-32)
6060 IF AS="Q" THEN IF BOULDER>0 THEN GO SUB
      1000: RETURN
6080 LET Z=2+8
6090 LET A=0
6095 GO SUB 7000
6100 GO TO 6020
7010 LET NX=INT ((Z-DEPTH)/8)
7020 LET NY=2-DEPTH-NX*8
7040 IF Q=1 THEN POKE 60004,157: POKE 60003,168
7050 IF Q=-1 THEN POKE 60004,157: POKE 60003,96
7070 LET NX=NX*3
7080 LET NY=NY*3
7100 LET X=(NX-0X)/3
7110 LET Y=(NY-0Y)/3
7150 POKE 60009,0X
7160 POKE 60010,0Y
7300 LET 0X=0X*Y
7310 LET 0Y=0Y*X
7340 POKE 60000,0X
7350 POKE 60001,0Y
7365 RANDOMIZE USR 46822
7370 RANDOMIZE USR 46640

```

```

7390 IF KK<OX OR WY<OT THEN GO TO 7130
7410 IF OX=18 THEN LET OX=15, LET DEPTH=DEPTH+40,
GO SUB 7500, GO TO 7000
7420 IF OX=0 THEN LET OX=15, LET DEPTH=DEPTH+40,
GO SUB 7500, GO TO 7000
7440 RETURN
7510 LET H=INT (DEPTH/256)
7520 LET L=DEPTH-H*256
7540 POKE 60006,L
7550 POKE 60007,H
7570 RANDOMIZE USR 46535
7580 PRINT AT 10,26;"LEVEL="
7585 PRINT AT 11,27;DEPTH;" "
7590 RETURN
7720 LET TIME=TIME-1
7730 PRINT AT 10,26;TIME;" "
7740 IF TIME=0 THEN RETURN
7750 PRINT AT 10,5;"IT IS ALL OVER"
7760 PRINT AT 11,4;"YOUR TIME IS UP"
7770 FOR F=1 TO 10: NEXT F
7780 POKE 60003,88: POKE 60004,159
7790 RANDOMIZE USR 46440
7800 FOR F=1 TO 10: NEXT F
7810 POKE 60003,16: POKE 60004,159
7820 RANDOMIZE USR 46440
7999 GO TO 7
8000 REM *** IOFF ***
8100 POKE 60001,3:PEEK 60001
8110 POKE 60003,24: POKE 60004,157
8120 RANDOMIZE USR 46440
8130 PRINT AT 0,0;" CONGRATULATIONS !!
YOU HAVE TURNED THE ILLUSION OFF"
8135 POKE 60000,9: POKE 60001,6
8136 POKE 60009,9: POKE 60010,9:
RANDOMIZE USR 46822
8140 POKE 60003,88: POKE 60004,159
8150 RANDOMIZE USR 46440
8160 FOR F=1 TO 10: NEXT F
8170 POKE 60003,16: POKE 60004,159
8180 RANDOMIZE USR 46440
8190 FOR F=1 TO 10: NEXT F
8200 POKE 60003,16: POKE 60004,159
8205 POKE 60000,OX: POKE 60001,OY
8210 RANDOMIZE USR 46440
8220 FOR F=0 TO 500: NEXT F
8230 GO TO 7

```

Hex loader.

```

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

```

46266 1,0,0,0,1,0,1,1
46272 1,1,1,0,0,0,1,1
46280 1,0,0,0,1,0,0,1
46288 1,2,1,0,1,1,1,1
46296 1,0,0,0,0,0,1,1
46304 1,1,0,0,0,0,1,1
46312 1,2,2,2,0,0,0,1
46320 1,1,1,1,0,1,1,1
46328 1,1,0,0,0,0,1,1
46336 1,0,0,0,0,1,2,1
46344 1,2,0,0,1,1,1,1
46352 1,1,0,0,1,1,0,1
46360 0,0,0,0,0,0,1,1
46368 0,0,0,0,0,0,2,1
46376 0,2,0,0,2,1,1,1
46384 0,1,1,1,1,1,1,1
46392 0,1,1,1,1,1,1,1
46400 0,1,1,1,1,1,1,1
46408 2,1,1,1,1,1,1,1
46416 2,0,0,0,1,0,0,0
46424 1,0,1,0,1,0,1,0
46432 1,0,1,0,1,0,1,0
46440 1,0,0,0,1,0,1,0
46448 1,1,1,0,0,1,1,0
46456 1,0,0,0,0,0,0,1
46464 1,2,2,2,2,2,2,1

14
15
13
19
16
14
18
17
14
15
18
15
11
13
18
17
17
16
19
13
14
13
13
15
12
14

```

46768 33,224,267,253
46776 3,0,25,15,26,5
46784 6,0,9,22,0,58
46792 221,33,8,182,
56800 35,186,32,32,6
46808 3,17,30,0,119
46816 119,25,16,748
46824 182,205,7,181
46832 31,183,203,58
46840 8,33,0,66,22,
46848 200,30,8,147,
46856 245,175,184,2
46864 0,25,16,253,20
46872 75,106,214,63
46880 8,207,63,1175
46888 8,62,0,119,35
46896 35,62,0,119,35
46904 9,193,36,237,
46912 40,26,127,8
46920 224,7,237,66
46928 32,113,197,1,
46936 14,0,24,203,21
46944 0,0,0,0,0,0

```

25,64,17,	1
253,78,1,	2
9,234,	3
1,86,0,221,	4
21,126,19,6,	5
5,119,35,	6
01,0,205,243,	7
05,05,23,183,205,	8
05,234,1,0,	9
186,216,	0
24,247,71,	1
8,241,17,32,	2
241,201,237,	3
9,201,79,	4
17,8,6,	5
20,0,119,	6
1,254,0,	7
217,5,184,	8
167,197,1,	9
3,62,8,185,	0
7,9,193,	1
7,8,201,0,	2
	3

40354	7,239,01,1,22
40362	0,0,0,0,0,0,0,0
40370	0,0,3,190,0,0
40378	0,185,0,0,13
40386	240,63,13,0
40394	127,96,0,206
40402	199,80,0,23
40410	32,28,239,24,96
40418	124,0,56,110
40426	267,192,0,97
40434	0,0,187,128
40442	192,234,3,56
40450	3,129,97,21
40458	192,0,215,12
40466	119,0,1,190
40474	7,227,240,16
40482	152,0,95,128
40490	39,0,63,63,0
40498	0,225,192,1
40506	0,63,253,252
40514	162,98,171,3
40522	63,187,185
40530	1,130,167,1
40538	0,1,128,0,1
40546	194,74,161,2
40554	1,107,60,3,3

0,0,0,
2,
127,0,
240,0,127,
0,30,160,0,
60,0,198,176,
112,0,231,
254,0,12,
1,247,0,
3,192,0,109,
111,192,2,
03,3,20,226,
1,193,1,190,
0,237,128,0,
12,3,221,224,
27,188,6,127,
78,128,0,
97,128,
3,224,0,0,
6,0,6,203,
43,58,36,41,
0,1,131,228,
0,33,1,128,
7,207,177,
232,185,64,0,
32,5,43,

469
2
321
705
685
963
849
596
538
863
621
825
837
900
950
934
582
327
885
875
601
904
591
571
1078
287

Machine code.

46000	1,0,1,1,1,1,1,1,1	1	8
46008	1,0,0,0,0,0,0,0,0	1	2
46016	1,0,6,7,0,0,1,1,1	1	16
46024	1,1,1,1,1,1,1,1,1	1	16
46032	1,0,0,0,0,0,0,0,1	1	10
46040	1,0,1,1,0,0,0,0,0	1	4
46048	1,0,0,1,1,1,1,0,1	1	3
46056	1,0,1,1,1,0,0,0,0	1	4
46064	1,0,0,0,1,1,0,1,1	1	5
46072	1,0,0,0,0,0,0,0,1	1	2
46080	1,2,2,2,2,0,0,0,1	1	8
46088	1,2,2,2,2,0,0,0,1	1	8
46096	1,1,1,1,1,1,0,0,1	1	6
46104	1,0,1,1,0,0,0,1,1	1	4
46112	1,0,0,0,0,0,0,1,1	1	3
46120	1,0,1,1,1,0,0,1,1	1	6
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46136	1,0,0,1,2,0,1,1,1	1	6
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46160	1,0,0,0,0,0,0,1,1	1	3
46168	1,1,1,1,1,0,0,1,1	1	6
46176	1,0,0,0,0,0,0,0,1	1	2
46184	1,0,0,1,1,1,1,1,1	1	6
46192	1,0,0,0,0,0,0,0,1	1	2
46200	1,1,1,0,0,1,1,2,1	1	7
46208	1,1,0,0,0,0,1,2,1	1	6
46216	1,0,0,1,0,0,1,2,1	1	6
46224	1,0,0,1,2,0,0,1,1	1	7
46232	1,0,1,1,1,1,1,1,1	1	7
46240	1,0,0,0,0,0,0,0,1	1	2
46248	1,0,0,0,1,2,2,1,1	1	7
46256	1,0,0,1,0,2,2,1,1	1	7

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48576 21, 205, 48, 182, 2
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48592 20, 62, 19, 186, 48
48600 64, 136, 208, 108
48608 128, 200, 16, 88, 0
48616 0, 0, 0, 0, 66, 127
48624 66, 66, 5, 69, 4, 12
48632 6, 20, 0, 0, 0, 0, 0
48640 205, 61, 182, 205, 8
48648 182, 61, 105, 182, 8
48656 1, 0, 8, 3, 0, 6, 2, 2
48664 106, 216, 200, 30
48672 247, 71, 245, 175, 8
48680 17, 35, 25, 16, 25, 15
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48696 201, 237, 75, 97, 23
48704 6, 3, 5, 375, 217, 8
48712 119, 19, 35, 46, 119
48720 119, 19, 197, 1, 234
48728 16, 237, 8, 217, 130
48736 217, 8, 162, 197, 19
48744 237, 66, 193, 62, 8
48752 197, 1, 0, 7, 193, 19
48760 26, 203, 217, 8

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41318 127, 254, 255, 63
41416 0, 0, 127, 0, 20
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41710 255, 127, 222, 148
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42004 254, 254, 127, 223
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43208 0, 157, 0, 153
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89	00631	0,0,0,0,0,0,0,0
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92	00664	235,205,235,0
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95	00686	192,124,73,0
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00	00730	206,108,32,5
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05	00770	26,141,200,38
06	00778	132,152,26,2
07	00786	176,192,0,0
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09	00802	0,0,0,0,0,0,0
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11	00816	96,44,16,12
12	00826	175,96,2,166
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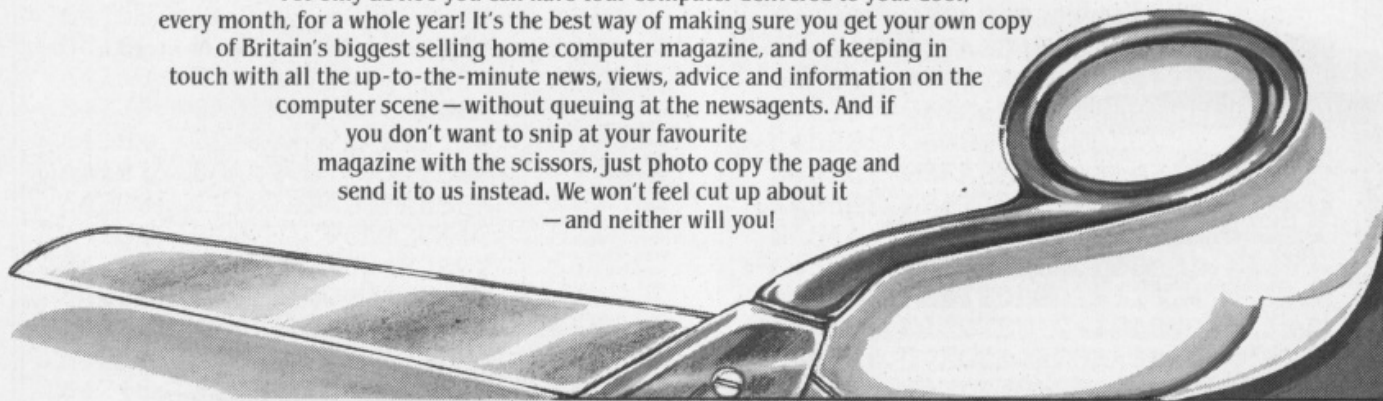
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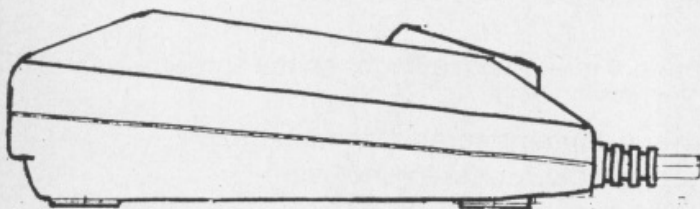
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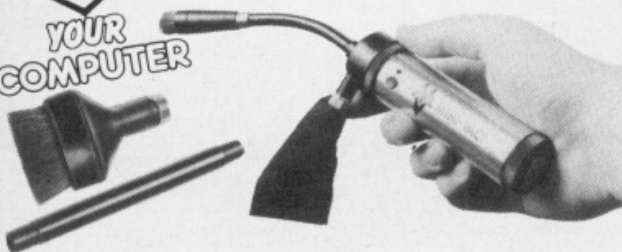
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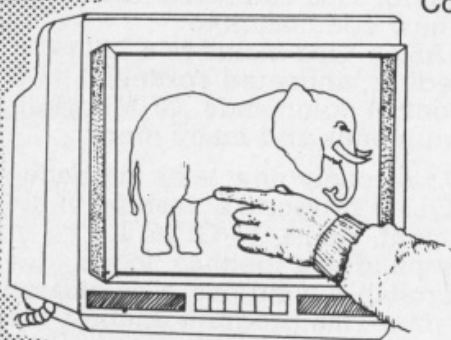


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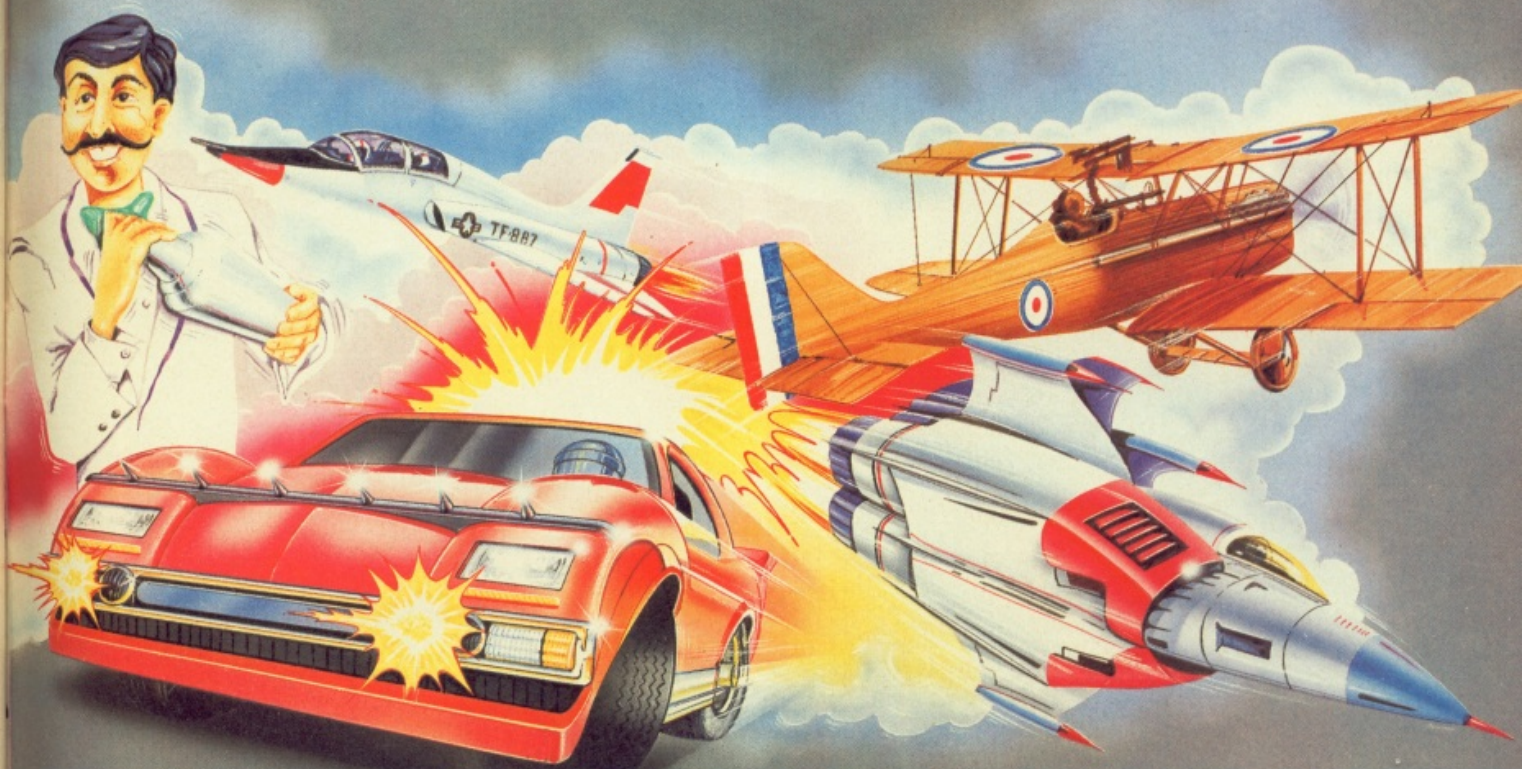
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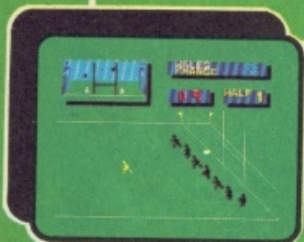
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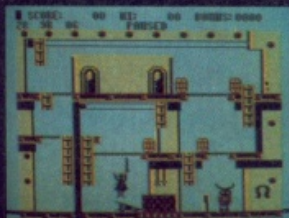
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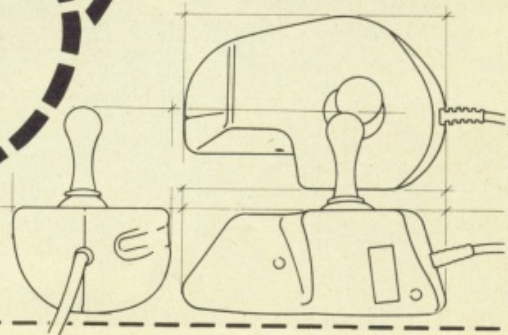
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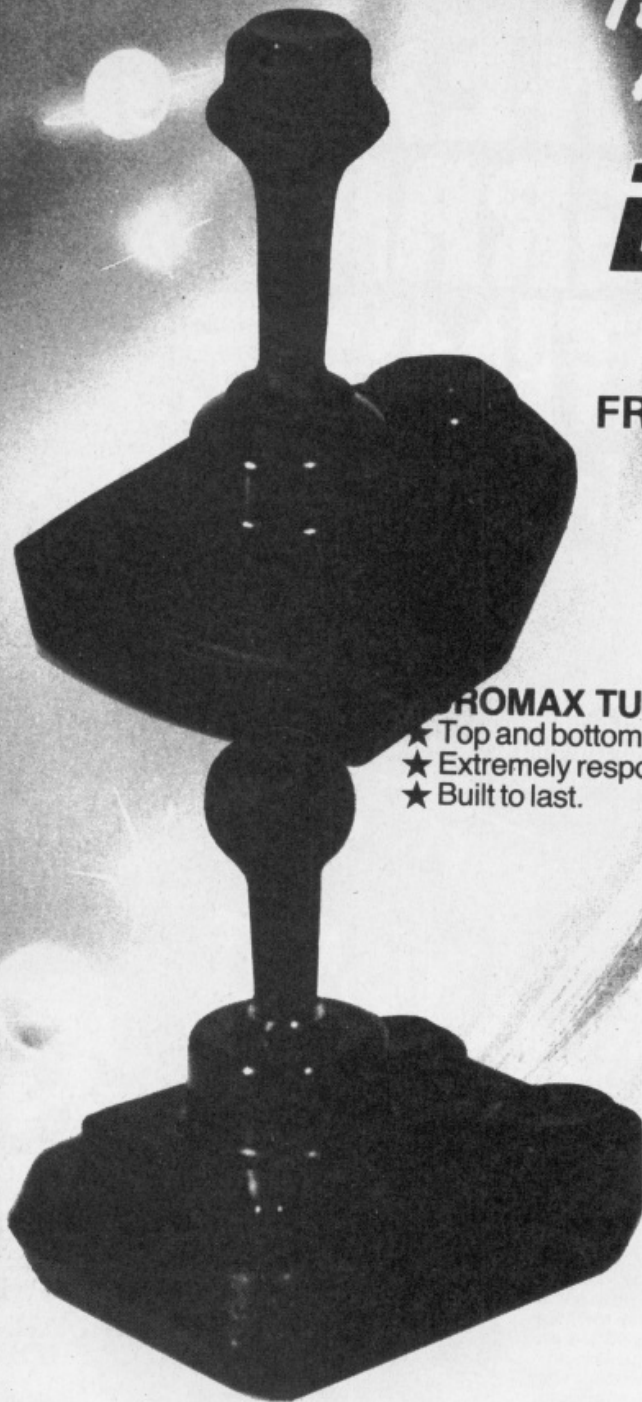
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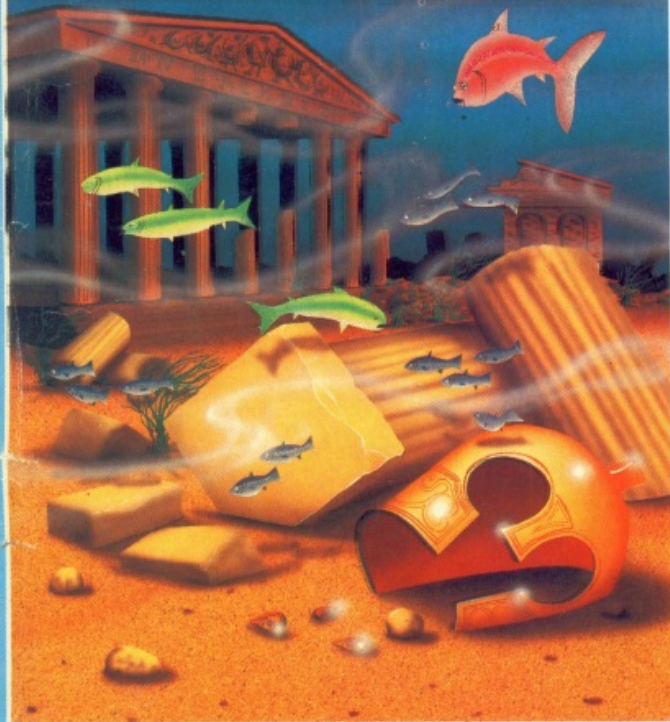
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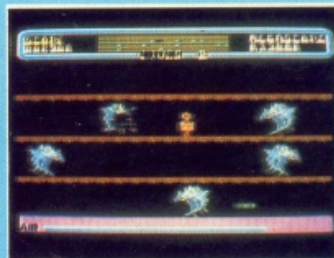
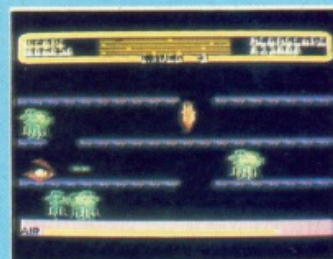
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