

# COMMODORE

**COMPUTING INTERNATIONAL**  
The Independent Commodore Magazine

**IN THIS 96 PAGE ISSUE**

*Around Sound -  
Special Features*

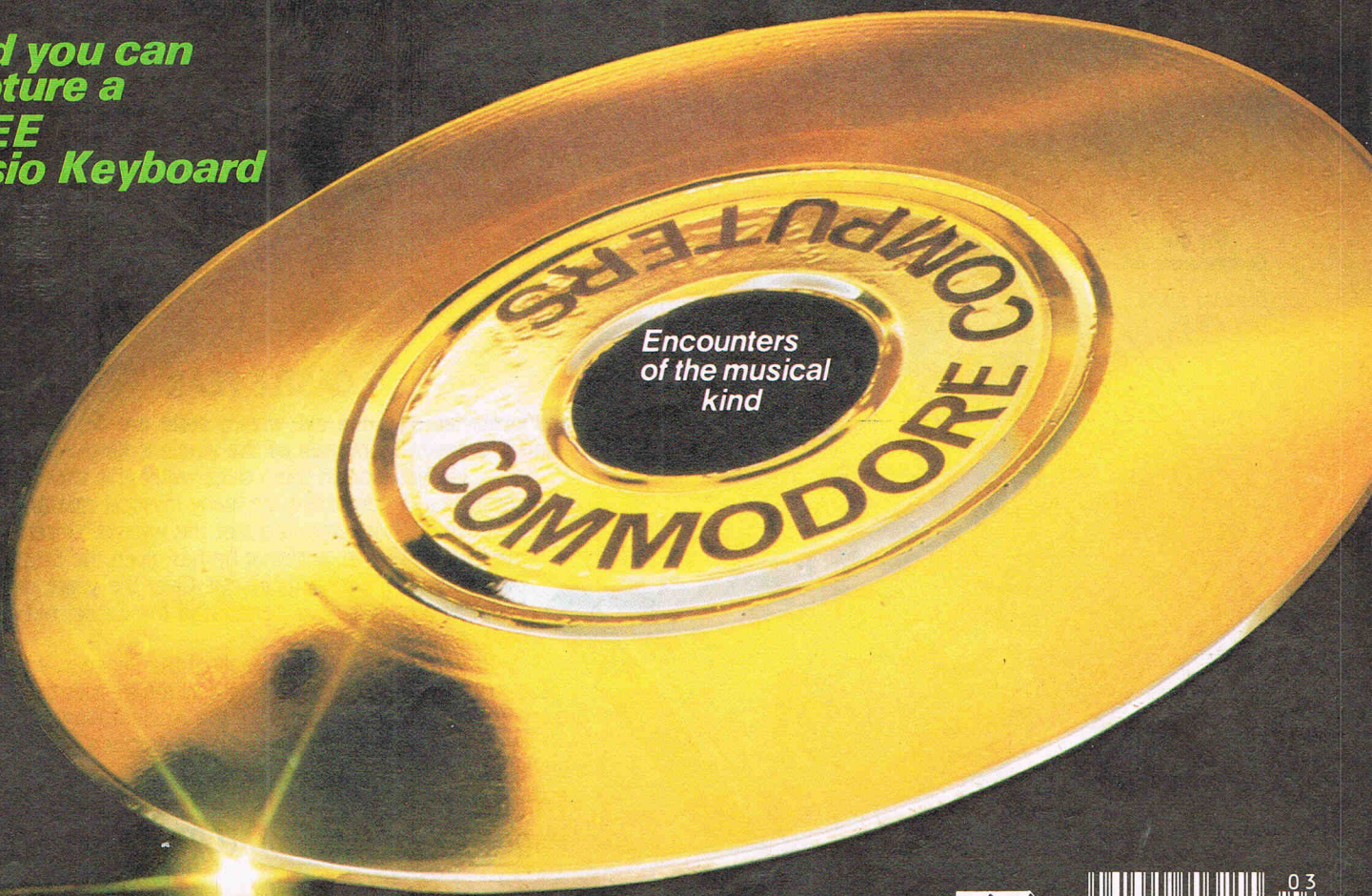
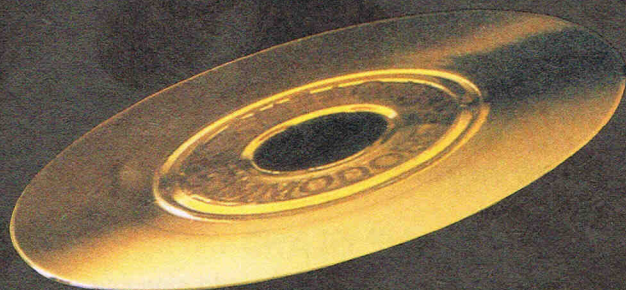
*Commodore  
Makes Music*

*32 page  
Games Supplement*

**PLUS**

**News · Reviews · Listings**

*And you can  
capture a  
FREE  
Casio Keyboard*



Encounters  
of the musical  
kind

COMMODORE  
COMPUTERS



0



# Braingames

Braingames bring you the most entertaining and fulfilling adventure and strategy games.

Our adventures combine strong story lines, high quality graphics and sound, to produce games you will want to play time after time.

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The origin of the Emerald is lost in the mists of time, however the stories suggest that it has esoteric powers of a mystical nature. It is suggested that the monks have placed the Emerald on a dias deep within their temple and have laid many devious traps to protect it.

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A sophisticated adventure with full graphics and sound.

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## CASTLE FEAR

# The tough nuts to crack!

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## FLAME ISLAND

## CASTLE FEAR

Many centuries ago, the evil wizard stole the Golden Crown and the seven Diamonds of the Ancient Kings.

He has hidden them deep within his stronghold, Castle Fear, where there are many mystical creatures to guard them. It is rumoured that the wizard himself keeps the Golden Crown, and that he has given the Seven Diamonds to his servants of evil. Over the years, certain brave adventurers have penetrated the Castle, but none have ever returned.

To win the hand in marriage of the Princess, you must dare the evils of Castle Fear and return with the Golden Crown and the Seven Diamonds of the Ancient Kings.

A sophisticated adventure with full graphics and sound

For more information on the tough nuts  
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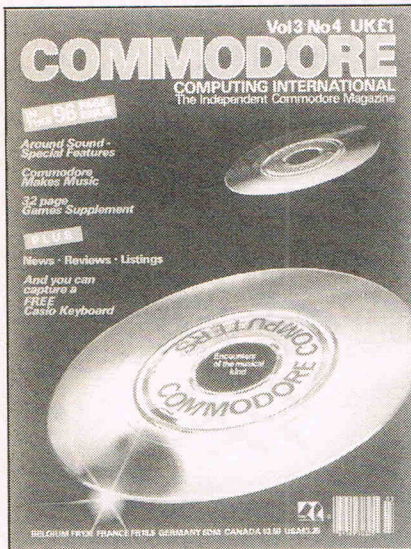
BRAINGAMES Ampicon Group  
Richmond Road, Brighton East Sussex BN2 3RL  
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# COMMODORE

COVER STORY

COMPUTING INTERNATIONAL

OCTOBER 1984



Our theme this month is sound – an era in which interesting possibilities are arising for the home computer owner.

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**NEWS** \_\_\_\_\_ 6  
Commodore produces millionth computer at Corby, while prices rise

**PRODUCT SURVEY** \_\_\_\_\_ 7  
Our sound special starts with a look at music packages and speech synthesisers

**MUSIC** \_\_\_\_\_ 15  
Using computers in music at home and professionally

**SOUND** \_\_\_\_\_ 20  
Adding sound to your programs

**LETTERS** \_\_\_\_\_ 28  
You moan and groan and we do our best to help

**BASIC PROGRAMMING** \_\_\_\_\_ 30  
Figure it out with a maths quiz

**MACHINE CODE** \_\_\_\_\_ 33  
Copy up to four screens from the 64 to a 7-row printer

**HINTS AND TIPS** \_\_\_\_\_ 41  
Using floating pointers and arithmetic routines

**PRODUCT NEWS** \_\_\_\_\_ 45  
The latest hardware and software for Commodore users

**BUSINESS PRODUCTS** \_\_\_\_\_ 48  
Especially for business users of Commodore machines

**BOOK REVIEWS** \_\_\_\_\_ 51  
We help you to steer a course through a sea of words

**REVIEWS** \_\_\_\_\_ 53  
Looking at four new products including Gilsoft's Quill

## NEXT MONTH

CCI takes a look at the business end of the market next month with reviews of hardware and software, plus opinions from key Commodore executives.

## First, a question.

Who do you think are the world's most avid consumers of microcomputers?

The ingenious Japanese?  
The fashionable French?  
The acquisitive Americans?

Believe it or not, it's we British who own more micros per person than any other nation on earth.

Yet, despite its amazing impact, the microcomputer has only just begun to scratch at the surface of our lives. Without doubt, the best is yet to come.

## Use and Abuse.

In several recent surveys, some astonishing facts about micro use and abuse were revealed.

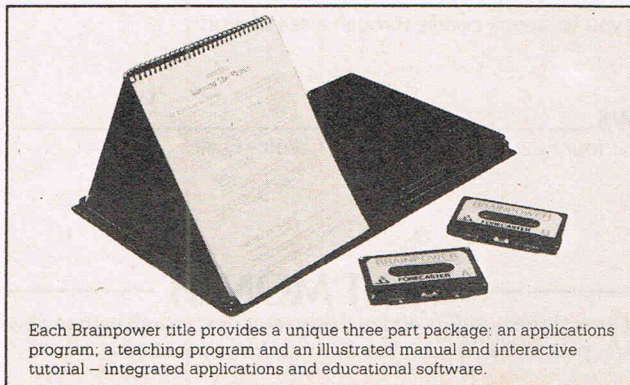
It was discovered that the micro is hopelessly under-utilised. If you're already a micro owner, your own experience may well confirm this unhappy state of affairs.

## Brainpower. A source of knowledge.

For thousands of years, the key to self improvement has been in the hands of the written word. Now, thanks to the Brainpower range, it's very much in the hands of the micro.

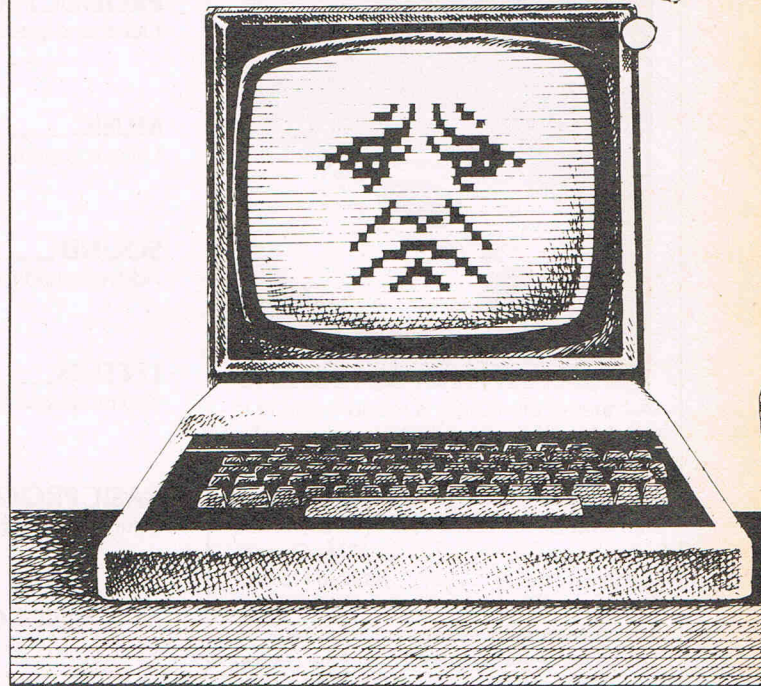
As the Brainpower range demonstrates, this does not require prior knowledge of micros, or how they work.

The Brainpower concept has been devised as *integrated* applications and educational software. And its aim



Each Brainpower title provides a unique three part package: an applications program, a teaching program and an illustrated manual and interactive tutorial - integrated applications and educational software.

WHEN WILL HE STOP  
USING ME LIKE A TOY AND  
START USING ME LIKE  
A COMPUTER ?



# Now you and y bring out the be

is to stretch both your mind and your imagination.

It offers a unique way to realise your own full potential and that of your micro. In a way you could never hope to achieve from the printed word alone.

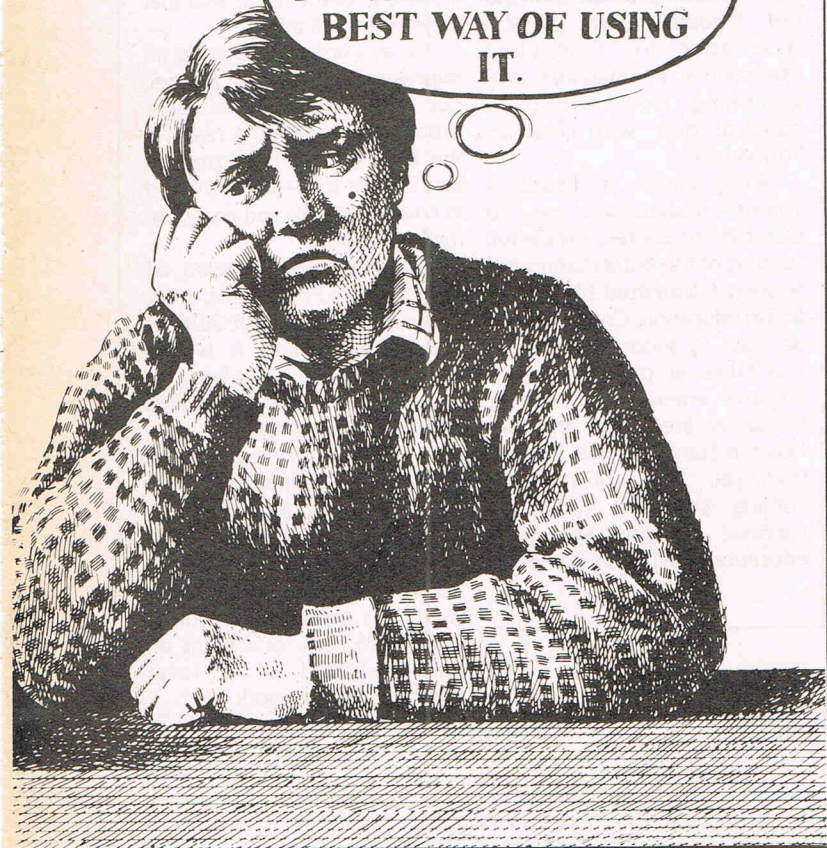
In this respect, the Brainpower range stands on its own.

## A unique concept.

All the Brainpower titles share one thing in common, apart from their stimulating subject matter, that makes them unique.

You will find each title comprises three distinctive elements: A teaching program that helps you to get to grips

**IKNOW HE'S GOT A  
BRAIN IN THERE. IF ONLY  
I COULD DISCOVER THE  
BEST WAY OF USING  
IT.**



# your micro can best in each other.

with the subject at your own pace. An applications program to put what you learn into action. And finally, with each package, you get an expertly written book and interactive tutorial.

	SPECTRUM 48K	BBC B Tape	BBC B DISK 40/80 Track	COMMODORE 64 Tape	COMMODORE 64 Disk
Tick your choice	£14.95	£19.95	£24.95	£19.95	£24.95
Decision Maker		N/A	N/A		
Numbers at Work		N/A	N/A		
Star Watcher		N/A	N/A	N/A	N/A
Entrepreneur		N/A	N/A		
Project Planner	N/A				
Forecaster	N/A				

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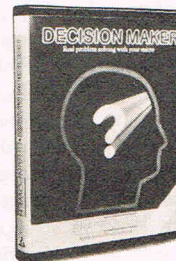
The secrets of the heavens are yours. Isolate all the constellations as well as main stars for easy identification. Even turn stars and constellations on and off at will. Screen by screen, you will see exactly how the 1,500 brightest stars move through time and space. And all from any point on the Earth's surface at any time of the year.

Star Watcher is without doubt the definitive home observatory.

## DECISION MAKER

Should you buy a new house? Change jobs? Have children? Start your own business? Such decisions should not be taken lightly. Armed with Decision Maker, you can be quite sure of examining every avenue, and arriving at a rational, structured answer.

If you value the way you run your life, you need Decision Maker.



## NUMBERS AT WORK

Tackle all the number problems you're likely to face in daily and business life. From straightforward multiplication and division of fractions, through decimals, percentages, ratios, mark-ups and margins to compound interest, depreciation, VAT and PAYE.

Numbers at Work gives you a distinct edge, since you will be able to both understand and manipulate numbers at will.

## PROJECT PLANNER

Project Planner teaches you how to divide even the most complex project down into meaningful components. Learn how to determine the length and importance of every single task, and those elements critical to the fulfilment of your plan. Even anticipate problems you hadn't envisaged.

You have the measure of any situation because you have the fullest possible grasp of all the factors which affect it.

## FORECASTER

Forecaster takes the guesswork out of forecasting, by accepting that tomorrow's events will be best predicted on the basis of today's facts. Armed with Forecaster, sales targets and growth trends, even sporting events and election results can be accurately and very quickly predicted.

Invaluable to you in both your private and business life.

## ENTREPRENEUR

Entrepreneur teaches you all the steps required to plan and start your own business. It will forecast your first 18 months' cash flows, generate your Profit and Loss Account and Balance Sheet. Help you in discussions with your bank manager and partners. Explain the notions of assets, liabilities, overheads, working capital, cash flow and break even point.

Invaluable to anyone who is planning a business venture.

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# BRAINPOWER

## Commodore buy Amiga

Commodore look set to start a war with Apple with their purchase of Amiga — a home computer using the same MC68000 chip as the Macintosh and, it is claimed, matching the high-quality graphics of the Apple box.

Commodore recently purchased Amiga, the tiny privately-held outfit, to the pique of former Commodore boss Jack Tramiel who also wanted the Amiga for his new company, Atari, bought from Warner Communications.

In fact Tramiel and Atari are suing Amiga over the fraud of three chips which they say were commissioned by Atari to design, when Atari was still owned by Warner Communications.

Likely specifications of the Amiga are a 128Kb CPU, expandable to 256Kb; one 5.25 inch 360Kb floppy drive, built in modem, and optional hard disk. This is Amiga's own spec and Commodore have the option to change it.

Both Commodore and Atari are working to produce a machine to compete with the Apple Macintosh, but at a lower price.

A figure that has been quoted for the Amiga is under \$1000 (£775). Some reports say that Commodore are to launch the Amiga next month. However, Howard Stanworth, Commodore's UK general manager, says: "Precisely what form the machine will be marketed in is still being decided".

## Backing education

Commodore is to sponsor the first European Heat of the Association for Computing Machinery's International Programming Competition in collaboration with Thames Polytechnic.

Taking place at London's Thames Polytechnic on 20 October, the contest has the full support of the British Computer Society. Committed to backing British education, Commodore's decision to sponsor the event was taken as part of a major initiative aimed at encouraging computer literacy in the UK. Howard Stanworth, UK general manager, says: "Over the coming year we intend to continue investing heavily in education in this country and this

is just one of the forms that that investment will take.

"We aim not only to stage an impressive contest in October, but also hope that the event produces the winning team in the International final, proving that Europe still leads the world in computer skills and programming creativity."

Last year's European team, all from Thames Polytechnic, went on to form the British Student ACM chapter and it is this chapter which will host in October the first ever European Heat of the competition.

Teams are set six programming problems which must be solved in the shortest possible time. Solutions can be programmed in either Pascal or Fortran using Commodore 8000 computers linked by means of a Cortex Intercomm communications interface linked to a local minicomputer network.

## CBM make a million

Commodore recently celebrated the production of the millionth Commodore computer to be manufactured in Corby since the temporary factory opened 15 months ago.

Brandishing the 64 in question at a recent press conference Howard Stanworth, Com-

modore UK's general manager, said: "This Commodore 64 is very special to us. It not only symbolises an unprecedented success story for us since it is the best-selling home computer in the world, but it says a great deal about Commodore's growing contribution to Britain in terms

of jobs, both directly and indirectly, and also in terms of export".

Currently producing one home computer every five seconds, Commodore say that this rate will double when production is up to full capacity.

At this point we must apologise for the gremlins that found their way into a news story in last month's CCI which stated that Commodore were producing 2,000 computers a month. This should, of course, have read every week. Otherwise it would be a couple of years yet before Commodore could have celebrated their millionth computer produced in Corby! Sorry.

Both the C16 and Plus/4 will also be manufactured in Corby. Both have also suffered a price increase since first announced. The C16, which is being sold as a complete starter pack, retails at £133.99, while the Plus/4 is up to £299.99. Stanworth blamed these price increases on the changing rate of the American dollar.

## De-bugged 64

A couple of interesting snippets for anyone who has bought one of the 64's manufactured in Corby. Commodore have made a couple of (unannounced) changes.

In the old 64's there was a bug in screen editing due to the linking of lines. When you wanted to make a character appear on the screen by POKEing, you would have to POKE to screen memory, plus colour into colour memory, before the character would appear. Modifications have been made to the Kernal of the machine and now all you need to do is POKE to screen and the character will appear straight away.



## The 64 sounds off

Learn the fundamentals of music or transform your 64 into a synthesiser and create musical compositions

The sound capabilities of the 64 are already above average for the home computer. Now there are numerous music packages available catering from the beginner to the advanced musician.

There are programs to teach the fundamentals of music; to experiment with different sounds, tempos and rhythmic styles; to transform the 64 into a synthesiser; to enable programmers to create tunes and even copy sheet music directly by writing notes on the staves.

We have picked a selection of music programs to give you an idea of what is available on the market.



### MUSICALC TEMPLATES

These templates can be used to extend the number of pre-recorded tunes on Musicalc 1. Thirty-two scores and sounds can be used in any combination as a basis for compositions. By using the slider controls with templates, sounds and timing can be altered.

Templates currently available include Latin/American rhythms, New Wave/Rock and the Beat File, which contains a set of drum rhythms.

Each disk costs £15.

**Contact:** Musicalc UK, Paradox Group, The Metropolitan, Enfield Road, London N1. Tel: 01 241 2448.

### MUSICALC 1

A three-voiced music synthesiser with slider controls, modulators, transposers, a score composition panel and step sequencer. Thirty-two pre-programmed melodies can be played. In addition personal compositions can be performed in styles ranging from Classical to New Wave and stored for later playback. Disk costs £45.

**Contact:** Musicalc UK, Paradox Group, The Metropolitan, Enfield Road, London N1. Tel: 01 241 2448.

### MULTISOUND

A musical synthesiser program enabling a wide variety of sounds to be created – musical instruments such as piano, violin and flutes and special effects. The 64 can be used as a musical keyboard or to compose tunes which can be saved on tape. Eight full octaves can be utilised and a visual display provides feedback on play as well as individual notes to be entered in preset mode. Background drum rhythms can also be used. Available on cassette for £14.99.

**Contact:** Romik, 272 Argyll Avenue, Slough, Berks. Tel: 75 71535.

### MUSICALC 2

Operates with Musicalc 1 to print out compositions in standard music notation. No knowledge of musical notes is necessary. It also improves Musicalc's facility by allowing compositions to link 32 scores up in various combinations. Musicalc 2 will also enable Musicalc 1 to be linked to electronic instruments such as Drum machines and keyboards. Disk retails at £31.

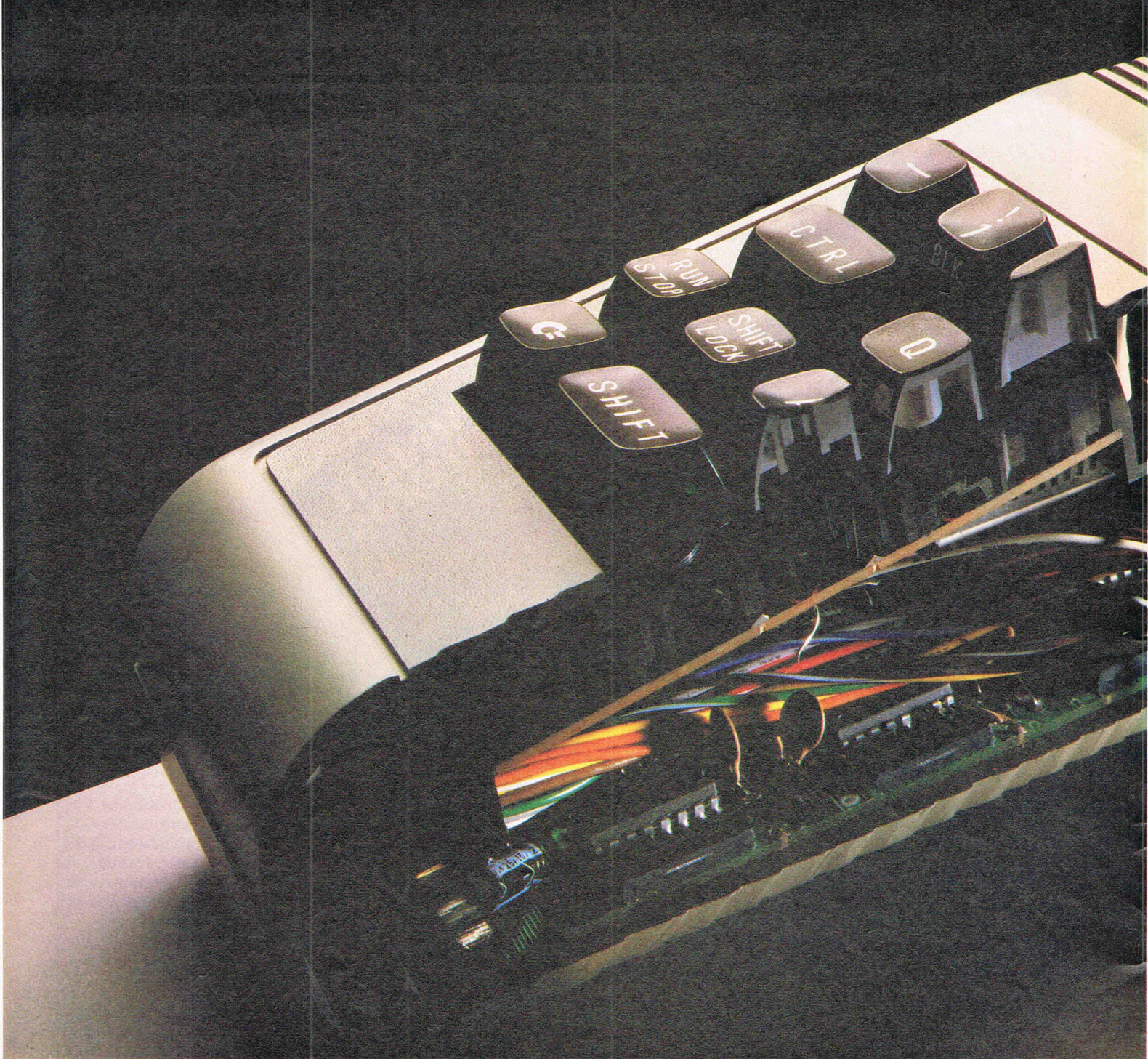
**Contact:** Musicalc UK, Paradox Group, The Metropolitan, Enfield Road, London N1. Tel: 01 241 2448.

### MUSICALC 3

The 64's keyboard can be customised to play scales. Eighty present scales are provided with the package. Scales can be transposed, combined, and moved on Musicalc 3. The program operates with Musicalc 1 as well as independently. Disks retails at £31.

**Contact:** Musicalc UK, Paradox Group, The Metropolitan, Enfield Road, London N1. Tel: 01 241 2448.





# Are you only using

To only play games on a Commodore computer is like asking Albert Einstein to work out the square root of four.

The computer's brain barely ticks over.

To really stretch it, you need more interesting software programs. For example, record keeping, interactive education, stimulating adventure games or word processing.

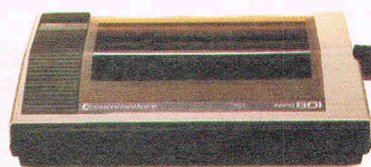
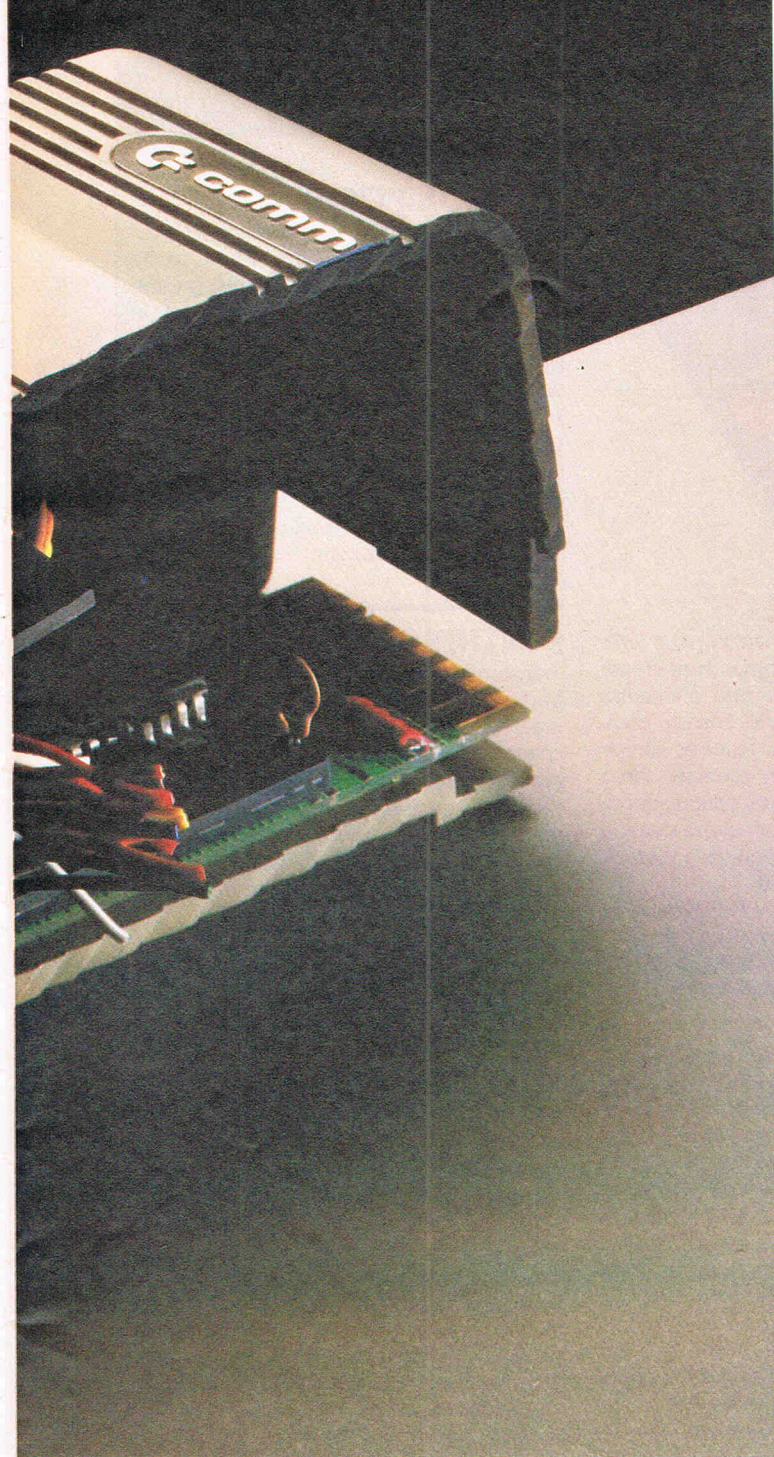
And for those you need peripherals.

Like a Commodore disk drive, a really fast storage and retrieval system with a vast memory.

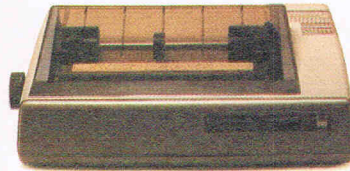
Or a Commodore cassette unit, the inexpensive way of loading and storing programs.

For those who like the idea of text and graphics being more alive and having greater clarity than on a TV, there's the Commodore colour monitor.

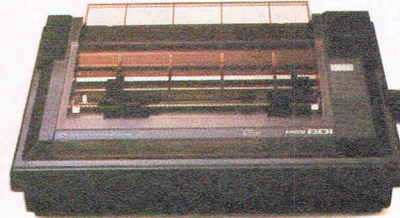




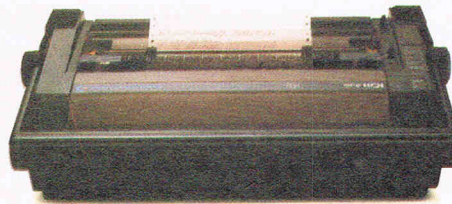
COMMODORE MPS801   
 Dot matrix printer. £230.00.  
 Tractor feed. Print speed:  
 50 characters per second.



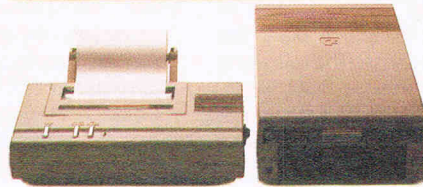
COMMODORE MPS802   
 Dot matrix printer. £345.00.  
 Friction feed for standard  
 paper. Print speed:  
 60 characters per second.



COMMODORE MCS801   
 Dot matrix colour printer.  
 £399.99. 7 colours including  
 black. Print speed:  
 38 characters per second.



COMMODORE DPS1101   
 Daisy wheel printer. £399.99.  
 Letter quality print on  
 standard paper. Print speed:  
 18 characters per second.



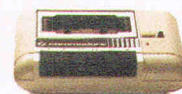
COMMODORE 1520   
 Printer plotter. £169.99. For  
 charts and graphs. Print speed:  
 14 characters per second.



COMMODORE 1541   
 Disk drive. £229.00.  
 170K memory. 5 1/4" diskette.



COMMODORE 1531   
 Cassette unit. For Commodore  
 16 and Commodore plus/4.



COMMODORE 1530   
 For Commodore 64.  
 £44.95 each.



COMMODORE 1701   
 Colour monitor. £230.00.

JOYSTICKS   
 (prices from £7.50)

PADDLES (£13.50).

Details correct at time of going to press.

# 1/10th of your brain?

And for hard copy, there are our four printers and a printer plotter. These will preserve on paper—in colour, black and white, chart form, graphs or text, the fruits of all your labour.

Finally, for more exciting games, there are joysticks and paddles.

So use your brain. And make sure you use all of your computer's brain.

FOR FURTHER INFORMATION, TICK ONE (OR MORE) OF THE BOXES ABOVE AND SEND TO THE COMMODORE INFORMATION CENTRE, 1 HUNTERS ROAD, WELDON, CORBY, NORTHAMPTON NN17 1GX. TEL: CORBY (0536) 205252.

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PECC1084



BY APPOINTMENT TO HER MAJESTY  
 THE QUEEN, MANUFACTURERS OF COMPUTER  
 BUSINESS SYSTEMS, COMMODORE BUSINESS  
 MACHINES (UK) LIMITED, CORBY

# PRODUCT SURVEY

## MUSIC MASTER

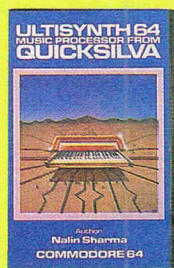
A programmable synthesiser with an automatic rhythm and sequencing capabilities. It contains 34 pre-programmed rhythms and patterns and two further rhythms can be composed by user. An edit and playback facility provides a means to entering and playing three part music scores. Two to three recordings can be played back at a wide range of tempos. Program also includes graphical displays of keyboards and music staves. It retails on cassette for £17.95 and on disk for £19.95.

**Contact:** Supersoft, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex. Tel: 01 861 1166.

## DANCING FEATS

A program enabling programmers to experiment with different sounds, tempos and rhythmic styles. It is menu-driven and the programmer is confronted with a choice of Bass, Beat, Style and Tempo. If Bass, the lowest note in music, is chosen the following musical styles can be used - Jazz, Rock, Blues and Boogie Woogie. Musical compositions can be created with the various sounds and saved. Retail at £6.95 on cassette.

**Contact:** Artic, Main Street, Brandesburton, Driffield. Tel: 0401 43553.



## ULTISYNTH 64

Ultisynth enables the 64 to operate as a musical synthesiser. Various musical sounds for instance the piano, violin, woodwind, drums or cymbals can be played along with the programmers own or any of the six preset rhythms. Sound effects such as explosions, birdsong and trains can be included in programs. Other features include four waveforms, synchronization, recording and editing facilities. Two user defined rhythms can be created. Retail at 14.95

**Contact:** Quicksilva, 13 Palmerstone Road, Southampton. Tel: 0703 20169.



## GRAPHICS BASIC

Primarily a program enhancing the 64's BASIC with additional commands to create complex graphics, sprites and animation with easily understandable English commands, the program also features similar facilities for sound. It can generate three voices with automated background sound, four waveforms and four envelope shaping controls. Graphics Basic requires a joystick and retails at £27.95 on disk.

**Contact:** Hesware, Thorn EMI, Thomson House, 296 Farnborough Road, Farnborough, Hants. Tel: 0252 543333.

## SYNTHY 64

Music and sound synthesiser for the 64. Enables programmers to create music and sounds by adding a set of powerful commands to BASIC. Three voices can be played simultaneously over a range of eight octaves and in addition the character of each voice can be varied. Instrumental sounds such as piano, banjo and drum can be synthesised as well as special effects varying from chimes to wah-wah. Sample compositions are included on the program which is available on disk and retails at £14.95.

**Contact:** Adamsoft, 18 Norwich Avenue, Rochdale, Lancs. Tel: 0706 5244304.

## MUSICOM

The Casio MR-200 when inter-faced to the 64 can either be programmed with a BASIC program, (a slow, but effective method) or used with Musicom, a music editor approved by Casio. It enables the user to produce a very wide range of performances ranging from single note melodies with auto-accompaniment to eight note polyphonic keyboard virtuoso arrangements from original music scores. The program also has editing control facilities and built in timing checks. Music can be stored on cassette. Retail at £9.95 on cassette.

**Contact:** Micro Musical, 37 Wood Lane, Shilton, Coventry. Tel: 0203 616760

## THE COMPOSER 64

This music composer/synthesiser creates tunes and also allows sheet music to be copied directly by writing notes on the staves. The pre-programmed instruments in the program include woodwind, organ, guitar and harpsichord. Other features such as three voices, 15 range octave, four combinable wave forms, tempo control can be used to create compositions which can then be stored. It is available on cassette for £8.95 and on disk for £10.95.

**Contact:** Vulcan Computing Dept (C2), 32 Guildford Road, Farnham, Surrey. Tel: 0252 724182.

## SYNTHESOUND

Transform the 64 into a music synthesiser. Various sounds and special effects can be created such as Bagpipes, Flutes, outer space panic, chirping birds. Solo and accompaniment keyboards are provided on the program. Features include a real time clock, eight waveforms, four envelope shaping controls, three voices and eight filter modes and 256 pitches or presets can be stored. Retail at £27.95 on disk.

**Contact:** Hesware, Thorn EMI, Thomson House, 296 Farnborough Road, Farnborough, Hants. Tel: 0252 543333.

## BRAVO

An introductory music program for beginners, Bravo teaches the fundamentals of music in six sections. Note Tutor and Symbol Tutor present the treble clef, pitch names and different note lengths. Name the Notes and Play the Songs are games utilising knowledge gained in other sections. Free Play teaches you pitch in relation to the 64's keyboard and Mini-Composer puts everything together enabling melodies to be played with various instrumental sounds. Requires a joystick. Costs £22.95 on disk.

**Contact:** Hesware, Thorn EMI, Thomson House, 296 Farnborough Road, Farnborough, Hants. Tel: 0252 543333.



# Computer conversation

**"Argle bargle muffled moof" – speech synthesis at its worst! Electronic speech is not always BBC English, but Sally Wood was pleasantly surprised at the quality of some of the Speech Synthesisers currently on the market for the 64 and VIC 20.**

Artificial speech has interested people ever since the Victorian days when they attempted to simulate speech by operating models of the human vocal tract by hand. Home computer owners now face a bewildering variety of speech synthesisers of an equally confusing range of prices and quality to choose from.

The recent phenomena of home computer owning households and the mass production of special chips designed for speech synthesis has prompted many of the companies to develop them.

There are two types of speech synthesiser, those utilising a library of sounds, the Phenome system or the digitisers.

Research into language has found that there are a number of phenomes or groups of sounds making up a language. These sounds, known as allophones, can be programmed onto a chip together with the means to link them up to create words. An almost infinite vocabulary can be created.

There seems to be a number of different types in this group. The more cumbersome synthesisers have to be programmed by PEEKing and POKEing the values into memory.

The text to speech synthesiser is becoming increasingly popular. Words typed straight into the computer are repeated out loud.

The disadvantage of the phenome system is that the voice sounds like a cross between a drowning man and Doctor Who's Daleks, although, to be fair, most words can be understood if you listen carefully.

Digitisers sound more human because the human voice is pre recorded and burned into the speech chip. The disadvantages are that only about 200 words can be stored and they have to be predetermined. There is not so much potential for the peripheral market, but they have a bright future in other areas of speech synthesis, for example education.

The human voice covers a wide range of frequencies – high pitched to low and deep and home computer synthesisers cannot hope to emulate this range. Speech 64 from Currah does have four voice intonations and in some applications, the voice tone used can be vital. A fairly deep male voice is preferred for business and home applications whereas in the Military services, a woman's voice is preferred because the experts reckon that lonely young fighter pilots and ship's navigators will pay more attention!

In the past year, software companies have started to incorporate speech into their games. Interceptor's Tales of the Arabian Knights and Bug Byte's Twin Kingdom Valley, both include speech, but not in a very active way. Lines of text are merely repeating text already on the screen.

Rod Holland, Sales Manager of Currah foresees a great future for speech synthesis especially in the games and education field. Most games at the moment utilise sound and Gyruus from Parker Software is one of the best examples. Bach's Tocatta and Fugue in D Minor contribute a lot to the excitement and enjoyment of the game.

Perhaps in the near future speech will also become an integral part of a game or a program.

Currah have generated some interest among games manufacturers with their unit and in the next few months more and more programs are going to include speech in a much more interactive way than previously. Anirog's new game PC Fuzz utilises speech actively. Adventure games hold numerous possibilities for speech. Evil wizards, cunning creatures and strange voices could pose crucial questions or boom out commands which if not answered correctly or followed would result in disaster for the player.

Apart from the comparatively frivolous games world, numerous exciting possibilities exist in education. In particular reading and spelling for children and in computer assisted learning programs for the blind, partially sighted and mentally handicapped where printed displays are inappropriate.

A speech program which says letters and words as it is written, may help with spelling or pronunciation in reading. Blind or partially sighted people could perhaps learn to touch type as each key pressed would say a letter and help mistakes to be corrected.

Business and commerce also hold opportunities for speech synthesis. Washing machines fitted with a self diagnostic mechanism would save the housewife pounds. If anything went wrong the machine could actually tell the housewife what it is; your fanbelt has snapped or the pipe is blocked, thus saving a service bill. Already some cars use speech to inform occupants that their lights are on or the seatbelts aren't properly locked. The 64's timing mechanism could be utilised with a speech synthesiser to say 'wake up' in the morning – an effective alarm, although it can't make tea yet – yet! Speech synthesis could also be used in burglar proofing a house. Linking a unit up to the windows and doors could be triggered off by any forced entries and a 'stop thief' mechanism activated.

The possibilities are numerous and in the next few years the speech synthesiser potential may be developed to the full. Hopefully we have prompted your imagination and perhaps speech would add an extra dimension to your programming.

Speech Synthesisers for the 64 and VIC 20 are still in the games peripheral stage, but I think that will change.

# PRODUCT SURVEY

## SPEECH 64

The most important test for any device purporting to be a speech synthesiser is, of course, whether it actually does speak. Anything can mumble and squawk, but if you can actually understand what the computer is saying, then the device has passed its first qualifying test.

Speech 64 passed with flying colours and although some words sounded a bit obscure, for instance "ragged", the majority of words were perfect, albeit slightly inhuman.

The device is small and black and plugs into the cartridge expansion port at the back of the 64. The attached DIN plug fits snugly into the Audio/video socket. Absolutely nothing to it and operating it is even easier.

All that is necessary to get the computer talking is to tap INIT (+ RETURN) on the keys and it's ready to go. From then on, every single character that is typed in is repeated. There are four voice intonations although they are on the deep side.

To get the 64 to say a whole sentence, SAY is typed at the beginning of the line and the sentence is enclosed with speech marks: SAY "a long sentence" (+ RETURN).

Speech 64 is a text to speech synthesiser, but it uses the allophone system so not all words can be typed in as they are spelt. The English language is full of quirky pronunciations and spellings. For instance "sew" and "few" look the same, but sound completely different. Currah have included 58 speech sounds and four pauses and these can imitate most English words.

A system of square and round brackets are used to help the computer distinguish between single allophone sounds in a word. Allophonic words can be mixed with normal text. For example: SAY "I come from [haw(ii)(e)]" which when said would be "I come from Hawaii".

A speech buffer holds up to 25 seconds worth of speech and is extremely useful when you want the 64 to repeat long sentences. Incorporating the speech into your own programs — in both Machine Code and Basic is quite easy especially if you follow the manual instructions carefully. The sample program — The Speaking Clock may be a help.

The manual is excellent and has lists of allophones, pronunciations and deals clearly and concisely with the Speech 64 operation.

Currah hope that people will use it in serious programming rather than just a gimmick. It is certainly not a gimmick and I felt very impressed with it.

**Product Name:**

Speech 64

**Product:**

Speech Synthesiser

**Company:**

Currah Computer Components Ltd, Hollymount, Wooler Road, Hartlepool, Cleveland. Tel: 0429 34511

**Hardware Requirements:**

CBM 64

**Applications:**

Pure fun, can be used in programs, in educational games

**Documentation:**

Extremely clear and concise manual

**Price:**

£29.95

## CHATTERBOX

Chatterbox has quite a history behind it. Currah designed it and Adman Electronics marketed it under a different name — Speech Synthesiser for the VIC 20. Currah are now back to selling it themselves under its former title — Chatterbox!

As the same company designed both synthesisers, Chatterbox and Speech 64 bear many similarities in operation, although the latter is a much improved version.

The device is creamy coloured and has an amusing picture of two Jack in the Boxes on its front. Connecting it to the VIC is easy. The unit plugs into the expansion slot and has two connector leads. One fits into the TV modulator plug and the other 5 pin DIN plug attaches to the displaced TV modulator plug.

Once in, it is ready to be programmed to speak immediately. It doesn't have a text to speech function and every word has to be typed in as it sounds using the allophones. Strings of words have to be followed by a SYS command and sentences of over 30 allophones will need more than one of these SYS commands.

I'm afraid that having been spoilt with Speech 64, Chatterbox just seems to be cumbersome to program.

However it is about the only speech synthesis device for VIC 20 owners and will have to do for the while. Actually the speech is quite good and the manual is very detailed in its explanation of allophones and gives numerous useful charts and lists.

Chatterbox can still chatter and although it has been upstaged by Speech 64, it is still a good product.

**Product Name:**

Chatterbox

**Product:**

Speech Synthesiser

**Company:**

Currah Computer Components Ltd, Hollymount, Wooler Road, Hartlepool, Cleveland. Tel: 0429 34511

**Hardware Requirements:**

VIC 20

**Applications:**

Making the computer talk

**Documentation:**

Excellent manual with sample program, clearly laid out information

**Price:**

£19.95

## JCB MICROSYSTEMS

A vocabulary of 200 pre-defined words is one of the features of the new JCB Microsystems Speech Synthesiser that allows the user to create whole sentences when the words are combined with the allophones.

The unit has text and numeric capability, the latter of which includes exponential forms. And you won't have trouble understanding the JCB — it speaks proper English for numeric as well as textual expressions. For example, the computer will say the number 10,246 as ten thousand two hundred forty-six rather than merely saying each numeral in the number group.

When it is speaking text, the synthesiser has the ability to say up to 40 words with one command and pauses can be inserted to give the effect of a comma in a written sentence.

The package, which retails for £29.95, allows the user to intermix speech with any graphics that are on the screen without interrupting the speech. In case of a mistake, special error messages flash up giving more detailed information rather than simply flashing the ambiguous "syntax error".

The synthesiser cartridge plugs into the back of the Commodore 64 and comes with a detailed user manual.

Contact: JCB Microsystems, 29 Southbourne Road, Bournemouth, Dorset BH6 5AE. Tel: 0202 25417.

## COMMTALK

The Commodore VIC 20 hasn't been neglected in the speech synthesiser market. The Irish company Andor has come out with a cassette form synthesiser compatible with the Commodore 64 as well as the VIC 20.

Commtalk has no pre-set vocabulary, but a spokesman for Andor says the possibility of vocabulary is infinite because the allophones are used to form words. The system utilizes a standard voice although it can be varied (to sound gruff, for example) by adjusting the frequencies using the Commodore's sophisticated SID chip. Once again, graphic displays on the screen will not interrupt the speech mechanism.

Including a large manual, it retails for £29.

By the way, Andor says they will be coming out with a more sophisticated unit by the beginning of 1985 that a spokesman says will be totally different from the Commtalk and designed for professional use (as well as the professional wallet).

Contact: Andor, 28 Hillside Drive, Rathfarnham, Dublin 14, Ireland. Tel: 0001 900 107.

# PRODUCT SURVEY

## MICRO COMMAND

Micro Command is not a speech synthesiser in the technical sense. It is a device which is taught to recognise the programmer's voice and then used to control the 64. In other words it is a voice recognition unit.

The Micro Command device plugs into the back of the 64 and operates with an accompanying cassette. This cassette contains eleven files; micro, logo, header, men, games, subrs, sheeptalk, symbols, teach, sheeptalk and symbols.

The first program, micro, is designed to introduce speech recognition. Micro Command has to be taught to recognise what the user's voice sounds like. "Up" and "down" are the first words it is taught. A little man will walk up and down a ladder on your command — if it has understood. It takes time for the recognition process and Orien have used game ideas to make this process more interesting.

In Sheeptalk, four words are used and the idea is to herd sheep into a pen by giving Rex, the sheepdog, commands.

After enough practise, speech recognition can be used in personal programs — an interesting challenge for programmers bored with games. Manuals accompany the device and include adequate programming instruc-

tions. Micro Command retails at £49.95.

Contact: Orien Data, 31/32 High Street, Dorset Gardens, Brighton. Tel: 0273 672291.

## MAGIC VOICE

Magic Voice is a speech synthesiser utilising the text to speech process. It plugs into the cartridge port at the 64's rear and has its own cartridge port permitting other cartridges to be stacked on top. A manual is available.

The voice options are male, female or child. Female voices are rare in speech synthesis, but Commodore plan to use the device in Educational software and consider the children will respond better to a woman's voice.

The module contains enough data to say all 26 letters of the alphabet, as well as a vocabulary of 187 words. It can also repeat numbers and a diskette with extra vocabulary is planned.

Speech and music can be generated simultaneously and by using Commodore BASIC or machine code, voice and graphics can also be used at the same time.

Educational software have been planned and will include Talking Books and B J the Bear, a suite of programs on writing, thinking and arithmetic.

Magic Voice is still not available in this country, although a Commodore spokesman assured CCI that it would be soon. The price is to be decided, but will probably be in the region of £49.95.

Contact: Commodore (UK) Ltd, 1 Hunters Lane, Weldon, Corby, N Hants NN17 1QX. Tel: 0536 205555.

## GALA-SPEECH

This is the only speech synthesiser which runs by software alone. It uses the allophone system and is available on cassette for £7.95 and disk for £10.95.

It has an ABC demonstration program with examples of allophones and general rules for their use.

Either machine code or BASIC can be utilised. If the programmer is using BASIC, the command 'say' is incorporated into the program together with the text that is desired.

The speech program is loaded first and followed by the preprogrammed software. The speech program does not interfere with the normal program because it occupies a high place in the memory.

Contact: Gala Soft, 116 Church Parade, Canvey Island, Essex. Tel: 0268 682719.

## DUCKWORTH HOME COMPUTING

All books written by Peter Gerrard, former editor of *Commodore Computing International*, author of two top-selling games for the Commodore 64, or by Kevin Bergin. Both are regular contributors to *Personal Computer News*, *Which Micro?*, *Popular Computing Weekly* and *Commodore Horizons*.

### SPRITES & SOUND ON THE COMMODORE 64

by Peter Gerrard

A complete guide to using the extraordinary features of the Commodore 64, together with a full working explanation of the chips that make it possible: the 6581 Sound Interface Device and the 6566 Video Interface Chip, together with the processor that make it all tick, the 6510.

Sections on programming your own musical instruments, producing sprite and programmable character animation, make this the guide for users of the Commodore 64 who want to get the most from the special features of their computer. £6.95

### COMMODORE 64 GAMES by Kevin Bergin

This is a collection of 21 exciting programs specially written for the Commodore 64, including Golf, Snake, Air Attack, Draughts, Car Dodge, Tank Battle, and Minefield. An adventure game is also included as well as a program to enable you to devise your own version of Basic by re-defining keywords. Each program is accompanied by notes on its structure to enable you to modify or extend it. £6.95

### THE COMPLETE 64 ROM DISASSEMBLY

by Peter Gerrard and Kevin Bergin

This book is for anyone who has ever wondered how the Commodore 64 really works. Intended for the serious programmer, it includes fundamental memory maps, memory architecture maps, the disassembly itself and (for reference) the complete machine code instruction set. £5.95

£5.95

### EXPLORING ADVENTURES ON THE 64

by Peter Gerrard

The complete guide to computer adventure games: playing, writing and solving them. Starting with an introduction to adventures, and their early history, it takes you gently through the basic programming necessary on the 64 before you can start writing your own games. Inputting of information, room mapping, movement, vocabulary, and everything required to write an adventure game are explored in full detail. Then follow a number of adventure scenarios, and finally three complete listings, written specially for the 64. The games are available on one cassette at £7.95.

£6.95

### USING THE COMODORE 64

by Peter Gerrard

A complete look at the latest home computer from Commodore Business machines. Starting with a refresher course in Basic Programming, it moves on through machine code, before considering in great detail sprites, graphics and sound. A section on peripherals, and then the heart of the book: an in-depth look at the chips that make it work, including the 6581 Sound Interface Device and the 6566 Video Controller Chip, as well as the heart of the computer, the 6510. The comprehensive appendices cover the full Basic and Machine Code Instruction sets, as well as several useful reference tables, and a complete machine code assembler/disassembler listing.

**Personal Computer News said:** "In this case, we are dealing with a gem of a book. It deserves a place on the bookshelves of every 64 user whether beginner or expert."

£9.95

Many other books and cassettes are available, write in for a catalogue.



DUCKWORTH, The Old Piano Factory, 43 Gloucester Crescent, London NW1 7DY. Tel: 01-485 3484

**Real Music  
on Computer!**

# A NEW DIMENSION FOR THE COMMODORE 64

It is now possible, using a MIDI\* based music keyboard to use the Commodore 64 with suitable hardware and software to create music of professional quality.

## What is MIDI?

Quite simply MIDI (Musical Instrument Digital Interface) is a standard means of communication used by many of the leading instrument keyboard manufacturers, enabling an instrument of one make to 'talk to' another. In practice, using the JMS interface and suitable JMS software a whole new world opens up for the musically minded.

## Do I have to be a keyboard player?

Obviously, it helps a great deal if you are! But if not – especially if you can 'Pick out a tune with one finger' you can have enormous fun with the Composer and Studio programs.

## What do I need?

A Midi Keyboard with amplifier (there is a wide choice from several manufacturers).  
A Midi Interface RMS-2H • RMS Software • A Commodore 64 and 1541 disk drive (or CX 64) • Connecting leads

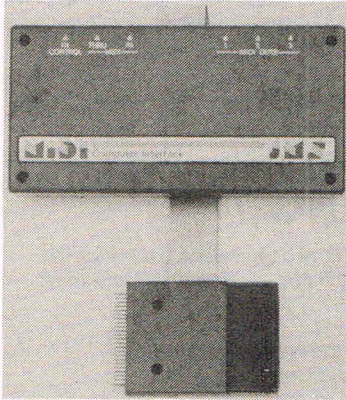
## What can I do with it?

In a word – plenty! Depending on which software you choose you can compose, playback, even use your computer as a 12 Track Recording Studio using facilities unheard of even in sophisticated recording studios.

## Where can I buy these?

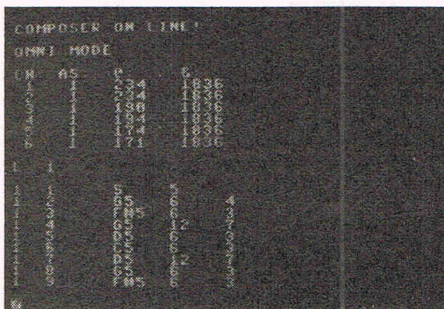
Any good musical instrument shop can supply the software, hardware, and MIDI keyboards. In case of difficulty contact Rosetti.

### RMS24 MIDI INTERFACE



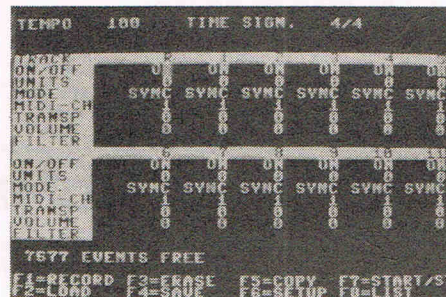
Midi interface for Commodore 64 and Sinclair Spectrum 48k computers. 3 Midi outputs, midi in, midi thru and control in.

### RMS20C MULTITRACK COMPOSER



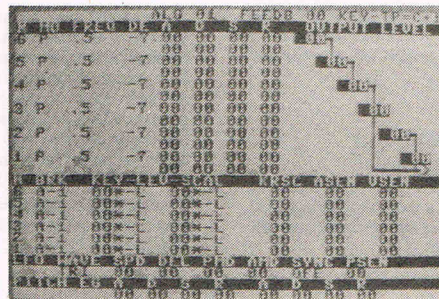
For use with Midi Keyboards, JMS Interface, Commodore 64 or SX64 Computer, Disk Drive, Drum Unit (clock pulse 24). (If using drum unit RMS-5H cable required).  
Step time input from computer. Six voice channels. Each voice channel assignable to a Midi channel. Over 1500 steps per channel. Tempo changes without pitch changes. Sound changes can be made in any voice at any point. Supplied with demo/storage disk. Retains Midi key velocity data.

### RMS24C RECORDING STUDIO



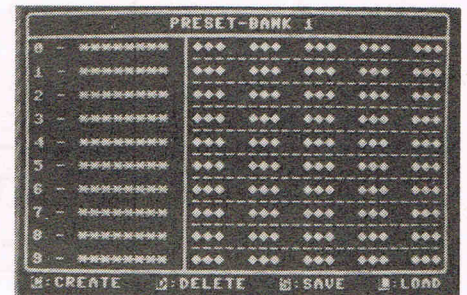
The 12 Track Recording Studio can actually improve on a conventional recording machine. Tempo change without any change of pitch. A total change of any sound after the recording. Transposition of any sound after recording. Listing and editing of any measure in any channel.

### RMS21C SOUND EDITOR



For use with Yamaha Dx7 or Dx9 Synthesiser, JMS Interface, Commodore 64 or SX64 Computer, Disk Drive and Printer (optional).  
Displays all sound parameters together on screen. Edit on keyboard and screen parameters change. Print out facility from screen. Store new sounds on floppy disk. Simplifies editing.

### RMS25C MASTER KEYBOARD



The Master Keyboard program permits fast control of a series of connected Keyboards. It has the following facilities.  
Sounds can be drawn from any connected Midi Keyboard and set into a designated area on the master keyboard. A series of Midi based keyboards and devices can be pre-set to up to 80 variations, enabling the player to reset the entire range of keyboard sounds on stage between numbers. A simulated "drawbar" facility can be used to add harmonies to designated areas of the master keyboard. Pitch variation.

### Distributed Worldwide by

Rosetti Limited  
138-140 Old Street, London EC1V 9BL  
Telephone 01-253 7294

### Germany

Jellinghans Musik Center  
Dortmund  
Telephone 49-231-171921

### USA

Cherry Lane Music Co.

Telephone 0101-203-661-0707

### Australia

Dynamic Music  
Brookvale, New South Wales  
Telephone (02) 939-1299

### Spain

Ventamatic  
Barcelona  
Telephone (93) 230-9790

# Musical Connections

As computers take on a more important role in the music world, Sue Pearce explains the concept of MIDI (Musical Instrument Digital Interface) and talks to well-known musicians about their use of computers.

No article about the growing use of computers in music would be complete without a mention of MIDI (Musical Instrument Digital Interface). MIDI is an interface specification enabling easy and inexpensive interconnection of digital equipment such as synthesisers, sequencers and computers.

Before MIDI, older analogue synthesisers used a system of 1 volt per octave. What they had on the back was a CV (control voltage) gate. The gate being either on or off. You needed four strands of wire for each note. Two notes required eight strands of wire, and so on. You can imagine the spaghetti effect of all that wire.

These synthesisers were only compatible on 1v systems. Another problem was voltage control. DCO's (digital control octaves) were stable, but didn't control voltage.

There came a stage in the development of synthesisers where manufacturers were using micro processors more

and more in production. Musical instruments are of a nature where you may want to use them together with other instruments. Like a computer, the synthesiser has peripherals — synthesisers have sequencers.

Some manufacturers instruments worked with others, some did not. Before things went too far, the manufacturers decided to get together and devise a standard. After all, all were using similar technology for keyboards, so why not make them all the same?

After much discussion, MIDI (Musical Instrument Digital Interface) was born. All the information passes along one wire. Each piece of information takes a very short amount of time to travel — just 320 microseconds. So short that it is not registered by the human ear. The line is then clear for another message.

The hardware used is a 5-pin Din (although only two pins are actually used). It's a very common and cheap device unlike something such as a centronics plug.

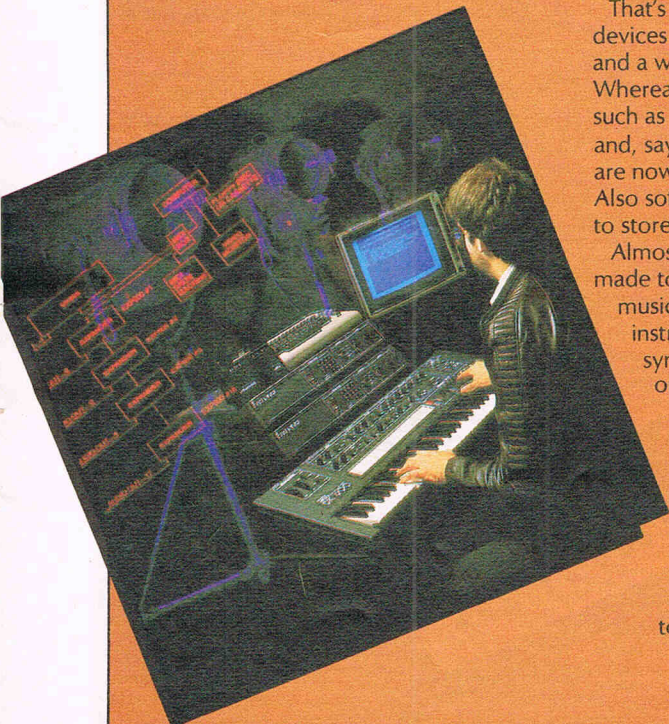
That's how it all began. Now there are devices which interface with computers and a whole new industry is emerging. Whereas in the past you had companies such as Commodore making computers and, say, Roland making keyboards, there are now third parties making interfaces. Also software houses are writing programs to store sound on the computer.

Almost all musical instruments are now made to meet MIDI specifications. Many musicians and groups link their instruments, so, for example, two synthesisers can be played from just one keyboard. Or a drummer can now even be replaced by a drum machine. Now, in addition to the numerous sound packages available to create music on the 64 (see this month's product survey), there is vast scope for the home computer owner to link musical instruments to computers such as the 64.

Manufacturers have not been slow to recognise this potential market. Siel, for example, feels that its future lies within the compatibility of electronic keyboards and computers. Their aim is to bring music to computer owners and computers to synthesiser owners.

A series of keyboards is being introduced by Siel aimed at the home, education and computer markets. And Siel's MIDI Computer Interface allows connection to computers using CPUs Z80, 6502 and 6510. Any MIDI equipped instrument may be interfaced directly to a computer for musical control.

This range is being backed up with a range of computer software. For example, a Composer/Arranger program for the 64 which is a six track pulse time sequencer. Each track is inputted monophonically via the Qwerty keyboard in terms of step number, note name and octave, note duration and gate time. The program's flexibility allows full staccato and legato in Omni and Poly MIDI modes.



# SOUND

While Siel are making a definite attempt to cater for this new market, the availability of MIDI interfaces means that instruments from most manufacturers such as Roland and Yamaha can be linked to your computer. Admittedly it can be an expensive affair, but computer enthusiasts with a bent for music will be more than pleased with the result. (If your budget is limited you should enter this month's music competition, the prize being Casio's MT200 keyboard plus the PA-1 interface — all you need to set you on your way!)

There are music shops and centres all over the country whose staff are trained to advise customers on a suitable purchase for their price range and requirements. Some of these are listed in this feature along with a list of some of the many manufacturers and instruments that can be interfaced with a computer.

If you are interested in interfacing instruments with your computer and would like to research a little deeper into the concept, there is a MIDI Users Group at 8426 Vine Valley D.R. Sun Valley, CA91352, USA.



**SIEL**  
MK 900

## SIEL

**DK 600:** MIDI 6 Voice Programmable Polyphonic Synthesiser

Price: £999

**MK 900:** MIDI Keyboard

Price: £449

**MIDI Computer Interface**

Price: £99

**Siel Software for the 64:**

Composer/arranger program — disk £39,

cassette £36

16 track Live Sequencer — disk £69.50,

cassette £64

## Coming Soon:

Expander Editor

Synthesiser Database plus programs

Contact: Siel (UK) Ltd, AHED Depot,

Reigate Road, Hookwood,

Horley, Surrey. Tel: 02934 76153.

## JMS

**RMS-20c:** MIDI Multitrack Composer

Price: £49.95

**RMS-23c:** MIDI Arpeggiator Program

Price: £19.95

**RMS-25c:** MIDI Master Keyboard

Price: £99.95

**MIDI Recording Studio**

Price: £99.95

Contact: Rosetti Ltd, 138-140 Old Street, London EC1. Tel: 01-253 7294.

## MPC ELECTRONICS

**Music Percussion Computer**

Price: £595

Contact: MPC Electronics, The Gables, Willingham, Cambridge. Tel: 0954 60264.

## ROLAND

**Juno-106** — Analogue synthesiser

Price: £800

Contact: Roland, Unit 6, Great West Trading Estate, 983 Great West Road, Brentford, Middx. Tel: 01-568 4578.

## SEQUENTIAL CIRCUITS

**Model 64:** MIDI Sequencer

Price: £185

**Six-Trak:** Multi-trimbral Polyphonic

Synthesiser

Price: £800

Contact: Available through leading music shops.

## MICRO MUSICAL

(Software for use with Casio MT-200 and PA-1 Interface)

**Microlink System ML-11:** Editor/interface

Price: £29.95

**Microlink System ML-13:** Interface

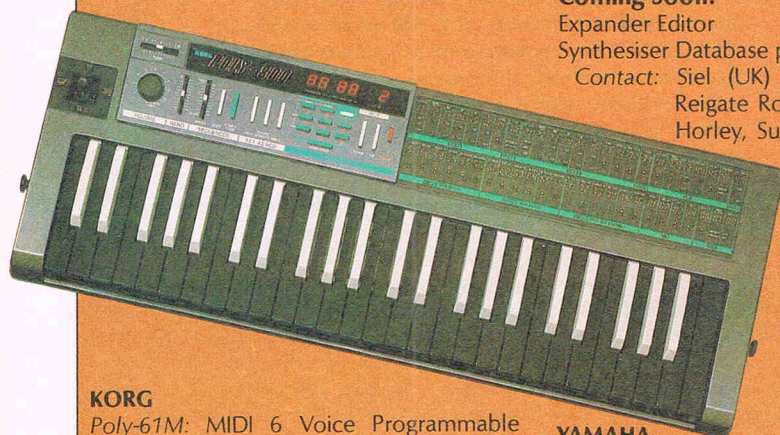
Price: £19.95

## AUTOGRAPHICS

**Microsound 64:** Full-size, 4 octave Keyboard

Price: £145 (plus £3 p&p)

Contact: Autographics Ltd, 3a Reading Road, Henley-on-Thames, Oxon. Tel: 0491 575 469.



**KORG**  
Poly-800

## KORG

**Poly-61M:** MIDI 6 Voice Programmable Digital Synth, 64 Program.

Price: £849

**Poly-800:** MIDI Programmable 8 Voice

Digital Synth

Price: £575

**EX-800:** MIDI Programmable 8 Voice Synth

Module

Price: £425

**RK-100:** Remote MIDI Keyboard

Price: £499

**DDM-110:** Programmable Digital Drum

Machine

Price: £229

**DDM-220:** Programmable Digital

Percussion

Price: £229

Contact: Rose Morris Ltd, 32-34 Gordon House Road, London NW5. Tel: 01-267 5151.

## YAMAHA

**DX-7:** Digital Algorithm Synthesiser

Price: £1399

Contact: Yamaha, Mount Avenue, Bletchley, Milton Keynes, Bucks. Tel: 0908 71771.

## CASIO

**CT6000:** MIDI Synthesiser

Price: £600

Contact: Casio, Unit 6, 1000 North Circular Road, London NW2 7JD. Tel: 01-450 9131.



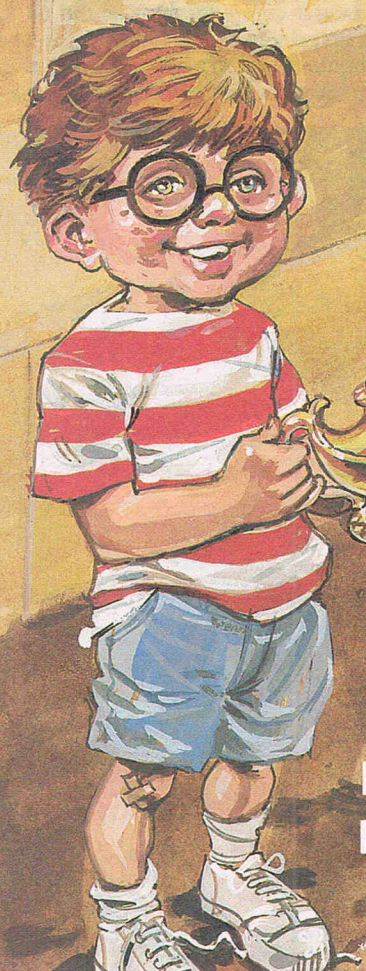
**CASIO**  
MT200



For your Commodore 64

# Guthbert Enters the Tombs of Doom

£6.95



Our intrepid hero's BACK. In his latest action packed adventure!

**INVENTORY**

- ★ 200 PLUS LOCATIONS in ye High Resolution Graphics
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or **WEBSTERS SOFTWARE**  
0483 62222

# MICRODEAL

Selected Microdeal Titles available from computer dealers nationwide or from larger branches of

John Menzies and Roots



## IAN ANDERSON

While Jethro Tull is a band that has been around for many years, it is also a band which keeps close tabs on all new technology. During the recent 'Under Wraps' tour I went along to the Hammersmith Odeon to talk to Ian Anderson (who for many is Jethro Tull) about the band's use of computers in music.

Backstage, the interview got off to a bad start with Ian launching into the story of his brief and disappointing experience with the 64.

"I bought one for the kids at Christmas," recalls Ian. "I also spent £100 on educational software. Nothing would load. I took it back to the shop and eventually replaced it with a BBC computer - the last one I thought I would buy."

On the home computer front, Ian feels that using a computer such as the 64 for music purposes is purely hobbyist. He says: "The home-user with a computer might find it fun to play around with music, but it strikes

## the stranglers

### STRANGLERS

This isn't a story about how the Stranglers use computers in their music, but it does concern an interesting concept which ties in well with our theme of computers and music.

All tape versions of Aural Sculpture, an album to be released by the Stranglers on 5 November, will include a computer adventure game. Called Aural Quest, it is a lengthy adventure written on the Quill system. The aim of the adventure is to search around the world for pieces of the ear.

Keyboard player Dave Greenfield, himself a keen adventure player, says: "Nobody has put an adventure game onto a musical release before. Initially the idea was formed within the band and it was designed by Mike Turner of Star Dreams."

Throughout the game clues are provided in the form of bursts of Stranglers' music and lines from the band's songs.

"The player doesn't have to be a Stranglers fan to complete the adventure," says Dave, although presumably most people who purchase the album will already be familiar with the Stranglers music.

Unfortunately, the version of Aural Quest featuring on the album is only suitable for the Spectrum. However while berating this point to Dave, he did suggest that should demand for a 64 version exist it is possible that a suitable version of the game could be made available through the fan club.

So if you are interested it's up to you to generate that demand. The address to write to is Stranglers Information Service, PO Box 32, Shepperton Studio Centre, Studios Road, Shepperton Road, Middlesex.



me as being hobby orientated and low in terms of output.

"There are a number of music programs that have been utilised with the 64," continues Ian. "But my own opinion is that if you are talking about music in any serious application, with any control, you are down to spending money.

"I don't really believe in the future of any home computer systems for the home user who also happens to be a musician, other than rudimentary assistance.

"It needs a dedicated system. It isn't like playing Pac-Man — you can't play games with a 24 multi-track, but it's a useful tool for professionalism.

Returning to Jethro Tull's use of computers, Ian explains that each of the keyboards on stage feature a number of micro processors.

"Looking at the level of dedicated computer technology in something like the Roland Sequencer — they are all simple computers in that its limitations are in terms

of the way it is programmed.

"When you get into the serious stuff such as the Fairlight or Sinclavier, which use Winchester disk drives, you are talking about computers that have far more capability — really industrial machines."

They also cost more at between £20-30,000!

At this point in the interview, Peter-John Vettese took over to elaborate on the band's use of computers on stage.

## PETER-JOHN VETTESE

As the keyboard player, Peter-John Vettese was nominated as the most logical person to explain how Jethro Tull are using computer technology as a stage medium.

Peter immediately reeled off a long list of instruments which are MIDI'd together including Yamaha and Oberheim keyboards, expanders, emulators, sequencers and vocoders!

"The computer revolution has taken place," comments Peter. "Things changed when digital sound came about. For example, when the Yamaha DX7 was launched it was entirely digital and used frequency modulation as the sound source.

"The advantage is programmability" he continues. "You can store a program and switch instantly from program to program. Then there's MIDI which enables you to multi-layer, which you can't do with gates and CV's."

Peter explains that the Fairlight and Sinclavier synthesisers use a computer terminal and disk drive and therefore are, in effect, computer music studios.

Jethro Tull also make use of drum machines. When the last album, *Walk Into Light*, was recorded the group had not yet discovered the drumming talents of Don Perry. Peter recalls: "Ian and I used the Linn drum on the last album. On stage it is replaced by the fantastic playing of Don Perry!

"The advantage of a drum machine is that the writer of a song is allowed to program what he thinks the drums should be doing. On the other hand, the disadvantage is that the creative element of another brain is missing."

Does the use of computers in music take away some of the natural creativity of musicians? Peter believes that the most natural instrument for a human to use is his or her voice and that some synthesisers are lacking in human expression. However, he says: "The ones I play have as much if not more expression than any other conventional instrument. They can only be that way because of computers. Velocity, volume — the whole thing is monitored by computers.

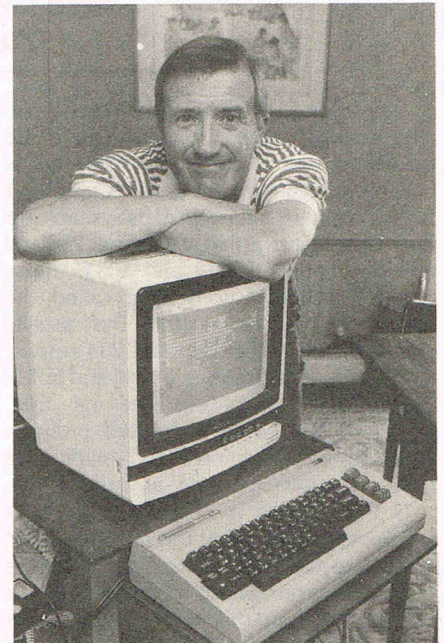
"I can be as emotional and expressive in my music as anybody can. And that is only because there are computers."

## ROY CASTLE

Whenever I think of Roy Castle, I think back to his TV series 'Record Breakers' and in particular to one program in which Roy attempted to play a record breaking number of instruments — and make music from objects that are far from being instruments in the true sense. It isn't everyone who can play a tune on a teapot!

So when we heard that Roy was now the proud owner of a 64 we couldn't wait to find out just what he was doing with it. Transforming it into a wind instrument? Or maybe using it for percussion?

Nothing that dramatic as it turned out, but Roy does find the 64 invaluable in writing music.



"It certainly doesn't replace real instruments," comments Roy. "What it does do is to allow you to very deliberately plan a musical arrangement and listen to it.

"It's a very good way of learning how to listen to an orchestration without trying to write it not knowing how it will sound. After all not many people can afford to employ a whole orchestra to listen to how it is coming on."

Roy originally bought the 64 to enable his children to have access to "what is obviously the thing of the future". He says: "I'm not very good at it yet. In programming terms I'm still a baby, but I do realise its potential. It's quite difficult," he continues. "It's like learning a new language, but once you've mastered the technique..."

"I would never want to eliminate real instruments because of the personal attitude and live music," continues Roy. "But it's obviously the thing of the future. Soon the whole world will be computerised."



# Musical interrupts

**One of the common features shared by a number of popular arcade games at the moment (Frantic Freddie is a prime example) is that of musical interrupts. In other words, while the program is getting one with doing one thing, a tune miraculously carries on in the background.**

**Pete Gerrard explains, with the aid of a mixture of Basic and machine code, how it's done.**

Since this whole thing is based on interrupts, there's obviously got to be something somewhere in the 64 that is capable of being interrupted. A glance at one of the many memory maps available for the machine shows that at locations 788 and 789 decimal (or \$0314 and \$0315 hexadecimal), there is something called the hardware interrupt vector. This usually contains the numbers 49 and 234 respectively in the two locations, or \$31 and \$EA in hexadecimal. This tells the 64 that, everytime this routine is checked, program flow must go to location \$EA31, reading the numbers in low-high order as usual.

As this routine is checked with great frequency, we can alter this (it is only RAM after all) to jump to a routine of our own. The main thing to remember is, having made this change, to ensure that at some point in our own routine program flow still branches to that routine at \$EA31, which updates the clock, amongst other things, and generally helps keep the 64 ticking over. If this call wasn't present, it would be a very sick 64 indeed, and your musical career would die at birth.

## Re-routing interrupts

So the first thing to do is alter the content of those two locations, which is really the only purpose of the first and third blocks of machine code. Set interrupt disable (in other words, we don't want to be disturbed), load the accumulator with \$50 and store it at location \$0314, load the accumulator with \$C0 and store that at location \$0315, clear interrupt disable (in other words, carry on interrupting), do nothing for a bit and return from this subroutine.

The last part of the routine sets everything back to normal.

What have we achieved by doing this? Well, program flow from the hardware

interrupt vector no longer goes off to location \$EA31 directly, it now goes there via location \$C050 instead. This is set up by typing in SYS49152, and everything is returned to normal by typing SYS49171. However, since we haven't got any code at location \$C050, there's not a lot of point in typing this just yet.

## Getting Going

Without an assembler, typing all this in is going to be tricky from the machine code listings, and so the data program has been included as well. This is in fact longer than the machine code equivalent, since the listings only show the relevant parts of the machine code, not the gaps in between. But, if you haven't got an assembler you'll just have to resign yourself to doing a bit more typing.

The last two blocks of machine code (the hexadecimal dumps) are the actual tune that is going to be played: in this case, a simple boogie riff, since my musical talent is minimal. Again, these can be typed in either with an assembler, or you'll have to do it the long way and enter all the data.

The final bit of typing is the Basic program headed Musical Interrupts. Straightforward, since it's all in Basic. The only line needing an explanation at the moment, in order that you can get it working before we dive into the great explanation of how it all does what it does, is line 5. This checks a memory location where part of the machine code lies, and if that location doesn't contain a 65, then we load the program 'boogietime' from disk. If you're using a tape system, change that eight to a one. 'Boogietime' is just the name I gave to the whole of the machine code collection of routines.

If you have got it all typed in, just run the Basic program as a normal Basic program, and sit back and listen to the music. Now, the great question, how does it all work?

## Basic program explanation

Taking this line by line, we have:

Line 3: Set the border and background colours, revert to an upper case/lower case display, and print up a title.

Line 5: See if the machine code is in place, and if it isn't load it in.

Line 10: See the variable S to equal the start of the SID chip, and set the low order pulse frequency for voice 3 to be maximum, give it an attack/decay setting of 142 and a sustain/release setting of 150.

Line 20: Turn the volume up to maximum, and POKE some values which the machine code program will later use.

Line 30: More values for the machine code program.

Line 100-120: Do the same for voice 2 before activating the routine with a call of SYS49152.

Lines 130- : Just a little demo to prove that you can carry on doing things while the tune is playing.

## Machine Code explanation

We'll just concentrate on the routine for voice 3 (which lies from locations \$C050 to \$C0AF), as the one for voice 2 is virtually identical.

First of all, check the content of location \$C042 (49218), and if it contains a zero then carry on with the program. If not, jump to the internal routine at \$EA31 and carry on as normal.

Decrease the content of location \$C041 (49217) and if that isn't equal to zero, branch back to \$C058 and off to \$EA31 again.

Load the accumulator with the content of location \$C040 and store it at \$C041. These are all the locations that our earlier Basic program poked when it was setting everything up.

Now the next lot of instructions, concerning locations \$FB, \$FC and so on, requires a

# SOUND

bit of discussion. The locations used (and the ones in block four of the machine code as well) form part of what is referred to as page zero of the 64's memory map, and it so happens that these locations don't do very much, we can use them ourselves to store numbers in. The Basic program earlier poked some values into these locations, 178 and 192 for locations \$FB and \$FC respectively, which form, when linked together, the hexadecimal number \$COB2 (since 178 is \$B2 in hexadecimal, 192 is \$C0, and we reverse the order of the numbers as usual).

What the rest of this machine code program is doing, is to load the accumulator with the value to be found in locations \$CO20 onwards, and store that value in the locations that form the high and low order frequencies for the note to be played by voice 3.

Complicated eh? This 'offset' machine code instruction is not one of the easiest in the world to understand, and many

competent machine code programmers will probably never use it, which is a shame, since it makes this type of program so much easier to write. Without using it, the code needed here would be about five times as long as is necessary.

The latter part of the program turns the waveform off and on again (as should always be done before playing a note, otherwise you'll usually just get silence), jumps off to the other routine to play the next note for voice 2, before finally setting everything back to normal and going back to start all over again.

The end of a tune is indicated by a value \$FF, or decimal 255, being read, so just make sure that none of your musical notes contain this value.

By altering what is stored in locations \$COB2 and \$C8B2 onwards, you can change the tune that is being played, and since this code is well spaced out there is room to have something like 900 notes in each tune

before running out of space, which should be enough to keep most people happy.

## Conclusion

You'll probably only really understand what's going on by typing everything in, getting it running, and then experimenting with it to see what happens. Do make sure that you save copies of everything to tape or disk before attempting to run it, because a simple error in entering the code can so easily cause the machine to crash.

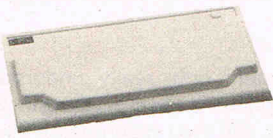
By changing the ADSR settings for the voices, perhaps experimenting with different wave forms, different pulse widths, and so on, you should be able to produce some excellent background music for your programs. Voice one is still available to perform as normal, so you can still have various sound effects being played as well as the tune.

Have fun!

## BASIC INTERRUPT PART ONE

```
10 FORI=0TO71:READA:B=B+A:POKE49152+I.A:NEXT
12 IFB<>11101THENPRINT"ERROR IN BLOCK #0":STOP
20 FORI=72TO143:READA:C=C+A:POKE49152+I.A:NEXT
22 IFC<>11286THENPRINT"ERROR IN BLOCK #1":STOP
30 FORI=144TO175:READA:D=D+A:POKE49152+I.A:NEXT
32 IFD<>4866THENPRINT"ERROR IN BLOCK #2":STOP
34 PRINT"PART ONE OF DATA ENTERED CORRECTLY AND NOW IN PLACE.":END
30000 REM BLOCK # 0
30001 DATA234.234.234.120.169.80.141.20
30002 DATA3.169.192.141.21.3.88.234
30003 DATA234.96.120.169.49.141.20.3
30004 DATA169.234.141.21.3.88.234.96
30005 DATA234.222.222.222.222.222.222.222
30006 DATA222.222.222.222.222.222.222.222
30007 DATA222.222.222.222.222.222.222.222
30008 DATA222.222.222.222.222.222.222.222
30009 DATA10.9.0.65.0.0.0.0
30010 REM BLOCK # 1
30011 DATA0.0.0.65.0.0.0.0
30012 DATA234.234.234.173.66.192.240.4
30013 DATA76.49.234.234.206.65.192.208
30014 DATA247.234.234.234.173.64.192.141
30015 DATA65.192.234.230.251.208.2.230
30016 DATA252.234.160.0.177.251.201.255
30017 DATA240.40.234.234.234.234.160.0
30018 DATA141.15.212.230.251.208.2.230
30019 DATA252.234.177.251.141.14.212.173
30020 REM BLOCK # 2
30021 DATA67.192.72.169.0.141.18.212
30022 DATA104.141.18.212.234.234.76.100
30023 DATA200.234.234.234.165.253.133.251
30024 DATA165.254.133.252.76.100.192.0
```

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# SOUND

## BASIC INTERRUPT PART TWO

```
10 FORI=0T071:READA:B=B+A:POKE51200+I.A:NEXT
12 IFB<>11110THENPRINT"ERROR IN BLOCK #0":STOP
20 FORI=72T0143:READA:C=C+A:POKE51200+I.A:NEXT
22 IFC<>11280THENPRINT"ERROR IN BLOCK #1":STOP
30 FORI=144T0175:READA:D=D+A:POKE51200+I.A:NEXT
32 IFD<>4835THENPRINT"ERROR IN BLOCK #2":STOP
40 PRINT"PART TWO OF DATA ENTERED CORRECTLY AND N
OW IN PLACE.":END
30000 REM BLOCK # 0
30001 DATA234.234.234.120.169.80.141.20
30002 DATA3.169.200.141.21.3.88.234
30003 DATA234.96.120.169.49.141.20.3
30004 DATA169.234.141.21.3.88.234.96
30005 DATA234.222.222.222.222.222.222.222
30006 DATA222.222.222.222.222.222.222.222
30007 DATA222.222.222.222.222.222.222.222
30008 DATA222.222.222.222.222.222.222.222
30009 DATA10.10.0.65.0.0.0.0
30010 REM BLOCK # 1
30011 DATA0.0.0.65.0.0.0.0
30012 DATA234.234.234.173.66.200.240.4
30013 DATA76.49.234.234.206.65.200.208
30014 DATA247.234.234.234.173.64.200.141
30015 DATA65.200.234.230.247.208.2.230
30016 DATA248.234.160.0.177.247.201.255
30017 DATA240.40.234.234.234.234.160.0
30018 DATA141.8.212.230.247.208.2.230
30019 DATA248.234.177.247.141.7.212.173
30020 REM BLOCK # 2
30021 DATA67.200.72.169.0.141.11.212
30022 DATA104.141.11.212.234.234.76.49
30023 DATA234.234.234.234.165.249.133.247
30024 DATA165.250.133.248.76.100.200.0
READY.
```

## TUNE IN BASIC

```
10 FORI=0T080:READA:B=B+A:POKE49331+I.A:NEXT
12 IFB<>2543THENPRINT"DATA ERROR IN BLOCK #0":STOP
20 B=0:FORI=0T080:READA:B=B+A:POKE51379+I.A:NEXT
22 IFB<>4541THENPRINT"DATA ERROR IN BLOCK #2":STOP
24 PRINT"DATA ENTERED CORRECTLY AND CODE NOW IN P
LACE."
30000 REM BLOCK # 0
30001 DATA4.73.0.0.4.73.0.0
30002 DATA4.73.0.0.4.73.0.0
30003 DATA4.73.0.0.4.73.0.0
30004 DATA4.73.0.0.4.73.0.0
```

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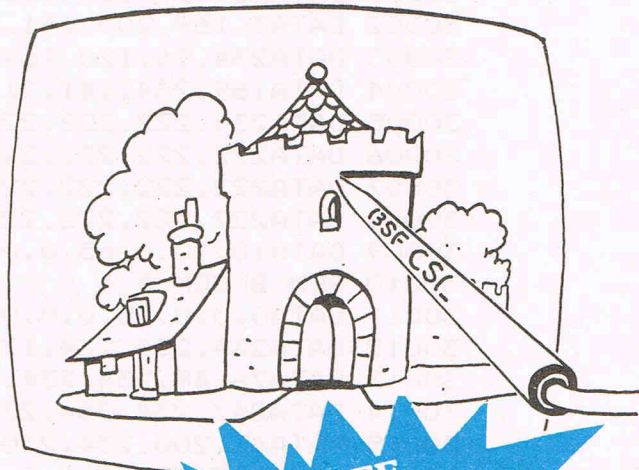
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# SOUND

```
30005 DATA5,185,0,0,5,185,0,0
30006 DATA5,185,0,0,5,185,0,0
30007 DATA4,73,0,0,4,73,0,0
30008 DATA4,73,0,0,4,73,0,0
30009 DATA6,106,0,0,6,106,0,0
30010 REM BLOCK # 1
30011 DATA5,185,0,0,5,185,0,0.255
30021 DATA4,73,5,103,6,106,7,53
30022 DATA7,163,7,53,6,106,5,103
30023 DATA4,73,5,103,6,106,7,53
30024 DATA7,163,7,53,6,106,5,103
30025 DATA5,185,7,69,8,147,9,159
30026 DATA10,60,9,159,8,147,7,69
30027 DATA4,73,5,103,6,106,7,53
30028 DATA7,163,7,53,6,106,5,103
30029 DATA6,106,8,23,9,159,8,23
30031 DATA5,185,7,53,8,147,7,53,255
```

READY.

## MUSICAL INTERRUPTS

```
3 POKE53280.9:POKE53281.7:POKE53272.23:PRINTCHR$(1
47)"[BLK]WELCOME TO THE SHOW."
5 IFPEEK(49219)<>65THENLOAD "BOOGIETIME".8.1
10 S=54272:POKES+17.255:POKES+19.142:POKES+20.150
20 POKES+24.15:POKE49216.10:POKE49218.0:POKE49219.
65:POKE251.178:POKE252.192
30 POKE253.178:POKE254.192
100 POKES+10.255:POKES+12.142:POKES+13.150
110 POKE51264.10:POKE51266.0:POKE51267.65:POKE247.
178:POKE248.200
120 POKE249.178:POKE250.200:SYS49152
130 PRINT:PRINT:PRINT"AS YOU CAN NOW HEAR. IF YOU
VE GOT THE VOLUME TURNED UP. ";
140 PRINT"THERE IS SOME MUSIC PLAYING IN THE BAC
KGROUND. WHILE WE CAN ";
150 PRINT"STILL CARRY ON WITH SOME PROGRAMMING."
160 PRINT:PRINT"70 PROVE IT. LET'S PRINT OUT THE N
UMBERS1 TO 100.":PRINT
170 FORI=1TO2000:NEXTI
180 FORI=1TO100:PRINTI::NEXT
190 PRINT:PRINT:PRINT"YOU CAN BREAK INTO THE PROGR
AM AND LIST IT IF YOU LIKE."
200 GOTO200
```

READY.

# SOUND

```

B*
PC SR AC XR YR SP      C08C 8D 0E D4      STA $D40E      C86F E6 FB      INC $FB
.:87D8 33 00 C0 00 F6  C08F AD 43 C0      LDA $C043      C871 EA      NOP
C000 EA      NOP      C092 48      PHA      C872 A0 00      LDY $$00
C001 EA      NOP      C093 A9 00      LDA $$00      C874 B1 F7      LDA ($F7).Y
C002 EA      NOP      C095 8D 12 D4     STA $D412      C876 C9 FF      CMP $$FF
C003 78      SEI      C098 68      PLA      C878 F0 28      BEQ $CBA2
C004 A9 50     LDA $$50      C099 8D 12 D4     STA $D412      C87A EA      NOP
C006 8D 14 03  STA $0314      C09C EA      NOP      C87B EA      NOP
C009 A9 C0     LDA $$C0      C09D EA      NOP      C87C EA      NOP
C00B 8D 15 03  STA $0315      C09E 4C 64 C8     JMP $C864      C87D EA      NOP
C00E 58      CLI      C0A1 EA      NOP      C87E A0 00      LDY $$00
C00F EA      NOP      C0A2 EA      NOP      C880 8D 08 D4     STA $D408
C010 EA      NOP      C0A3 EA      NOP      C883 E6 F7      INC $F7
C011 60      RTS      C0A4 A5 FD      LDA $FD      C885 D0 02      BNE $C889
C012 78      SEI      C0A6 85 FB      STA $FB      C887 E6 F8      INC $FB
C013 A9 31     LDA $$31      C0A8 A5 FE      LDA $FE      C889 EA      NOP
C015 8D 14 03  STA $0314      C0AA 85 FC      STA $FC      C88A B1 F7      LDA ($F7).Y
C018 A9 EA     LDA $$EA      C0AC 4C 64 C0     JMP $C064      C88C 8D 07 D4     STA $D407
C01A 8D 15 03  STA $0315      C0AF 00      BRK      C88F AD 43 C8     LDA $C843
C01D 58      CLI      C0B0 EA      NOP      C892 48      PHA
C01E EA      NOP      C801 EA      NOP      C893 A9 00      LDA $$00
C01F 60      RTS      C802 EA      NOP      C895 8D 08 D4     STA $D408
C020 EA      NOP      C803 78      SEI      C898 68      PLA
C050 EA      NOP      C804 A9 50     LDA $$50      C899 8D 08 D4     STA $D408
C051 EA      NOP      C806 8D 14 03  STA $0314      C89C EA      NOP
C052 EA      NOP      C809 A9 C8     LDA $$C8      C89D EA      NOP
C053 AD 42 C0   LDA $C042      C80B 8D 15 03  STA $0315      C89E 4C 31 EA     JMP $EA31
C056 F0 04     BEQ $C05C      C80E 58      CLI      C8A1 EA      NOP
C058 4C 31 EA   JMP $EA31      C80F EA      NOP      C8A2 EA      NOP
C05B EA      NOP      C810 EA      NOP      C8A3 EA      NOP
C05C CE 41 C0   DEC $C041      C811 60      RTS      C8A4 A5 F9      LDA $F9
C05F D0 F7     BNE $C058      C812 78      SEI      C8A6 85 F7      STA $F7
C061 EA      NOP      C813 A9 31     LDA $$31      C8A8 A5 FA      LDA $FA
C062 EA      NOP      C815 8D 14 03  STA $0314      C8AA 85 F8      STA $FB
C063 EA      NOP      C818 A9 EA     LDA $$EA      C8AC 4C 64 C8     JMP $C864
C064 AD 40 C0   LDA $C040      C81A 8D 15 03  STA $0315      C8AF 00      BRK
C067 8D 41 C0   STA $C041      C81D 58      CLI      .:C0B3 04 49 00 00 04 49 00 00
C06A EA      NOP      C81E EA      NOP      .:C0BB 04 49 00 00 04 49 00 00
C06B E6 FB      INC $FB      C81F 60      RTS      .:C0C3 04 49 00 00 04 49 00 00
C06D D0 02     BNE $C071      C820 EA      NOP      .:C0CB 04 49 00 00 04 49 00 00
C06F E6 FC     INC $FC      C850 EA      NOP      .:C0D3 05 B9 00 00 05 B9 00 00
C071 EA      NOP      C851 EA      NOP      .:C0DB 05 B9 00 00 05 B9 00 00
C072 A0 00     LDY $$00      C852 EA      NOP      .:C0E3 04 49 00 00 04 49 00 00
C074 B1 FB     LDA ($FB).Y   C853 AD 42 C8   LDA $C842      .:C0EB 04 49 00 00 04 49 00 00
C076 C9 FF     CMP $$FF      C856 F0 04     BEQ $C85C      .:C0F3 06 6A 00 00 06 6A 00 00
C078 F0 28     BEQ $C0A2      C858 4C 31 EA   JMP $EA31      .:C0FB 05 B9 00 00 05 B9 00 00
C07A EA      NOP      C85B EA      NOP      .:C8B3 04 49 05 67 06 6A 07 35
C07B EA      NOP      C85C CE 41 C8   DEC $C841      .:C8BB 07 A3 07 35 06 6A 05 67
C07C EA      NOP      C85F D0 F7     BNE $C858      .:C8C3 04 49 05 67 06 6A 07 35
C07D EA      NOP      C861 EA      NOP      .:C8CB 07 A3 07 35 06 6A 05 67
C07E A0 00     LDY $$00      C862 EA      NOP      .:C8D3 05 B9 07 45 08 93 09 9F
C080 8D 0F D4   STA $D40F      C863 EA      NOP      .:C8DB 0A 3C 09 9F 08 93 07 45
C083 E6 FB     INC $FB      C864 AD 40 C8   LDA $C840      .:C8E3 04 49 05 67 06 6A 07 35
C085 D0 02     BNE $C0B9      C867 8D 41 C8   STA $C841      .:C8EB 07 A3 07 35 06 6A 05 67
C087 E6 FC     INC $FC      C86A EA      NOP      .:C8F3 06 6A 08 17 09 9F 08 17
C089 EA      NOP      C86B E6 F7     INC $F7      .:C8FB 05 B9 07 35 08 93 07 35
C08A B1 FB     LDA ($FB).Y   C86D D0 02     BNE $C871

```

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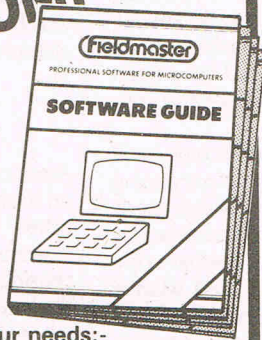
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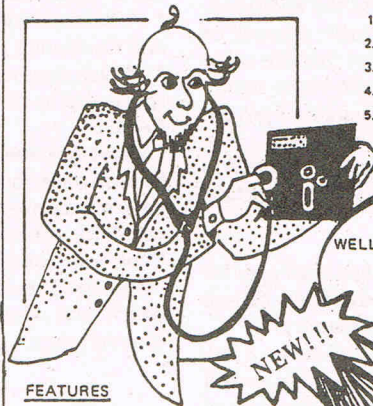
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PROGRAMMERS: Contact us if you have any interesting programs - We would like to hear from you.

# LETTERS

Dear Editor

I have purchased Volume 2, numbers 9 to 12 of your magazine in computer stores here in Toronto.

The first program I have typed in is "Reformed characters" from page 64 of Volume 2 No 9, but I can't make it work. I typed in the monitor dump and it works, but ONLY FOR THE FIRST LINE of any program. Lines after the first are not reformed.

I have checked my typing very carefully twice and I'm convinced I have got it right. What could be wrong?

**A W Ludlam**  
Islington Ontario  
Canada

*The best advice we can give you is to recheck the whole program again as we have found no mistakes. There are quite a few numbers to type in and an error is easily made. Sorry we can't be more exact!*

Dear Editor

How do you record sounds from the 64?

I would like to record the sound of Morse on to a Ferguson Cassette Recorder. It has a 5-pin Din Socket. Is there any way of connecting the 64 to the Ferguson.

Thanks for the great magazine!

**Mr J J Sales**  
Lancaster  
LA15 5RW

*It is possible to connect the Ferguson to the 64, but you will need to make your own cable connections.*

*Pins 2 and 3 are the important ones and are respectively the ground and the audio out. You can either splice the cable yourself or get someone else to do it so that the cable plugs into the 5 pin Din audio/video socket at the back of the 64. Fit a suitable 5 pin din plug on the cable for the Ferguson.*

*If you are still unsure contact Ferguson themselves, they may have some useful tips.*

Dear Editor

I noticed that in the June Letter's Page, Mr Geest from Belgium wanted to know if there were any user clubs in that country.

We started a 64 user club in Leuven a few months ago. Ring or write to either myself (address below) or Charles Rondas of Gelijkheidsstraat 2, 3200 Leuven, Tel: 25.73.77.

**Willy Wellekens**  
Molenstraat 147  
B-3200 Leuven  
Tel: 25.52.50

Dear Editor

I bought your magazine for the first time last month in my capacity as a new 64 owner, primarily because of the machine code merge and renumber routines. I have been unable to merge disk files together and your program looked ideal.

However, I didn't really want to type in all the machine code and decided to try using the "VIC 1541 single drive floppy disk user's manual". On page 16, a "COPY command is explained, together with the "format copy to combine files" and having tried what it suggests (plus various alterations) I fear I shall be obliged to type in your machine code!

Could you tell me if it is possible to make Print 15, "CO:newfile=:oldfile1,0:oldfile2,0:oldfile3,0:oldfile4" do more than copy just one file, as that is all I achieve at present.

**Nigen Tantrum**  
Reading  
Berks

*First the bad news - the COPY command in the manual mentioned is really intended for a 4040 dual disk drive and it can't be used to merge files. What it does do is transfer files from one disk to another in the 4040 disk drive.*

*The good news is that our Merge routine will be ideal for your requirements and will be worth the effort of typing the program in!*

Dear Editor

Are there any interfaces on the market for the 64 which satisfy the following criteria.

\* A hardware interface to connect the 64 and Centronics printer.

\* Which does not use any of the 64 address space and in particular does not need any RAM.

\* Does not need any modifications on the 64 firmware, but automatically and transparently converts - in hardware - the standard printer codes of the 64 to the Centronic standards.

If no device exists, please could you tell me which unit would satisfy some of these requirements.

**Michael Buckner**  
Balham  
London SW12 8SQ

*The perfect interface awaits you! The Tripler or Vic Sprinter from Ram Electronics - 106 Fleet Road, Fleet, Hants. Tel: 02514 5858 - satisfies all those requirements and costs £49.95.*

Dear Editor

Could you please tell me if American games which are bought on cassette in America will run on British 64 systems?

**Ewan Watson**  
Perthshire  
Scotland

*American manufacturers usually put a check on their software, but if they don't, the software will be compatible with British systems. It's worth asking before purchasing. If there is a check, then you are likely to have quite a few problems!*

*It really depends on the complexity of the game. The more complicated ones will probably crash. The quality of games which contain a lot of graphics and colour will probably be rather dubious when played on British 64's. For instance circles may appear as ovals and colours especially red and will be much duller.*

Dear Editor

I am 13 years old and I own a VIC 20. At the School I attend, rumours are going about that you might be discontinuing the VIC. Will you carry on with software?

**Chris Gregg**  
Orpington  
Kent

*Our magazine is in fact totally independent of Commodore, the manufacturers of the 64 and the VIC 20.*

*However we do know that Commodore are not producing the VIC 20 computer in the UK any more, but will continue to produce software for it. They know that many people like yourself still have VIC 20's and will of course want new good quality software.*

Dear Editor

Is there any way that a VIC 20 game such as Snooker by Visions Software factory, which needs 3K expansion, can run on a 16K expanded VIC 20? Or does it need a program to run properly?

**A J Larner**  
High Wycombe  
Bucks

*Any VIC 20 game which specifically requires 3K expansion is unlikely to operate with any other expansion, 16K or otherwise. (Unless of course the cassette states that it will.) In this case Snooker only works with a 3K expansion.*

## THE ADDRESS TO WRITE TO IS:

QUERIES, Commodore Computing International,  
Finsbury Business Centre,  
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## THE TELEPHONE NUMBER TO CALL IS:

01-278 0333 (remember - Thursday afternoons, 2 pm till 5 pm)

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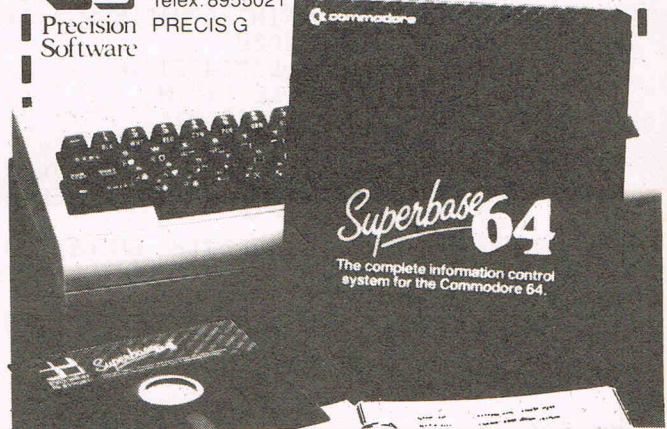
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## Figure it out

This month we have a program written by MIKE HURD called Maths Quiz. This program was written for his young children to help them with the basic maths functions of Addition, Subtraction, Multiplication and Division.

Maths Quiz was written for the Commodore 64 and tests you on 10 calculations in your chosen topic.

If they are too easy, Mr Hurd says that they can be made harder by simply changing the program at the required places.

```

1 POKE53280,6:POKE53281,3:PRINT"[CLS]":PRINTTAB(13)"[7CD][BLK]*****"
3 PRINTTAB(13)* MATHS QUIZ *:PRINTTAB(13)*[12SPC]*
5 PRINTTAB(13)*[5SPC]BY[5SPC]*:PRINTTAB(13)*[12SPC]*
7 PRINTTAB(13)* MIKE HURD[2SPC]*:PRINTTAB(13)******:FORX=1TO5000:NE
XTX
10 P=0:W=0:PRINT"[CLS][2CD]PLEASE ENTER YOUR NAME":INPUTNAME#
20 POKE53281,3:PRINT"[CLS][BLK][CD][12CR][REV]ENTER SUBJECT:--[OFF]"
30 PRINT"[2CD][CR]ADDITION [7G<@] 'A'";"[CD][CR]SUBTRACTION [4G<@] 'S'"
40 PRINT"[CD][CR]MULTIPLICATION [6G<@] 'M'";"[CD][CR]DIVISION [7G<@] 'D'"
50 PRINT"[2CD][CR]*****"
60 PRINT"[2CD][CR]PRESS 'R' FOR NEW PLAYER":PRINT"[CD][CR]PRESS 'G' FOR GUESSIN
G GAME"
70 PRINT"[CD][CR]PRESS 'H' TO SWITCH ON SOUND":PRINT"[CD][CR]PRESS 'L' TO SWITC
H OFF SOUND"
80 GETC#:IFC#=""THEN80
90 IFC#="A"THENGOSUB5000:GOTO200
100 IFC#="S"THENGOSUB5000:GOTO400
110 IFC#="M"THENGOTO600
120 IFC#="D"THENGOSUB1000:GOTO800
130 IFC#="L"THENPOKE54296,0:GOTO80
140 IFC#="H"THENPOKE54296,10:GOTO80
150 IFC#="R"THENGOTO10
160 IFC#="G"THENGOTO8000
170 IFC#<"+"ORC#<"- "ORC#<"*"ORC#<"/"ORC#<"L"ORC#<"H"ORC#<"G"THEN80
180 IFC#<"G"THEN80
199 REM ***** ADDITION *****
200 GOSUB1000:POKE53281,6
210 N=INT(RND(0)*HF)+1:M=INT(RND(0)*LF)+1:B=0:J=0
220 IFM>NTHENGOTO210
230 PRINT"[CLS][CD][2CR][WHT]RIGHT";P;"[7CR]";J+1;"TRY[8CR]WRONG";W
240 IFJ=>1THENPRINT"[CU][15CR]";J+1;"TRIES"
250 Q=N+M:GOSUB6000
260 PRINTTAB(23-L)"[4CD]";N
270 PRINTTAB(22-LL)"+";M
280 PRINTTAB(18)"[6G]*]"
290 A=0:PRINTTAB(22-LA):INPUTA
300 IFA=N+MTHENGOSUB4000:GOSUB2000:GOTO210
310 IFJ<3THENGOSUB3000:IFJ>2THENGOSUB330:GOTO210
320 GOTO230
330 B=N+M:PRINT"[2CD]THE ANSWER TO ";N;"+";M;"=";B:FORX=1TO3500:NEXTX:RETURN
399 REM ***** SUBTRACTION *****
400 GOSUB1000:POKE53281,6
410 N=INT(RND(0)*HF)+1:M=INT(RND(0)*LF)+1:B=0:J=0

```

# BASIC PROGRAMMING

```
420 IFM>NTHENGOTO410
430 PRINT"[CLS][CD][2CR][WHT]RIGHT";P;"[7CR]";J+1;"TRY[8CR]WRONG";W
440 IFJ=>1THENPRINT"[CU][15CR]";J+1;"TRIES"
450 Q=N-M:GOSUB6000
460 PRINTTAB(23-L)"[4CD]";N
470 PRINTTAB(22-LL)"-";M
480 PRINTTAB(18)"[6G]*J"
490 A=0:PRINTTAB(22-LA):INPUTA
500 IFA=N-MTHENGOSUB4000:GOSUB2000:GOTO410
510 IFJ<3THENGOSUB3000:IFJ>2THENGOSUB530:GOTO410
520 GOTO430
530 B=N-M:PRINT"[2CD]THE ANSWER TO ";N;"-";M;"=";B:FORX=1TO3500:NEXTX:RETURN
599 REM ***** MULTIPLICATION *****
600 POKE53281,6:PRINT"[CLS][2CD][WHT][REV]SELECT TABLES YOU REQUIRE (2-12)":INP
UT"[3CD]";M
610 IFM<2ORM>12THENGOTO600
620 GOSUB1000
630 N=INT(RND(1)*12)+1:B=0:J=0
640 PRINT"[CLS][CD][2CR]RIGHT";P;"[7CR]";J+1;"TRY[8CR]WRONG";W
650 Q=N*M:IFM>NTHENGOSUB7000:GOTO710
660 Q=N*M:GOSUB6000
670 PRINTTAB(23-L)"[4CD]";N
680 PRINTTAB(22-LL)"*";M
690 PRINTTAB(18)"[6G]*J"
700 A=0:PRINTTAB(22-LA):INPUTA
710 IFA=M*NTHENGOSUB4000:GOSUB2000:GOTO630
720 IFJ<3THENGOSUB3000
730 IFJ>2THENGOSUB750:GOTO630
740 GOTO640
750 B=N*M:PRINT"[2CD]THE ANSWER TO ";M;"*";N;"=";B:FORX=1TO3500:NEXTX:RETURN
799 REM ***** DIVISION *****
800 POKE53281,6
810 N=INT(RND(1)*144)+1:M=INT(RND(1)*12)+1
820 IFM>NTHENGOTO800
830 B=N/M:IFB>12THENGOTO810
840 IFB<>INT(N/M)THENGOTO810
850 B=0:J=0
860 PRINT"[CLS][CD][2CR][WHT]RIGHT";P;"[7CR]";J+1;"TRY[8CR]WRONG";W
870 IFJ=>1THENPRINT"[CU][15CR]";J+1;"TRIES"
880 PRINT"[5CD][4CR]WHAT IS ";N;" / ";M;" ="
890 A=0:INPUT"[HOM][7CD][23CR]";A
900 IFA=N/MTHENGOSUB4000:GOSUB2000:GOTO800
910 IFJ<3THENGOSUB3000
920 IFJ>2THENGOSUB940:GOTO800
930 GOTO860
940 B=N/M:PRINT"[2CD]THE ANSWER TO ";N;" / ";M;"=";B:FORX=1TO3500:NEXTX:RETURN
999 REM *****
1000 PRINT"[CLS][5CD][11CR]HELLO ";NAME$
1010 PRINT"[4CD][6CR]I HAVE TEN QUESTIONS FOR YOU":FORX=1TO2000:NEXTX:RETURN
1999 REM *****
2000 P=P+1:PRINT"[4CD][4CR]WELL DONE ";NAME$:FORX=1TO1100:NEXTX:IFP<10THENRETUR
N
2010 PRINT"[CLS][CD][2CR][WHT]RIGHT";P;"[20CR]WRONG";W
2020 W=W+1:J=P/W*10:PRINT"[7CD][11CR]YOUR SCORE=";INT(J)
2030 PRINT"[8CD][2CR]PRESS 'M' FOR MENU"
2040 IFA=M>NTHENPRINT"[CD][2CR]PRESS 'T' FOR TABLES"
2050 P=0:W=0:J=0:PRINT"[CD][2CR]PRESS 'Y' TO CONTINUE"
2060 IFA=N+MORA=N-MTHENPRINT"[CD][2CR]PRESS 'V' FOR NEW VALUES"
2070 GETA$:IFA$=""THEN2070
2080 IFA$="N"THENGOTO20
2090 IFA$="Y"THENPRINT"[CLS]":RETURN
2100 IFA$="T"THENGOTO600
```

# BASIC PROGRAMMING

```
2110 IFA#="V"ANDR=N+MTHENGOSUB5000:GOTO200
2120 IFA#="V"ANDR=N-MTHENGOSUB5000:GOTO400
2130 IFA#<>"M"ORR#<>"Y"ORR#<>"T"ORR#<>"U"ORR#<>"V"THEN2070
2999 REM ***** WRONG *****
3000 PRINT"[CLS][5CD]":W=W+1:J=J+1:PRINTTAB(10)"SORRY! WRONG":PRINTTAB(11)"[CD]
";A;"?"
3010 FORK=1T07:POKE54276,17:POKE54277,8:POKE54278,200:POKE54273,75:POKE54272,25
3020 FORZ=1T070:NEXTZ:POKE54273,50:POKE54272,200:FORZ=1T070:NEXTZ
3030 POKE54276,0:NEXTK:FORX=1T01000:NEXTX:RETURN
3999 REM ***** RIGHT *****
4000 POKE53280,1:FORK=5T030:POKE54276,33:POKE54277,8:POKE54278,8:POKE54273,K
4010 POKE54272,250-K:FORZ=1T030:NEXTZ:POKE54276,0:NEXTK:POKE53280,6:RETURN
4999 REM ***** VALUES *****
5000 P=0:POKE53281,3:PRINT"[CLS][2CD][BLK]ENTER HIGHEST FIGURE (10-1000)"
5010 INPUT"[CD][4CR]";HF:IFHF>1000ORHF<10THENGOTO5000
5020 PRINT"[CLS][2CD]ENTER LOWEST FIGURE (9-999)"
5030 INPUT"[CD][4CR]";LF:IFLF>999ORLF<9THENGOTO5020:RETURN
5999 REM **** NUMBER POSITION *****
6000 LETX=N
6010 X#=STR$(X)
6020 L=LEN(X#)
6030 LETY=M
6040 Y#=STR$(Y)
6050 LL=LEN(Y#)
6060 LETZ=0
6070 Z#=STR$(Z)
6080 LA=LEN(Z#)
6090 RETURN
6999 REM ***** REVERSE NUMBER *****
7000 LETY=M
7010 Y#=STR$(Y)
7020 L=LEN(Y#)
7030 PRINTTAB(23-L)"[4CD]";M
7040 LETY=N
7050 Y#=STR$(Y)
7060 L=LEN(Y#)
7070 PRINTTAB(22-L)"*";N
7080 PRINTTAB(18)"[6G]*"
7090 LETY=0
7100 Y#=STR$(Y)
7110 L=LEN(Y#)
7120 A=0:PRINTTAB(22-L):INPUTA
7130 RETURN
8000 REM ***** GAME *****
8010 POKE53281,7:POKE53280,6:PRINT"[CLS][2CD][5CR][BLK]*** NUMBER GUESSING GAME
***"
8020 INPUT"[3CD][3CR]ENTER UPPER LIMIT FOR GUESS";LI
8030 NM=INT(LI*RND(1))+1:CN=0:PRINT"[CLS][4CD]I'VE GOT THE NUMBER"
8040 INPUT"[CD][CR]WHAT IS YOUR GUESS";GU:CN=CN+1
8050 IFGU>NMTHENPRINT"[CD][CR]MY NUMBER IS LOWER":PRINT:GOTO8040
8060 IFGU<NMTHENPRINT"[CD][CR]MY NUMBER IS HIGHER":PRINT:GOTO8040
8070 IFGU=NMTHENGOSUB4000:PRINT"[2CD][2CR]GREAT YOU GOT MY NUMBER ";NAME#
8080 PRINT"[2CD][2CR]IN ONLY";CN;"GUESSES.":PRINT
8090 IFCN<2THENPRINT"[CHOM][12CD][2CR]IN ONLY";CN;"GUESS.[3SPC]":PRINT
8100 FORX=1T05000:NEXTX
8110 PRINT"[CLS][8CD][5CR]PRESS 'Y' TO CONTINUE":PRINT"[CD][5CR]PRESS 'M' FOR M
ENU"
8120 GETA#:IFA#=""THEN8120
8130 IFA#="Y"THENGOTO8000
8140 IFA#="M"THENGOTO20
8150 IFA#<>"Y"ORR#<>"M"THEN8120
READY.
```



## On a printing note...

**Dr Jethro Hill of Joreth Music has supplied us with this program to copy one or four screens simultaneously from the 64 to a 7-row dot matrix printer such as the MPS 801. User defined characters are permitted and the full 8x8 dot screen resolution is maintained.**

Unlike me, you probably purchased your printer with an instruction book or at least some idea of its specification. (Un)fortunately, I was given an offer I could not refuse for the MPS 801 without any book or information at all. It soon dawned on me after playing around with it for a little while that it was only a 7 row matrix printer and thus some problems lay ahead in copying the character based screen graphics I had devised for music transcription system.

Undaunted I persevered and in due course I obtained a user's manual and realised that with the use of the graphics mode (and a pinch of byte manipulation) I could map the 8x8 screen patterns into the awkward base 7 format.

I had already thought of using multiple screens to retain musical stave patterns, since the screen resolution of the 64 only permitted the display of half a line of standard double stave piano music with sufficient quality. The MPS 801 confirmed this format since if I printed them sideways fours screens would fit neatly on a single sheet. Each sheet could then handle two complete lines of piano music.

### How it works

To print a screen sideways on a printer is not difficult. It requires that you start at the bottom left hand corner and work up the screen in columns while printing in rows. However if you were to do this on the 64 by merely reading the character byte by byte from its code memory and translating it directly to, suppose, a pseudo 8-row matrix printer with the same facilities as the MPS 801, then the characters, although correctly placed and rotated, would be mirror images of the real things! This is because the first row to the printer is the least significant bit while the last column of the character pattern byte is the least significant. The same is true even if mapping to a 7-row printer; thus the first

thing to do with every character pattern byte is to reverse it:

```
B[76543210] --> B[01234567]
           or
           B --> RVS(B)
```

To output the first line to the printer is then easy: starting at the bottom left corner we look up the code number of the character there. From this the location of its pattern bytes can be calculated. Working backwards through these bytes, we simply reverse them, discard the 8th bits and/or each with \$80 to give the correct MPS 801 graphic data format. The same procedure applies to all the characters found as we climb the leftmost column.

The next column is a touch trickier: we read the character upwards as before, reverse them, but this time we include the discarded 8th bits from the characters in the first column. These bits will become the new 1st bits of the second column output bytes, the remainder being filled by a shift left one bit of the first 6 bits of the present character pattern byte. A final setting of the 8th bit of the output byte to "1" completes the required graphic data byte and the procedure is again repeated for every character up the column.

Note that the 6-column format of the matrix printer does not matter any more since the data is just a continuous stream of bytes in that direction.

I could go on explaining verbally the output of each byte but I think it is probably clear that every subsequent column gives progressively one more discarded byte to handle in the next column until, at the seventh column, we have to handle 7 bits entirely from the previous column. These are handled as before and eight lines of 7-row characters have been output for 7 columns of 8 bit wide characters.

Table 1 indicates how we must combine the reversed pattern bytes to obtain graphic data bytes.

Output Line	Screen Column	Present Byte	Previous Byte	c
1	1	[6543210]	—	0
2	2	[543210]	[7]	1
3	3	[43210]	[76]	2
4	4	[3210]	[765]	3
5	5	[210]	[7654]	4
6	6	[10]	[76543]	5
7	7	[0]	[765432]	6
8	7	—	[7654321]	7

**Table 1**

The mathematically minded among you will recognise that the formula for the cth required output graphic byte is:

$$O(c) = \$80 \text{ AND } [ \text{LSR}([8-c] \text{ times}) \text{ of } (\text{RVS}(\text{Bprev})) ]$$

OR

$$[ \text{ASL}(c \text{ times}) \text{ of } (\text{RVS}(\text{BPres})) ]$$

where ASL and LSR are left and right shift one bit operators.

After the seventh screen column we merely go throughout the procedure again until the last column is reached, where we must be careful not to read from the forbidden area beyond it.

The four screen case is similar but allowances must be made for gaps between screens, and the correct bottom left corner must be chosen. In the program that follows the screens are assumed to fall consecutively in the normal screen memory locations of the VIC II chip. The program does not allow direct access to the ROM characters (I did not want them) but screens and character memory may be anywhere in any BANK so long as they do not clash with your program and this program. There is no reason in principle why ROM characters cannot be used directly (the sample BASIC

# MACHINE CODE

loader and run program uses them indirectly) by using suitable POKEs and PEEKs to look beneath the I/O. If you do, please remember to reinstate the I/O immediately after reading the byte: the printer needs it!

One further refinement: the MPS 801 is none too fast. It only has a 90 byte buffer and it has an irritating way of returning to the start of a line while receiving data after printing a full buffer. This makes printing rather slow, but it is the printer holding things up. Use has been made of repeatable graphic bytes to avoid clogging up the printer's buffer with a queue of identical whenever they occur. An improvement not

included here, but left as an exercise to the reader would be to suppress entirely a row of "0" bytes (space) by using only a carriage return.

## The program

The machine code occupies 713 bytes from \$C000 (49152) to \$C2C9 (49865).

It is relocatable but the variables used within remain fixed between \$CF00 (52992) and \$CF19 (53017) with some use made of the floating point accumulator in zero page between \$69 and \$70 (105 to 112). (If you do not have the will to type this out, a telephone call to me at Malvern 62158 may

secure a cassette copy at a reasonable cost!)  
The user has to do four things externally:

- 1 Select the BANK
- 2 POKE (start of screens location)/256 at \$CF01 (52993)
- 3 POKE (start of character data)/256 at \$CF03 (52995)
- 4 POKE number of screens (1 or 4) at \$CF04 (52996)

The program is then run by a call of SYS (49660) (\$C1FC).

Happy printing!

```

100 033C          SCREEN      = $CF00
120 033C          CHAR        = $CF02
140 033C          NSCRNS      = $CF04
160 033C          C           = $CF05
200 033C          N           = $CF07
220 033C          CBAR        = $CF09
240 033C          LMAX        = $CF0A
260 033C          L           = $CF0B
280 033C          MMAX        = $CF0C
300 033C          M           = $CF0D
320 033C          D           = $CF0E
340 033C          AA          = $69
360 033C          BB          = $6B
380 033C          AAA         = $6D
400 033C          BBB         = $6F
420 033C          T1          = $CF10
440 033C          T2          = $CF11
460 033C          T3          = $CF12
480 033C          T4          = $CF13
500 033C          T5          = $CF14
503 033C          NEWC        = $CF15
504 033C          LCHAR       = $CF17
505 033C          NCHAR       = $CF18
506 033C          RPCHAR      = $CF19
510 C000          * = $C000
520 C000 20AEFF   INIT        JSR $FFAE      ! UNLISTEN SERIAL BUS
540 C003 A904          LDA #4
560 C005 20B1FF   JSR $FFB1      ! COMMAND DEV.4 TO LIST
EN
580 C008 A960          LDA #$60
600 C00A 2093FF   JSR $FF93      ! SET SEC. ADD. TO ZERO
620 C00D A908          LDA #8
640 C00F 20A8FF   JSR $FFA8      ! OUTPUT BYTE = 8 TO OP
EN GRAPHICS MODE
660 C012 A90D          LDA #13
670 C014 20A8FF   JSR $FFA8      ! CR
674 C017 A907          LDA #7
675 C019 8D02CF   STA CHAR
680 C01C A901          LDA #01
700 C01E 8D05CF   STA C           ! C=1
740 C021 8D07CF   STA N
750 C024 A900          LDA #0
770 C026 8D08CF   STA N+1        !N=1
782 C029 8D18CF   STA NCHAR
784 C02C 8D19CF   STA RPCHAR
787 C02F 8D00CF   STA SCREEN
800 C032 A908          LDA #8
820 C034 8D09CF   STA CBAR      ! CBAR=8
840 C037 18          CLC
860 C038 AD00CF   LDA SCREEN
880 C03B 69C0          ADC #$C0

```

# MACHINE CODE

```

900 C03D 856B          STA BB
920 C03F AD01CF       LDA SCREEN+1
940 C042 6903         ADC #$03
960 C044 856C          STA BB+1             ! BB=SCREEN+960
980 C046 A9E8         LDA #$E8
1000 C048 8D0ECF      STA 0
1020 C04B A903         LDA #$03
1040 C04D 8D0FCF      STA 0+1             ! 0 = 1000
1060 C050 A928         LDA #40
1080 C052 8D0ACF      STA LMAX            ! LMAX = 40
1100 C055 A918         LDA #24
1120 C057 8D0CCF      STA MMAX            ! MMAX = 24
1140 C05A AD04CF       LDA NSCRNS
1160 C05D C904         CMP #4               ! ARE 4 SCRNS REQUESTED
1180 C05F F001         BEQ FOUR
1200 C061 60           RTS                 ! 1 SCREEN          2.
1220 C062 18          FOUR          CLC                 ! 4 SCREENS
1240 C063 A56C          LDA BB+1
1260 C065 6908         ADC #$08
1280 C067 856C          STA BB+1            ! BB= BB+2048
1300 C069 AD0FCF       LDA 0+1
1320 C06C 6908         ADC #$08
1340 C06E 8D0FCF      STA 0+1             ! 0=0+2048
1360 C071 A950         LDA #80
1380 C073 8D0ACF      STA LMAX            ! LMAX=80
1400 C076 A931         LDA #49
1420 C078 8D0CCF      STA MMAX            ! MMAX=49
1440 C07B 60           RTS
1460 C07C             ! REVERSE A BYTE
1480 C07C             ! ABCDEFGH ---> HGFEDCBA
1500 C07C 8C10CF      REVBYT          STY T1
1520 C07F 8E11CF      STX T2            ! TEMP. STORE X & Y
1540 C082 A280         LDX #$80          ! X = 128
1560 C084 A8           TAY
1580 C085 A900         LDA #$00
1600 C087 8D12CF      STA T3            ! INIT. SUM REGISTER
1620 C08A 98          NXTBYT          TYA
1640 C08B 4A          LSR A
1660 C08C A8           TAY                ! EXAMINE NEXT BIT FROM
LEFT
1680 C08D 8A          TXA
1700 C08E 9007         BCC IGNORE
1720 C090 18          CLC
1740 C091 6D12CF      ADC T3            ! IF BIT = 1 THEN ADD X
TO SUM
1760 C094 8D12CF      STA T3
1800 C097 8A          TXA
1820 C098 4A          LSR A
1840 C099 AA          TAX                ! DIVIDE X BY 2
1860 C09A C900         CMP #$00          ! TEST IF FINISHED
1880 C09C D0EC         BNE NXTBYT
1900 C09E AE11CF      LDX T2
1920 C0A1 AC10CF      LDY T1            ! RELOAD X & Y
1940 C0A4 AD12CF      LDA T3            ! LOAD RESULT IN A
1960 C0A7 60           RTS
1980 C0A8             ! CALCULATE PRINTER BYTE AND OUTPUT
2000 C0A8 A000         CALC            LDY #$00
2020 C0AA 8C13CF      STY T4
2040 C0AD A200         RET            LDX #$00
2060 C0AF B16D         LDA (AAA),Y      LDA (AAA),Y
2080 C0B1 207CC0      JSR REVBYT
2120 C0B4 4A          LSR A
2140 C0B5 E8          INX
2160 C0B6 EC09CF      CPX CBAR         ! ROLL RIGHT CBAR TIMES
2180 C0B9 D0F9         BNE RCBAR
2220 C0BB 0980         ORA #$80
2240 C0BD 8D14CF      STA T5

```

# MACHINE CODE

2260	C0C0	A00BCF		LDX L	
2280	C0C3	EC0ACF		CPX LMAX	
2300	C0C6	D003		BNE SPEC	
2320	C0C8	4CDFC0		JMP NORM	
2340	C0CB	A201	SPEC	LDX #01	
2360	C0CD	B16F		LDA (BBB),Y	
2365	C0CF	207CC0		JSR REVBYT	
2380	C0D2	EC05CF	RPT	CPX C	
2400	C0D5	F005		BEQ RLC	
2440	C0D7	0A		ASL A	
2460	C0D8	E8		INX	
2480	C0D9	4CD2C0		JMP RPT	! ROLL LEFT C TIMES
2500	C0DC	0D14CF	RLC	ORA T5	
2520	C0DF	2006C2	NORM	JSR OPBYTS	
2540	C0E2	C66D		DEC AAA	
2560	C0E4	A9FF		LDA #FF	
2580	C0E6	C56D		CMP AAA	
2600	C0E8	D002		BNE SKIP1	
2620	C0EA	C66E		DEC AAA+1	
2640	C0EC	C66F	SKIP1	DEC BBB	
2660	C0EE	A9FF		LDA #FF	
2680	C0F0	C56F		CMP BBB	
2700	C0F2	D002		BNE SKIP2	
2720	C0F4	C670		DEC BBB+1	
2740	C0F6	18	SKIP2	CLC	
2760	C0F7	EE13CF		INC T4	
2780	C0FA	A908		LDA #08	
2800	C0FC	CD13CF		CMP T4	
2820	C0FF	F003		BEQ REVD	
2840	C101	4CADC0		JMP RET	
2860	C104	60	REVD	RTS	
2880	C105		! SCAN THE	SCREEN(S)	
2900	C105	A900	SCAN	LDA #0	
2920	C107	8D0BCF		STA L	
2940	C10A	A900	LAB17	LDA #0	
2960	C10C	8D0DCF		STA M	
2980	C10F	AD0DCF	NEXTM	LDA M	
3000	C112	C919		CMP #19	
3020	C114	D00D		BNE LAB10	
3040	C116	38		SEC	
3060	C117	A56B		LDA BB	
3080	C119	E918		SBC #18	
3100	C11B	856B		STA BB	
3120	C11D	A56C		LDA BB+1	
3140	C11F	E904		SBC #04	
3160	C121	856C		STA BB+1	! IF M = 25:BB=BB-1048
3180	C123	38	LAB10	SEC	
3200	C124	A56B		LDA BB	
3220	C126	ED07CF		SBC N	
3240	C129	8569		STA AA	
3260	C12B	A56C		LDA BB+1	
3280	C12D	ED08CF		SBC N+1	
3300	C130	856A		STA AA+1	! AA=BB-N
3320	C132	18		CLC	
3340	C133	A200		LDX #00	
3360	C135	A169	LAB13	LDA (AA,X)	
3380	C137	8D10CF		STA T1	
3400	C13A	0A		ASL A	
3420	C13B	0A		ASL A	
3440	C13C	0A		ASL A	
3480	C13D	18		CLC	
3500	C13E	6D02CF		ADC CHAR	
3520	C141	A000		LDY #00	
3540	C143	9001		BCC LAB11	
3560	C145	C8		INY	

# MACHINE CODE

```

3580 C146 956D LAB11 STA AAA,X
3600 C148 AD10CF LDA T1
3620 C14B 4A LSR A
3640 C14C 4A LSR A
3660 C14D 4A LSR A
3680 C14E 4A LSR A
3700 C14F 4A LSR A
3760 C150 C001 CPY #$01
3780 C152 D001 BNE LAB12
3800 C154 38 SEC
3820 C155 6D03CF LAB12 ADC CHAR+1
3840 C158 E8 INX
3860 C159 956D STA AAA,X
3880 C15B E8 INX
3900 C15C E004 CPX #$04
3920 C15E D0D5 BNE LAB13
3940 C160 20A8C0 JSR CALC
3960 C163 38 SEC
3980 C164 A56B LDA BB
4000 C166 E928 SBC #$28
4020 C168 856B STA BB
4040 C16A A56C LDA BB+1
4060 C16C E900 SBC #$00
4080 C16E 856C STA BB+1 ! BB=BB-40 : NEXT ROW
4120 C170 AD0DCF LDA M
4140 C173 CD0CCF CMP MMAX
4160 C176 F006 BEQ ENDM
4180 C178 EE0DCF INC M
4200 C17B 4C0FC1 JMP NEXTM
4240 C17E 2085C2 ENDM JSR NEWLINE
4260 C181 AD05CF LDA C
4280 C184 C908 CMP #8
4300 C186 D010 BNE NEXTC
4320 C188 A901 LDA #1
4340 C18A 8D05CF STA C
4400 C18D A908 LDA #8
4420 C18F 8D09CF STA CBAR
4440 C192 CE0BCF DEC L
4460 C195 4CA8C1 JMP SKIP3
4480 C198 EE05CF NEXTC INC C
4500 C19B CE09CF DEC CBAR
4620 C19E E66B INC BB
4640 C1A0 A900 LDA #0
4660 C1A2 C56B CMP BB
4680 C1A4 D002 BNE SKIP3
4700 C1A6 E66C INC BB+1
4720 C1A8 18 SKIP3 CLC
4740 C1A9 A56B LDA BB
4760 C1AB 6D0ECF ADC 0
4780 C1AE 856B STA BB
4800 C1B0 A56C LDA BB+1
4820 C1B2 6D0FCF ADC 0+1
4840 C1B5 856C STA BB+1 ! BB=BB+0
4860 C1B7 A901 LDA #1
4880 C1B9 8D07CF STA N
4900 C1BC A900 LDA #0
4920 C1BE 8D08CF STA N+1 ! N=1
4940 C1C1 AD0BCF LDA L
4960 C1C4 C927 CMP #$27
4980 C1C6 D017 BNE LAB15
5000 C1C8 A9D9 LDA #$D9
5020 C1CA 8D07CF STA N
5040 C1CD A903 LDA #$03
5060 C1CF 8D08CF STA N+1 ! IF L=39: N=985

```

# MACHINE CODE

5080	C1D2	18		CLC	
5100	C1D3	A56B		LDA BB	
5120	C1D5	69D8		ADC #\$D8	
5140	C1D7	856B		STA BB	
5160	C1D9	A56C		LDA BB+1	
5200	C1DD	856C		STA BB+1	! IF L=39: BB=BB+984
5220	C1DF	AD0BCF	LAB15	LDA L	
5240	C1E2	CD0ACF		CMP LMAX	
5260	C1E5	F006		BEQ LAB16	
5280	C1E7	EE0BCF		INC L	
5300	C1EA	4C0AC1		JMP LAB17	
5310	C1ED	60	LAB16	RTS	
5320	C1EE	A90D	FINI	LDA #13	
5340	C1F0	20A8FF		JSR \$FFA8	! PRINT CR
5360	C1F3	A90F		LDA #\$0F	
5380	C1F5	20A8FF		JSR \$FFA8	! RESET PRINTER TO NORM
AL					
5400	C1F8	20AEFF		JSR \$FFAE	! UNLISTEN SERIAL BUS
5420	C1FB	60		RTS	
5440	C1FC	2000C0	SCRIPT	JSR INIT	
5460	C1FF	2005C1		JSR SCAN	
5480	C202	20EEC1		JSR FINI	
5490	C205	60		RTS	!RETURN TO BASIC
5495	C206	8E11CF	OPBYTS	STX T2	
5500	C209	8D15CF		STA NEWC	
5520	C20C	AE18CF		LDX NCHAR	
5540	C20F	E000		CPX #0	
5560	C211	D00E		BNE NOTFIRST	
5580	C213	8D17CF		STA LCHAR	
5600	C216	E8		INX	
5620	C217	8E18CF		STX NCHAR	
5640	C21A	8E19CF		STX RPCHAR	
5650	C21D	AE11CF		LDX T2	
5660	C220	60		RTS	
5680	C221	CD17CF	NOTFIRST	CMP LCHAR	
5700	C224	D021		BNE NEWCH	
5720	C226	EE19CF		INC RPCHAR	
5740	C229	A200		LDX #0	
5760	C22B	EC19CF		CPX RPCHAR	
5780	C22E	D013		BNE SKIP4	
5800	C230	EE19CF		INC RPCHAR	
5820	C233	A91A		LDA #26	
5840	C235	20A8FF		JSR \$FFA8	
5860	C238	A9FF		LDA #255	
5880	C23A	20A8FF		JSR \$FFA8	
5900	C23D	AD17CF		LDA LCHAR	
5920	C240	20A8FF		JSR \$FFA8	
5930	C243	AE11CF	SKIP4	LDX T2	
5940	C246	60		RTS	
5941	C247	AE19CF	NEWCH	LDX RPCHAR	
5942	C24A	AD17CF		LDA LCHAR	
5943	C24D	E000		CPX #0	
5944	C24F	F022		BEQ N3	
5945	C251	E002		CPX #2	
5946	C253	D009		BNE N4	
5947	C255	20A8FF		JSR \$FFA8	
5948	C258	20A8FF	N5	JSR \$FFA8	
5949	C25B	4C73C2		JMP N3	
5950	C25E	E001	N4	CPX #1	
5951	C260	F0F6		BEQ N5	
5952	C262	A91A		LDA #26	
5953	C264	20A8FF		JSR \$FFA8	

# MACHINE CODE

5954	C267	AD19CF		LDA	RPCHAR
5955	C26A	20A8FF		JSR	\$FFA8
5956	C26D	AD17CF		LDA	LCHAR
5957	C270	20A8FF		JSR	\$FFA8
6000	C273	AD15CF	N3	LDA	NEWC
6020	C276	8D17CF		STA	LCHAR
6040	C279	A901		LDA	#1
6060	C27B	8D19CF		STA	RPCHAR
6070	C27E	AE11CF		LDX	T2
6080	C281	60		RTS	
6090	C282	8E11CF		STX	T2
6100	C285	A900	NEWLINE	LDA	#0
6120	C287	8D18CF		STA	NCHAR
6140	C28A	AD17CF		LDA	LCHAR
6150	C28D	C500		CMP	\$0
6160	C28F	D009		BNE	NZCHARS
6180	C291	A90D	NOWT	LDA	#13
6200	C293	20A8FF		JSR	\$FFA8
6210	C296	AE11CF		LDX	T2
6220	C299	60		RTS	
6240	C29A	AE19CF	NZCHARS	LDX	RPCHAR
6260	C29D	AD17CF		LDA	LCHAR
6280	C2A0	E000		CPX	#0
6300	C2A2	F0ED		BEQ	NOWT
6320	C2A4	E002		CPX	#2
6340	C2A6	D009		BNE	N1
6360	C2A8	20A8FF		JSR	\$FFA8
6380	C2AB	20A8FF	N2	JSR	\$FFA8
6400	C2AE	4C91C2		JMP	NOWT
6420	C2B1	E001	N1	CPX	#1
6440	C2B3	F0F6		BEQ	N2
6460	C2B5	A91A		LDA	#26
6480	C2B7	20A8FF		JSR	\$FFA8
6500	C2BA	AD19CF		LDA	RPCHAR
6520	C2BD	20A8FF		JSR	\$FFA8
6530	C2C0	AD17CF		LDA	LCHAR
6535	C2C3	20A8FF		JSR	\$FFA8
6540	C2C6	4C91C2		JMP	NOWT

```

10 PL=49152: PH=49865: SC=49660: SN=52992: CH=52994: NS=52996: CL=10240
20 FOR PR=PL TO PH: READA: POKE PR,A: NEXT
30 PRINT CHR$(142): POKE 52,40:POKE 56,40
40 POKE 56334,PEEK(56334)AND254: POKE 1,PEEK(1)AND251
50 FOR I=0 TO 2047: POKE I+CL,PEEK(I+53248): NEXT
60 POKE 1,PEEK(1)OR4: POKE 56334,PEEK(56334)OR1
70 SB=1024: S=SB/256: C=CL/256
80 POKE SN+1,S: POKE CH+1,C: POKE NS,1
90 GOSUB 500
100 SYS(SC)
110 SL=10240+2048: S=SL/256: POKE SN+1,S
120 POKE NS,4
130 FOR A=192 TO 240 STEP 16: POKE 53272,(PEEK(53272)AND15)ORR: POKE 648,A/4
140 SB=64*A
150 GOSUB 500
160 PRINT "SCREEN WITH A=";A
170 NEXT A
180 SYS(SC)

```

# MACHINE CODE

```
190 POKE 53272,(PEEK(53272)AND15)OR16: POKE 648,4
210 END
500 PRINT "ASCII CODE TABLE"
510 FOR I=0 TO 32: POKE SB+120+I,67: POKE 55416+I,1: NEXT
520 FOR I=0 TO 17: POKE SB+81+40*I,66: POKE 55377+40*I,1: NEXT: POKE SB+121,91
530 A$= "0 1 2 3 4 5 6 7 8 9 A B C D E F "
540 PRINT "ASCII CODE TABLE"
550 PRINT: FOR I=1 TO 31 STEP 2: PRINT MID$(A$,I,1): NEXT
560 S=SB+162: CO=55458
570 FOR I=0 TO 15: FOR J=0 TO 30 STEP 2: Z=J/2
580 C=Z*16+I: P=40*I+J: POKE S+P,C: POKES+P+1,32: POKE CO+P,1: POKE CO+P+1,1
590 NEXT: NEXT: RETURN
1000 DATA 32,174,255,169,4,32,177,255,169,96,32,147,255,169,8,32
1010 DATA 168,255,169,13,32,168,255,169,7,141,2,207,169,1,141,5
1020 DATA 207,141,7,207,169,0,141,8,207,141,24,207,141,25,207,141
1030 DATA 0,207,169,8,141,9,207,24,173,0,207,105,192,133,107,173
1040 DATA 1,207,105,3,133,108,169,232,141,14,207,169,3,141,15,207
1050 DATA 169,40,141,10,207,169,24,141,12,207,173,4,207,201,4,240
1060 DATA 1,96,24,165,108,105,8,133,108,173,15,207,105,8,141,15
1070 DATA 207,169,80,141,10,207,169,49,141,12,207,96,140,16,207,142
1080 DATA 17,207,162,128,168,169,0,141,18,207,152,74,168,138,144,7
1090 DATA 24,109,18,207,141,18,207,138,74,170,201,0,208,236,174,17
1100 DATA 207,172,16,207,173,18,207,96,160,0,140,19,207,162,0,177
1110 DATA 109,32,124,192,74,232,236,9,207,208,249,9,128,141,20,207
1120 DATA 174,11,207,236,10,207,208,3,76,223,192,162,1,177,111,32
1130 DATA 124,192,236,5,207,240,5,10,232,76,210,192,13,20,207,32
1140 DATA 6,194,198,109,169,255,197,109,208,2,198,110,198,111,169,255
1150 DATA 197,111,208,2,198,112,24,238,19,207,169,8,205,19,207,240
1160 DATA 3,76,173,192,96,169,0,141,11,207,169,0,141,13,207,173
1170 DATA 13,207,201,25,208,13,56,165,107,233,24,133,107,165,108,233
1180 DATA 4,133,108,56,165,107,237,7,207,133,105,165,108,237,8,207
1190 DATA 133,106,24,162,0,161,105,141,16,207,10,10,10,24,109,2
1200 DATA 207,160,0,144,1,200,149,109,173,16,207,74,74,74,74,74
1210 DATA 192,1,208,1,56,109,3,207,232,149,109,232,224,4,208,213
1220 DATA 32,168,192,56,165,107,233,40,133,107,165,108,233,0,133,108
1230 DATA 173,13,207,205,12,207,240,6,238,13,207,76,15,193,32,133
1240 DATA 194,173,5,207,201,8,208,16,169,1,141,5,207,169,8,141
1250 DATA 9,207,206,11,207,76,168,193,238,5,207,206,9,207,230,107
1260 DATA 169,0,197,107,208,2,230,108,24,165,107,109,14,207,133,107
1270 DATA 165,108,109,15,207,133,108,169,1,141,7,207,169,0,141,8
1280 DATA 207,173,11,207,201,39,208,23,169,217,141,7,207,169,3,141
1290 DATA 8,207,24,165,107,105,216,133,107,165,108,105,3,133,108,173
1300 DATA 11,207,205,10,207,240,6,238,11,207,76,10,193,96,169,13
1310 DATA 32,168,255,169,15,32,168,255,32,174,255,96,32,0,192,32
1320 DATA 5,193,32,238,193,96,142,17,207,141,21,207,174,24,207,224
1330 DATA 0,208,14,141,23,207,232,142,24,207,142,25,207,174,17,207
1340 DATA 96,205,23,207,208,33,238,25,207,162,0,236,25,207,208,19
1350 DATA 238,25,207,169,26,32,168,255,169,255,32,168,255,173,23,207
1360 DATA 32,168,255,174,17,207,96,174,25,207,173,23,207,224,0,240
1370 DATA 34,224,2,208,9,32,168,255,32,168,255,76,115,194,224,1
1380 DATA 240,246,169,26,32,168,255,173,25,207,32,168,255,173,23,207
1390 DATA 32,168,255,173,21,207,141,23,207,169,1,141,25,207,174,17
1400 DATA 207,96,142,17,207,169,0,141,24,207,173,23,207,197,0,208
1410 DATA 9,169,13,32,168,255,174,17,207,96,174,25,207,173,23,207
1420 DATA 224,0,240,237,224,2,208,9,32,168,255,32,168,255,76,145
1430 DATA 194,224,1,240,246,169,26,32,168,255,173,25,207,32,168,255
1440 DATA 173,23,207,32,168,255,76,145,194,0
```

READY.



## Floating advice

**The floating point storage of numbers on Commodore computers is very complicated to understand but the use of the routines from machine code is fairly easy. Richard Franklin gives basic commands and their equivalent methods from machine code.**

The first routines to describe are those that transfer constants from memory into the floating point accumulators (FAC's). These routines will transfer a FAC to memory

packing the sign bit into the msb of the mantissa or transferring memory into a FAC unpacking the sign bit from the msb into it's separate byte.

### Transfer FAC#1 to memory

This routine will unload the contents of FAC#1 into a memory location pointed to by the index registers. .X(low order) and .Y(high order).

Computer	Entry Point
CBM 64	\$BBD4.
VIC 20	\$DBD4.
PET Bas 4	\$CD0A.
PET Bas 2	\$DAE0.
PET Bas 1	\$DAA6.

For example to transfer the FAC#1 into memory at location \$C000 on the 64:

```
LDX    #$00.
LDY    #$C0.
JSR    $BBD4.
```

### Transfer memory to FAC#1

This routine will load FAC#1 with the contents of memory pointed to by the registers .A(low order) and .Y(high order).

Computer	Entry Point
CBM 64	\$BBA2.
VIC 20	\$DBA2.
PET Bas 4	\$CCD8.
PET Bas 2	\$DAAE.
PET Bas 1	\$DA74.

For example to transfer memory at location \$C000 to FAC#1 on the 64:

```
LDA    #$00.
LDY    #$C0.
JSR    $BBA2.
```

### Transfer memory to FAC#2

This routine does the same as transfer memory to FAC#1 with the same pointer registers.

Computer	Entry Point
CBM 64	\$BA8C.
VIC 20	\$DA8C.

PET Bas 4	\$CBC2.
PET Bas 2	\$D998.
PET Bas 1	\$D95E.

Example:

```
LDA    #$00.
LDY    #$C0.
JSR    $BA8C.
```

N.B. To transfer FAC#2 to memory, FAC#2 must first be transferred to FAC#1 and then FAC#1 to memory.

The next routines are the ones that transfer one FAC to the other.

### Transfer FAC#1 to FAC#2

This routine will copy the contents of FAC#1 to FAC#2.

Computer	Entry Point
CBM 64	\$BC0F.
VIC 20	\$DC0F.
PET Bas 4	\$CD45.
PET Bas 2	\$DB1B.
PET Bas 1	\$DAE1.

Example:

```
JSR    $BC0F.
```

### Transfer FAC#2 to FAC#1

This routine will copy the contents of FAC#2 to FAC#1.

Computer	Entry Point
CBM 64	\$BBFC.
VIC 20	\$DBFC.
PET Bas 4	\$CD32.
PET Bas 2	\$DB08.
PET Bas 1	\$DACE.

Example:

```
JSR    $BBFC.
```

### The arithmetic routines

There are several routines for arithmetic that use the FAC's. These will be explained

# HINTS AND TIPS

now. All the entry points listed are those where it is assumed that both FAC's have already been loaded with the values.

## Perform add.

This routine adds the contents of FAC#1 to FAC#2 and stores the result in FAC#1.

Computer	Entry Point
CBM 64	\$B86F.
VIC 20	\$D86F.
PET Bas 4	\$C9A0.
PET Bas 2	\$D776.
PET Bas 1	\$D73F.

Example:

load FAC's 1 & 2 as previous.  
JSR           \$B85F.

## Perform subtract

This routine subtracts the contents of FAC#1 from FAC#2 and stores the result in FAC#1.

Computer	Entry Point
CBM 64	\$B853.
VIC 20	\$D853.
PET Bas 4	\$C989.
PET Bas 2	\$D736.
PET Bas 1	\$D728.

Example:

load FAC's 1 & 2 as previous.  
JSR           \$B853.

## Perform multiply

This routine multiplies the contents of FAC#1 to FAC#2 and stores the result in FAC#1.

Computer	Entry Point
CBM 64	\$BA30.
VIC 20	\$DA30.
PET Bas 4	\$CB66.
PET Bas 2	\$D93C.
PET Bas 1	\$D902.

Example:

load FAC's 1 & 2 as previous.  
JSR           \$BA30.

## Perform divide

This routine divides the contents of FAC#2 by FAC#1 and stores the result in FAC#1. A must be loaded with the exponent of FAC#1.

Computer	Entry Point
CBM 64	\$BB12.
VIC 20	\$DB12.
PET Bas 4	\$CC4A.
PET Bas 2	\$DA20.
PET Bas 1	\$D9E6.

Example:

load FAC's 1 and 2 as previous.  
LDA           \$61.  
JSR           \$BB12.

## Calculate SIN

This routine calculates the sine of the value stored in FAC#1 and puts the result in FAC#1.

Computer	Entry Point
CBM 64	\$E26B.
VIC 20	\$E268.
PET Bas 4	\$D289.
PET Bas 2	\$DFDF.
PET Bas 1	\$DFA5.

Example:

load FAC#1 with the value in radians.  
JSR           \$E26B.

## Calculate COS

This routine calculates the cosine of the value stored in FAC#1 and puts the result in FAC#1. The routine actually adds PI/2 to the value and then calculates the sine.

Computer	Entry Point
CBM 64	\$E264.
VIC 20	\$E261.
PET Bas 4	\$D282.
PET Bas 2	\$DFD8.
PET Bas 1	\$DF9E.

Example:

load FAC#1 with the value in radians.  
JSR           \$E264.

## Calculate TAN

This routine calculates the tangent of the value stored in FAC#1 and puts the result in FAC#1. The routine actually divides the sine of the value by the cosine of the value.

Computer	Entry Point
CBM 64	\$E2B4.
VIC 20	\$E2B1.
PET Bas 4	\$D2D2.
PET Bas 2	\$E028.
PET Bas 1	\$DFEE.

Example:

load FAC#1 with the value in radians.  
JSR           \$E2B4.

## Calculate ATN

This routine calculates the arc-tangent of a value stored in FAC#1 and puts the result in radians in FAC#1.

Computer	Entry Point
CBM 64	\$E30E.
VIC 20	\$E30B.
PET Bas 4	\$D32C.
PET Bas 2	\$E08C.
PET Bas 1	\$E048.

Example:

load FAC#1 with the value.  
JSR           \$E30E.

# HINTS AND TIPS

## Calculate EXP

This routine calculates the exponent of the value in FAC#1 and stores the result in FAC#1.

Computer	Entry Point
CBM 64	\$BFED.
VIC 20	\$DFED.
PET Bas 4	\$D184.
PET Bas 2	\$DEDA.
PET Bas 1	\$DEAO.

Example:

```
load FAC#1 with the value.
JSR      $BFED.
```

## Calculate LOG

This routine calculates the logarithm of the value stored in FAC#1 and puts the result in FAC#1.

Computer	Entry Point
CBM 64	\$B9EA.
VIC 20	\$D9EA.
PET Bas 4	\$CB20.
PET Bas 2	\$D8F6.
PET Bas 1	\$D8BF.

## Calculate power

This routine calculates the result of FAC#2 to the power of FAC#1 and puts the result in

FAC#1. .A must be loaded with the exponent of FAC#1.

Computer	Entry Point
CBM 64	\$BF7B.
VIC 20	\$DF7B.
PET Bas 4	\$D112.
PET Bas 2	\$DE68.
PET Bas 1	\$DE2E.

Example:

```
load FAC#2 with number.
load FAC#1 with power.
LDA      $61
JSR      $BF7B.
```

## Calculate SQR

This routine calculates the square root of the value in FAC#1 and puts the result in FAC#1. The routine actually calculates FAC#1 to the power 0.5.

Computer	Entry Point
CBM 64	\$BF71.
VIC 20	\$DF71.
PET Bas 4	\$D108.
PET Bas 2	\$DE5E.
PET Bas 1	\$DE24.

Example:

```
load FAC#1 with the value.
JSR      $BF71.
```

## CURSOR CHARACTERS

- ␣ - By pressing the cursor down key
- ␣ - By pressing the cursor down key with the shift key
- ␣ - By pressing the cursor right key
- ␣ - By pressing the cursor right key with the shift key
- ␣ - By pressing the home key
- ␣ - By pressing the home key with the shift key
- ␣ - By pressing the control key and key 1
- ␣ - key 2
- ␣ - key 3
- ␣ - key 4
- ␣ - key 5
- ␣ - key 6
- ␣ - key 7
- ␣ - key 8
- ␣ - By pressing the CBM key with key 1
- ␣ - key 2
- ␣ - key 3
- ␣ - key 4
- ␣ - key 5
- ␣ - key 6
- ␣ - key 7
- ␣ - key 8
- ␣ - key 9
- ␣ - By pressing the control key and key 0
- - By pressing key F1
- - By pressing key F2
- - By pressing key F3
- - By pressing key F4
- - By pressing key F5
- - By pressing key F6
- - By pressing key F7
- - By pressing key F8

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Phone 0892-27454  
for data-sheets or  
contact your nearest  
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## Storage

A 'unique' flip 'n' file disk storage system has been independently announced by two different companies.

ISA Gold's storage system caters for up to 15 5.25 inch disks. A fanned out easel position allows easy retrieval of disks without bending during selection. A perspex window allows the files to be visible even when the file is closed.

Other features include a hand grip, four anti-slip grips and a range of self-adhesive labels for indexing and archive filing. The product costs £5.95 (plus VAT).

ACS's Flip 'n' File system is available in three sizes. The

Minibox takes 15 disks and there are two versions of the Keybox, which incorporate a double locking system, and hold 25 and 50 disks. Priced at £5.80, £25 and £35 respectively, the files are transparent low-static, smoke coloured material and include index dividers. For easy retrieval, the disks are presented vertically when the boxes are opened.

*Contacts: ISA Gold, 80/84 Thornton Road, Bradford, West Yorkshire. Tel: 0274 306787.*

*ACS, Bowmaker House, Etruria Road, Hanley, Stoke-on-Trent. Tel: 0782 287121.*

## Budgetting and banking

Adventure game specialists, Richard Shepherd Software are entering the business market with the launch of the 64 Cash Controller.

Available on cassette (£9.95) and disk (£14.95), the program caters with three important areas of money management.

A bank account section allows for the storage of 400 transactions including standing orders.

An integrated budget section caters for sixteen budget headings, and expenditure is automatically coded through from the bank account section.

A loan and mortgage calcu-

lator calculates principal sum, rate of interest, period of loan or repayment details on the basis of the other three factors.

Data can be saved and is secured by the allocation of a password for each data file created.

The program is compatible with the Commodore MP 801 and 1526 printers and has facilities to provide printouts of statements, budgets, etc.

*Contact: Richard Shepherd Software, Elm House, 23/25 Elmshott Lane, Cippenham, Slough, Berks. Tel: 06286 63531.*

## Adaptors

Letco, pioneers of the 64K memory expander for the VIC 20, have produced an adaptor (model 64KVA) to use with their 64KV memory expander on the 64.

When used on the 64, the addresses from \$8000 to \$9FFF will have eight separate blocks

of 8K locations, each block selected by a single POKE instruction.

The adaptor costs \$29.95 and the combination for use on the 64 costs \$139.95.

*Contact: Letco, 7310 Wells Road, Plain City, Ohio 43064.*

## Robot George

While not strictly a Commodore product, George the programmable robot will appeal to many computer enthusiasts.

Retailing at £23.95, George is a 16.8cm high robot with 48 programmable steps. He has three selectable gears and nine time intervals. George also emits a light beam and robot-like sound, and has a demo program to show off everything he can do.

Dressed fetchingly in grey, red and blue, George is more than



just a toy, providing all the fundamental features of an expensive teaching system. Fully self-contained, he has an in-built microprocessor controller. Functions are programmed by a small keyboard on top of his 'head'. Traction and steering are provided by dual motors which drive rubber-tyred wheels and a built-in speaker and light, operated under control of the microcomputer.

George is suitable for children aged four upwards.

*Contact: CGL, CGL House, Golding Hill, Loughton, Essex. Tel: 01-508 5600.*

## Megarule rules

The Megarule is a perspex magnifying ruler which makes the reading of computer listings very much easier. Placed over the text, it magnifies over 100% and in the centre is a guide line for accuracy.

Available clear or slightly tinted, the Megarule costs £2.99.

*Contact: Dealer Deals, 20 Orange Street, London WC2. Tel: 01-930 1612.*

## Shaping up

Hewson Consultants have secured a contract from the Longman publishing group to supply an exercise planning program.

Called Shaping Up, the program was designed for use with the 64 and features an on-screen demonstration of exercises tailored to the individual user's requirements.

Shaping Up is being marketed in conjunction with the magazine, Successful Slimming.

*Contact: Hewson Consultants, 56B Milton Trading Estate, Milton, Abingdon, Oxon.*

## New idea

'The Practical Guide for People with a New Idea' explains how to protect a new idea, product or scheme and exploit it to the full.

Areas covered in the book include market research, approaching a manufacturer, telling the world about an idea without losing your rights, patenting an invention, secret patents, checking an idea is original, patent cost and life span. Also information about copyrights, designs, trademarks and licences.

It costs £5.95.

*Contact: The Patent Eye, George House, George Road, Edgbaston, Birmingham.*

## Colours

Fashion conscious micro owners can now buy a colour monitor in a livery to match their computers.

A range of colour cabinets has been launched by Compuser for their medium resolution monitor, the Professional 2000, Commodore's colours being two-tone grey. The monitor features a black face anti-reflection faceplate. It has RGB linear input and is also available in RGB/TTI.

The retail price is £325.

Contact: Compuser, 27 Vulcan Way, New Addington, Croydon, Surrey. Tel: 0689 46116.

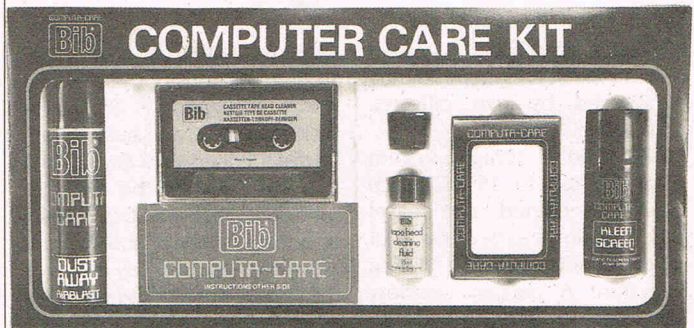
## Brochure

All you ever wanted to know about word processing but were afraid to ask can now be discovered in a free illustrated eight-page brochure published by Dataview Wordcraft.

Focusing on Wordcraft software, the brochure explains what word processing does, hardware and software, how it can save or make money, and how it makes life easier for the user.

Contact: Dataview Wordcraft, Radix House, East Street, Colchester, Essex. Tel: 0206 869914.

## Clean up



A range of computer care products from Memorex includes: VDU and TV screen cleaning kit comprising cleaning tissues and two anti-static cloths, at £4.95; case and keyboard cleaning kit, also at £4.95, comprising aerosol spray foam, cleaning cloth and cotton buds; disk drive and head cleaning kit with 10 disposable head cleaners and aerosol spray cleaner for wet and dry action, costing £9.95; and a storage case of 5.25 inch floppy disks, costing £2.25.

Bib have also produced a Computer Care Kit comprising Audio cassette head cleaner with cleaning fluid, air duster for cleaning dust and dirt away from keyboard and printer, together with anti-static screen cleaning fluid with cleaning. The kit costs £8.74.

Contacts: Memorex, Memorex House, 96/104 Church Street, Staines, Middx. Tel: 0784 51488.

Bib, Kelsey House, Wood Lane End, Hemel Hempstead, Herts. Tel: 0442 61291.

## Triptych

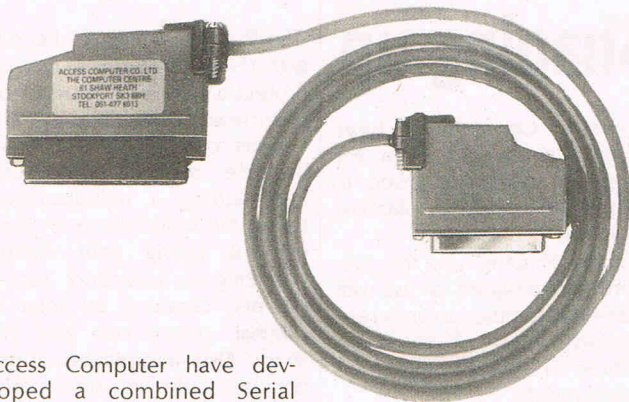
Each title in Triptych's Brainpower range contains an educational book and program, together with a practical applications program.

Five titles are available for the 64: Entrepreneur, Numbers At Work, Decision Maker, Project

Planner and Forecaster. Cassette and disk versions are available for each title at £14.95 and £24.95 respectively.

Contact: Triptych Publishing, Sterling House, Station Road, Gerrards Cross, Buckinghamshire. Tel: 0753 889988.

## Interface Adapter



Access Computer have developed a combined Serial Interface and Cable to printer. Designed for use with most RS232 Serial printers, the unit is supplied with simple instructions and is available by mail order for £34.95.

Contact: Access Computer Company, The Computer Centre, 61 Shaw Heath, Stockport, Cheshire. Tel: 061 477 6013.

## Light pen

A light pen package for the 64 is now available from Stack Computer Services. Costing £28, it comprises a light pen, a comprehensive user manual, two demonstration cassettes containing nine games, and Stack's new paintbox draw software.

Stack's new dustcovers comply with anti-static and fire resistant regulations with costs varying from £1.50 to £5 according to machine size.

Also new from Stack are three basic compilers for the 64. These vary from £14.95 on cassette to a security key version at £39.95.

Contact: Stack Computer Services, 290/298 Derby Road, Liverpool. Tel: 051 933 5511.

## Lightning strikes!

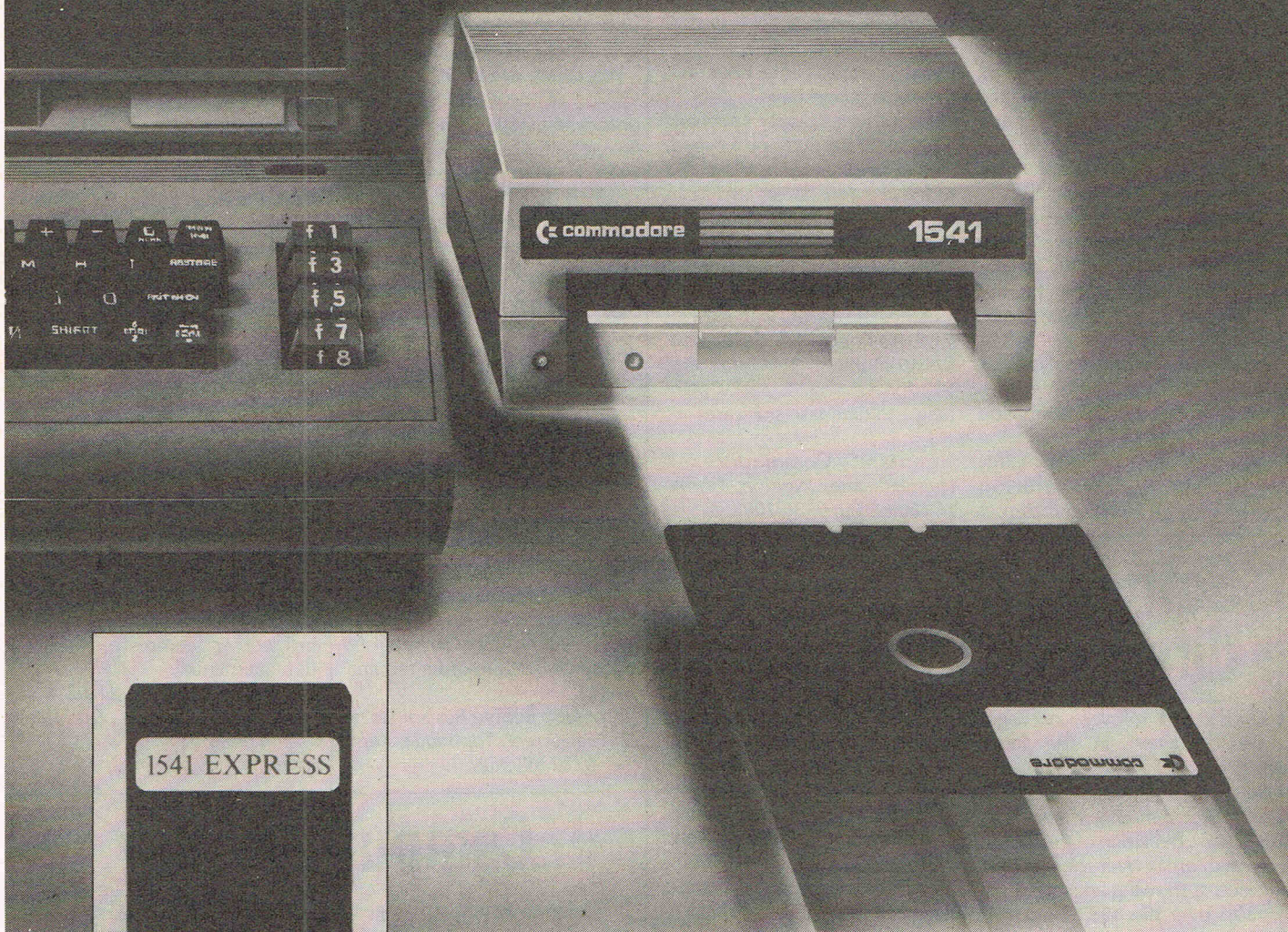
Oasis Software have launched three 64 games writing utilities, all available on disk and cassette.

Basic Lightning is an extended BASIC with more than 200 extra keywords. A cassette version costs £14.95 and the disk, £24.95. White Lightning (cassette £19.95, disk £29.95) includes the BASIC Lightning package and produces very fast stand alone machine code programs.

Machine Lightning (cassette £29.95, disk £39.95) is a Macro Assembler/Monitor.

Contact: Oasis Software, Alexandra Parade, Weston-Super-Mare, Avon. Tel: 0934 419921.

# Drive faster!



There's nothing worse than waiting for your program to load. And good though the Commodore 1541 is, speed isn't exactly its biggest feature.

Hook up the new 1541 Express from RAM, though, and you'll be up and running like lightning.

This ingenious add-on speeds up data transfer from the 1541 and new 1542 disk drives to your Commodore 64. So much so, that you'll wonder how you ever found the patience to wait before.

With the Express you can load programs in a third of the normal time. That means less frustration and less time wasted.

(You can fit it yourself in minutes, too – and disconnect it just as easily).

The new 1541 Express from RAM.

To shift your drive into top gear call into your nearest dealer today.

Or call our credit card hot line on 02514 25252. (Access and Visa welcome).

Or complete the coupon below and send it today to: Dept CCI, Ram Electronics (Fleet) Ltd, 106 Fleet Road, Fleet, Hampshire, GU13 8PA.

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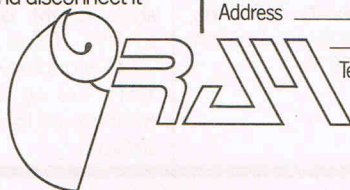
Address \_\_\_\_\_

Post Cd. \_\_\_\_\_

Tel. \_\_\_\_\_

To: Dept CCI Ram Electronics (Fleet) Ltd, 106 Fleet Road, Fleet, Hampshire GU13 8PA.

Trade and export enquiries welcome.



## Package deal from CBM

Commodore's 8296D is now being sold complete with over £865 worth of software.

This software comprises three packages: SuperScript, a word processing package including Spelling Checker; The Manager, a comprehensive database and file management package; and Calc Result, a financial planning spreadsheet.

"No other machine in the price bracket offers as much floppy disk storage capacity as the 8296D," says Mark Horne, Commodore UK Business systems product manager. "When coupled with free applications software, we believe the machine offers unbeatable value for money."

The 8296D offers 128K memory, high resolution graphics with 80-column 25-row

green-phosphor integral screen, four screen page-switching and compatibility with a range of printers — from a 60 cps dot-matrix printer to a 40 cps letter-quality printer. Using Basic 4.0, the 8296 range have a detachable, full-size Qwerty keyboard with separate numeric keypad. Styling includes swivel/tilt on the monitor and programs can optionally display information in high resolution.

The entire package is sold for £1,690 (excluding VAT) and includes the 8296D with integral 2 Mbyte floppy disk drive, 128K RAM, monitor, keyboard and wordprocessing, financial planning and database software.

Contact: Commodore, 1 Hunters Lane, Weldon, Corby, N. Hants. Tel: 0536 205555.

## Audiogenic

Audiogenic have launched the Professional Range of business software for the 64. Supplied on disk, the three packages cover all business applications.

Wordcraft, at £24.95, is a disk version of the Wordcraft word processing system for the CBM Business range of computers. Swift is a spreadsheet facility retailing at £19.95. It provides features normally associated

with expensive, desk-top micro packages.

Magpie, at £39.95 is a data base system. A range of modules, each costing £14.95, is also available covering areas such as sale account, mail lists and invoicing.

Contact: Audiogenic, 39 Sutton Industrial Park, London Road, Reading, Berks. Tel: 0734 664646.

## Good news!

Bubble Bus Software have taken over the marketing of business products from their offshoot, the Computer Room.

Supernews, a delivery and accounting system for news-agents is the first package to be marketed. This Commodore approved product is available for the 64 and 8000 series and costs £499 (excluding VAT).

It caters for up to 3000 deliveries, produces rounds lists, accounts, and pre-order requirements.

Contact: Bubble Bus Software, 87 High Street, Tonbridge, Kent. Tel: 0732 355962.

## Ledger

Kemp have launched Purchase Ledger for the 64. A ledger accounting program for recording and analysing purchases, Purchase Ledger is menu-driven and costs £27.95 for the cassette version and £29.95 on disk.

Up to 100 creditor accounts and 50 nominal accounts are catered for and the program has a full range of print-out. It can be used with Centronics interfaces and comes complete with a 16-page manual.

Contact: Kemp Ltd, 43 Muswell Hill, London N10. Tel: 01-444 5499.

## Software directory

Over 5,000 software packages are contained in the latest edition of Microcomputer Software Directory.

Business management software has been one of the largest growth areas over the last nine months, showing an increase of 130% over the 1983 Directory. The number of business and commercial packages available in the UK, including word processing and integrated business systems, grew by 108% over the year with there now being some 400 packages in this category.

In addition to business applications, the Directory addresses a further two fast-growing sectors of the microcomputer software industry — education and games.

The Microcomputer Software Directory costs £40 plus £2.20 p&p.

Contact: Computing Publications, Evelyn House, 62 Oxford Street, London W1. Tel: 01-323 3211.

## Unisoft

Unistat is a statistical package for the 64 from Unisoft. Features include Multivariate regression; analysis of variance, scatter diagrams and time series plots; statistical tests, correlation coefficients and probability distributions; descriptive statistics, frequency distributions and histograms.

Available on disk or cassette, Unistat costs £85.

Also available from Unisoft is Unimax, a linear programming package capable of handling all sorts of linear programming problems. Matrix operations include inversion, transposition, determinant, pre and post-multiplication, scalar multiplication, addition and subtraction of matrices and vectors. Matrices can be saved and loaded at any stage.

Available on disk or cassette, Unimax costs £60.

Contact: University Software, Dept C, St Peter's Street, London N1. Tel: 01-359 0978.

## Computer trolley

In addition to a standard range of tray sizes, Bulldog Computer Services are offering VDU trolleys which can be custom built to suit any size and make of computer.

Supplied with a length of flexible conduit and fixing clamp to ensure that the interface and power cables are kept together, each unit is equipped with lockable castors.

Bulldog trolleys are available on 30 days approval.

EME offer a choice of trolleys with two shelf levels. Model 2225/Primary with an overall height of 842mm and a lower shelf height of 610mm costs £54.95 (plus VAT). Model 222/Secondary, at £56.95 (plus VAT), has an overall height of 892mm and lower shelf height of 660mm.

Finally, Servicon Dynamics have developed a stand which gives the illusion that the monitor is floating. The stand utilises a counter balance system allowing the fulcrum for the swivel/tilt mechanism to be positioned at the rear of the monitor. The user positions the monitor at the required angle and direction and it stays there.

Contacts: Bulldog Computer Services, 33 Hinkley Road, Sapcote, Leicester. Tel: 045527 2329 (or enquiry Hotline — 045527 4575).

EME, 70 West End Road, High Wycombe, Bucks. Tel: 0494 26508.

Servicon Dynamics, 186/190 Cirencester Road, Charlton Kings, Cheltenham, Glos. Tel: 0242 528213.



# BUSICALC 3

## - the sophisticated spreadsheet !

Easy to learn, easy to use - something that can't be said of many business programs. But it's true of all the programs in the BUSICALC series.

BUSICALC 3 can handle all sorts of jobs - budgets, expenditure analysis, stock lists, price lists, and product costing are just a few of the possibilities. Three-dimensional formulae automatically access data stored on disk, so that you can easily pull together information from several different sheets and summarise or manipulate it.

It's simple to transfer data to other programs such as Easy Script. And you can use virtually any printer with BUSICALC 3, whether dot matrix or daisy wheel, Commodore or non-Commodore.

For the CBM 64 and PET/CBM 4000 & 8000 series.

Available through dealers or from:

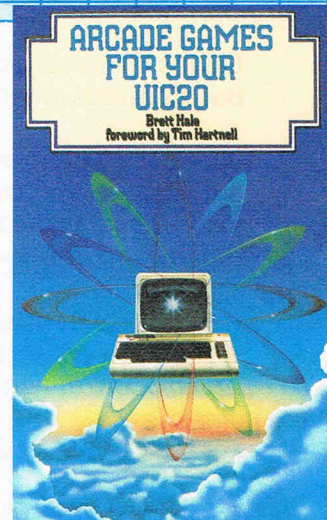
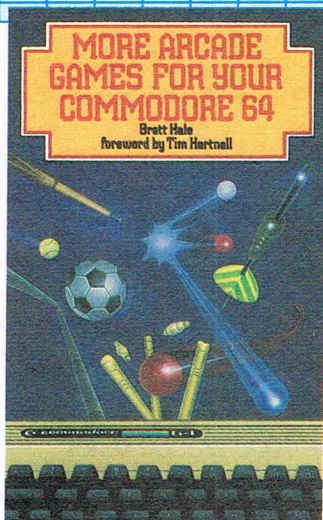
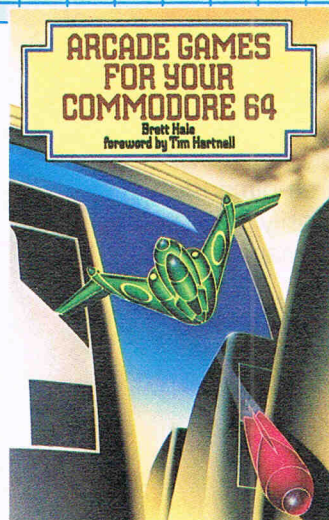
**Supersoft, Winchester House, Canning Road, Harrow HA3 7SJ**

**Phone 01-861 1166 for more details and a free catalogue.**



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## YOU OWN A COMMODORE 64 OR VIC 20, BUT ARE YOU MAKING THE MOST OF IT?



### YOU SOON WILL BE, WITH ONE OF THESE BOOKS FROM CORGI/ADDISON-WESLEY!

Each one is packed with a stunning array of arcade games, enabling you to explore the full power and potential of your micro.

- \* All the games are in BASIC, so you can modify them however you want
- \* Each one is listed twice – once for keyboard use, and once for use with a joystick

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THE NEW FORCE IN COMPUTER BOOK PUBLISHING



All these books are available at your bookshop, though should you find any difficulty in obtaining them, they can be ordered direct from the publisher. Simply fill in the form below.

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- \_\_\_ 99124 4 Arcade Games for your Vic 20 at £4.95 (128 pages)
- \_\_\_ 99125 2 Arcade Games for your Commodore 64 at £4.95 (128 pages)
- \_\_\_ 99127 9 More Arcade Games for your Commodore 64 at £4.95 (128 pages)

Please allow cost of book(s) plus 30p for one book plus 15p for each additional book for postage and packing.

I enclose my cheque/postal order for £\_\_\_\_\_ payable to: TRANSWORLD PUBLISHERS LTD.

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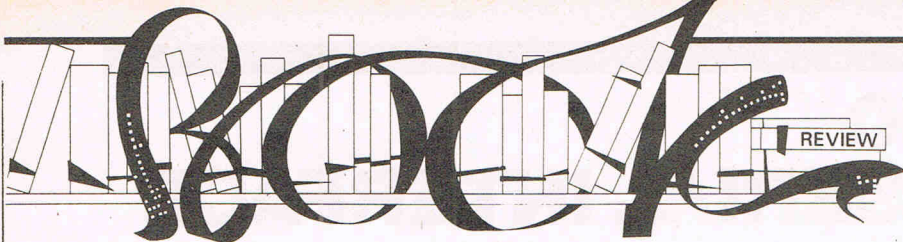
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Now send to CORGI/ADDISON-WESLEY BOOKS,  
61-63 Uxbridge Road, London W5 5SA

ⓑ



## THE REALLY EASY GUIDE TO HOME COMPUTING — COMMODORE 64

Now here's a book that really lives up to its title. Aimed at the complete beginner, it's a large format book packed with cartoons illustrating almost every move you make. The 'Magic Micros' Mike and Rose guide the reader through his or her introduction to all the concepts central to programming in BASIC on the 64. Extra guidance to the positioning of keys is provided by Inspector Key and his dogs!

Two mothers, Sue Beasley and Ruth Clark, are the authors of this book and they manage to capture the attention of the youngest reader in a way that will also amuse and interest older readers.

It is a book to be read from the start to finish rather than a reference guide to be dipped into, with each chapter offering 'extra things to do'.

With the aid of Mike and Rose, the reader soon learns how to use all the facilities of the keyboard, how to create a program and make it work, together with editing, program control, simple loops and numeric variables, and how to understand syntax errors and report codes. In addition to this, instruction is given on how to control the placing of text and pictures on the screen, how to use colour and movement and how to produce sound effects.

At £7.95, The Really Easy Guide To Home Computing is a clear and concise introduction to your 64.

Contact: Century Publications, Portland House, 12-13 Greek Street, London W1.

## GATEWAY TO COMPUTING WITH THE COMMODORE 64

"Learning is fun" is the message put across by many computing books aimed at the first-time user. Ian Stewart's Gateway to Computing enforces this idea with programs concerning colourful characters such as Carlton Q Cashesnitcher, the Gnatwest Bankager and Ivan Nokyablokov, spy with a mission. Not to mention his groan a minute humour and the resurrection of ancient jokes such as "Do you know the difference between an elephant and a letterbox?". However, all this is relevant to the book's aim to introduce the reader to the fundamentals of computing.

Most introductory computer books

assume that the reader has already switched on the computer. Ian Stewart assumes total ignorance, explaining how to set up a computer and advising a suitable and comfortable layout of equipment.

After 'making friends with your computer' consecutive chapters lead the reader further into the world of BASIC programming. Diagrams, cartoons and listings reinforce and illustrate the text throughout the book. Towards the end of the books, the author explains in more detail how the computer works and also provides a glossary of terms and a commands and symbols index.

The only fault some parents might find the Gateway to Computing (which retails at £4.95) is that it may enforce such phrases as 'get stuffed' and 'no sweat' into a child's vocabulary!

Contact: Shiva Publishing, 64 Welsh Row, Nantwich, Cheshire CW5 5BR.

## KIDS AND THE COMMODORE 64

Only an American book could begin with a list of acknowledgements filling a whole page. Even Aunt Mildred and Rover the dog get a mention (well almost!)

Written by Edward H Carison of Michigan State University, Kids and the Commodore 64 is extremely reminiscent of a school text book despite the use of cartoon illustration.

Although intended for home study, each chapter contains notes for the teacher and questions to ask the class. The reader is also tested on what has just been read with space left to fill in answers.

At some points of the book, particularly at the very beginning, a programming concept is thrown in without any explanation. For Example: before programming is even mentioned, the reader is advised to POKE 53281,0 to get a black screen. The result will be achieved, but the reader won't know how or why this has happened. Another grumble, which is probably purely personal, is that some of the text made me cringe. A couple of examples: "...the computer may get sick and you will have to turn it off, then on, to make it well." "The flashing cursor is like the computer snoring." Yuk! At the princely sum of £19.95, it is arguable whether the reader benefits more from the 'school book' approach than from the 'learning is fun' end of the market. It's probably a matter of taste, but I'm sure most beginners would choose to steer clear of anything reminiscent of school.

Contact: Prentice/Hall International, 66 Wood Lane End, Hemel Hempstead, Herts.

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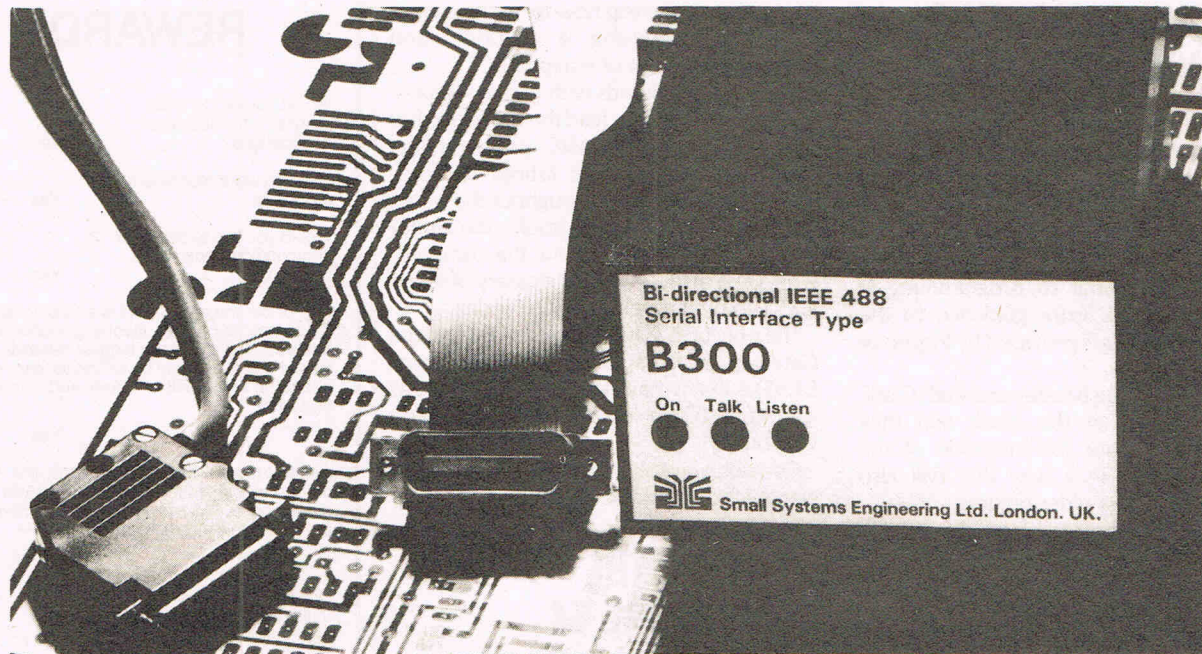
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Parity—ODD/EVEN  
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Baud Rates—110, 300, 1200, 9600  
Talk Addresses—4, 5, 6, 7  
Listen addresses—4, 5, 6, 7  
Code Conversion—Mode A/B  
No. of Data Bits—7/8

## Software selectable options

Baud Rate selection using a secondary listen address followed by a configuring byte which sets input baud rates. 16 different baud rates in the range 50-19,200 baud can be selected. Input and output baud rates can be set to different values.

## RS232C signals

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## Connectors

IEEE-488 lead—24 way male ribbon connector.  
Female 24 way ribbon and an edge connector to fit PETs IEEE port supplied as options.  
RS232 lead—25 way D-Type connector (male or female).

## Packaging

The B300 is housed in a small instrument case with integral power supplies. ON, LISTEN and Talk indicators are provided on the front panel.

## Options

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# Adventurers aid

Programmer Duncan Gamble looks at four recently-released packages including *The Quill*, an adventure writing package from Gilsoft.

## THE QUILL

*"an excellent utility"*

The Quill is effectively a database within the framework of which the user enters data and conditions which combine to produce an adventure game. The final runtime code is separable from the compiler and manufacturers Gilsoft make it known that the runtime code can be used, with a statement of acknowledgement to the quill, by adventure writers for their own games for sale. A measure of how successful this has been can be gained from the number of adventures now available written under The Quill.

The Quill allows good adventure creators who are not good programmers to exploit their skills without being handicapped by having to write a Basic or Machine code program with which to express their creations. The adventure must first be thought up, with maps, objects and problems. This is then entered in the editor by location or by object number. Text and replies to inputs must be entered as must conditions for events. To control the flow of the adventure, 32 flags are available. 1-10

are predefined by the interpreter for the usual requirements of an adventure — whether it's dark, how many times a command is entered, how many times a location description is used. Some flags depend on whether object number 0 is present or absent. This object can be used for a torch or lamp as some other flags depend on whether it is dark or not and whether this object is present.

The manual is informative and concise — for such a powerful package it is of needs quite lengthy but is well structured and includes appendices of error messages generated by the editor and interpreter and a list of quill commands.

The quill language itself is very simple but adequate for describing adventures. The manual contains several example routines showing implementation of such usual adventure features as hunger and opening locked doors. Some words are predefined by the interpreter such as load, save, end.

These are needed by all adventures so to save space they are in the run-time system itself. For adventures with a random element Chance produces a number between 1 and 100.

The Spectrum origins of the Quill are shown in Ink, Paper and Border colour commands. If sound is required a SID command pokes a register number with a value, this is enough to make purists rattle their spears and bang their shields in distaste, but sound can convey an atmosphere as much as any text.

Do not expect to write adventures as sophisticated as *Lords of Time* or *the Hobbit*, but adventures far better than many of those on the market now can be produced with this excellent utility.

Contact: Gilsoft, 30 Hawthorn Road, Barry, S Glamorgan. Tel: 0446 732 765.

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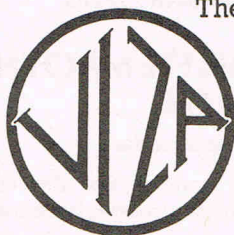
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# REVIEWS

the trouble as the results can be spectacular — witness the amazing games available for the '64.

Programming in machine code gives the programmer access to speeds of execution for his programs which could not be contemplated in Basic. The complete machine code tutor consists of 23 lessons with associated examples of programming and exercises. An assembler emulator is included which allows the user to run his programs without fear of the machine hanging as it is wont to do in real machine code.

The user is taken step by step through the registers, memory and then some actual instructions. The booklet and the on-screen tutor complement each other well, the user need only move on when he is sure that he understands all taught so far. Any section can be recapped from the menu of lessons which appears on the screen when any lesson or exercise is completed or when an exercise is interrupted.

The first lesson is entitled 'Registers' and consists of only a page of text — most lessons are much longer than this. Lesson two teaches about memory: what do those sacred words RAM and ROM mean. After the third lesson, which is about loading and storing registers, comes the first exercise. Exercise one shows use of LDA and STA in a very short assembly language (assembly language is machine language in a more readable form) program running under the simulator. The status of the flags and the contents of each of the registers is shown for each instruction as it is executed. The flags are then discussed and simple arithmetic follows.

The Complete Machine Code Tutor manages to get over concepts such as registers and flags without resorting to being condescending or treating the reader like a moron. Explanations are concise and well worded and do not repeat themselves unnecessarily.

Topics covered include the use of different addressing modes to access different types of data, comparing data and conditional branching. Binary coded decimal and its uses are explained, and other mathematical instructions and techniques are also covered fully.

The Complete Machine Code Tutor takes the reader up to such concepts as stack manipulation and interrupts. Beyond this point the reader should have the confidence to 'go it alone'.

A package of this type can instruct the reader on actual 6502 Instructions and how to use them. To program effectively the reader must still then practice and practice to appreciate the techniques behind machine code programming.

Contact: Anirog, 29 West Hill, Dartford, Kent. Tel: 0322 92513.

## PILOT-PLUS/64

"would suit the programming beginner"

Pilot is a language used for computer assisted learning (CAL). It is a very simple language, sometimes sited as the ideal beginners language. Pilot-Plus/64 conforms to the language base specifications as set down by Western Washington University, but has been expanded to make use of the 64's graphics and sound capabilities and also can be interfaced to Basic.

Pilot-Plus/64 commands are all one or two letters, this makes Pilot-Plus/64 programs less readable than Basic, but due to the lesser number of commands to learn, one becomes accustomed to reading and understanding Pilot listings very quickly.

Pilot-Plus/64 comes with a powerful screen editor with bi-directional scrolling, search and replace and renumber commands included. Pilot-Plus/64 line numbers are insignificant within the language as labels are used — they appear only for convenience while editing. The editor section of the manual is well explained and easy to read, but when one starts reading about the language itself one is immediately confronted by 'A line of Pilot-Plus/64 can be up to 80 characters long and consists of a line number from 1 to 63999...; O.K. so far; ..followed by an optional label or a \* followed by up to six characters, followed by an op-code, followed optionally by one or more modifiers and/or conditionals, followed by a colon, followed optionally by a line of text'; phew!

Pilot-Plus/64 provides for quite advanced screen handling with commands to position the cursor, set graphics or no-graphics character set and scroll the screen.

Sound has not been forgotten with a sound effect command with time, frequency and an attribute defining voice and waveform parameters. Printers are handled by hard copy versions of pilots printing commands — only Commodore printers through the serial port are supported, so interfacing other printers could be tricky.

Pilot is based around a question and answer system with structures for several attempts at a problem, with different messages on different attempts. Input is accepted from the keyboard and then matched to an answer or set of answers, conditionals ('if..then' type statements) then direct program flow depending on correct or incorrect input.

Typical Pilot usage would be for teaching lists of information, or shape recognition. Pilot-Plus/64's Basic interface is used for those jobs Pilot cannot handle such as files

and also as an intermediary to machine code routines.

Pilot-Plus/64 seems well implemented and would suit the programming beginner but for the verbose and unnecessarily complicated manual. For most other purposes Pilot is too simple a language to produce more powerful programs.

Contact: New Generation Software, The Brooklands, 15 Sunnybank, Lyncombe Vale, Bath. Tel: 0225 316924.

## PULSE ASSEMBLER

"difficult to recommend"

Pulse is Interceptor's second assembler for the 64, and is an extension of their first assembler. Written in compiled basic, which does slow down assembly speed quite considerably, Pulse is not directly source code compatible with other assemblers on the market for the 64. Listings retyped from other assemblers or from magazines will require some work to convert them to Pulse format.

The major differences are semi-colons being used instead of commas for indexed addressing and delimiters in BYT instructions. A far more crucial difference is the limiting of labels to two characters! Anyone who can write meaningful two letter labels will not find this too much of a disadvantage but for the rest of us this does not help in producing readable source code. Pulse allows branches to labels or to linenumbers. A limited form of expression evaluation is available but allows only addition.

With Pulse only 11k is available for source code, and there are no linking instructions to allow longer programs. This limits severely the size of program that can be assembled.

For disk users commands have been added to display the disk directory on screen without losing the source program, and for initialising and validating disks, it is also possible to read the disk error channel.

Most 6502 conventions are followed apart from those described above, < and > for low and high byte and # for immediate addressing are implemented. As Pulse can work only in decimal, the \$ and % signs for hexadecimal and binary are discarded. Comments are preceded by three asterisks.

Auto line-numbering, renumbering and block delete commands are available, as is listing to a printer. Typing 'commands' gives a summary of Pulse commands.

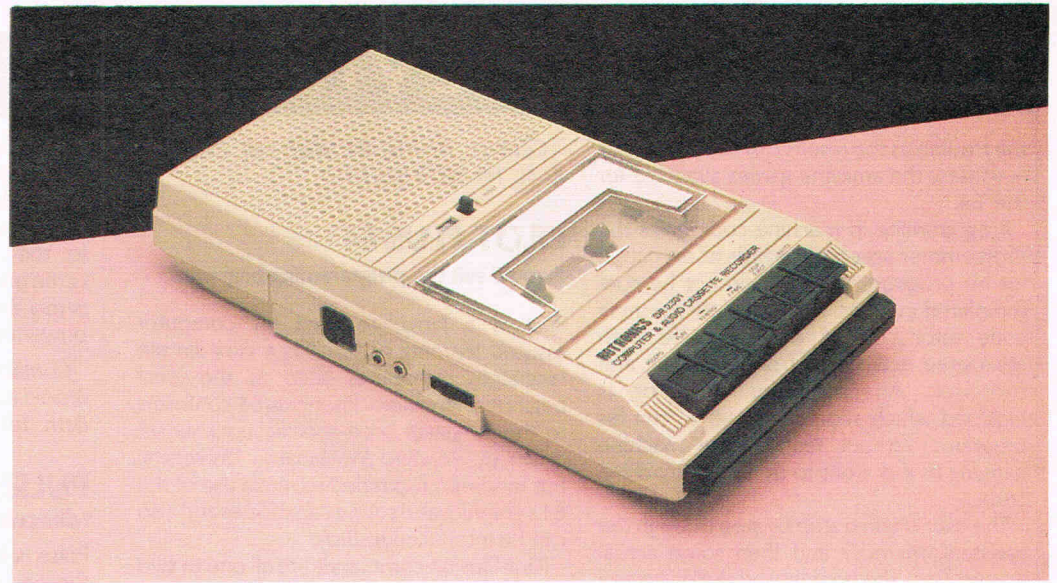
Pulse is one of the cheapest assemblers on the market, but it is still difficult to recommend it to anyone who intends to use an assembler for more than an occasional short machine code routine.

Contact: Interceptor, Lindon House, The Green, Tadley, Basingstoke, Hants. Tel: 07356 71145.

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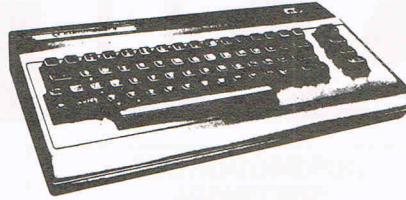
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Activision	(s) 17	Dynavision	(s) 4	Rosetti	14
Adcomp	29	Fieldmaster Software	27	Rotronics	56
Amplicon Group	IFC	Gilsoft	(s) 4	Screens Microcomputers	44
Anger Productions	(s) 21	Impex Software	22	Small Systems	52
Anirog	IBC	JCL	44	Stack Computer Services	(s) 11
Arrow Micro Services	(s) 30	Level 9	(s) 14	Superior Software	OBC
Audiogenic	(s) 26	Mermaid Software	27	Supersoft	49
Aurac	51	Microdeal	17	System 3 Software	(s) 25
BSF	24	Microport	(s) 28	Talent Computer Systems	(s) 23
Calco	27, 44	Micropower	(s) 2, 32	Tekform	22
Car Fleet Controls	29	Midland Computers	(s) 21	Terminal	(s) 31
Cascade Games	(s) 14	M.P.S. Software	(s) 28	Triptych Publishing	4, 5
Chronasonic	57	Precision Software	29	Viza Software	54
Commodore	8, 9	RAM Electronics	47	Zero Electronics	22
Corgi Books	50				
D&P Magnum	(s) 30				
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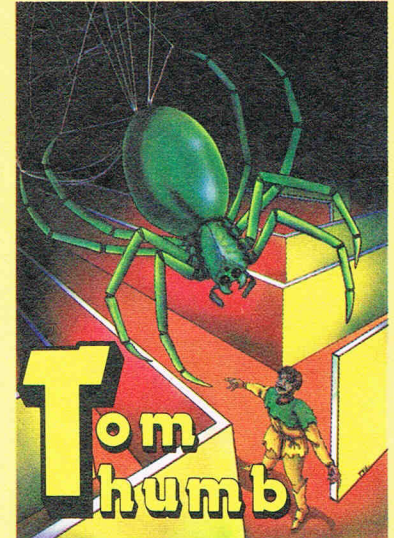
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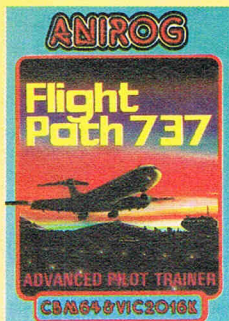
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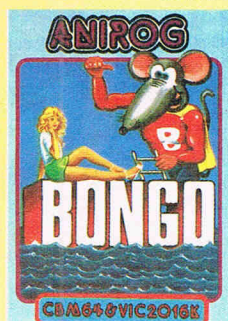
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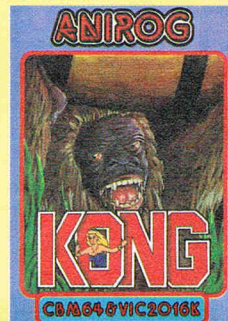
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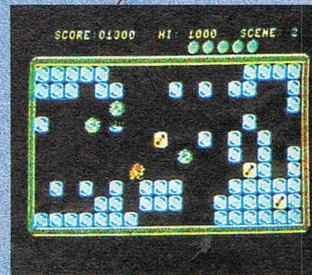
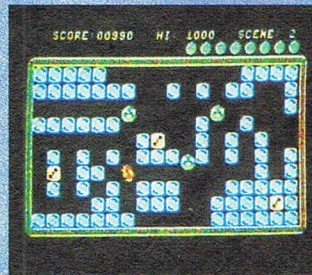
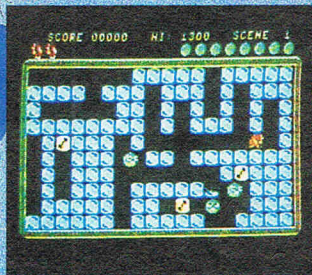
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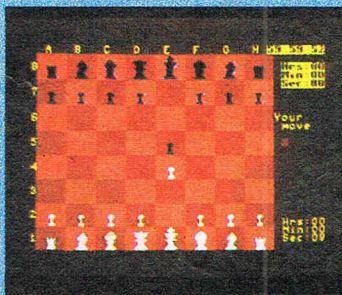
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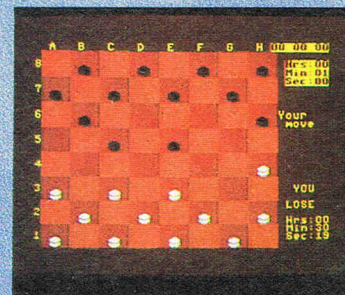
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# Games

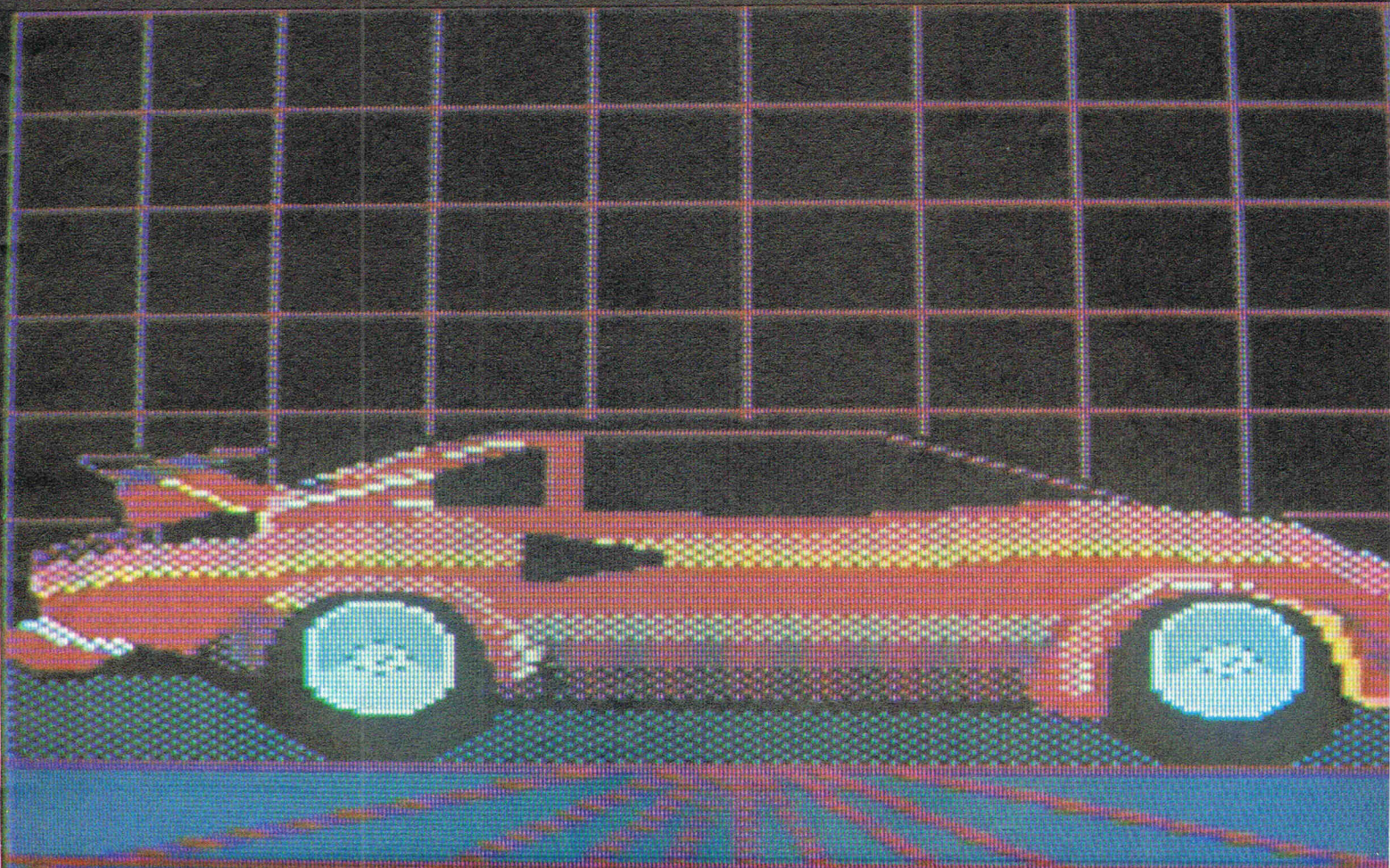
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## Mosaic adventures

Three illustrated text adventures based on popular books have been released by Mosaic Publishing.

Erik the Viking is based on the children's book *The Saga of Erik the Viking*, by Monty Python's Terry Jones. Programmed by Level 9 Computing, the game is designed to appeal to all ages from eight upwards and comes complete with a 20-page booklet containing extracts from the book.

The Stainless Steel Rat Saves the World, based on Harry Harrison's sci-fi classic, includes a paperback copy of the book. Michael Moorcock's Oswald Bastable stories are the basis for *The Nomad of Time*, which includes a 16-page booklet with an extract from the *Nomad of Time* trilogy.

All three adventures are available for the 64, costing £9.95 each.

**Contact:** Mosaic Publishing, 187 Upper Street, Islington, London N1. Tel: 01-226 0828.

## Virgin cuts

Virgin Games are reducing the price of 32 games down to £2.99 until the end of November. Included in this offer are Commodore titles such as *Falcon Patrol*, *Hideous Bill* and *Mission Mercury*.

Two new titles have also been announced. *Falcon Patrol II* continues the desperate desert war and features 3D graphics.

Terrorist puts the player in the role of Red Commander to an anti-terrorist squad with the mission of making safe a town.

Both these 64 titles cost £7.95.

**Contact:** Virgin Games, 2-4 Vemon Yard, Portobello Road, London W1. Tel: 01-727 8070.

## Death of the joystick

Could Cheetah Marketing's new Remote Action Transmitter (RAT for short) bring about the death of the traditional joystick?

RAT is a remote hand-held unit reliant on infra-red signals. Initially developed for the Spectrum, a 64 version is said to be in the pipe-line.

Retailing at £29.95, the RAT can only be used with Cheetah RAT and Kempston joystick compatible games. Software writers can incorporate RAT compatibility in programs through the use of a six line coding provided by Cheetah Marketing in both BASIC and Machine Code form.

RAT consists of two pieces of hardware: a black-cased receiver which plugs directly into the edge connector at the rear of the computer and a transmitter,

powered by a PP3 battery, which has been designed to fit neatly into the palm of either hand.

Touch controllable, the RAT utilises two touch sensitive pads — one controlling rapid fire and the other, direction.

Infra-red signals transmitted from the RAT's nose are picked up by the infra-red diode sited in the front of the receiver. As it operates on a different infra-red frequency to other products such as TVs and video recorders, it is claimed that the RAT will not cause any interference.

Signals are transmitted over a fairly wide angle and the RAT is said to operate at up to 30ft.

**Contact:** Cheetah Marketing, 24 Ray Street, London EC1. Tel: 01-833 4909.

## BT software range

British Telecom are entering the software market with a range of computer games under the label Firebird.

Twenty titles are being released this month as part of the Firebird Silver range. Costing just £2.50 each, titled for the 64 are *Mr Freeze*, *Booty*, *Exodus*, *Headache* and *Zulu* — all arcade style games.

Two arcade games are being released for the VIC 20 — *Snake Bite* and *Mickey The Brick*.

Richard Hooper, chief executive of British Telecom's Value Added Systems and Services, says: "In a market where quality and prices tend to be variable and complaints of misrepresentation frequent, Firebird software is setting new standards".

Future plans include the Firebird Gold range featuring premium titles priced and launched individually, and also educational and other types of programs.

**Contact:** British Telecom, 2-12 Gresham Street, London EC2. Tel: 01-357 3814.

## Adventure

Games Workshop are to release a 64 version of adventure game, *Tower of Despair*, in November.

Described as a 'new challenge to adventure gamers', *Tower of Despair* casts the player in the role of the Warrior-Mage of Castle Argent with the task of destroying evil Malnor, Demonlord of Darkness, who is about to ravage the realm of Aelandor.

Retailing at £7.95, the game will include an adventure guide containing a history and map of the realm of Aelandor together with vital clues to the adventure.

**Contact:** Games Workshop, 27/29 Sunbeam Road, London NW10. Tel: 01-965 3713.

## ZIM SALA BIM

Zim Sala Bim is a new scrolling graphic adventure for the 64 from Melbourne House. Russel Comte of Mugsy fame created the 3D scrolling graphics which are complimented by an exotic musical soundtrack.

Retailing at £9.95, the aim of the game is to retrieve stolen gold from the Sultan and return it to the elders of the village raided and pillaged by the Sultan.

A new colour-coding concept designed by Melbourne House enables the consumer to see at a glance which products are for which micros. (Commodore games are marked in red.)

**Contact:** Melbourne House, Castle Yard House, Castle Yard, Richmond. Tel: 01-940 6064.

## Hyper biker

PSS has released *Hyper Biker* for the 64.

A graphic representation of the popular cycle sport BMX, *Hyper Biker* enables up to four players to act out the more sophisticated manoeuvres associated with top quality bikers, such as wheelies, long jumps, high jumps and bunny hops.

Available on cassette at £7.95, control of the bike is via joystick or keyboard and track features include table top, whoop de doos, ramps, speed bumps, ditches and drop offs.

**Contact:** PSS, 452 Stoney Stanton Road, Coventry CV6 5DG.

### CONTENTS

News .....	3
Interview .....	5
Reviews .....	7
Show Report .....	12
Sport Special .....	13
Listings .....	19
Competition .....	22
Charts .....	24
Results .....	27
Feature .....	30

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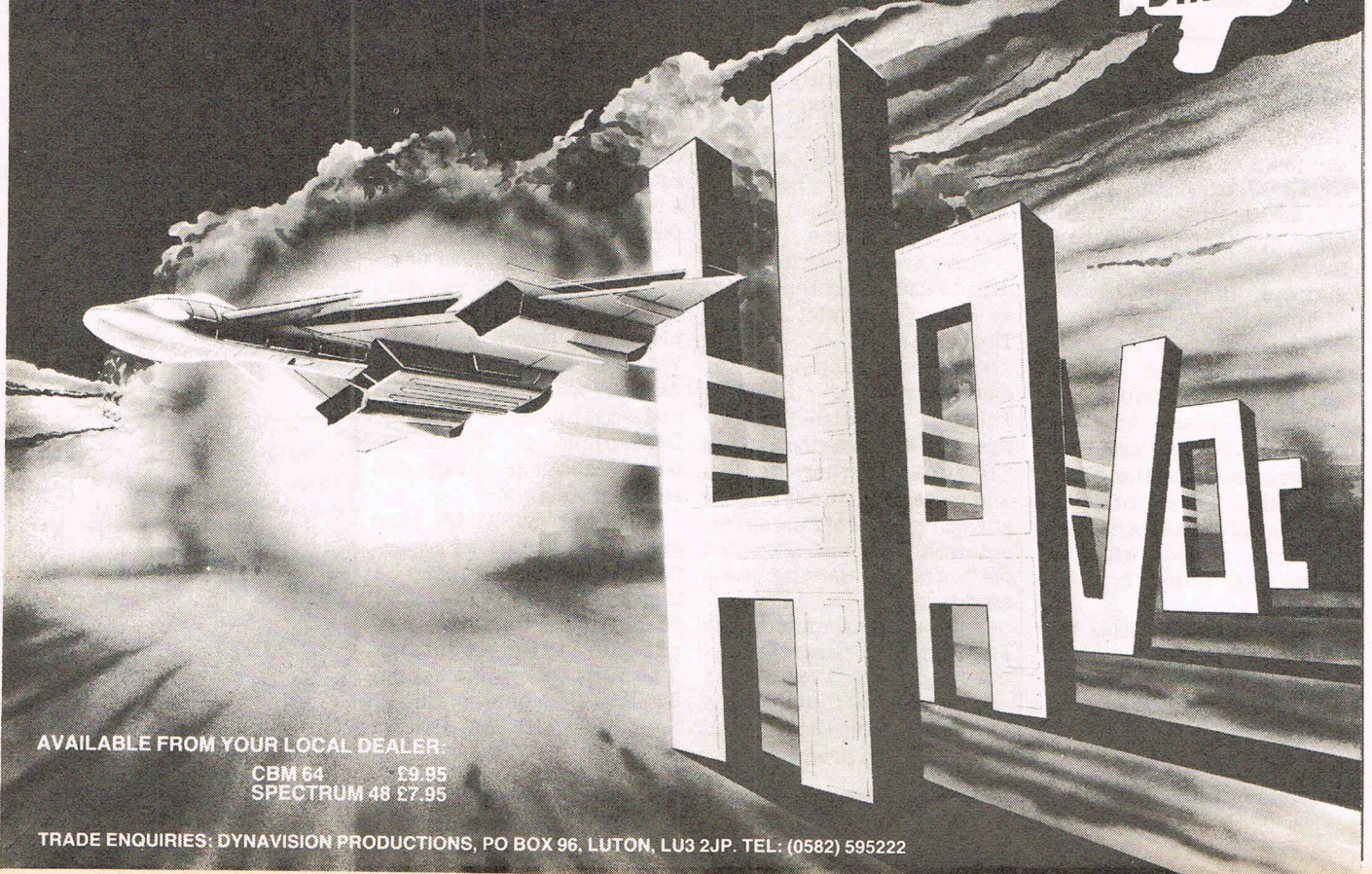
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# Computers- FASHION OR FUTURE?

**Sally Wood talks to Martin Maynard, managing director of Audiogenic, and finds that he has some rather interesting and perhaps controversial views about the industry he has chosen to make a living in.**

Audiogenic must be one of the oldest companies in the computer software business. CCI went along to Reading, the site of Audiogenic's factory premises, to talk to Martin Maynard about the company and his ideas about the business in general.

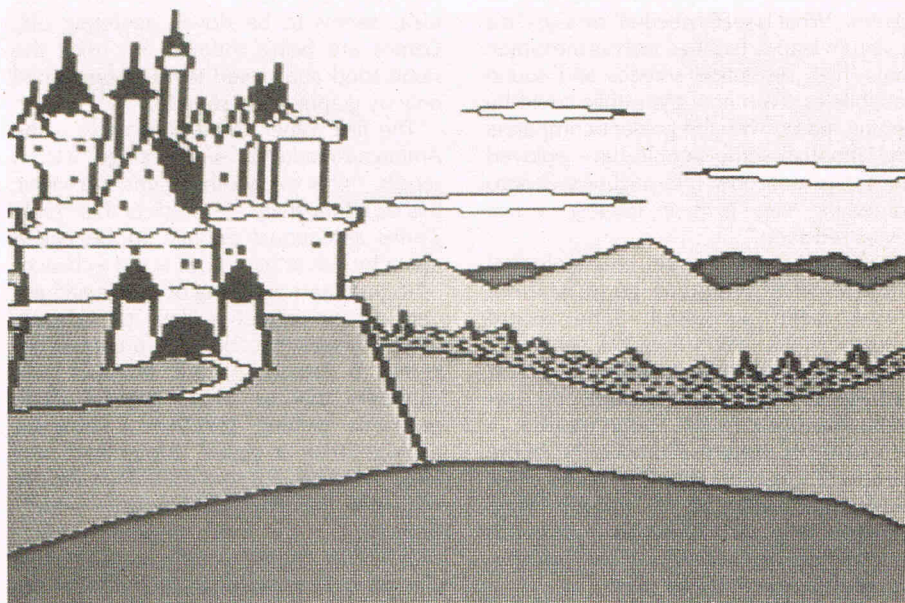
Audiogenic means faithfully reproduced sound and the name reflects the company's early beginnings as a recording studio where bands were managed and record deals carried out. After a few years, they branched out into cassette duplication until Martin decided that "there was more to this than duplicating" and they started to program games for the Commodore machines. Mockaker Blitz for the VIC 20 was their very first game.

By 1981 they were producing software in earnest and last year's net profits came to about £100,000. Martin expects those figures to double this year.

Audiogenic have succeeded in an extremely volatile business field — that of computer software where so many companies have failed, Imagine and Rabbit being two of the most recent casualties.

Martin attributes some of the Audiogenic's success to "luck" and concedes that Audiogenic are probably "more experienced in understanding what the industry wants". He says: "It's a fashion business and fashions are changing all the time!" He continues: "These companies have failed because they didn't know what they wanted

or what anybody else wanted, people want different things all the time — even in



*An illustration produced by Audiogenic's Koalapid*

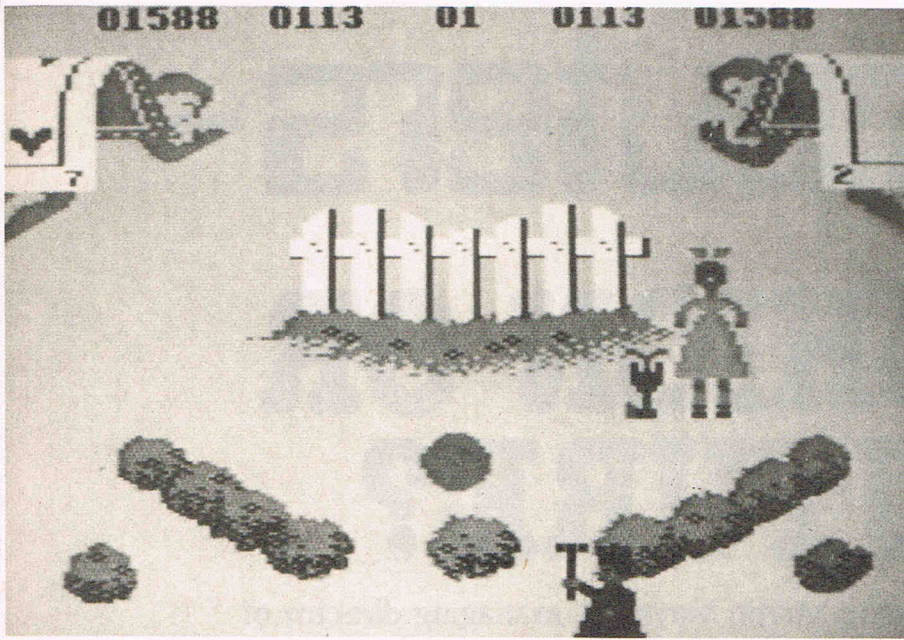
computers."

Software houses' precarious position will probably worsen. Martin believes that "computers are only just beginning to be consumer products" and are not yet a "true consumer item". Most consumer industries have to adapt to the everchanging fashions and fads of the public and the changes can be remarkably quick. A dress style or rock group can be the best thing since sliced bread one week and forgotten for ever the next!

Computers and software are on the

threshold of being in the same position, but not quite yet. Martin believes that it is still the enthusiasts who own computers, "Everyone these days owns a video and a record player but I'm not totally convinced it will ever be like that for home computers, cliques are still involved."

"Home computers are just toys" he says. "The quality of software is going to have to be significantly improved before home computers ever rise above toy status." For instance, Martin regards educational software as being merely "a gimmick" with



Screen shot from *Alice in Videoland*

very little genuine "educational merit".

Technological advances in computers over the past few years have not been as great as could be expected according to Martin. "What is really needed" he says, "is a quantum leap in facilities such as megabyte rams, high resolution screens and sound capabilities. Even now the public could be getting fed up with the present computers and although some people have enjoyed the fashion until now, they might move onto something else if their interest is not revitalised soon."

However in the past, technological improvements in consumer goods have not always been successful. "The record industry in the 1960's and 70's enjoyed a boom, and then declined almost as soon as innovations such as digital records and laser technologies appeared!" Martin recalls.

Despite his scepticism about the home computer market, Martin thinks that "computers will move on" and will creep "unobtrusively" into every home in goods such as fridges and cookers. "The microchip will evolve around us" he says.

"One area that is likely to improve is that of Communications" Martin thinks. Networks like Compunet, Prestel and Micronet will soon be in the home and "the house dweller will soon be dependent on those systems." Home shopping, banking and entertainment information will soon be available to anyone without leaving the house. "Home computers do have the capacity to become more than just games machines, but the possible applications will have to be developed and promoted."

Of course there have been tremendous changes in the industry over the last few years, the standard of games, their graphics

and sounds have improved dramatically and as Martin confirms: "No company would produce a game of the standards existing two years ago, now!" However new game ideas seems to be slowly peetering out. Games are being churned out using the same tried and tested ideas distinguished only by graphics and sounds.

"The first Miner game appeared on the American market a few years ago" Martin recalls. "Now every other game is a Manic this or miner that!" He predicts that "Only games sensational enough to be talked about by kids at school will stand a chance."

Programmers are tiring of games and the demand for utilities is likely to increase. Martin foresees that "business programs are going to become more popular" and considers that as "there are no more problems putting together a business package than a game" competition will force companies to start including software with their machines (Commodore already do so).

One of the most innocuous and seemingly unimportant inventions, the cassette has possibly been instrumental in the development of the home computer. It presents a convenient, safe and reliable means to store data for the user, although it has been overtaken by floppy disks and cartridges because of their superior memory and fast loading qualities. However not many computer owners own disk drives, Martin thinks only one in ten people do. Cartridges present the best means of storage, but the smaller software houses could not hope to produce the ten thousand at a time that would be needed to justify costs. Commodore are one of the few companies that can.

Martin considers the vertical pack density diskettes and compact audio disk (a record with laser engraved pits on the surface) to be alternative forms of data storage, although new computer designs would be needed.

Whatever Martin thinks of the industries future at the present, he is busily organising his products for the "massive Christmas" that he expects this year. More home computers are expected to be sold this year than at any other time and Audiogenic have a few new products to take advantage of the expected boom in Christmas shopping.

Swift, a home accounting program, combining word processing, budget accounts and a spreadsheet for under £50, Koalapad software - a printer routine and programmers guide and two adventure games, Magic Stone and Time Traveller are their newest products. In the future, Martin thinks that Audiogenic may concentrate more on peripherals and they hope to launch a mass storage device and the Gibson lightpen next year.

During the year, Audiogenic's games have been predominantly American. "Americans are a year ahead of us in the computer industry" Martin says, "But now the market has collapsed" and "the British and European markets have caught up and are now just as good if not better." Their two new adventures are from Holland. They do have a line of American software ready for release, but Martin felt "a bit cautious about putting them out!"

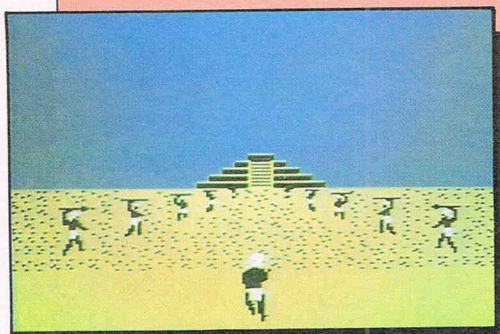
Audiogenic do not believe in having in-house programmers as in their experience, contracted ones produce better programs than those working from nine to five in the office. "They seem to thrive on working odd hours for days at a stretch" says Martin. "A comfortable secure working existence doesn't do them any good at all, they would do much better if they were on the breadline!"

On the software piracy front, Martin (a GOSH committee member) disagrees with current estimates of money lost through piracy. "People have greatly overestimated the losses" he says. "Audiogenic have lost money to large counterfeiting companies, but not on the scale people are quoting. There is no real solution, but I would like to see the authorities responsible taking more action in the software copyright legislation."

Martin concluded the interview with an opinion that since home computers came onto the market nothing immensely spectacular has happened. "What the industry really needed", suggests Martin, "is a Stephen Spielberg of computers to shake it up, inject enthusiasm, originality and innovation". A tall order, but you never know what might happen in an industry when nothing is certain except the fact that nothing is!

# A sound choice

Sound can add considerably to the success of a game. Here we have selected a few games which we feel merit attention for the use they make of sound either through the inclusion of a speech synthesiser or purely effective use of music



## AZTEC CHALLENGE

A test of endurance – an Aztec warrior must prove himself by running and jumping through a series of levels beset with danger. Using the joystick, the player guides the warrior through each of the seven levels – the gauntlet, stairs, temple, vermin, tiles, piranha and finally the bridge.

Dangers include falling spears, cracks in the floor, spiked tiles and piranhas. The graphics, colour and sound are excellent and the warrior's hair rises every time he jumps. On each level the music changes and the size of the buildings indicates how advanced the warrior is in completing the level.

Once the player has successfully completed all seven levels he automatically goes onto the next phase of difficulty where the action is much faster. There are four phases in total. Two players can play and each level offers five lives, once the next level is achieved the game restarts at the same level. Aztec Challenge is as its title suggests an excellently challenging game.

**Title:** Aztec Challenge

**Programmer:** Paul Norman

**Contact:** Audiogenic Ltd, PO Box 88, Reading, Berks. Tel: 01-290 6044 or 0734 586334

**Hardware:** CBM 64, disk drive and joystick  
**Type of game:** Arcade

**Graphics:** \*\*\*\*

**Sound:** \*\*\*\*\*

**Playability:** \*\*\*\*\*

**Description:** Aztec Warrior has to run and jump through seven levels avoiding traps and obstacles

**Price:** £8.95 (cassette) and £12.95 (disk)

**CCI Rating:** \*\*\*\*\*

## TWIN KINGDOM VALLEY

Twin Kingdom Valley will satisfy any yearning for adventure you may have.

Featuring a speech-synthesiser the action takes place in a valley belonging to two kings. This mountainous mythical region is covered in forests and moors and is largely inhabited by strong elves, trolls with broadswords, witches, castle guards and assorted creatures such as bunnies, skinny squirrels and mice.

The computer gives you the possible directions and you key in which way you want to go and what you want to do with any objects that appear.

One of the most attractive features about the game is the graphics. Very colourful pictures with moving clouds and animals illustrate your whereabouts and in many cases offer vital clues.

Castles, dungeons full of bones, grates, secret doors, and magic lakes are just some of the 175 locations in the game. Treasures like crystal balls, jewelled crowns, bags of silver, lie all over the place and placing them in the Sword Inn will ensure their safety.

Weapons, jugs and other items also help you on your way.

However the rather aggressive valley occupants continually try to kill you. Helpful tip – a polite coward will do much better than a rude aggressive and brave adventurer!

We enjoyed playing this game, it's well constructed, colourful and full of surprises.

**Title:** Twin Kingdom Valley

**Programmer:** Trevor Hall

**Company:** Bug-Byte Ltd., Mulberry House, Canning Place, Liverpool L1 8JB. Tel: 051 709 7071

**Hardware:** 64 and cassette recorder

**Type of game:** Adventure

**Graphics:** \*\*\*\*

**Sounds:** Speech synthesiser

**Playability:** \*\*\*\*

**Description:** Roam around the valley collecting as much treasure as possible without being killed

**Price:** £9.50

**CCI Rating:** \*\*\*\*

## TALES OF THE ARABIAN NIGHTS

Sultan Saladin believed all women to be faithless and after he'd spent one night with a wife he had her put to death (charming!)

The beautiful Princess Anitra is next on the list and Prince Imrahil sets out to save her.

His quest begins on board a ship where he has to collect all the jugs spelling ARABIAN whilst avoiding octopi, cannon balls and Rocs. Next he negotiates a crocodile infested river and has to duck the rocks thrown by hostile nomads. Once in the underground cavern, mad genies make life very difficult, but with your brilliant arcade skills, Imrahil will have no trouble. His final act must be to grab Anitra and sail away on a magic carpet.

Tales of the Arabian Nights is challenging entertainment and uses the 64's graphics and sound capabilities well. The program also includes a voice synthesiser which introduces you to the game!

**Title:** Tales of the Arabian Nights

**Programmer:** Ian Gray

**Company:** Interceptor Software, Lindon House, The Green, Tadley, Hants. Tel: 07356 71145

**Hardware:** 64, cassette recorder, joystick essential

**Type of game:** Arcade

**Graphics:** \*\*\*\*

**Sound:** \*\*\*\*\*

**Playability:** \*\*\*\*

**Description:** Rescue princess Anitra in this Arabian adventure

**Price:** £7 (cassette) and £9 (disk)

**CCI Rating:** \*\*\*\*

# COMBAT LYNX

From **DURELL**  
(Technical Support from Westland Helicopters)

An aerial illustration of a desert battlefield. In the lower-left, a tank is shown with a large, bright orange and red explosion erupting from its rear. The terrain is a mix of green and yellowish-brown, with a winding path or trench. In the distance, several missile trails with orange and yellow flames streak across the sky. The overall scene is dynamic and action-oriented.

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**DURELL** sales dept., Castle Lodge,  
Castle Green, Taunton, Somerset, TA1 4AB

## ARCHIPELAGO

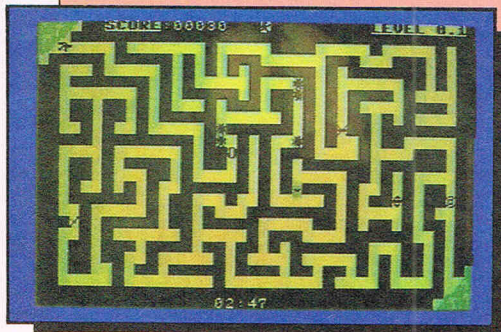
Lashed to a grating you somehow find yourself on a remote Pacific island completely alone. A storm rages around you — admirably shown with graphics in the opening screen shot of palm trees waving to and fro in front of dark stormy clouds.

Shelter appears in the form of a vast system of underwater labrynth linking the islands together. You jump inside the cave entrance and the real nightmare starts!

A maze forms to the sound of the Flight of the Bumble Bee by Rimsky Korsakov and the effect is absolutely brilliant. The best use of the 64's sound facilities that I have seen or heard.

Once in the maze, you are confronted by hordes of creepy hairy spiders who smell the man's presence and immediately head in his direction. Not only has the player got to guide the man through the maze to the next maze, he also has to collect five diamonds scattered at random. These have magic properties and while you can shoot the ever increasing tarantulas with your primitive energy lazer through these stones, they can't pass through.

If a spider gets to you, an amazing quantity of blood fills the maze. If they don't and you run out of time, the sea floods the maze and horrid devilfish give chase.



Altogether there are three levels of increasing difficulty and five mazes in each.

Archipelago is a super game in its own right, but with the excellent graphics and sound it deserves to do very well indeed.

**Title:** Archipelago

**Programmer:** Craig Renfrew

**Company:** Talent Computer Systems

**Hardware:** 64, cassette recorder or disk drive, joystick essential

**Type of game:** Arcade

**Graphics:** \*\*\*\*

**Sound:** \*\*\*\*

**Playability:** \*\*\*\*

**Fast loader:** Fast Burn

**Description:** Help the man to collect the diamonds, combat creatures and escape through all the mazes

**Price:** £7.95 (cassette) £9.95 (disk)

**CCI Rating:** \*\*\*\*

## ROOTIN TOOTIN

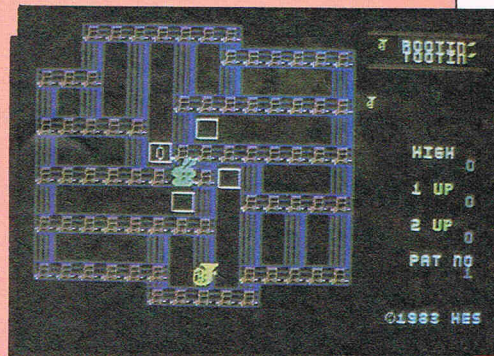
Rootin' Tootin sounds as if it's going to be a really happy fun game! But it wasn't, it was just another fairly ordinary arcade game played with weird musical instruments rather than Pac Men.

A Tuba is apparently trapped in a musical scale. It has the unenviable task of clearing away all the notes on one level and many levels afterwards to try and escape.

However, a mutated orchestra is after him and they appear in vast numbers from four boxes in the maze's centre. Besides avoiding them, which is difficult because they gang up and trap him, the only way to succeed is to blast the notes on the scale with the Tuba. The other method is to press the fire button and become temporarily invisible.

The pursuing hordes are worth points if eliminated. The pianha is worth the most at 800 and the more common Guitaro is only worth 200. Other participants include the Guitaro, Madphone, Trien and Cymbomb. Each one has its own peculiar way of trapping the tuba. The graphics are reasonably good, but the music let the program down. Good music would have transformed the game into something worth spending a few hours over.

There is a pause mechanism — useful if you want to leave the game in a tight spot and sup a wee dram of whiskey or perhaps tea. There are four difficulty levels and at least 21 mazes to play in.



Rootin' Tootin is an adaptation of a Japanese arcade game, but does not quite capture the excitement of an arcade game.

**Title:** Rootin' Tootin

**Programmer:** Bryce C. Nesbitt

**Company:** Hesware, Thorn EMI Software Company, Thompson House, 296 Farnborough Road, Farnborough, Hants. Tel: 0252 543333

**Hardware:** 64, cassette recorder or disk drive, joystick essential

**Type of game:** Arcade

**Graphics:** \*\*\*

**Sound:** \*\*\*

**Playability:** \*\*\*

**Fast loader:** Turbo

**Description:** Escape from the scale by trapping musical notes with your tuba.

**Price:** £9.95 (cassette) and £27.95 (disk)

**CCI Rating:** \*\*\*

## FLIP AND FLOP

A platform game with a difference — a very big difference actually! Flip, the kangaroo and Mitch monkey are desperately trying to escape captivity and you have to help them.

Suspended in mid air are a series of platforms joined together with ladders. On each platform there are marked squares and to make things a little trickier there are also some sticky squares. Flip starts and has to jump from square to square flipping over the marked ones. He can descend and ascend only by means of the ladder and one false move over the edge and precious life is lost (a bit like Q\*Bert).

Next it is Mitch's turn and the whole platform appears upside down! Mitch has to swing from square to square. To successfully complete each level, all the marked squares have to be flipped over in a certain time.

Once the movements have been mastered it gets much more difficult because the circus keeper gives chase to the kangaroo and a wire cage follows Mitch. After five levels, the player is rewarded with a touching scene of the two friends visiting all their old circus buddies.

Subsequent levels get more difficult as the platforms increase and there are at least 25 levels.

The sound is good and the graphical illusion of the upside down platform is very clever. Flip and Flop is completely addictive and it is going to be a best seller for a long time to come.

**Title:** Flip and Flop

**Programmer:** Jim Nangano

**Company:** Statesoft. Tel: 0438 316561 ext.298

**Hardware:** 64, cassette recorder or disk drive, joystick essential

**Type of game:** Arcade

**Graphics:** \*\*\*\*

**Sound:** \*\*\*\*

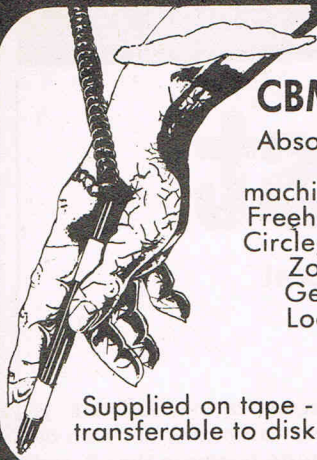
**Playability:** \*\*\*\*

**Fast loader:** Fastload

**Description:** Help Flip and Mitch escape from the Circus

**Price:** £8.95 (cassette) and £10.95 (disk)

**CCI Rating:** \*\*\*\*



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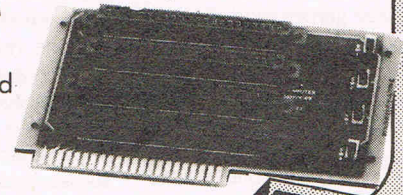
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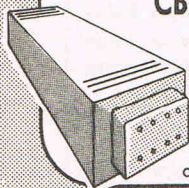
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**COMPUTER PRODUCTS**

# Pick of the best

Amidst the multitudes of products on show at the recent PCW Show, we discovered several which deserve a special mention.

The star of the PCW show was definitely Mirrorsoft's new Games Creator.

This program is simplicity in itself. No knowledge of programming is required to create original games.

Available for the 64 on cassette (\$12.95) or disk (\$15.95), the Games Creator comes complete with three games ready to play.

On screen instructions and a step-by-step booklet tell you all you need to know. Features which can be included in your game include: jumping with gravity effects, scrolling background, detailed scenery with barrier and killer effects, animated multicoloured sprite graphics, full length tunes, explosive sound effects, successive levels of difficulty, high speed bullets, and joystick or keyboard control.

In fact everything you could possibly want!

You don't even have to know about music to write a catchy tune. Cursor movement allows you to choose notes and instrument. The computer can then play your tune back.

An extremely impressive product which looks set to make a fortune for its young programmers, David (18) and Richard Darling (16).

The result of 10,000 risky man-hours and the possibility of a £25,000 prize greeted viewers of the Eureka! exhibit by Domark software publishers.

The package of five adventure games and five arcades all on one cassette is the first offering from the new company and takes the player on a trail of five eras in history. The plot unfolds in the days of dinosaurs and mammoths and goes through the Roman Empire, the King Arthur legend and World War II

before winding down with a spy adventure in the Caribbean of present day.

Eureka! is packed with riddles, clues and puzzles that a Domark spokesman says may take as long as 15 months to solve. But it may be worth the effort. A secret telephone number at the end of the adventure will yield £25,000 for the first person to find it and call the number. The package, which is available for the 64, also has a history of its own. It was compiled by a group of "Hungarians programming in secrecy behind the Iron Curtain. The team of 20 included: four graphic artists, two musicians, a professor of logic and an Oscar winning cartoonist," Domark says. The scripts and an accompanying colour-illustrated book of more clues and symbols were written by best-selling author Ian Livingstone who also wrote the Fighting Fantasy series.

The game will retail at £14.95 and will be available by mail order from 31 October. It should be in the shops by mid-November. The deadline for finding and calling the secret telephone number is 1 December 1985 and if no one has discovered the secret by then, the prize money will be divided among all registered owners of Eureka!

Contact: Domark, 228 Munster Road, London SW6.

Eight built-in voices to simulate guitar, piano and synthesiser are featured in a new music software package designed for the 64 by music publishers Music Sales Limited for Commodore.

The package comes complete with book of 28 popular songs and tutorial material as well as a 24-key piano-style keyboard that fits over the computer keyboard. The parameters of

each sound can be altered within the capability of the 64 to create different sounds, and modes selected from the menu include one which creates base rhythms ranging from waltzes to disco. Commodore say users need no previous musical experience for this portion of the program.

The more experienced can play three-note polyphonic music on the overlay keyboard while the keys are duplicated on screen and light up when corresponding notes are played.

Music Maker will be available before Christmas for less than £30, though the specific price hasn't been fixed. The program will be in disk and cassette form.

Contact: Commodore, 1 Hunters Lane, Weldon, Corby, N Hants NN17 1QX. Tel: 0536 205555.

Change a rabbit into a kangaroo, create a maze, pick a tune from a rainbow-coloured octave — all while you're learning.

That's the idea behind the latest five of eleven titles in the Good Housekeeping series of Mr T Early Learning programs available for the 64. Ebury Software introduced the new titles, compatible with the 64, at the PCW show. The second group of titles is aimed at a wider age range than the last set, which was designed for use by three-to-six year olds. Each program costs £9.95.

Contact: Ebury Software, 72 Broadwick Street, London W1. Tel: 01-439 7144.

Touch typing is given a whole new meaning with the launching of Touchmaster, a colourful, touch-sensitive surface that interfaces with the computer keyboard — either the 64 or VIC 20 — to simplify computer use for everyone.

Accompanying software is called Touchware, designed by software houses in the UK and the USA. In addition to games and teaching programs, various keyboard overlays cater to all tastes with a Multisound music synthesiser, Multipaint graphics package and the Graphics Editor. The first two are usable on the VIC 20 and the 64, the latter for the 64.

Once an overlay is fixed onto Touchmaster and the proper software is loaded, the simple touch of a finger gets the program started. Available in mid-October, the Touchmaster touchboard will cost £149. Programs cost extra.

Contact: Touchmaster Ltd, PO Box 3, Port Talbot, West Glamorgan, SA13 1WH. Tel: 0656 744770.

Essex University's famed Multi-User Dungeons (MUD) game will soon be available to Commodore 64 owners through the company's Compunet system.

Compunet was launched officially at the PCW show. It is a telephone-linked home micro service available to 64 owners who buy the Commodore Communications Modem. The Modem comes with all the software required to access Compunet and a year's subscription to the service, all at a cost of £99.99. The modem contains special software to secure material moving across the lines from interruption by bad phone connections.

In addition to features of Compunet described previously in CCI, the link-in with Essex University will allow a large number of players to participate in the Dungeons game.

Contact: Compunet Teleservices, Metford House, 15/18 Clipstone Street, London W1P 5DS.

# Sport For All

**Summer is over and the evenings are drawing in. Soon only the most dedicated will don track suits to pursue their chosen sport. In a burst of enthusiasm Sue Pearce and Sally Wood show great physical endurance in a multitude of sports. Well, admittedly it was from the comfort of an armchair!**

Sport-based games have come a long, long way since the days when the whole family was amazed at the revolutionary idea of being able to play games on the television in their own home. Hours were spent engrossed in controlling little rectangles (bats!) and hitting a cursor (the ball) from one side of the screen to the other. If you were lucky, you could also control the speed of the 'ball'. Amazing! Or so it seemed then.

From those humble beginnings, sport has grown into a popular area of the software market. Now, of course, things are a little more sophisticated. For example Commodore's own International Soccer game. Here you control a whole team with the ball being hit by the player nearest to it. Goals result in rapturous applause from the crowd and the winning team is presented with a cup, along with much celebration and flag waving.

Football is just one of the sport simulations available. The decision of where to draw the line between sport and simulation is not an easy one. Do you classify a flight simulator program as sport? What about games which have you parachuting out of planes? Can zapping the aliens be defined as target practise?

The arguments are endless, but for the purpose of this article we will stick to those games that obviously fit into this category. (Otherwise we could go on indefinitely!)

Interest in sport-based games was boosted during the summer with a flood of Olympic-based games hot on the heels of the 1984 Los Angeles Olympics. Heads must have rolled in the American software houses who missed out on this market completely and who had to resort to importing UK games.

The Decathlon was a popular choice with Ocean Software's Daley Thompson's Decathlon and Activision's version of the Decathlon which features tips from athlete David Crane.

Eleven field and track events have to be tackled in Micro Olympics from Database, while all the thrills of spills of the Slalom, Ski Jump and Downhill events are provided in Mr Chip's Olympic Skier.

In addition to these, Storm Software produced two programs for the Olympic enthusiast. The first lists all the medal winners since the 1896 Athens Olympics and the second enables you to record details of all the medallists in the Los Angeles Olympics, matching them against winners in the two previous Olympic games.

The Olympics is not the only sporting event to become the subject of a computer game. All the excitement of the Wimbledon fortnight is recreated in Wimbledon 64, a game from Merlin Software catering for both the beginner and the accomplished player. Cricket fans are also catered for by CRL's Test Match and Tim Love's Cricket from Peaksoft.

Football, basketball, tennis, Olympics – all very energetic. But what about those people who choose a more relaxing sport? They haven't been forgotten. In fact one of the earlier sport games to appear on the market was Romik's Pottit – a combination

of pool and snooker. And now the sports enthusiast has a choice of snooker and pool games from companies like HesWare.

A market is also emerging for ardent sports fans who want to use their computers for more than just simulating sport. BEC Sports, the UK and International distributors of soccer souvenirs have taken this opportunity to launch a database program for the 64 designed specifically for the soccer enthusiast. Called Your Team, the program enables fans to keep up to date records of his/her favourites, from First Division clubs to the local youth teams. A menu covers results, scores, attendances, personalities and statistics which, at the touch of a key, can be recorded in popular club colours. To boost sales, BEC is giving away a real leather match ball autographed by Bobby Charlton (for a limited period). The program, at £9.95 is only available from BEC Sports, BEC House, Highlands Avenue, Northampton. Tel: 0604 499246.

Here we look at a selection of sport-based games to guide you on your way.

The following review was submitted to us by a reader – G Adamson. (We are planning to form a reader's reviewing panel in the near future – watch this space for more details!)

## INTERNATIONAL SOCCER

This is undoubtedly the best sports simulation available for any micro, successfully capturing what so many previous attempts at sports simulations have failed to do. That is, to provide the feel of the sport capturing not only the action, but also the skill, excitement and competitive element.

To begin with you select team colours and choose whether or not you want to play an opponent or the computer – capable of playing at levels ranging from 1-9. You have a team of seven controlling the player nearest the ball, who's indicated by turning a lighter shade of the team colour. The action takes place on a horizontally scrolling pitch with the viewing angle reminiscent of Match of the Day.

Scoring causes the crowd to sway and cheer as they do when the victorious team is

presented with a trophy at the final whistle. Ball control and goalkeeping skills amongst others can be further developed, enhancing game play and allowing for some very realistic matches.

The graphics and playability are what really lift soccer above the majority of 64 software. The game is graphically superb and animation convincing. Sound effects although realistic are disappointingly not used to their full potential with occasional long, silent spells during the match.

**Title:** International Soccer

**Programmer:** Andrew Spencer

**Company:** Commodore, 1 Hunters Lane, Weldon Corby, N Hants. Tel: 0536 205555.

**Hardware:** 64, joystick essential

**Type of Game:** Sports simulation

**Graphics:** \*\*\*\*\*

**Sound:** \*\*\* **Playability:** \*\*\*\*

**Description:** Soccer game for one or two players

**Price:** £9.99 **CCI Rating:** \*\*\*\*\*



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6	CRUISER	23	STOMPER	41	SKETCH PAD
7	STARTRK	24	PINBALL	42	BUTZ
8	MARTIAN	25	CAVERN	43	FISHING MISSION
9	KNOCK OUT	26	LASER	44	MYSTICAL
10	BOOGLES	27	ALIEN	45	DIAMONDS
11	ALIEN ATTACK	28	CARGO	46	GALAXY DEFENCE
12	LUNAR LANDER	29	THE RACE	47	CYPHER
13	WAKE EATER	30	THE SKULL	48	RETMOBLE
14	MICROTRAP	31	ORBIT	49	BARREL JUMP
15	MOTORMAN	32	MUNCH	50	ATTACKER
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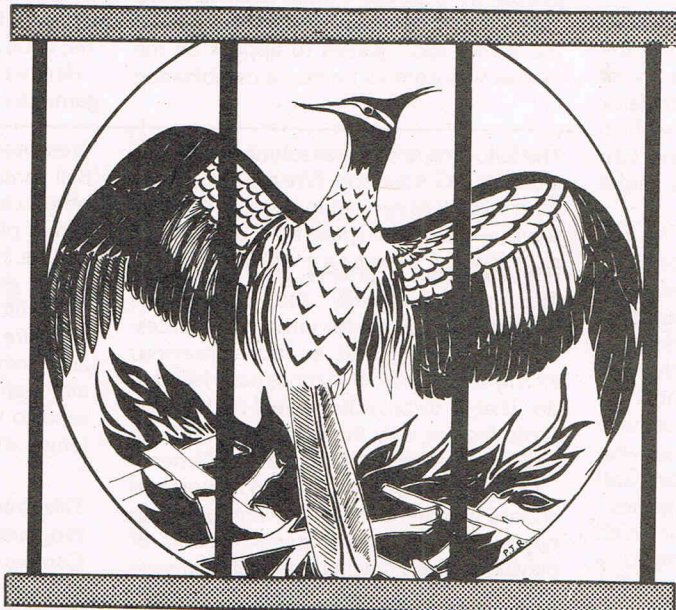
**4: SNOWBALL.** The first of Pete Austin's second trilogy. The giant colony starship, Snowball 9, has been sabotaged and is heading for the sun in this giant game with 7000 locations.

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**7: LORDS OF TIME.** Our congratulations to Sue Gazzard for her super design of this new time travel adventure through the ages of world history. Chill to the ice-age, go romin' with Caesars legends, shed light on the Dark Ages, etc. etc.

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**REVIEWS**

"Adventures which have a fast response time, are spectacular in the amount of detail and number of locations, and are available to cassette owners... Simply smashing!" - *Soft, Sept 83*

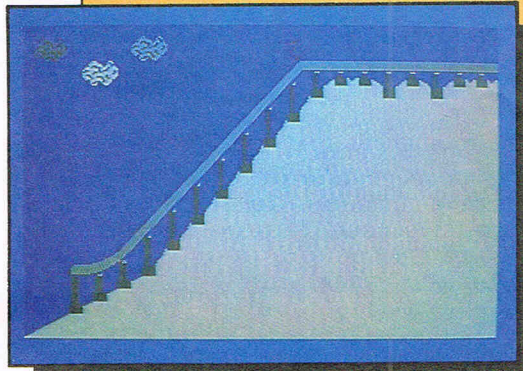
"Colossal Adventure is included in Practical Computing's top ten games choice for 1983: "Poetic and tough as hell." - *PC, Dec 83*

"To sum up, Adventure Quest is a wonderful program, fast, exciting and challenging. If you like adventures then this one is for you" - *NILUG issue 1.3*

"Dungeon Adventure is recommended. With more than 200 locations, 700 messages and 100 objects it will tease and delight!" - *Educational Computing, Nov 83*

"Snowball... As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denizens... this program goes to prove that the mental pictures conjured up by a good textual adventure can be far more vivid than the graphics available on home computers." - *Which Micro?, Feb 84*

"Lords of Time. This program, written by newcomer Sue Gazzard, joins my favourite series and is an extremely good addition to Level 9's consistently good catalogue... As we have come to expect from Level 9, the program is executed with wonderful style - none of those boring "You can't do that" messages! Highly recommended." - *PCW, 1st Feb 84*



## OLYMPIC SKIER

Olympic Skier features three of the Winter skiing events – the slalom, ski jump and downhill – and is really good fun to play.

In the slalom, the intrepid skier has to weave a course down the snow covered slope, through gates. Missing three results in immediate disqualification. Points are lost for a slow time, and knocking or completely missing gates. Crashing into any of the numerous rocks and logs means instant death. You know when you're dead because "splat" appears on screen and a helicopter bearing a stretcher whirrs onto the screen and carries away your corpse. Ugh!

Trees lining the downhill route can also present a nasty hazard. Luckily the joystick controlling the skier is extremely sensitive because evasive tactics are absolutely essential, especially in the downhill race.

The ski jump is accompanied by the theme tune to the television program, "The Saint" and perfect landings are required to complete the jump successfully.

Both the graphics and the sound are good. Bad scores are rewarded with remarks such as "hilarious, amusing, rubbish" or just plain "awful!"

Olympic Skier is the most addictive of the sports simulation games and this could be because it is so close to being an arcade game.

**Title:** Olympic Skier

**Programmer:** Shaun Southern

**Company:** Mr Chip, Neville Plac, Llandudno. Tel: 0492 79026

**Hardware:** 64, cassette recorder, joystick optional

**Type of game:** Sports simulation

**Graphics:** \*\*\*\*

**Sound:** \*\*\*\*

**Playability:** \*\*\*\*\*

**Fast loader:** None

**Description:** Ski skillfully in the slalom, ski jump and downhill events

**Price:** £5.99 (cassette) and £7.99 (disk)

**CCI Rating:** \*\*\*\*

## PLAY MICRO... OLYMPICS

"Awful" was my first reaction to the game and I'm afraid that feeling still hasn't changed.

Eleven Olympic events are featured; the 100, 200, 400, 1000 and 1500 metres, javelin, discus, hammer, pole vault, high jump and the long jump. There is no joystick and instead, two keys have to be selected by the player to represent the left and right feet. An additional key is chosen for jumping. No joystick is necessary.

Running races were again a dead loss, because no matter how hard the two keys are pressed, the computer-controlled competitor still wins. He is also vastly superior on every single other event. I absolutely hate losing!

Neither the sound or graphics were particularly good although the game was redeemed by some of the scornful remarks which flashed on screen if pathetic scores were achieved. For instance "it is the Olympics you know!" and for wayward discus throws the computer reported smashed television cameras or dead Olympic officials. False starts were recorded if the player starts running before the starter pistol finished firing.

It was a disappointing game and not the most successful sports simulation game on the market.

**Title:** Play Micro... Olympics

**Programmer:** Peter Davidson, Ches Jeske, Chris Price

**Company:** Database Publications, 68 Chester Road, Hazelgrove, Stockport

**Hardware:** 64, cassette recorder

**Type of game:** Sports simulation

**Graphics:** \*\*

**Sound:** \*

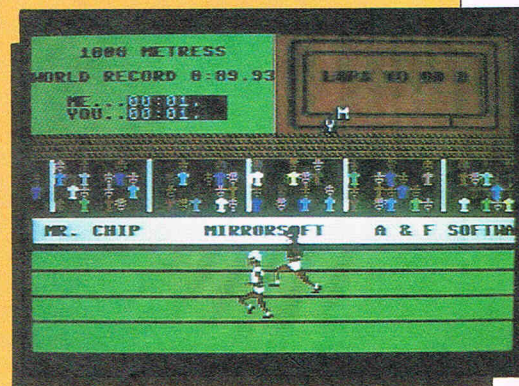
**Playability:** \*\*

**Fast loader:** None

**Description:** Compete eleven Olympic events

**Price:** £5.95 (cassette) £7.95 (disk)

**CCI Rating:** \*\*



## POOL CHALLENGE

The real challenge in this game was staying awake long enough to finish one of the six versions of Pool. It is a disappointing game because the idea sounds so good, but nothing seemed to work properly.

The screen featured a huge pool table with one white cue ball and six coloured balls collected together in the familiar triangle. A constantly changing power gauge runs up one side and this can be used to control the power of a shot – a low power rating will only produce a very weak one. A crosshair is placed between your cue ball and the coloured ball that you intend to hit. A joystick or keyboard can be used.

The first shot of any of the six game variations is a break and the idea is to place them into good playing positions. If your shot is too hard, half of them will instantly vanish and your score reaches atrocious levels.

There are three games each for one or two players. The variations are based around hitting numbered balls into the pockets in sequential order, or hitting a numbered ball into the correspondingly numbered pocket. 'Sinking' is what us experts call hitting a ball into the pocket.

The main trouble was that the balls seemed to disappear before they'd even reached the side and this phenomenon was at first confusing and then extremely irritating.

We used the cassette, so perhaps the disk version is an improved one – it should be since it's more than twice the price! The music is enjoyable, but sound alone is not enough in a game. Minnesota Fat's who is featured on the cover will turn in his grave if he sees this one!

**Title:** Pool Challenge

**Programmer:** N. Strange

**Company:** Hesware, Thorn EMI Computer Software, Thomson House, 296 Farnborough Road, Farnborough, Hants. Tel: 0252 543333

**Hardware:** 64, cassette recorder or disk drive, joystick optional

**Type of game:** Sports simulation

**Graphics:** \*\*

**Sound:** \*\*\*\*

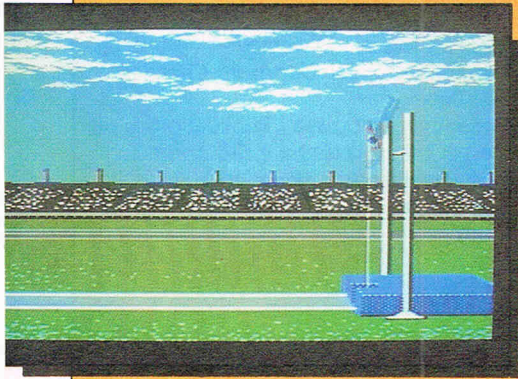
**Playability:** \*\*

**Fast loader:** Turbo

**Description:** Play six variations of Pool

**Price:** £9.95 (cassette) and £27.95 (disk)

**CCI Rating:** \*\*



## SUMMER GAMES

This must rate as one of the best sport simulations on the market. The player has the opportunity to compete in eight events: pole vault, platform diving, 100m, 4x100m relay, gymnastics (vaulting horse), 100m freestyle swimming, 4x100m freestyle, skeet shooting (clay).

An American originated game, the player has the option to compete in either one or all of the events in succession.

The introductory screens certainly merit a mention, with an athlete entering the stadium bearing the Olympic flame — all to the sound of the Olympic anthem. When the flame is lit, white doves fly across the screen.

Another nice touch is that you can choose which country you wish to represent. This is done by moving the cursor over a choice of 30 flags. When you have chosen that country's national anthem is played.

Each event is loaded individually so it makes sense to go for the disk version rather than the twin-cassette package — assuming you own a disk drive.

World records are stored and if the player breaks a record the file is updated. Winners

of any events get their national anthem played and flag displayed.

The graphics in this game are superb. For example, in the pole vault the pole bends very realistically. Highly recommended.

**Title:** Summer Games

**Programmer:** American author

**Company:** Quicksilver, Palmerston Park House, 13 Palmerston Road, Southampton. Tel: 0703 20169

**Hardware:** 64, cassette player or disk drive, joystick required

**Type of game:** Sport simulation

**Graphics:** \*\*\*\*\*

**Sound:** \*\*\*\*\*

**Playability:** \*\*\*\*\*

**Description:** Compete in Olympics

**Price:** £14.95 (twin-cassette) and £19.95 (disk)

**CCI Rating:** \*\*\*\*\*

## POTTIT

Arguably the most uncomplicated game on the market, Pottit still manages to sustain mildly addictive properties!

The billiard table holds three balls — a white, a black and a red. The first two are the cue balls and belong to the two competitors. The idea is to control the ball with the joystick and knock the red into one of the four pockets.

Points are scored by pocketing a red ball, hitting an opponents ball as soon as a red ball is potted, hitting red first if the two cue balls collide and if the opponents cue ball goes down a pocket.

The graphics are quite good and the sound of the balls hitting each other is realistic. Joystick control is quite difficult and rather insensitive. This ungainly control only adds to the sheer silliness of the game, but I wouldn't have it any other way.

Pottit is a harmless funny game and not to be taken seriously by anyone!

**Title:** Pottit

**Company:** Romik, 272 Argyll Avenue, Slough, Berks

**Hardware:** 64, cassette recorder, 2 joysticks essential

**Type of game:** Sports simulation

**Graphics:** \*\*\*

**Sound:** \*\*\*

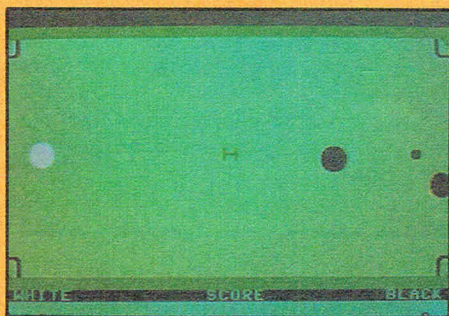
**Playability:** \*\*\*\*\*

**Fast loader:** none

**Description:** Pocket red balls and hit opponents cue ball to win points

**Price:** £???

**CCI Rating:** \*\*\*\*\*



## DALEY THOMPSON'S DECATHLON

It says on the cover "simulates all ten events in this the most gruelling event in the History of the Olympiad" and I completely agree!

The most gruelling part was waggling the joystick from side to side in a desperate attempt to finish the running races — winning was almost impossible! The 1500 was the worst, I felt totally exhausted and nearly ended up with severe wrist strain!

Ten events are played over two days — 100, 400, 1500 metre running races, 110 metre hurdles, long jump, high jump, pole vault, discus, shot and javelin. The screen shows us the arena with the appropriate scene for the sport. High jumps, hurdles, red race tracks and even a sand pit complete with a little man who rushes out and rakes the sand after every jump. The crowd oversee all events and cheer wildly for a good performance.

A scoring system at the top of the screen was rather messy, but featured the world



records for each event alongside the players time, distance or height. Achieving a qualifying time is essential for point scoring.

The graphics were quite good and some of the complicated movements like high jump and running were very accurate. Sound was adequate. If your wrist is up to it, this game is most suitable for armchair Decathlon enthusiasts.

**Title:** Daley Thompson's Decathlon

**Programmer:** Bill Barna and two others

**Company:** Ocean Software, Ocean House, 6 Central Street, Manchester 2. Tel: 061 832 9143

**Hardware:** 64, cassette recorder, joystick essential

**Type of game:** Sports simulation

**Graphics:** \*\*\*

**Sound:** \*\*\*\*\*

**Playability:** \*\*\*

**Fast loader:** Novaload

**Description:** Compete in the Decathlon with Daley

**Price:** £7.90

**CCI Rating:** \*\*\*



# Stay cool. Stay low. Stay alive.



## RIVER RAID

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

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

The mission is seemingly hopeless.

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

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

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

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

Each target you destroy adds to your points  
score.

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

Chocks away!

Lose yourself in the world of

 **ACTIVISION**®



## HESGAMES

Six events are covered in HesGames: 100m sprint, 110m hurdles, long jump, archery, spring board diving and weight lifting. More than one player can participate in each event with the program keeping a record of scores and showing rank position.

As in Quicksilva's Summer Games, each event is loaded individually. Movement is controlled by a joystick. While this does take a bit of time to get used to, the joystick is actually quite sensitive to movement.

## POLE POSITION

A particular favourite here at CCI, Pole Position (available on cartridge) offers three choices of track: Malibu Grand Prix, Namco Speedway and Atari Grand Prix.

A practise run will send you on the track with no cars to compete with. The 64's function keys are used to select the track and the player chooses between one and eight laps of the track.

The object of the game is to complete the course without going off the track and avoiding other cars. Points are awarded for the time in which you complete the course and the number of crashes.

Your car is controlled by the joystick, with the fire button selecting a choice of two gears. Extended play is offered if you do well.

There are some nice touches to this game. After you select the track, 'prepare to

The game does make good use of graphics, although they are on the chunky side.

Sound is not used extensively, but is effective. Apart from applause from the crowd, a nice touch is the differing sounds produced by dropping weights. A heavy weight results in a heavy 'clunk' and vice versa.

**Title:** HesGames

**Programmer:** American author

**Company:** HesWare, Thorn EMI Computer Software, Thomson House, 296 Farnborough Road, Farnborough, Hants. Tel: 0252 543333

**Hardware:** 64, disk drive, joystick essential

**Type of game:** Sport simulation

**Graphics:** \*\*\*\*

**Sound:** \*\*\*\*

**Playability:** \*\*\*

**Fast loader:** None

**Description:** Compete in six events

**Price:** £27.95

**CCI Rating:** \*\*\*\*

qualify' appears on the screen. This round determines where your starting position is in the race. Pole Position is number one, but we were lucky to get eighth position!

Graphics are very realistic as is the sound, with engine revs and screeching tyres. A highly addictive game.

**Title:** Pole Position

**Programmer:** American Author

**Company:** Atarisoft, Atari House, Railway Terrace, Slough, Berks. Tel: 0753 33344

**Hardware:** 64, joystick essential

**Type of game:** Sport simulation

**Graphics:** \*\*\*\*\*

**Sound:** \*\*\*

**Playability:** \*\*\*\*\*

**Fast loader:** n/a

**Description:** Complete a race course in the fastest time

**Price:** £14.99

**CCI Rating:** \*\*\*\*\*

## FOOTBALL MANAGER

The armchair football expert who is critical of today's quality of play and its management will welcome this game with open arms.

It is not a football simulation game. The player assumes the role of the team manager and all the worries that go with it. Using cunning strategy, luck and an awareness of the game, the aim is to move a football team from Division four up to the first.

Everything that the manager might have to cope with in the world of football is included. Finances, selling or buying players, the teams fitness, skill, energy and even its morale have to be considered as they all play a part in the game.

On screen the teams football skills are listed — energy, skill, morale, defense, attack and midfield and given grades. You have to make decisions whether or not to keep a player who is high on skill, but low on energy or the other way round.

The team has to be selected by replacing injured players with a pool or buying good ones, selling bad ones or just recruiting those who haven't already been picked by the computer. Once the team is ready, the match is played on screen, but only the highlights are shown. The result effects team morale and gate money among other things.

Once fifteen of these league games have been played, only the top three in the division move up!

## DECATHLON

The qualities "Speed, strength, stamina and the desire to win" quoted on the pack were certainly needed to get anywhere in the running events!

Every single race involved a frantic side to side movement with the joystick and it was made worse because the opponent was Carl Lewis, Sebastian Coe and Superman rolled into one. I just couldn't overtake him which is very demoralising for an atrocious loser!

The Ten Decathlon events: 100, 400, 1500 metre running races, 110 metre hurdles, discus, shot, javelin, long jump, high jump and pole vault were, of course, all included. Your opponent is a rather attractive athlete clad in a white sports tunic and white headband.

The screen is well set out and the graphics are extremely good. Scores are clearly recorded, although a world record could have been included to compare results with.

For the throwing and jumping events, a lot of practise is needed, but after a while the complicated joystick and fire button controls can be mastered.

I enjoyed this game and it is probably one of the better games celebrating the Los Angeles Olympics.

**Title:** Decathlon

**Programmer:** David Crane

**Company:** Activision, CGI House, Goldings Hill, Loughton, Essex

**Hardware:** 64, cassette recorder, joystick optional

**Type of game:** Sports simulation

**Graphics:** \*\*\*\*

**Sound:** \*\*\*\*

**Playability:** \*\*\*\*

**Fast loader:** None

**Description:** Compete in ten Decathlon events

**Price:** £9.99

**CCI Rating:** \*\*\*\*

Football Manager is totally absorbing and extremely addictive. For £7.95 you just can't beat it for thrills and spills! I was sitting on the edge of my seat hoping desperately that I'd moved up a division!

**Title:** Football Manager

**Programmer:** Jean Frost

**Company:** Addictive Software

**Hardware:** 64, cassette recorder

**Type of game:** Strategy

**Graphics:** \*\*\*

**Sound:** n/a

**Playability:** \*\*\*\*\*

**Fast loader:** none

**Description:** Manage a football team from the fourth division into the first

**Price:** £7.95

**CCI Rating:** \*\*\*\*

# PET chomper!

Here's a program for PET owners who sometimes complain of feeling left out. It's a game for use on the 40-column PET, called Chomper.

This is a game of skill in which you are required to steer your snake around an oblong course filled with food. It makes its way through the course eating the food and leaving crumbs. It will not stop or change direction and your only control comes when it reaches one of the four gaps in the course. By using the number keys you can make it change lanes out of the path of the little creature which comes in the opposite direction to devour you. It moves at exactly the

same speed but has less manoeuvrability when it comes to change lanes (you can change up to four lanes at a time whereas it can only change one).

The creature will try to get into your lane where he can eat you. Eating the barrel will give you extra points but be warned, it leaves a place which the creature can use to change lanes.

Dots (.) – score 1 point each.

Barrels (O) – score 5 points each.

```

1 REM*****
2 REM* *
3 REM* CHOMPER *
4 REM* *
5 REM* N.A.SCHOFIELD *
6 REM* *
7 REM*****
8 M=0
9 PRINTCHR$(147)
10 PRINT:PRINT" "
20 PRINT" "
30 PRINT" "
40 PRINT" "
50 PRINT" "
60 PRINT" "
70 PRINT" "
80 PRINT" "
90 PRINT" "
100 FORA=1TO4
110 PRINT" "
120 NEXTA
130 PRINT" "
140 PRINT" "
150 PRINT" "
160 PRINT" "
170 PRINT" "
180 PRINT" "
190 PRINT" "

```

```

200 PRINT"█ █..... █ "
210 PRINT"█ █"
220 Y=33670
230 I=33169
240 GOSUB2000
250 D1=1
260 D2=-40
280 P=46
290 C=58
300 G=4
310 K=4
320 F=0
500 POKEY,42
510 POKEI,214
600 FORA=1TO40:NEXT
700 POKEY,C
870 IFPEEK(I+D2)=160THENGOSUB2070
878 POKEI,P
879 P=PEEK(I+D2)
880 I=I+D2
890 IFPEEK(Y+D1)=160THENGOSUB2030
899 C=PEEK(Y+D1):IF C=46THENC=58:S=S+1:F=F+1:IFF=280THEN 9
900 Y=Y+D1
910 IFC=87 THENS=S+5:C=61:GOSUB2000
915 IFPEEK(151)<>255ANDC=32THENGOSUB2160
920 IF G<>K ANDPEEK(I-(D2*3))=32ANDP=32THENGOSUB2300
930 IFF=61THENGOSUB2300
940 IFF=61THENP=58
950 IFY-1=IORY+1=IORI=YORY+40=IORY-40=ITHEMM=M+1:GOTO2120
1000 GOTO500
1999 END
2000 B=INT(RND(1)*820)+32800
2010 IFPEEK(B)=46ORPEEK(B)=58THENPOKEB,87:RETURN
2020 GOTO2000
2030 IFD1=1THEND1=-40:RETURN
2040 IFD1=-40THEND1=-1:RETURN
2050 IFD1=-1THEND1=40:RETURN
2060 IFD1=40THEND1=1:RETURN
2070 IFD2=-40THEND2=1:RETURN
2080 IFD2=1THEND2=40:RETURN
2090 IFD2=40THEND2=-1:RETURN
2100 IFD2=-1THEND2=-40:RETURN
2115 RETURN
2120 FORQ=1TO5
2125 POKEY,169:FORA=1TO30:NEXT:POKEY,214:FORA=1TO30:NEXT:POKEY,163
2130 FORA=1TO30:NEXT:POKEY,164:FORA=1TO30:NEXT:POKEY,
165:FORA=1TO30:NEXT
2140 POKEY,219:FORA=1TO30:NEXT
2142 NEXTQ
2143 IFM=3THEN2250
2145 FORA=1TO150:NEXT
2150 GOTO9

```

```

2160 IF(PEEK(151)=42ANDD1=40ANDG<4)THENY=Y-2;G=G+1;RETURN
2170 IF(PEEK(151)=42ANDD1=-40ANDG>1)THENY=Y-2;G=G-1;RETURN
2180 IF(PEEK(151)=41ANDD1=40ANDG>1)THENY=Y+2;G=G-1;RETURN
2190 IF(PEEK(151)=41ANDD1=-40ANDG<4)THENY=Y+2;G=G+1;RETURN
2200 IF(PEEK(151)=50ANDD1=1ANDG>1)THENY=Y-80;G=G-1;RETURN
2210 IF(PEEK(151)=50ANDD1=-1ANDG<4)THENY=Y-80;G=G+1;RETURN
2220 IF(PEEK(151)=18ANDD1=1ANDG<4)THENY=Y+80;G=G+1;RETURN
2230 IF(PEEK(151)=18ANDD1=-1ANDG>1)THENY=Y+80;G=G-1;RETURN
2240 RETURN
2250 IFS>S1 THENS1=G
2260 PRINT "#####SCORE "S
2265 PRINT "#####HI-Score" S1
2270 PRINT "#####CANOTHER GAME?"
2280 IFPEEK(151)=255THEN2280
2290 IFPEEK(151)=54THEN8
2295 END
2300 IFD2=1ANDK<GTHENI=I-80;K=K+1;RETURN
2310 IFD2=1ANDK>GTHENI=I+80;K=K-1;RETURN
2320 IFD2=-1ANDK<GTHENI=I+80;K=K+1;RETURN
2330 IFD2=-1ANDK>GTHENI=I-80;K=K-1;RETURN
2340 IFD2=40ANDK<GTHENI=I+2;K=K+1;RETURN
2350 IFD2=40ANDK>GTHENI=I-2;K=K-1;RETURN
2360 IFD2=-40ANDK<GTHENI=I-2;K=K+1;RETURN
2370 IFD2=-40ANDK>GTHENI=I+2;K=K-1;RETURN
2380 RETURN
    
```

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**Anger**  
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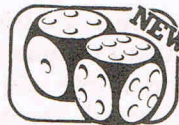
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# Win the Casio MT-200 plus PA1 interface



Be a Twentieth Century Beethoven...  
make music on your micro and win the  
Casio MT-200 keyboard and PA1 interface

If you consider yourself a budding musician, we are looking for the most original piece of music written on the Commodore 64.

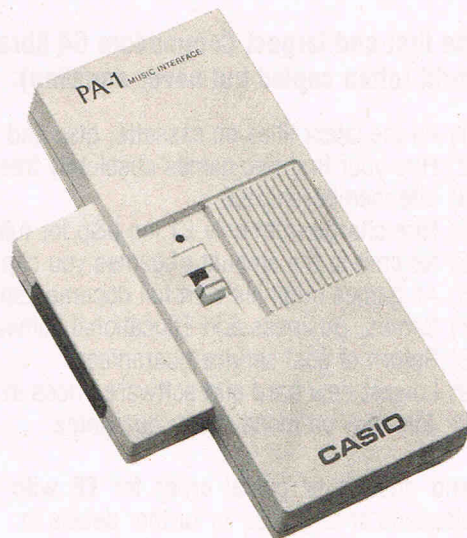
Our first prize is the MT-200 keyboard and PA1 Interface, which connects the keyboard to a 64.

In addition to this, the 10 best entries will be professionally recorded onto a CCI computer music compilation tape which will be presented to the 10 winners. We will also offer this compilation tape to our readers through the magazine.

Entries should be no longer than three minutes long and should reflect the title of the piece. A panel of judges will select the winning entries and this panel will include the Editor, CCI's resident musician Paul Fenton (Advertisement Executive) and also a well-known professional musician.

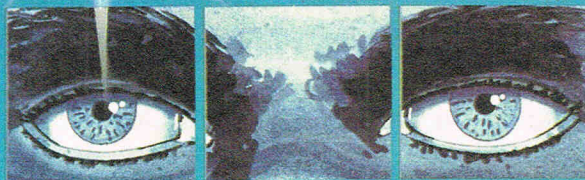
The closing date for the competition is 10 November 1984. Your entry should be submitted, on cassette, to Music Competition, Commodore Computing International, Finsbury Business Centre, 40 Bowling Green Lane, London EC1.

If you would like your cassette returned to you, please enclose a stamped addressed envelope.



We've got the

# TALENT



and our games prove it!

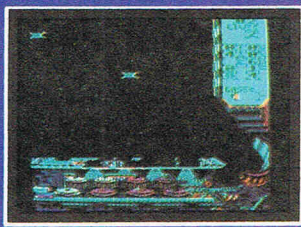
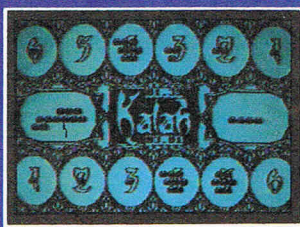
Amazing graphics, fast and furious action, challenging strategy, compelling adventure – this first wave of games from TALENT has got the lot!

Written by professional computer scientists using powerful new programming techniques (which leave machine code standing), these games have pushed home micros to the very limit.

## Kalah



## ARCHIPELAGO



### KALAH

One of the oldest games in the world! Originally played by Bedouins using pebbles and holes scooped in the desert sand, this strategy game has absorbed the mind of man for thousands of years. Superb graphics and music, with a choice of levels and depth of search. Easy to learn, fiendishly difficult to beat!

Commodore 64 Cassette £7.95 Disk £9.95

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COMMODORE SOFTWARE WILL SHORTLY BE AVAILABLE ON COMPUTET

### ARCHIPELAGO

Dare you venture into the ancient undersea labyrinths which link the islands of the Archipelago? Fabulous jewels await you there – but the guardians of the treasure mark your every move, waiting to deal a swift and terrible vengeance. How long can you survive?

A fast-moving, action-packed game with brilliant graphics, animation and music.

Commodore 64 Cassette £7.95 Disk £9.95  
(Joystick needed)

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A compulsive adventure game set in a ghost town in the Wild West. Your task – to flush out a gang of bank robbers and retrieve their loot – with only your trusty steed and your six-shooter to aid you!

Test the speed of your draw, your skill at cards, your powers of survival!

The first of a stunning series of adventure games from Allan Black, played in real-time.

Commodore 64 Cassette £9.95 Disk £12.95  
BBC Model 'B' (text only) Cassette £7.95  
Electron (text only) Cassette £7.95

### PANORAMA (H)

An outstanding graphics package for the Commodore 64. Features include: free-hand sketches, circles, ellipses, block move, copy and reverse, magnification choice of cursor, joystick or key control. PLUS texture definition and texture and colour fill. PANORAMA (H) uses the full colour facilities of the Commodore 64.

Commodore 64 Cassette £17.95 Disk £19.95  
The programme is mouse-driven and comes with a comprehensive illustrated instruction booklet.



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Talent games should shortly be available from your local software retailer – or post off the coupon now.

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PANORAMA (H)	—	Disk (£19.95)	<input type="checkbox"/>
ARCHIPELAGO	—	Cassette (£ 7.95)	<input type="checkbox"/>
ARCHIPELAGO	—	Disk (£ 9.95)	<input type="checkbox"/>
KALAH	—	Cassette (£ 7.95)	<input type="checkbox"/>
KALAH	—	Disk (£ 9.95)	<input type="checkbox"/>
WEST	—	Cassette (£ 9.95)	<input type="checkbox"/>
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# TOP TWENTY

	GAME TITLE	MACHINE	COMPANY	PRICE (£)
1	Daley Thompson's Decathalon	CBM64	Ocean	7.90
2	High Noon	CBM64	Ocean	7.90
3	Decathalon	CBM64	Activision	9.99
4	Pitfall II	CBM64	Activision	9.99
5	Havoc	CBM64	Dynavision	9.95
6	Kokotoni Wilf	CBM64	Elite	6.95
7	Toy Bizarre	CBM64	Activision	9.99
8	Flip and Flop	CBM64	Statesoft	8.95
9	Astro Chase	CBM64	Statesoft	8.95
10	Stunt Bike	CBM64	Ocean	6.90
11	River Raid	CBM64	Activision	9.99
12	Zim Sala Bim	CBM64	Melbourne House	9.95
13	Monty Mole	CBM64	Gremlin Graphics	7.95
14	Falcon Patrol II	CBM64	Virgin	7.95
15	Death Star Interceptor	CBM64	Systems 3 Software	9.99
16	Battle Four Midway	CBM64	PSS	9.95
17	Zenji	CBM64	Activision	9.95
18	Strip Poker	CBM64	US Gold	9.95
19	Dodo Lair	VIC20	Software Projects	5.95
20	Jack and the Beanstalk 64	CBM64	Thor Computing	7.95

## BUBBLING UNDER

Zaxxon	CBM64	Synesoft	9.95
Psytron	CBM64	Beyond	7.95
World Cup	CBM64	Artic	6.95
Big Mouth	CBM64	Walltone	7.95

Compiled by Microdealer UK(AS)



# DEATHSTAR INTERCEPTOR

Each planet orbited by an Empire Deathstar, can you penetrate its defences and destroy it before it destroys you? 52K of pure machine code to give you 12 screens of 3D graphics, super smooth 3D animation, unbelievable sound effects, music, 4 skill levels and hiscore table... this is the ultimate challenge!

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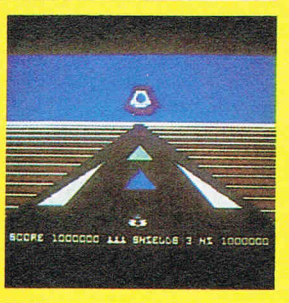
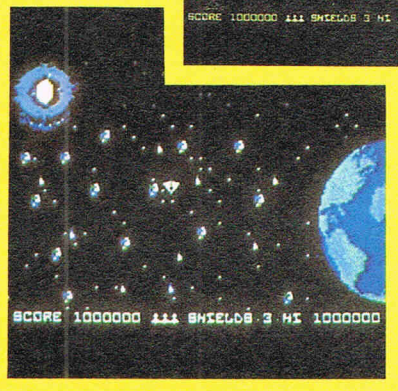
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# Alice IN VIDEOLAND



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Join Alice in her journey through Videoland - an enchanted place populated by strange creatures such as bread-and-butterflies and pipe smoking caterpillars; where little girls change size and flamingos turn into croquet mallets!

Alice in Videoland is a revolutionary new concept in entertainment for the Commodore 64, incorporating some of the finest graphics ever seen on any home computer, accompanied by a charming musical score. There are four different game scenes involved, and your performance in earlier ones will affect your ability to get through later ones and determine your eventual total score.

**Scene One** - Stunning title page graphics give way to the first game scene as Alice falls into the rabbit's warren. Score points for collecting the objects to be found there - including keys to open doors, bottles to make her smaller, cakes to make her bigger!

**Scene Two** - Out in the garden the Cheshire cat looks on as Alice meets the pipe-smoking caterpillar. Help her to catch the bread-and-butterflies and the rocking-horse flies that change into the balls used in the croquet game in the last scene!

**Scene Three** - Alice is a pawn in the chess game where her opponents are the Jabberwocky and Tweedledum and Tweedledee. Help her across the board by protecting her with your White Knights!

**Scene Four** - The most bizarre croquet game ever! Help Alice hit the balls through the playing-card-soldier hoops before the Queen of Hearts stomps on them!

Alice in Videoland is available for the Commodore 64 on disk - £12.95, and now on cassette - £8.95.

Alice in Videoland features graphics created with the Koala Pad.

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# Urban Upstart results

Obviously our readers are a brainy lot – entries to our recent logic competition arrived by the lorry load! The successful first 200 entrants will soon be able to test their brainpower on their free copies of Richard Shepherd Software's Urban Upstart adventure. Read on to see if you are amongst our winners.

For those of you unable to figure it out, the answers are:

NAME	SCORE	PROBLEM	TIME
NEIL	15	SINKING	3
TRACEY	7	EXPOSURE	4
PETER	13	FOOTBALL FANS	3.5
RICHARD	11	LOITERING	5
LYNNE	5	LITTERING	4.5

Our winners, who each receive a free copy of Urban Upstart are: Mrs Adams of Reading, Berkshire; A Gore of Wigan, Lancs; David Taylor of Middleton, Manchester; Mark Ripley of St-Annes-on-Sea, Lancs; Ian Davie of Shepshed, Leics; D Dangerfield of Highworth, Wilts; A Harsley of Scunthorpe, S Humberside; John Lockwood of Barrow-on-Soar, Leics; Keith Clutterbuck of Hertford, Herts; R Jones of Snodland, Kent; Mrs D Rogers of Letchworth, Herts; Geoffrey Crowther of Oldham, Lancs; Mr K Longton of Blackpool; Mr D Rook of Chelmsford, Essex; B Boon of Brentford, Essex; Miss London of Birkby, Huddersfield; P Gruner of Winterton, S Humberside; J Clifford of Christchurch, Dorset; Mr M Austwick of Weymouth, Dorset; R Palmer of Stafford; Miss Tracy Grimes of Widnes, Cheshire; Colleen Young of Addington, Croydon; David Russell of Bacup, Lancs; Miss S Carus of Darwen, Lancs; Mr J Hutton of Milton Keynes, Bucks.

Mr Martin Younger of Stockport, Cheshire; A Chaudhry of Sparkbrook, Birmingham; Mr David Anderson of Angus, Scotland; D Riches of Yate, Bristol; Mrs Diane Jones of

Portland, Dorset; Paul Magwood of Caerphilly, Mid-Glam; Adrian Carter of Ringwood, Hants; Mr J Lightfoot of Newport, Gwent; Robert Forster of Twickenham, Middx; G Ash of Bolton, Lancs; Roy Gillett of London; Mr R Conway of Skipton, N Yorks; A Bourner of Cotterell, Bristol; K Willers of Rotherham, S Yorks; L Crowe of Newport, Gwent; G Drew of Tonbridge, Kent; Mr P Tiffen of East Kilbride, Glasgow; Mr A Pickering of Southend, Essex; Steve Wood of Warley, W Midlands; Michael Coley of Wrexham, Clwyd; Miss N Chohan of Sandy, Beds; L Gilbert of Bristol; B Greatrix of Burton-on-Trent, Staffs; Miss K Williamson of Newport, Gwent; K Rhodes of Bridgenorth, Salop.

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Stewart of Shard End, Birmingham; S Rowlands of Tanworth, Staffs; R Cole of Tupsley, Hereford; D Harvey of Margate, Kent; I Mead of London; Mr D Holloway of Oxford; A Swann of Tunbridge, Kent; S Verber of London; Mr I Bowen of Lordswood, Southampton; Colin Bray of Haywards Heath; James Paterson Jnr of Stevenston, Ayresshire; T Sutton of Hindley, Wigan; Christopher Weston of Edinburgh; Matthew Stunt of Hemel Hempstead, Herts.

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# Competition

Warks; Mr A Linnell of Chessington, Surrey; J. Sparle of Gillingham, Kent; M Mansell of Spalding, Lincs; J Abel of London; Norman Doyle of Billingham, Cleveland; Iain Cuthbertson of London.

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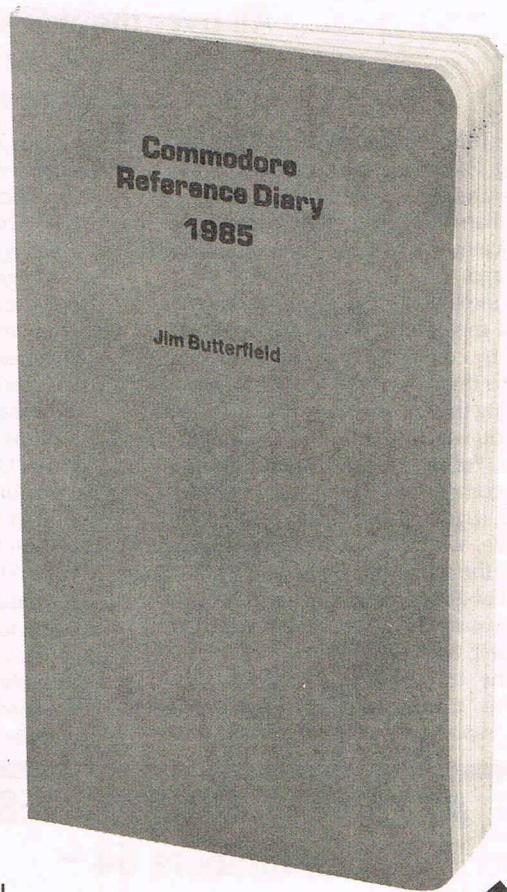
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The I Ching (Chinese Book of Changes) is older than Christianity, itself, being created by ancient sages over three thousands years ago.

Anyone seeking help and enlightenment sought this oracle. Originally it was consulted by counting yarrow stalks from one hand to the other and, more recently, by throwing three coins. Now you can do it all with you 64.

Solar Publishing plan to launch the I Ching computer program at the end of this month, together with the book The I Ching on Love, written by Guy Damien-Knight. Due to the range and scope of the I Ching, Solar Publishing have chosen to concentrate on just one aspect of our lives - love, friendship and marriage.

As the computer is one big number-cruncher, it is the ideal medium for the I Ching. In place of counting yarrow stalks or

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The I Ching contains 64 hexagrams, each consisting of two trigrams. A hexagram is an arrangement of six lines, one placed on top of the other. Lines can be broken or unbroken, moving or unmoving.

Each hexagram has a name, for example The Creative or The Encroaching Shadow. The hexagram gives the answers to eight questions: Is this person a compatible partner? Does my partner love me? Do we have a future together? Why has our relationship broken down? Will we get back together? What can I do to put things right? What do I want most from life?

Obviously not all these questions will be relevant to you. If you have a happy relationship you wouldn't need to ask 'why has our relationship broken down'.

The computer gives only brief answers to each question and you will want to use the

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When a copy of the program was bought into the CCI offices, we didn't want to leave it alone.

Although sceptical, strange things happened! Instead of pressing six keys at random, I spelt out my name. The hexagram I received told me that I had not been concentrating on my question. True I had been concentrating on spelling my name.

The programmer also had an interesting tale. While writing the I Ching program, the hexagram Completion Attained would flash up mysteriously on the screen. He discovered that this indicated the completion of a bug-free section!

Well, whether you take it seriously or not, the I Ching will certainly give you hours of fun.

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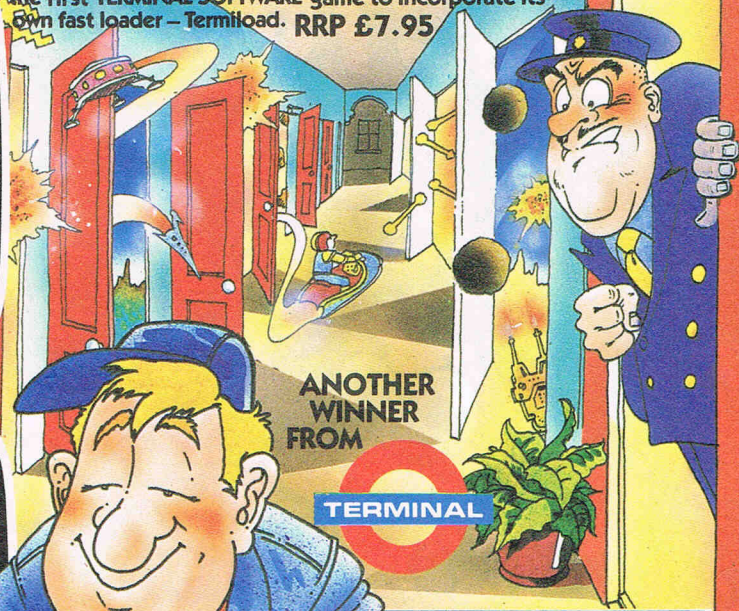
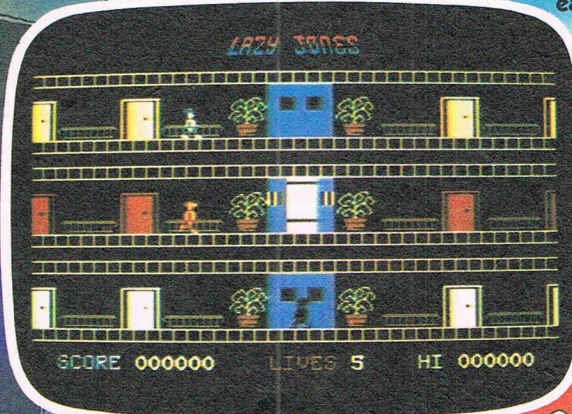
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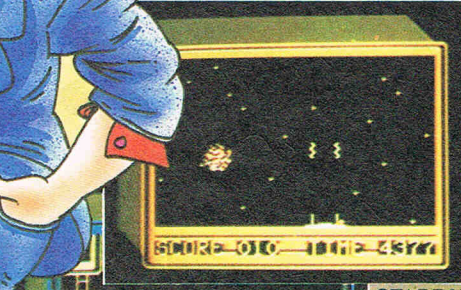
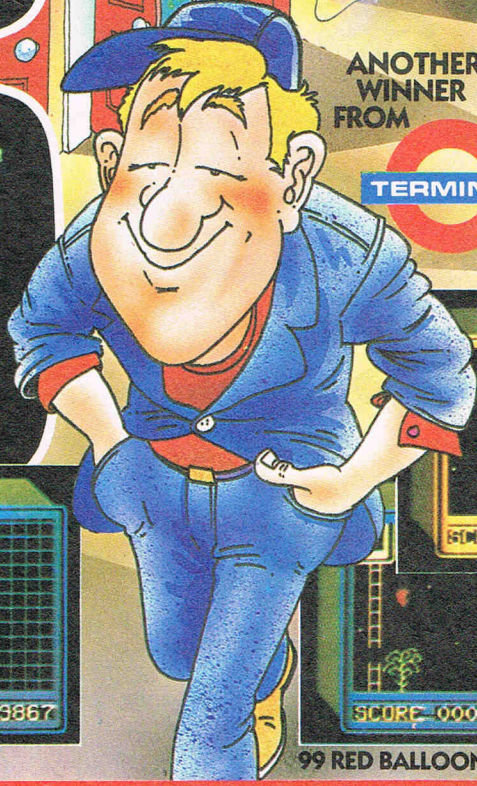
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