

**FREE GIANT ANT ATTACK POSTER-MAP INSIDE!**

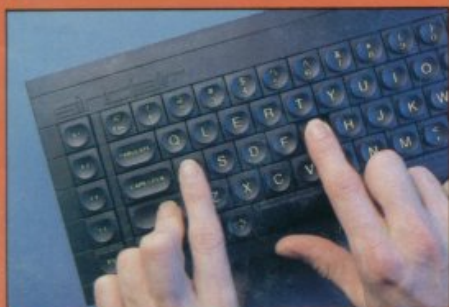
# YOUR SPECTRUM

**No.2 95p**

**& QL USER**



**INSIDE QL USER**



**HANDS-ON  
PREVIEW**

*A Look Before You Leap*

**ANT ATTACK COMPETITION**

**1000**

**PIECES OF SOFTWARE**

*Win The Lot!!!*

**SPONSORED BY PRISM**

**PROGRAM SECURITY**

**PROTECTION RACKET**

*Crafty Code To Beat The Cheats!*

8 SPONSORED BY  
PRISM SOFTWARE  
8.5000000000000000  
8.5000000000000000  
8.5000000000000000



# FREEZ' BEES!

48K  
SPECTRUM

"DOING THE SNO' SHOE SHUFFLE"



All games  
only

£5.95

Inc VAT and P&P  
for a free catalogue  
send SAE.

# SILVER SOFT

Selected titles available at  
Boots, W.H. Smith, J. Menzies, Laskys  
and all good computer stores.

Dealer enquiries welcome Tel: 01-748 4125

Silversoft Ltd, London House, 271/273 King Street, London W6.





# YOUR SPECTRUM

& QL USER No2

Ant Attack Competition Page 52



63▶

## Getting Into Print

For those toying with the notion of upgrading their system with a professional printer, *Henry Budgett's* on hand with an in-depth look at the interfaces available.

54▶

**Spectrum Soft**  
After taking a hefty swipe at the software industry, *Ron Smith* invites the Staines and Stanwell Computer Club to check out the latest software packages.



27▶

## The Protection Racket

If you've written a software masterpiece and you've got something to hide, *Simon Goodwin* will advise you as to the best means of protection.



**Your Spectrum** is proud to present a special new magazine supplement which henceforth will appear every issue in our illustrious pages. In this issue's **QL User**, *Quentin Lowe* gives us his first impressions of Sir Clive's new micro.



## REGULARS

### Front Lines ..... 5

Fun and philosophy, gossip and games, and the news behind the news.

### Forum ..... 17

Your Spectrum readers speak out!

### Routine Stuff — Take A Running Jump ..... 21

Machine codeist *Toni Baker* improves your arcade games by leaps and bounds.

### Spectrolysis — Tuning Up Your Spectrum ..... 41

Tuning troubles? *Ian Beardsmore* puts you in the picture.

### Paper Data — Cracking The Code ..... 73

If you're looking for a machine code tutor, let *Gary Marshall* be your literary guide.

### Play Power ..... 85

Boot up your Spectrum with our three annotated listings.

### Circe ..... 96

*Phil Manchester* tracks down Sinclair Research's head honcho and finds out how lonely life is at the top.

## FEATURES

### Rummaging In The ROM ..... 35

Taking iron to solder, *Mike Lord* unveils the SoftROM.

### Those Moody Microdrives ..... 45

Messing about in the ZX Microdrive, *Andrew Pennell* has come up with some interesting bugs.

### The Antman Cometh ..... 50

Heralded as this year's programming genius, *Sandy White* gives us the background to the classic *Ant Attack*.

### Variables On A Theme — Part One ..... 78

*Dilwyn Jones* delves deep into the Spectrum ROM, and emerges with a complete guide to the system variables.

Editor Roger Munford; Contributing Editor Bruce Sawford; Technical Editor Ron Smith; Software Consultant Gavin Monk; Editorial Consultant Andrew Pennell; Sub Editor Nik Lumsden; Contributors Toni Baker, Simon Goodwin, Mike Lord, Ian Beardsmore, Max Philips, Guy Kewney, Henry Budgett, Gary Marshall, Dilwyn Jones, Phil Manchester; Art Editor Jimmy Egerton; Art Assistants Steve Broadhurst, Mike Wilkes; Group Advertisement Manager Jeff Raggett; Advertisement Managers Shane Campbell, Gill Harris; Production Editor Derek Cohen; Typesetters Anne Ashby, Maggie Kayley, Velma Miller; Production Manager Sonia Hunt; Group Art Director Perry Neville; Publisher Steve England; Distribution Manager Colin James; Published by Sportsman Specialist Press Ltd, 14 Rathbone Place, London W1P 1DE. Company registered in England. Telephone (all departments) 01-631 1433. Telex 8954139 BunchG. Reproduction Graphic Ideas, London; Printers Chase Webb Offset, St Austell, Cornwall; Distribution Seymour Press, 334 Brixton Road, London SW9. Telephone 01-733 4444. All material in *Your Spectrum* © 1984 Felden Productions, and may not be reproduced in whole or in part without the written consent of the publishers. *Your Spectrum* is a bi-monthly publication and the third issue will be available during the second week of April 1984.





# The PARATROOPERS have landed

**They will make your computer go crazy with fear.**

*"One of the best examples of user-defined graphics that I have ever seen, along with excellent sound effects."*

...Home Computing Weekly

*"One of our best games yet."*

...Terry Grant, Rabbit software director

*"An obscene celebration of slaughter."*

...Home Computing Weekly

*"My Terry wouldn't do a thing like that."*

...Terry's mum

Now appearing at your local computer games shop, Boots, WH Smith and Rumbelows.

## RABBIT SOFTWARE LTD

*Brilliant on Spectrum, VIC-20 & CBM-64.*



**THESE PEOPLE  
AREN'T NICE.  
I'M GETTING OUT  
OF HERE!**



RABBIT SOFTWARE LTD  
Please terrify me with a copy of your catalogue  
NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_

THE WARREX (UNIT 11) FORWARD DRIVE,  
WEALSTONE, MIDDLESEX HA3 8NU.



## CALPAC LEARNING SERIES

Colour graphics and sound are used extensively to make learning more enjoyable.

**5. MULTIPLICATION TABLES.** This program with correction sequences enables you to test individual multiplication tables, or all tables up to a maximum that you choose. Carriages are added to a train as the score increases - see the train glide through the countryside when the test is finished.

**6. THE ROMANS.** Answer questions on the Romans to win a horse, chariot, viaduct and temple. Answer enough correctly and the horse will gallop away with its chariot.

**7. SPELLING TESTER.** The words in the test are initially displayed on the screen. Then short sentences are used as prompts for the words, which must be typed correctly to add stages to a space-ship.

Replace the words and sentences in the program with weekly spelling lists, save them on cassette, and you will rapidly create a whole library of programs.

**8. HOMOPHONES.** Sale or sail, bare or bear? Choose the correct word to complete the sentence. Extra motivation is provided by a coloured pot-plant, which grows with each correct response. The plant flowers in an unusually tuneful fashion at the end of the program.

J. J. Warren 1983

Published by Calpac Computer Software, 108 Hermitage Woods Crescent, St Johns, Woking, Surrey GU21 1UF

The programs on this cassette are subject to copyright, and may not be copied, transmitted, hired or lent without the written permission of Calpac Computer Software.

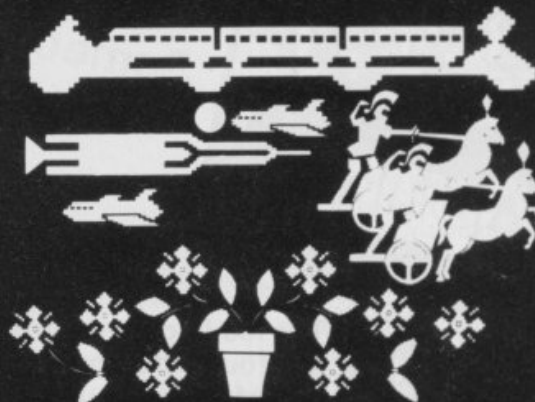


CALPAC LEARNING SERIES

ZX  
SPECTRUM  
VOL. 2

## CALPAC LEARNING SERIES

PROGRAMS 5-8



5 MULTIPLICATION TABLES  
6 THE ROMANS  
7 SPELLING TESTER  
8 HOMOPHONES

SPECTRUM 16K  
FROM 7 YEARS 48K

## CALPAC LEARNING SERIES

Colour graphics and sound are used extensively to make learning more enjoyable.

**9. NOUNS, VERBS, ADJECTIVES AND ADVERBS.** Sentences are displayed and you select the named parts of speech. Instant feedback and helpful comments ensure positive learning. Correct answers are rewarded by the creation of a coastal scene, which is animated at the end of the program.

**10. VERB PRACTICE.** You have to complete the sentences using the correct tenses of the verbs. The program concentrates on those irregular verbs that often cause difficulty. An underwater landscape is created as questions are correctly answered.

**11. THE STRUCTURE OF THE FLOWER.** This program explains how the parts of the flower are involved in the formation of seeds. This is a three part program which makes full use of high resolution colour graphics.

**12. LONG DIVISION.** This detailed program takes the learner through long division sums in easy stages. Correction sequences are automatically provided when they are needed. Sums with remainders can be chosen if required.

J. J. Warren 1983

Published by Calpac Computer Software, 108 Hermitage Woods Crescent, St Johns, Woking, Surrey GU21 1UF

The programs on this cassette are subject to copyright, and may not be copied, transmitted, hired or lent without the written permission of Calpac Computer Software.

Our software is available by direct mail from:-  
CALPAC COMPUTER SOFTWARE  
108 Hermitage Woods Crescent  
St Johns, WOKING, Surrey GU21 1UF

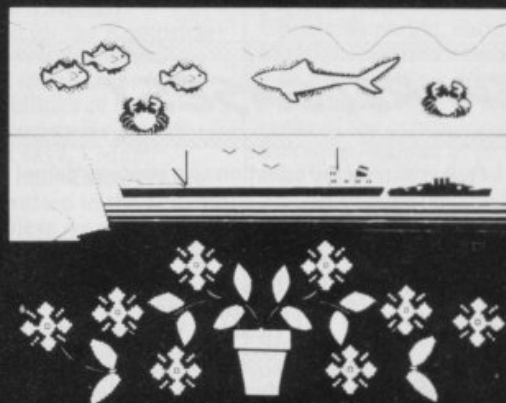


CALPAC LEARNING SERIES

ZX  
SPECTRUM  
VOL. 3  
FROM  
9  
YEARS

## CALPAC LEARNING SERIES

PROGRAMS 9-12



9 NOUNS, VERBS, ADJECTIVES  
AND ADVERBS  
10 VERB PRACTICE  
11 THE STRUCTURE OF THE FLOWER  
12 LONG DIVISION

SPECTRUM 16K  
FROM 9 YEARS 48K

Additional features of the CALPAC LEARNING SERIES include:-

\*Spelling checkers

\*"Help" call up routine

\*Easy insertion of subject material of your own choice into the programs

Our software is suitable for use in the home, school or college.

For further details or retail stockists please telephone:- 048 67 2584

We have a demonstration cassette available for retailers or schools.

We would like to hear from good programmers, graduates or teachers wishing to participate in the expansion of our Learning Series on the Spectrum, BBC Model B and other machines.

Our software is available by direct mail from:-

CALPAC COMPUTER SOFTWARE  
108 Hermitage Woods Crescent  
St Johns, WOKING, Surrey GU21 1UF

PRICE LIST

CALPAC LEARNING SERIES VOL 1  
CALPAC LEARNING SERIES VOL 2  
CALPAC LEARNING SERIES VOL 3  
CALPAC CHEMISTRY SERIES VOL 1  
CALPAC CHEMISTRY SERIES VOL 2  
CALPAC PATTERNS

16K or 48K Spectrum .....	£9.50
16K or 48K Spectrum .....	£9.50
16K or 48K Spectrum .....	£9.50
48K Spectrum .....	£7.50
16KZX81 .....	£7.50
16K ZX81 .....	£5.95

FOR FURTHER INFORMATION PLEASE COMPLETE COUPON BELOW

NAME .....

ADDRESS .....

AVAILABLE FROM HMV STORES & SELFRIDGES





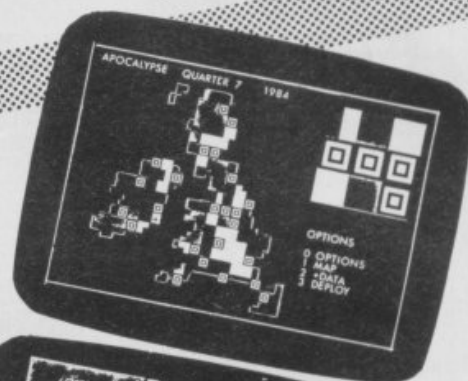
# WE THE WAR LORDS

## RUN CITIES, COUNTRIES, CONTINENTS— BUT, BE WARNED!

Someone is about to press the button for **Apocalypse** A GAME OF STRATEGY

"REDSHIFT HAS MADE THE WORLD OF WAR GAMES ORIENTATED COMPUTER GAMES ITS OWN"  
P.C.W. — 24/30 NOV 83 ISSUE

The leading game (APOCALYPSE) has four different maps, on any one of which you may fight your war (see section A.). An additional tape which contains a further six maps may also be added to expand your atlas (see section B.). Alternatively, you can be NERO in the FALL OF ROME or Napoleon's right-hand man in NAPOLEON'S CAMPAIGN in 1813 (see section C.). Can you survive the War of 1984 or could you lead your marines from island to island in the PACIFIC war? (see section D.).



### NEW RELEASES!

**NEBULA** A masterly introduction to a strategy game!  
48K Spectrum  
£6.96 inc. VAT and P&P

**REBEL STAR RAIDERS** Can you survive the Rebel Star Raiders?  
48K Spectrum  
£9.95 inc. VAT and P&P

**FIRST EMPIRE** Your introduction to complete "Table top moderated war games"  
48K Spectrum & BBC  
£14.95 inc. VAT and P&P

**TIME LORDS** Get entangled in the complexities of time travel...  
BBC £9.95 inc. VAT and P&P

#### A. APOCALYPSE

For: Spectrum 48K & BBC Model B  
£9.95 inc. VAT and P&P.  
Available from J Menzies, Boots & Microdealer UK.

#### B. Volume 1:

NOVAMAPS  
Six New Maps!  
USA ARCTIC CIRCLE  
SE ASIA STAR SYSTEMS  
S AFRICA NETHER EARTH

#### C. Volume 2:

CHAPTER 1  
FALL OF ROME  
NAPOLEON'S CAMPAIGNS  
1813

#### D. Volume 2:

CHAPTER 2  
THE 1984 PACIFIC WAR

Expansion Kits for Spectrum 48K (B, C & D only)  
£4.95 each inc. VAT and P&P.

*Microdrive version available by negotiation*

**HOW TO ORDER.** You may purchase any of the items listed by cheque or postal order. All you have to do is fill in the details in the coupon enclosing your cheque/P.O. made payable to Redshift Ltd. and your order will be dispatched within 7 to 14 days. All prices inclusive of VAT and P&P.

Post to: REDSHIFT LTD, 12c MANOR RD, STOKE NEWINGTON, N16

I would like to purchase item(s):  
(Please circle/tick item(s) required)

A B C D (For Apocalypse) Available for BBC/Spectrum (Delete which is not applicable)

☐ Nebula ☐ Rebel Star Raiders ☐ First Empire  
☐ Time Lords

I enclose my cheque/P.O. for £

Name

Address

Tel (Day) Tel (Eve)  
Please allow 7 to 28 days for New Releases

## REDSHIFT LTD.

12c MANOR ROAD, STOKE NEWINGTON, LONDON, N16  
TEL: (01) 800 1333



Apocalypse is produced under licence from The Games Workshop Ltd.



# FRONT LINES

## YOU HUM IT, WE'LL PLAY IT

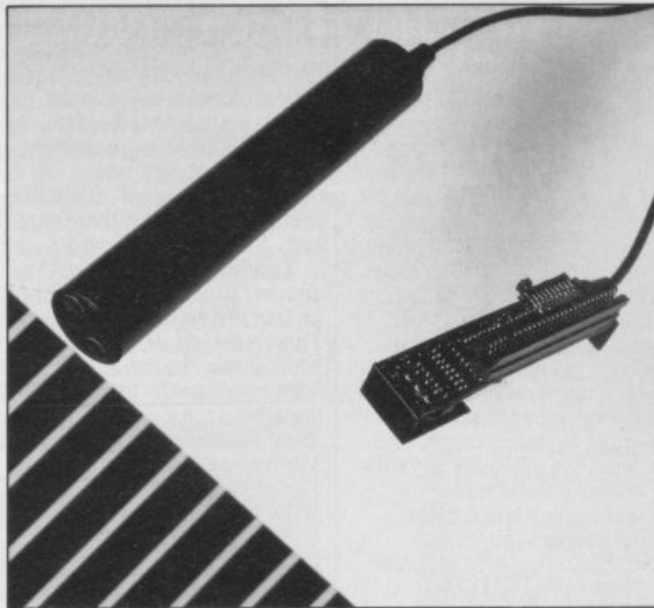
Is it a bird, is it a plane... well, it certainly doesn't look like a joystick!

When you first pick up a Trickstick, the idea that it might actually *help* you to play an arcade game seems ridiculous. Built rather like an audio microphone, all you have to do to create movement on the screen is to pass your fingers fleetingly over one of six blue metal buttons (which manage to look like the tops of drawing pins).

Getting down to some practise with Roger Vellacott of East London Robotics (Tricksticks' manufacturers), the device soon lost a lot of its mysterious qualities. The top two buttons move your character from side to side. The next two buttons move you up and down; there are also two fire buttons further down the body of the unit. It's all very easy to explain, but a little tricky to use (maybe that's how it got its name).

The Trickstick works from the mains hum picked up from the tips of the user's fingers, via the metal pads. A signal is fed into the interface you get with the device, and the voltage is converted — in effect — to a digital signal. The circuit contains a capacitor which, when built up via the charge from your fingertips, lets out a pulse that simulates the pressing of a key. A white plastic screw on the main shaft of the Trickstick allows individual adjustment of the device's sensitivity.

So why has a product that was heavily advertised during the latter months of 1983 taken so long to appear on the market? According to Roger Vellacott, the Trickstick was "quite difficult



Daunting at first, the Trickstick has more features than most joysticks.

to make. Originally our plans were to use light instead of mains hum, and therefore movement would be related to the amount of light detected by the sensors. It also meant we required a seventh sensor to act as a reference light source, providing a self-adjusting reference point; unfortunately, this just caused problems when someone switched a light on, or the sun came out. Plans to make the Trickstick operate on a light basis were shelved in October 1983, and the current design was begun."

However, the new design involves "much more complex circuitry" — which explains the new price of £34.50. There's also a game that'll be launched alongside the Trickstick to make use of the fact that up to eight of them can be attached to the back of a Spectrum. The game *Attactics*, which involves dogfighting and

escaping enemy fighters, allows you to manoeuvre the planes through incredible turns. At £10, the game tape on its own comes rather expensive; but if you buy it with a Trickstick, then you can pick it up for £7.50.

Although you can utilise your Trickstick with any game that's already converted for the Kempston joystick, you won't find anything which takes in the full capabilities of the new device. And as Roger Vellacott says, "Many software manufacturers are very interested in the concept — but unless we sell great quantities of Tricksticks, there won't be many professional eight player games."

For more information on the Trickstick, you'll find East London Robotics at No 11 Gate, Royal Albert Dock, London E16; alternatively, phone 01-474 4430.

RM

## SPECTRUM SALES OVERHEAT

Despite the news that Sir Clive managed to notch up his 'millionth Spectrum made' on December 9th, 1983, a few unlucky people may have been cursing the Cambridge wizard over Christmas.

Demand for the ZX Spectrum in the three-month run-up to Xmas was to quote a Sinclair Research spokesperson, "beyond our most optimistic expectations". (Quite an understatement for reported sales of approaching half a million Spectrums.)

However, what that meant to Joe Punter on his Clapham Common omnibus was a distinct lack of Spectrums on the shelves. Indeed, it's actually rumoured that, at a late stage, Sinclair Research reduced the number of adverts placed in the press — purely in an attempt to curb catastrophic demand!

Even with production figures topping 100,000 units per month in the pre-Christmas period, shops found themselves having to turn away many a potential micro buyer eager to join the ranks of the computer literates. And not even those wise and wealthy faces at Sinclair Research could foresee that the 48K Spectrum would outsell the 16K model at a reported ratio of eight to one.

High street chain, WH Smith, announced unprecedented sales of home computers over the Christmas holiday and for many of its customers, it was a case of "yes, we have no computers, we have no computers today". But the record, at the time of writing, seems to rest with the Princess Street branch of Menzies where a delivery of 75 48K Spectrums was snapped up by eager Yuletide fanatics in just 15 minutes. Can anyone beat that?

And lastly, the good news for you one or two people *still* not owning a Spectrum — by the time you read this, supplies should have returned to an even keel. RM

## KEYNESIAN COURSES

With microcomputers growing ever more prolific in home and office, the Silicon City (Milton Keynes to you!) Information Technology Exchange has decided to have another bash at running some one- and two-day courses. These are pitched primarily at the business user, but course administrator Ann Sidgwick

is quick to assure they would also be of benefit "to all potential users". Asked why the idea hadn't lifted-off at the first attempt, Ms Sidgwick said "People are a little slow in Milton Keynes when it comes to computers, and are only just beginning to take an interest. They are still not forward-thinking when it comes to their future

understanding of this subject."

In an effort to improve response, the IT Exchange has decided to put out a questionnaire asking people what they would like to see on this year's courses. For further information telephone the IT Exchange on 0908 668866.

RS



## SINCLAIRWATCH

### Atari Spectrumises Its Software.

Atari has recently announced an intention to release its classic arcade games for use with other computers, including the Spectrum. As well as the company's reknown arcade machines, Atari also produces its own high-spec low-cost micros, famed for their grossly expensive software. Atari is, in fact, one of the leading home computer loss makers, with yearly deficits running into hundreds of thousands of dollars, and are supported by the massive American Warner Corporation.

This latest move is an effort to break into the huge Spectrum software market, and maybe it really is clean-up time as Atari pulls from the hat such classics as *Pacman*, *Centipede* and *Donkey Kong*, and the rights the company possess to *Williams' Defender*. Ever since the release of the Spectrum, companies have been churning out lookalikes, but few have proved good enough to encourage more than passing customer interest. And those that were well accepted often found themselves swamped by writs alleging copyright infringement, thus calling for cosmetic changes to the title and/or graphics.

Theoretically, with any number of Spectrum users still awaiting an excellent version of *Defender* and *Pacman*, Atari should do well releasing them themselves or becoming the official licensee. However, the company says it is going to charge £14.99, not for the complete set, but for *each* game! Perhaps millionaire Atari 400 owners might consider this cheap, but your

average Spectrum user is liable to stand there agog at such a price tag. How long will it take for Atari UK to realise that the British computer market is not about people buying cheap micros and vastly expensive software? It's a policy that's done the company little good in the past and one that's unlikely to fare much better for it in the future — Texas Instruments, please copy.

For Atari's own machines, programmers are apparently offered exceptionally good deals in the form of 35 per cent royalties on the retail price. This pans out to at least a tenner a program — twice the price of your average Spectrum tape, and at least ten times the royalty that many Spectrum programmers can expect. Atari is even said to be tempting Spectrum program writers with £10,000 advances.

### Topping Up Prices

Talking of inflated prices, there has been recent rumour concerning profiteering in the Spectrum software market — a problem that recently centred around Ultimate's *Atic Atac*. Enquiries for the heavily-promoted mate of *Lunar Jetman* were so great that many dealers opted to stick an extra £1.50 or so on the retail price, an increase of almost 30 per cent. Let's hope that Ultimate steps in and does something before the next blockbusting release.

Another practice that's become painfully obvious these days is the advertising of a new world-beating product, months before anything is ever likely to become available. An award of some kind must go to Sinclair Research, who advertised the Microdrive as 'coming soon' a full 16

months before Sir Clive's tree was to bear fruit. And neighbourly rival, Acorn, comes high in the stakes too with its announcement of the Electron micro at the same time as the Spectrum's appearance — a year before the machine's real launch was to actually take place. And, of course, even though both products are now officially 'launched', it's still pretty hard to get either for love or money.

Turning to software, another produce famous for its late arrival has been *Terror-Daktil 4D*, from Melbourne House. It took at least two months to materialise, following the usual flamboyant Melbourne House launch. No official reason was ever given for the delay, though after about a month a member of Melbourne House's staff was heard to admit that it was still being de-bugged!

And talking of late-comers, whatever happened to the Trickstick from East London Robotics? According to the blurb, it's the ultimate in joysticks, with hitherto unavailable control. Shown in prototype form many months ago and advertised in full colour double pages for almost as long, at the time of writing we are still all waiting to sample the goods.

In many ways, the home computer market is becoming increasingly more commercial and professional. Yet still companies insist on launching product that's just a gap in the managing director's wallet. It's easy to argue that Spectrum enthusiasts are well used to waits of this kind — even so, disappointed customers are unlikely to provide the soundest of bases for most company's long term commercial success.

## STACK SHOOTS TO

The Merseyside firm of Stack Computer Services, formed only five years ago by Jeff Orr, has moved away from pure computer retailing, towards the lush pastures of manufacturing add-ons for other manufacturer's equipment. Its latest, and probably most successful product to date, is the Stack Light Rifle (SLR).

Similar to the old video games where a rifle was attached to the television and the player had to shoot some object on the screen, this device claims a far higher degree of sophistication and is already doing well, judging by the advance orders. Stack

## ART FOR ARTS SAKE

If you're looking for a closer involvement with the subtle art of machine code programming, you may be interested to know that you can go and meet Toni Baker and her enthusiastic fellow members of the ZX Machine Code Users' Club on Saturday, March 31. Scheduled to meet in The Amber Room, Sittingbourne Town Hall, Sittingbourne, Kent, the room will be available to all-comers between 10am and four in the afternoon.

It also looks as though one of Toni's longterm projects will be reaching fruition in the near future — the club's magazine, *Micro Arts*. This will be a regular mag, filled with machine code wonders, such as new discoveries, programs, news and info on the club's meetings. Don't send any money yet — just keep watching these pages for news on when it hits the presses.

Fans of Toni's literary works may like to know that she has been wading through *Mastering Machine Code On Your ZX Spectrum* and has come up with an A4 errata sheet which may explain some of those messes you've been getting while typing in the odd program. This can be obtained free from Toni by sending a stamped addressed envelope to 37 Stratford Road, Wolverton, Milton Keynes MK12 5LW.

## YS GOES MONTHLY

Thanks to the incredible level support that *Your Spectrum's* first issue received, we'll be going monthly from our April issue.

Despite the very obvious overcrowding in the computer magazine

marketplace, we've proved that there is a very definite need for a 'grown-up' Spectrum magazine. We make no secret of the fact that we deliberately set out to produce a much more demanding user magazine

than ever before.

And that approach has worked. So no longer will you have to wait two months for your new copy. After April, we'll be with you every month. See you then.



## SUCCESS

was strangely tight-lipped about function details, but it seems to work using a single dot of light which scans backwards and forwards down the screen. Thus, when the rifle is aimed and the trigger pulled, the specially written software takes over to record and check co-ordinates. If these match, then the target is removed from the screen and points are awarded accordingly. However, should a mismatch (ie. a 'miss') be recorded, the target remains on-screen and the game will continue as before.

But don't think you've got it all your own way.

Naturally, the SLR can only be used with specially written games and that has led those nice people at Stack to include three cassette-based games with the rifle for an inclusive price of £29.95. And if that's not enough to satisfy you, the promise is there'll be a total of 30 compatible games available by the end of January. You'll get these — and the rifle — either by mail order from Stack Computer Services Ltd, 290-298 Derby Road, Bootle, Merseyside (telephone 051-933 5511) or through WH Smith, Menzies, Boots and others. RS

SMITHS VERSATILE  
LOADER

The WH Smith data recorder lets you listen in on saving and loading.

'Own brand' products from large retail outlets tend normally to be cheaper than the better-known variety, but not so in the case of the CPD8300 tape/data recorder from WH Smith.

But at a cost of £39.95, this cassette machine is unlikely to leave its cheaper, non-dedicated competitors free to clean up. That's because it's designed specifically for personal computers, and offers such features as a computer

controlled electronic pause, adjustable save and load levels, a meter for indicating same, a tape counter for locating programs easily and a switch that enables one to listen in on program loading (or not as the case may be).

Oh, and it can also be used for boring old audio recording and playback. The device is available from larger branches of WH Smith, ie. those stores which have a home computer section.

RS

## SPECTRUM CONTROL

*This issue, Roger Pramm turns his attention to music's silver strains — then casts us adrift with savage discord!*

The replies and solutions to the problem of the less-than-functioning tactile 'joystick' that appeared in the first issue have been rolling in, and some of them have been rather imaginative. But, not all of them have been complimentary about the code printed to start you off — in fact, one or two of the replies were quite rude (which suggests that some readers simply missed the point). The projects suggested in this column are designed to set you thinking and doing exciting things with your Spectrum. Interaction is the name of the game.

In the next issue, we'll be taking a brisk look through some of the replies received for our first project — who knows, we might even be able to print a listing that definitively points our wayward 'joystick' in the right direction! But if graphics are not your bag, why not have a go at the project coming right up — you might just turn your Spectrum into a cheap synthesiser.

## Project 2

A major problem of using the Spectrum for music is that it's difficult to get it to produce a variable length note based on how long you hold down a key. The standard BEEP instruction requires that you specify the duration of the note beforehand. This makes it impossible to use it for generating notes in the same way that an organ or electronic synthesiser does.

This issue's project is aimed at overcoming that sad handicap and will almost certainly involve delving into machine code. Fortunately, much of the work is already done in the Basic interpreter, and an examination of the keyboard scanning and loudspeaker routines as detailed in *The Complete Spectrum ROM Disassembly* (Ian Logan and Frank O'Hara) will give some clues as to how this might be done.

The problem involves combining the keyboard scanning operation with the sound generation routine. This can be simulated in Basic by setting up a loop which includes a test for what key is being pressed and a BEEP of short duration. This would go something like this:

```
100 REM ** Loop **
200 FOR n=1 TO 40
300 IF INKEY$ = K(n) THEN
    BEEP 0.00125,N(n)
400 NEXT n
500 GOTO 200
```

(Note: K is an array with all the keyboard notes READ in from a DATA statement and N is another array with the frequency numbers stored in similar fashion.)

This is a crude representation of how a machine code routine would handle it, and the effect will be to produce a modulated sound which is quite unacceptable. The situation can be improved quite a lot by shortening the arrays to include only those keys that will be used in a simulation of a piano keyboard. If you start with the typewriter key 'F' as F, 'T' as F sharp and so on, you only need about 15 in each array. (The appropriate note frequencies can be found in your Spectrum manual.)

The scan time on the keyboard can also be altered by doing a POKE on the appropriate systems variable to increase the speed of the scan. In the end, though, the speed of the Basic interpreter is the real limiting factor; it's got to be at least 200 times slower than good machine code.

If the keyboard scanning part of the exercise sounds complicated, then the BEEP routine itself is a mind-blower! It works on the principle of setting up a timing loop which will oscillate the tiny loudspeaker a certain number of times a second according to the frequency of the note required. Essentially the BEEP command turns the speaker on and off very quickly and creates a note by varying the speed of the oscillation. This is why the length of the note has to be specified in advance. The oscillation is actually created with an OUT instruction to port 254 with D4 either high (deactivate) or low (activate). By flipping back and forwards between a high and low value, the BEEP routine produces the sound.

This is a toughie, so good luck. Remember, there are no prizes for all your hard work — just tell us how you're getting on by writing to: *Spectrum Control, Your Spectrum*, 14 Rathbone Place, London W1P 1DE.



# MANIAC

by Matthew Smith

Penguins, Man Eating Toilets, Seals, Mutant Telephones, Bugs, Falling Skylabs and Kangaroo's plus many more, join forces to stop Willy in his quest to get the treasure.

★ AVAILABLE SHORTLY FOR THE COMMODORE 64.

Distributors contact:

**SOFTWARE PROJECTS**

**Bear Brand Complex,  
Allerton Road,  
Woolton, Liverpool,  
Merseyside L25 7SF  
051-428 7990**

FOR THE 48K SPECTRUM



# Let Set Willy

By Matthew Smith

The saga continues... from rags to riches. Follow Miner Willy in his latest hair raising adventure as new perils await him in his luxurious cliff top mansion.

FOR THE 48K SPECTRUM

## DEALER ENQUIRIES TO:

TIGER DISTRIBUTION,  
4 VICTORIA ROAD,  
WIDNES,  
CHESHIRE,  
051-420 8888

- ★ JUST TWO OF THE EXCITING GAMES FROM OUR CATALOGUE.
- ★ AVAILABLE FROM SELECTED BRANCHES OF JOHN MENZIES AND HOUSE OF FRAZER.





**STOP PRESS: NEW SPECTRUM DOMINOES 16K/48K £4.95**

## **ZUCKMAN**

**ZX81 (16K)**

- \* ALL MACHINE CODE (10K)
  - \* FOUR INDEPENDENT GHOSTS
  - \* HIGH-SCORE 'HALL OF FAME'
  - \* AUTHENTIC ARCADE ACTION
  - \* TITLE/DISPLAY MODE
- ONLY £4.95 INC. P&P**

## **★ ZX Spectrum <sup>New</sup>**

**FROGGY 16K or 48K**

SPECTRUM VERSION OF ARCADE GAME WITH FULL ARCADE FEATURES:-

\* Fabulous Hi-Res Colour Graphics  
 \* Authentic Sound Effects - 3 Tunes  
 \* 3-D Logs, Swimming & Diving Turtles  
 \* 3 Lanes of Multi-coloured vehicles  
 \* On-screen Score, Hi-Score, Time-bar  
 \* Snake, Alligators and Baby Frog  
 \* Top 5 High-Score initials table  
 \* Demonstration Game routine

Your home-sick frog must leap across a busy main road, then onto logs and turtles in the river to reach safety of the river bank frog-homes.

THIS MACHINE-CODE GAME MUST BE SEEN TO BE BELIEVED!!

**ONLY £5.95 INC. P&P**



## **FROGGY**

**ZX81 (16K)**

- \* MOVING CARS, LOGS, TURTLES
  - \* ALLIGATORS, DIVING TURTLES
  - \* FOUR 'SCREENS' OF ACTION
  - \* ALL ARCADE FEATURES
  - \* ENTIRELY MACHINE CODE
- ONLY £4.95 INC. P&P**



# **DJL SOFTWARE**

**DEPT YSFM , 9 TWEED CLOSE, SWINDON, WILTS SN2 3PU Tel: (0793) 724317**

Trade enquiries welcome Export Orders: Please add £1.00 per tape airmail  
 Dealer enquiries: Tiger Distribution, 4 Victoria Road, Widnes, Cheshire. 051-420 8888.

— ORDER FORM —

Name .....

Address .....

Please send me the following .....

I enclose cheque/P.O. No ..... for £ .....  
 SEND TO: DJL Software, Dept ysfm, 9 Tweed Close, Swindon, Wilts SN2 3PU.



## NO GROUCHING

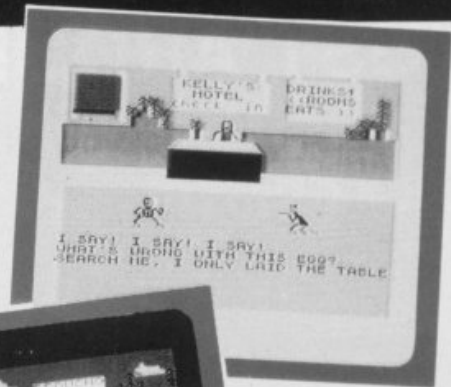
So confident is Automata that its adventures are horrendously difficult to solve, the company keeps offering prizes of inestimable value for the first correct solution.

The first of these challenges appeared back in October 1982, and the news is that it's still to be beaten. This evolved around Automata's very popular *Pimania* adventure and, 15 months later, still no one has come within a mile of winning the diamond encrusted golden sundial (valued at £6,000) — not even, alas, some poor chap who planned to travel all the way to Bethlehem on Xmas day!

Asked whether the game was too boring, too complicated or just plain not

selling in enough quantity, Automata's spokesperson hedged two-thirds of the question and would only commit herself to saying "It's not at all boring."

But it would be wrong to draw too many conclusions from that and, spirits never dampened (and not content with just one prize puzzle), Automata is now offering a free trip to Hollywood to meet the 'star' who can be identified by solving its laboriously named package *'My name is Uncle Groucho. You win my fat cigar'*. The excited winner will fly out on Concorde, stay at the Waldorf Astoria, sail back on the QE2, and receive £500 pocket money to boot. But hurry, because the competition ends on June 1st, 1984. RS



Big prizes await those first solving Automata's adventure games.



## DEBUGGIT

For all those debuggists who tried desperately to find the silly mistakes left by YS idiot, Dick Head, here are the corrections.

that worked properly, whether or not they uncovered all DH's errors.

The ten lucky winners of the £25 tokens are: Cameron Naish, Oxford; Tony Nail, Southsea, Hants; Byron Partridge, West Ealing, London; Mr I Grant, Willenhall, West Midlands; Tony Giscombe, Droitwich, Worcs.; Jolyon Ralph, Wimbeldon, London; Nicola Elsom, Saffron Walden, Essex; Paul Vanlint, Walthamstow, London; Mr J Fewings, Hull, North Humberside; and last but not least, Mark Gibson of Wigginton, York.

### HE'S DONE IT AGAIN

Will nothing keep a good moron down? Not content with last issue's ludicrous nonsense, DH has now landed us with another load of programming codswallop — this time entitled *Choices*. As usual it's racked with errors, but he assures us that anyone who gets it going will find it 'deeply meaningful' — coming from Dick, that's a contradiction in terms!

Anyway, here it is. For those unable to figure it out, he reckons he'll be listing the corrections next issue — that's a joke!

1. Line 10 should read — **BORDER 2: PAPER 6** (or some other choices that make it possible to read the screen!).
2. Lines 60 and 290 were transposed.
3. Line 100 should check if r is not equal to one, not 10.
4. Line 170 should check if bc is greater than or equal to 90, and the **GO SUB** should be to line 380.
5. Line 240 should check for r not being equal to one, not 10.
6. Line 260 should read — **PRINT AT 10,0...** (and not **PRINT AT 0,10**).
7. Line 290 was transposed with line 60 (see item 2).
8. Line 380 should check for f (not m).
9. Line 490 should be a **RETURN** statement (and not the **GO TO** statement Dick Head managed to come up with).

These were the specific errors made by our Dick — but as with any bugged-up excuse for a program, there's more than one solution. So what we've done is

```

10 LET t=0
20 LET a$=""
30 PRINT "Do you think a joystick is?"
40 PRINT
50 PRINT "a) A device for controlling an aeroplane"
60 PRINT "b) Something your girlfriend likes"
70 PRINT "c) An object for entertaining the dog"
80 INPUT a$: PRINT a$
90 IF a$="a" THEN LET t=t+1
100 IF a$="b" THEN LET t=t+2
110 IF a$="c" THEN LET t=t+3
120 PRINT
130 PRINT
140 PRINT "You would like to live in America because:"
150 PRINT
160 PRINT "a) You forgot to unpack the machine"
170 PRINT "b) You haven't got a TV set or monitor"
180 PRINT "c) You're watching BBC 2"
190 INPUT a$: PRINT a$
200 IF a$="x" THEN LET t=t+2
210 IF a$="y" THEN LET t=t+3
220 IF a$="z" THEN LET t=t+4
230 PRINT
240 PRINT
250 PRINT "When your software is loading, do you:"
260 PRINT
270 PRINT "a) Jog round the block"
280 PRINT "b) Feed the cat"
290 PRINT "c) Have a nervous breakdown as a loading error appears"
300 PRINT "minutes into a 15 minute program"
310 INPUT a$: PRINT a$
320 IF a$="a" THEN LET t=t+1
330 IF a$="b" THEN LET t=t+3
340 IF a$="c" THEN LET t=t+4
350 PRINT
360 PRINT
370 PRINT "Which one of the following is impossible?"
380 PRINT
390 PRINT "a) Walking on water"
400 PRINT "b) Holding your breath for 30 minutes"
410 PRINT "c) Typing on a Spectrum keyboard"
420 INPUT a$: PRINT a$
430 IF a$="a" THEN LET t=t+1
440 IF a$="b" THEN LET t=t+3
450 IF a$="c" THEN LET t=t+4
460 PRINT
470 PRINT
480 PRINT "You don't get a picture from a Spectrum because:"
490 PRINT "a) They have thick streaks"
500 PRINT "b) Ronald Reagan is a resident"
510 PRINT "c) The US version of the Spectrum has a defective keyboard"
520 INPUT a$: PRINT a$
530 IF a$="a" THEN LET t=t+2
540 IF a$="b" THEN LET t=t+3
550 IF a$="c" THEN LET t=t+4
560 IF t<9 THEN GO TO 590
570 IF t>10 AND t<=15 THEN GO TO 600
580 GO TO 610
590 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
600 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
610 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
620 PRINT
630 PRINT
640 PRINT "a) Walking on water"
650 PRINT "b) Holding your breath for 30 minutes"
660 PRINT "c) Typing on a Spectrum keyboard"
670 INPUT a$: PRINT a$
680 IF a$="a" THEN LET t=t+1
690 IF a$="b" THEN LET t=t+3
700 IF a$="c" THEN LET t=t+4
710 PRINT
720 PRINT
730 PRINT "You don't get a picture from a Spectrum because:"
740 PRINT "a) They have thick streaks"
750 PRINT "b) Ronald Reagan is a resident"
760 PRINT "c) The US version of the Spectrum has a defective keyboard"
770 INPUT a$: PRINT a$
780 IF a$="a" THEN LET t=t+2
790 IF a$="b" THEN LET t=t+3
800 IF a$="c" THEN LET t=t+4
810 IF t<9 THEN GO TO 840
820 IF t>10 AND t<=15 THEN GO TO 850
830 GO TO 860
840 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
850 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
860 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
870 PRINT
880 PRINT
890 PRINT "a) Walking on water"
900 PRINT "b) Holding your breath for 30 minutes"
910 PRINT "c) Typing on a Spectrum keyboard"
920 INPUT a$: PRINT a$
930 IF a$="a" THEN LET t=t+1
940 IF a$="b" THEN LET t=t+3
950 IF a$="c" THEN LET t=t+4
960 PRINT
970 PRINT
980 PRINT "You don't get a picture from a Spectrum because:"
990 PRINT "a) They have thick streaks"
1000 PRINT "b) Ronald Reagan is a resident"
1010 PRINT "c) The US version of the Spectrum has a defective keyboard"
1020 INPUT a$: PRINT a$
1030 IF a$="a" THEN LET t=t+2
1040 IF a$="b" THEN LET t=t+3
1050 IF a$="c" THEN LET t=t+4
1060 IF t<9 THEN GO TO 1090
1070 IF t>10 AND t<=15 THEN GO TO 1080
1080 GO TO 1100
1090 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
1100 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
1110 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
1120 PRINT
1130 PRINT
1140 PRINT "a) Walking on water"
1150 PRINT "b) Holding your breath for 30 minutes"
1160 PRINT "c) Typing on a Spectrum keyboard"
1170 INPUT a$: PRINT a$
1180 IF a$="a" THEN LET t=t+1
1190 IF a$="b" THEN LET t=t+3
1200 IF a$="c" THEN LET t=t+4
1210 PRINT
1220 PRINT
1230 PRINT "You don't get a picture from a Spectrum because:"
1240 PRINT "a) They have thick streaks"
1250 PRINT "b) Ronald Reagan is a resident"
1260 PRINT "c) The US version of the Spectrum has a defective keyboard"
1270 INPUT a$: PRINT a$
1280 IF a$="a" THEN LET t=t+2
1290 IF a$="b" THEN LET t=t+3
1300 IF a$="c" THEN LET t=t+4
1310 IF t<9 THEN GO TO 1340
1320 IF t>10 AND t<=15 THEN GO TO 1330
1330 GO TO 1350
1340 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
1350 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
1360 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
1370 PRINT
1380 PRINT
1390 PRINT "a) Walking on water"
1400 PRINT "b) Holding your breath for 30 minutes"
1410 PRINT "c) Typing on a Spectrum keyboard"
1420 INPUT a$: PRINT a$
1430 IF a$="a" THEN LET t=t+1
1440 IF a$="b" THEN LET t=t+3
1450 IF a$="c" THEN LET t=t+4
1460 PRINT
1470 PRINT
1480 PRINT "You don't get a picture from a Spectrum because:"
1490 PRINT "a) They have thick streaks"
1500 PRINT "b) Ronald Reagan is a resident"
1510 PRINT "c) The US version of the Spectrum has a defective keyboard"
1520 INPUT a$: PRINT a$
1530 IF a$="a" THEN LET t=t+2
1540 IF a$="b" THEN LET t=t+3
1550 IF a$="c" THEN LET t=t+4
1560 IF t<9 THEN GO TO 1590
1570 IF t>10 AND t<=15 THEN GO TO 1580
1580 GO TO 1600
1590 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
1600 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
1610 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
1620 PRINT
1630 PRINT
1640 PRINT "a) Walking on water"
1650 PRINT "b) Holding your breath for 30 minutes"
1660 PRINT "c) Typing on a Spectrum keyboard"
1670 INPUT a$: PRINT a$
1680 IF a$="a" THEN LET t=t+1
1690 IF a$="b" THEN LET t=t+3
1700 IF a$="c" THEN LET t=t+4
1710 PRINT
1720 PRINT
1730 PRINT "You don't get a picture from a Spectrum because:"
1740 PRINT "a) They have thick streaks"
1750 PRINT "b) Ronald Reagan is a resident"
1760 PRINT "c) The US version of the Spectrum has a defective keyboard"
1770 INPUT a$: PRINT a$
1780 IF a$="a" THEN LET t=t+2
1790 IF a$="b" THEN LET t=t+3
1800 IF a$="c" THEN LET t=t+4
1810 IF t<9 THEN GO TO 1840
1820 IF t>10 AND t<=15 THEN GO TO 1830
1830 GO TO 1850
1840 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
1850 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
1860 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
1870 PRINT
1880 PRINT
1890 PRINT "a) Walking on water"
1900 PRINT "b) Holding your breath for 30 minutes"
1910 PRINT "c) Typing on a Spectrum keyboard"
1920 INPUT a$: PRINT a$
1930 IF a$="a" THEN LET t=t+1
1940 IF a$="b" THEN LET t=t+3
1950 IF a$="c" THEN LET t=t+4
1960 PRINT
1970 PRINT
1980 PRINT "You don't get a picture from a Spectrum because:"
1990 PRINT "a) They have thick streaks"
2000 PRINT "b) Ronald Reagan is a resident"
2010 PRINT "c) The US version of the Spectrum has a defective keyboard"
2020 INPUT a$: PRINT a$
2030 IF a$="a" THEN LET t=t+2
2040 IF a$="b" THEN LET t=t+3
2050 IF a$="c" THEN LET t=t+4
2060 IF t<9 THEN GO TO 2090
2070 IF t>10 AND t<=15 THEN GO TO 2080
2080 GO TO 2100
2090 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
2100 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
2110 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
2120 PRINT
2130 PRINT
2140 PRINT "a) Walking on water"
2150 PRINT "b) Holding your breath for 30 minutes"
2160 PRINT "c) Typing on a Spectrum keyboard"
2170 INPUT a$: PRINT a$
2180 IF a$="a" THEN LET t=t+1
2190 IF a$="b" THEN LET t=t+3
2200 IF a$="c" THEN LET t=t+4
2210 PRINT
2220 PRINT
2230 PRINT "You don't get a picture from a Spectrum because:"
2240 PRINT "a) They have thick streaks"
2250 PRINT "b) Ronald Reagan is a resident"
2260 PRINT "c) The US version of the Spectrum has a defective keyboard"
2270 INPUT a$: PRINT a$
2280 IF a$="a" THEN LET t=t+2
2290 IF a$="b" THEN LET t=t+3
2300 IF a$="c" THEN LET t=t+4
2310 IF t<9 THEN GO TO 2340
2320 IF t>10 AND t<=15 THEN GO TO 2330
2330 GO TO 2350
2340 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
2350 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
2360 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
2370 PRINT
2380 PRINT
2390 PRINT "a) Walking on water"
2400 PRINT "b) Holding your breath for 30 minutes"
2410 PRINT "c) Typing on a Spectrum keyboard"
2420 INPUT a$: PRINT a$
2430 IF a$="a" THEN LET t=t+1
2440 IF a$="b" THEN LET t=t+3
2450 IF a$="c" THEN LET t=t+4
2460 PRINT
2470 PRINT
2480 PRINT "You don't get a picture from a Spectrum because:"
2490 PRINT "a) They have thick streaks"
2500 PRINT "b) Ronald Reagan is a resident"
2510 PRINT "c) The US version of the Spectrum has a defective keyboard"
2520 INPUT a$: PRINT a$
2530 IF a$="a" THEN LET t=t+2
2540 IF a$="b" THEN LET t=t+3
2550 IF a$="c" THEN LET t=t+4
2560 IF t<9 THEN GO TO 2590
2570 IF t>10 AND t<=15 THEN GO TO 2580
2580 GO TO 2600
2590 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
2600 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
2610 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
2620 PRINT
2630 PRINT
2640 PRINT "a) Walking on water"
2650 PRINT "b) Holding your breath for 30 minutes"
2660 PRINT "c) Typing on a Spectrum keyboard"
2670 INPUT a$: PRINT a$
2680 IF a$="a" THEN LET t=t+1
2690 IF a$="b" THEN LET t=t+3
2700 IF a$="c" THEN LET t=t+4
2710 PRINT
2720 PRINT
2730 PRINT "You don't get a picture from a Spectrum because:"
2740 PRINT "a) They have thick streaks"
2750 PRINT "b) Ronald Reagan is a resident"
2760 PRINT "c) The US version of the Spectrum has a defective keyboard"
2770 INPUT a$: PRINT a$
2780 IF a$="a" THEN LET t=t+2
2790 IF a$="b" THEN LET t=t+3
2800 IF a$="c" THEN LET t=t+4
2810 IF t<9 THEN GO TO 2840
2820 IF t>10 AND t<=15 THEN GO TO 2830
2830 GO TO 2850
2840 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
2850 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
2860 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
2870 PRINT
2880 PRINT
2890 PRINT "a) Walking on water"
2900 PRINT "b) Holding your breath for 30 minutes"
2910 PRINT "c) Typing on a Spectrum keyboard"
2920 INPUT a$: PRINT a$
2930 IF a$="a" THEN LET t=t+1
2940 IF a$="b" THEN LET t=t+3
2950 IF a$="c" THEN LET t=t+4
2960 PRINT
2970 PRINT
2980 PRINT "You don't get a picture from a Spectrum because:"
2990 PRINT "a) They have thick streaks"
3000 PRINT "b) Ronald Reagan is a resident"
3010 PRINT "c) The US version of the Spectrum has a defective keyboard"
3020 INPUT a$: PRINT a$
3030 IF a$="a" THEN LET t=t+2
3040 IF a$="b" THEN LET t=t+3
3050 IF a$="c" THEN LET t=t+4
3060 IF t<9 THEN GO TO 3090
3070 IF t>10 AND t<=15 THEN GO TO 3080
3080 GO TO 3100
3090 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
3100 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
3110 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
3120 PRINT
3130 PRINT
3140 PRINT "a) Walking on water"
3150 PRINT "b) Holding your breath for 30 minutes"
3160 PRINT "c) Typing on a Spectrum keyboard"
3170 INPUT a$: PRINT a$
3180 IF a$="a" THEN LET t=t+1
3190 IF a$="b" THEN LET t=t+3
3200 IF a$="c" THEN LET t=t+4
3210 PRINT
3220 PRINT
3230 PRINT "You don't get a picture from a Spectrum because:"
3240 PRINT "a) They have thick streaks"
3250 PRINT "b) Ronald Reagan is a resident"
3260 PRINT "c) The US version of the Spectrum has a defective keyboard"
3270 INPUT a$: PRINT a$
3280 IF a$="a" THEN LET t=t+2
3290 IF a$="b" THEN LET t=t+3
3300 IF a$="c" THEN LET t=t+4
3310 IF t<9 THEN GO TO 3340
3320 IF t>10 AND t<=15 THEN GO TO 3330
3330 GO TO 3350
3340 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
3350 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
3360 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
3370 PRINT
3380 PRINT
3390 PRINT "a) Walking on water"
3400 PRINT "b) Holding your breath for 30 minutes"
3410 PRINT "c) Typing on a Spectrum keyboard"
3420 INPUT a$: PRINT a$
3430 IF a$="a" THEN LET t=t+1
3440 IF a$="b" THEN LET t=t+3
3450 IF a$="c" THEN LET t=t+4
3460 PRINT
3470 PRINT
3480 PRINT "You don't get a picture from a Spectrum because:"
3490 PRINT "a) They have thick streaks"
3500 PRINT "b) Ronald Reagan is a resident"
3510 PRINT "c) The US version of the Spectrum has a defective keyboard"
3520 INPUT a$: PRINT a$
3530 IF a$="a" THEN LET t=t+2
3540 IF a$="b" THEN LET t=t+3
3550 IF a$="c" THEN LET t=t+4
3560 IF t<9 THEN GO TO 3590
3570 IF t>10 AND t<=15 THEN GO TO 3580
3580 GO TO 3600
3590 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
3600 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
3610 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
3620 PRINT
3630 PRINT
3640 PRINT "a) Walking on water"
3650 PRINT "b) Holding your breath for 30 minutes"
3660 PRINT "c) Typing on a Spectrum keyboard"
3670 INPUT a$: PRINT a$
3680 IF a$="a" THEN LET t=t+1
3690 IF a$="b" THEN LET t=t+3
3700 IF a$="c" THEN LET t=t+4
3710 PRINT
3720 PRINT
3730 PRINT "You don't get a picture from a Spectrum because:"
3740 PRINT "a) They have thick streaks"
3750 PRINT "b) Ronald Reagan is a resident"
3760 PRINT "c) The US version of the Spectrum has a defective keyboard"
3770 INPUT a$: PRINT a$
3780 IF a$="a" THEN LET t=t+2
3790 IF a$="b" THEN LET t=t+3
3800 IF a$="c" THEN LET t=t+4
3810 IF t<9 THEN GO TO 3840
3820 IF t>10 AND t<=15 THEN GO TO 3830
3830 GO TO 3850
3840 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
3850 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
3860 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
3870 PRINT
3880 PRINT
3890 PRINT "a) Walking on water"
3900 PRINT "b) Holding your breath for 30 minutes"
3910 PRINT "c) Typing on a Spectrum keyboard"
3920 INPUT a$: PRINT a$
3930 IF a$="a" THEN LET t=t+1
3940 IF a$="b" THEN LET t=t+3
3950 IF a$="c" THEN LET t=t+4
3960 PRINT
3970 PRINT
3980 PRINT "You don't get a picture from a Spectrum because:"
3990 PRINT "a) They have thick streaks"
4000 PRINT "b) Ronald Reagan is a resident"
4010 PRINT "c) The US version of the Spectrum has a defective keyboard"
4020 INPUT a$: PRINT a$
4030 IF a$="a" THEN LET t=t+2
4040 IF a$="b" THEN LET t=t+3
4050 IF a$="c" THEN LET t=t+4
4060 IF t<9 THEN GO TO 4090
4070 IF t>10 AND t<=15 THEN GO TO 4080
4080 GO TO 4100
4090 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
4100 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
4110 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
4120 PRINT
4130 PRINT
4140 PRINT "a) Walking on water"
4150 PRINT "b) Holding your breath for 30 minutes"
4160 PRINT "c) Typing on a Spectrum keyboard"
4170 INPUT a$: PRINT a$
4180 IF a$="a" THEN LET t=t+1
4190 IF a$="b" THEN LET t=t+3
4200 IF a$="c" THEN LET t=t+4
4210 PRINT
4220 PRINT
4230 PRINT "You don't get a picture from a Spectrum because:"
4240 PRINT "a) They have thick streaks"
4250 PRINT "b) Ronald Reagan is a resident"
4260 PRINT "c) The US version of the Spectrum has a defective keyboard"
4270 INPUT a$: PRINT a$
4280 IF a$="a" THEN LET t=t+2
4290 IF a$="b" THEN LET t=t+3
4300 IF a$="c" THEN LET t=t+4
4310 IF t<9 THEN GO TO 4340
4320 IF t>10 AND t<=15 THEN GO TO 4330
4330 GO TO 4350
4340 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
4350 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
4360 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
4370 PRINT
4380 PRINT
4390 PRINT "a) Walking on water"
4400 PRINT "b) Holding your breath for 30 minutes"
4410 PRINT "c) Typing on a Spectrum keyboard"
4420 INPUT a$: PRINT a$
4430 IF a$="a" THEN LET t=t+1
4440 IF a$="b" THEN LET t=t+3
4450 IF a$="c" THEN LET t=t+4
4460 PRINT
4470 PRINT
4480 PRINT "You don't get a picture from a Spectrum because:"
4490 PRINT "a) They have thick streaks"
4500 PRINT "b) Ronald Reagan is a resident"
4510 PRINT "c) The US version of the Spectrum has a defective keyboard"
4520 INPUT a$: PRINT a$
4530 IF a$="a" THEN LET t=t+2
4540 IF a$="b" THEN LET t=t+3
4550 IF a$="c" THEN LET t=t+4
4560 IF t<9 THEN GO TO 4590
4570 IF t>10 AND t<=15 THEN GO TO 4580
4580 GO TO 4600
4590 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
4600 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
4610 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
4620 PRINT
4630 PRINT
4640 PRINT "a) Walking on water"
4650 PRINT "b) Holding your breath for 30 minutes"
4660 PRINT "c) Typing on a Spectrum keyboard"
4670 INPUT a$: PRINT a$
4680 IF a$="a" THEN LET t=t+1
4690 IF a$="b" THEN LET t=t+3
4700 IF a$="c" THEN LET t=t+4
4710 PRINT
4720 PRINT
4730 PRINT "You don't get a picture from a Spectrum because:"
4740 PRINT "a) They have thick streaks"
4750 PRINT "b) Ronald Reagan is a resident"
4760 PRINT "c) The US version of the Spectrum has a defective keyboard"
4770 INPUT a$: PRINT a$
4780 IF a$="a" THEN LET t=t+2
4790 IF a$="b" THEN LET t=t+3
4800 IF a$="c" THEN LET t=t+4
4810 IF t<9 THEN GO TO 4840
4820 IF t>10 AND t<=15 THEN GO TO 4830
4830 GO TO 4850
4840 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
4850 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
4860 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
4870 PRINT
4880 PRINT
4890 PRINT "a) Walking on water"
4900 PRINT "b) Holding your breath for 30 minutes"
4910 PRINT "c) Typing on a Spectrum keyboard"
4920 INPUT a$: PRINT a$
4930 IF a$="a" THEN LET t=t+1
4940 IF a$="b" THEN LET t=t+3
4950 IF a$="c" THEN LET t=t+4
4960 PRINT
4970 PRINT
4980 PRINT "You don't get a picture from a Spectrum because:"
4990 PRINT "a) They have thick streaks"
5000 PRINT "b) Ronald Reagan is a resident"
5010 PRINT "c) The US version of the Spectrum has a defective keyboard"
5020 INPUT a$: PRINT a$
5030 IF a$="a" THEN LET t=t+2
5040 IF a$="b" THEN LET t=t+3
5050 IF a$="c" THEN LET t=t+4
5060 IF t<9 THEN GO TO 5090
5070 IF t>10 AND t<=15 THEN GO TO 5080
5080 GO TO 5100
5090 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
5100 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
5110 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
5120 PRINT
5130 PRINT
5140 PRINT "a) Walking on water"
5150 PRINT "b) Holding your breath for 30 minutes"
5160 PRINT "c) Typing on a Spectrum keyboard"
5170 INPUT a$: PRINT a$
5180 IF a$="a" THEN LET t=t+1
5190 IF a$="b" THEN LET t=t+3
5200 IF a$="c" THEN LET t=t+4
5210 PRINT
5220 PRINT
5230 PRINT "You don't get a picture from a Spectrum because:"
5240 PRINT "a) They have thick streaks"
5250 PRINT "b) Ronald Reagan is a resident"
5260 PRINT "c) The US version of the Spectrum has a defective keyboard"
5270 INPUT a$: PRINT a$
5280 IF a$="a" THEN LET t=t+2
5290 IF a$="b" THEN LET t=t+3
5300 IF a$="c" THEN LET t=t+4
5310 IF t<9 THEN GO TO 5340
5320 IF t>10 AND t<=15 THEN GO TO 5330
5330 GO TO 5350
5340 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
5350 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
5360 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
5370 PRINT
5380 PRINT
5390 PRINT "a) Walking on water"
5400 PRINT "b) Holding your breath for 30 minutes"
5410 PRINT "c) Typing on a Spectrum keyboard"
5420 INPUT a$: PRINT a$
5430 IF a$="a" THEN LET t=t+1
5440 IF a$="b" THEN LET t=t+3
5450 IF a$="c" THEN LET t=t+4
5460 PRINT
5470 PRINT
5480 PRINT "You don't get a picture from a Spectrum because:"
5490 PRINT "a) They have thick streaks"
5500 PRINT "b) Ronald Reagan is a resident"
5510 PRINT "c) The US version of the Spectrum has a defective keyboard"
5520 INPUT a$: PRINT a$
5530 IF a$="a" THEN LET t=t+2
5540 IF a$="b" THEN LET t=t+3
5550 IF a$="c" THEN LET t=t+4
5560 IF t<9 THEN GO TO 5590
5570 IF t>10 AND t<=15 THEN GO TO 5580
5580 GO TO 5600
5590 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
5600 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
5610 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
5620 PRINT
5630 PRINT
5640 PRINT "a) Walking on water"
5650 PRINT "b) Holding your breath for 30 minutes"
5660 PRINT "c) Typing on a Spectrum keyboard"
5670 INPUT a$: PRINT a$
5680 IF a$="a" THEN LET t=t+1
5690 IF a$="b" THEN LET t=t+3
5700 IF a$="c" THEN LET t=t+4
5710 PRINT
5720 PRINT
5730 PRINT "You don't get a picture from a Spectrum because:"
5740 PRINT "a) They have thick streaks"
5750 PRINT "b) Ronald Reagan is a resident"
5760 PRINT "c) The US version of the Spectrum has a defective keyboard"
5770 INPUT a$: PRINT a$
5780 IF a$="a" THEN LET t=t+2
5790 IF a$="b" THEN LET t=t+3
5800 IF a$="c" THEN LET t=t+4
5810 IF t<9 THEN GO TO 5840
5820 IF t>10 AND t<=15 THEN GO TO 5830
5830 GO TO 5850
5840 PRINT "You are a clever little so-and-so, aren't you? You probably love talking about your Spectrum, and never stop going on about your latest peeking and poking. You probably bore people to death at parties by talking to them in machine code."
5850 PRINT "You're not that bothered about Spectrum, as an expert when you really wanted a tie or a new pair of slippers. Come to think of it, what are you doing reading this magazine?"
5860 PRINT "You like playing with your Spectrum, but you probably have time for the trivial aspects of life, such as talking to the kids, eating and going to the bathroom."
5870 PRINT
5880 PRINT
5890 PRINT "a) Walking on water"
5900 PRINT "b) Holding your breath for 30 minutes"
5910 PRINT "
```



# JUST AROUND THE CORNER, A NEW

## BLACK CRYSTAL



### BLACK CRYSTAL

The Classic, six program adventure game for the 48K Spectrum and 16K ZX81 computers. No software collection is complete without it. **Black Crystal** is an excellent graphics adventure and a well thought out package. *Sinclair User*, April '83 **Black Crystal** has impressed me by its sheer quantity and generally high quality of presentation. I am afraid I have become an addict. *Home Computing Weekly*, April '83 **Spectrum 48K** 180K of program in six parts only £7.50 **ZX81 16K** over 100K of program in seven parts only £7.50 **WHY PAY MORE FOR LESS OF AN ADVENTURE?**

### THE CRYPT by Stephen Renton

Prepare yourself for the many challenges that shall confront you when you dare to enter **THE CRYPT**. You will battle with giant scorpions, Hell spawn, Craners, Pos - Negs and if you are unlucky enough — the Dark Cyclops in this arcade style adventure.

Available now for the 48K Spectrum at £4.95



### THE ADVENTURES OF ST. BERNARD

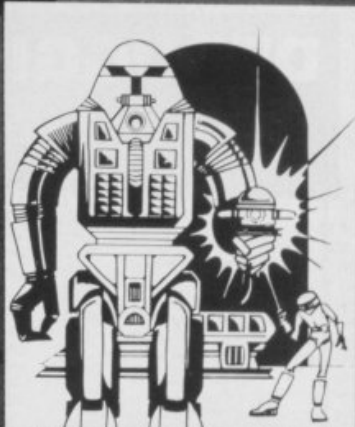
An exciting, fast moving, machine code, arcade game where you guide your intrepid St. Bernard through the perils of the icy wastelands to rescue his Mistress from the clutches of the abominable snowman.

Available for 48K Spectrum £5.95

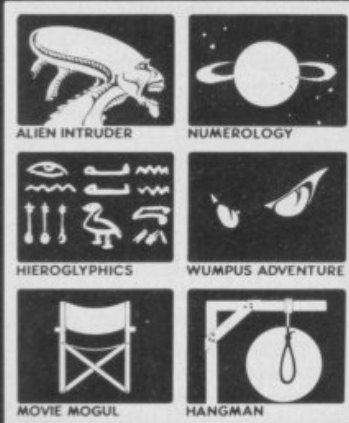
### STARFORCE ONE

Take on the robot guardians of the central computer in a superbly stylised three dimensional battle game. (100% machine code arcade action)

Available for 48K Spectrum £5.95



## ZX COMPENDIUM



### ZX81 COMPENDIUM

Alien Intruder, Wumpus Adventure, Numerology, Hangman, Hieroglyphics, Movie Mogul.

The ideal software package for all 16K ZX81 owners. Six major programmes on two cassettes for only £6.50. Alien Intruder/Hieroglyphics — Both programs make good use of graphics and words to make a very entertaining package. *Sinclair User* Aug 82. Alien/Hieroglyphics/Wumpus/Movie — A varied mix from Carnell, all featuring imaginative responses and graphics and all of them good games for all ages (Hieroglyphics is particularly good for children). *Popular Computing Weekly* Aug 82.

### THE DEVIL RIDES IN

I uttered the last incantations as the clock struck thirteen. All fell silent except for a faint rustling in the corner. From out of the shadows they came, all Hell's fury against me but I was not defenseless until the Angel of Death, astride a winged horse, joined the battle. Avoiding his bolts of hell fire, I took careful aim. My chances were slim, but if my luck held...

(Fast moving, machine code, all action, Arcade game)

Available for 48K Spectrum £5.95



The above are available through most good computer stores or direct from:

**CARNELL SOFTWARE LTD.,**

North Weylands Ind. Est., Molesey Road, Hersham, Surrey KT12 3PL.

**DEALERS:** Contact us for your nearest wholesaler.



RANGE FROM CARNELL SOFTWARE



COMING SOON

**"THE WRATH OF MAGRA"**

The first born has been destroyed. The Black Crystal of Beroth has been banished. The alliance of Evil has been defeated by the armies of Lord Fendal. So ends the Third Age. Now we invite you to write your name in the history of the Fourth Age of the Third Continent.

You will meet friends and enemies, old and new, in the long awaited sequel to Volcanic Dungeon. Using high resolution graphics and combining the best qualities of "Black Crystal" and "Volcanic Dungeon", we will allow you to become part of this tale of revenge.

"The Wrath of Magra" comes as three, 48K programmes on cassette, boxed with instruction manual and book detailing the history of the Third Continent and the many spells you will be using throughout the game.

**NOTE:** "The Wrath of Magra" is a complete adventure. You need not buy "Volcanic Dungeon" or "Black Crystal" to play it.



CARNELL SOFTWARE LTD



# At last!

# MASTER MACHINE CODE

## on your Spectrum



### MASTERING MACHINE CODE ON YOUR ZX SPECTRUM

Toni Baker £9.95

This 315-page book is designed to teach you the essential elements of programming in machine code. Written by Toni Baker, author of the highly successful 'Mastering Machine Code on the ZX81', this new book assumes absolutely no previous knowledge of machine code whatsoever, and yet promises to take you to a level of proficiency beyond your wildest dreams. Starting with simple addition and subtraction you'll be slowly guided through the entire subject of machine

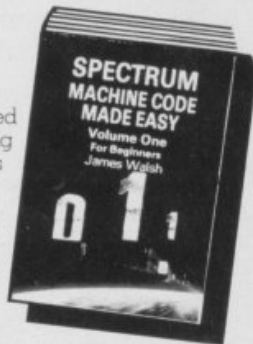
code. The book explores and utilises the incredible speed of machine code, giving you real time graphics games like BREAKOUT and leads you up to a full working DRAUGHTS program. Among other useful skills you'll acquire the ability to create music in real time (impossible in BASIC) and to plot in high-resolution graphics faster than you would have believed possible.

### SPECTRUM MACHINE CODE MADE EASY

Volume One — James Walsh

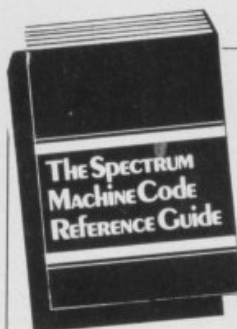
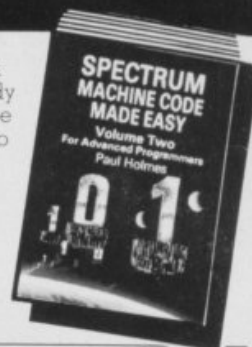
Volume Two — Paul Holmes

These two books provide a graduated course in machine code programming on the ZX Spectrum. Book one starts off with the basic concepts of machine code, followed by an explanation of binary maths, hexadecimal and base conversion, leading as quickly and painlessly as possible onto the rules and types of addressing the Spectrum's



powerful Z80 microprocessor. Book two is designed for those who already understand the rudiments of machine code programming, and now wish to increase their skills.

Each book is just £5.95



### THE SPECTRUM MACHINE CODE REFERENCE GUIDE

Microdrive, Interface 1, and ROM Disassembly

Richard Ross-Langley £4.95

This 170-page reference work for Spectrum machine code programmers contains a full disassembly of the Spectrum ROM, with details of the Microdrive and Interface 1.

Features of the disassembler include: Zilog mnemonics are used, eg LD A, (HL) instead of MOV A, M; relative jumps show the signed decimal offset and the result; hex values are default and are printed without suffix; decimal values are preceded by a plus or minus sign; and some restart instructions are followed by data bytes. The absolute addresses of all system variables and several important routines have been named, using where possible the standard names shown in the manual. The chapter headings in the Microdrive/Interface 1 section of the book include the RS232 Interface; Microdrive Channel data; Local Area Network; Network Algorithms; System Variables; and a summary of functions. This book is a must reference work for serious Spectrum machine code programmers.

Interface Publications, Dept. S, 44-46 Earls Court Road, London W8 6EJ

Please send me the following books. I enclose £

- ☐ Mastering Machine Code on your ZX Spectrum — Toni Baker — £9.95
- ☐ Spectrum Machine Code Made Easy, Volume One for beginners — James Walsh — £5.95
- ☐ Spectrum Machine Code Made Easy, Volume Two for advanced programmers — Paul Holmes — £5.95
- ☐ The Spectrum Machine Code Reference Guide — Richard Ross-Langley — £4.95
- ☐ Creating Adventures on your ZX Spectrum — Peter Shaw and James Mortleman — £4.95
- ☐ Putting Your Spectrum to Work (includes 15 major programs, including a word-processor and spread-sheet calculations) — Chris Callender — £4.95
- ☐ Creating Arcade Games on the ZX Spectrum — Daniel Haywood — £3.95
- ☐ Programming Your ZX Spectrum — Hartnell/Jones — £6.95
- ☐ 60 Games and Applications for the ZX Spectrum — David Harwood — £4.95
- ☐ Beyond Simple BASIC — Delving Deeper into your ZX Spectrum — Dilwyn Jones — £7.95

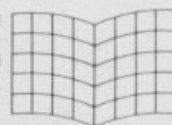
- ☐ Instant Spectrum Programming (tape and book) — Tim Hartnell — £4.95
- ☐ 20 Simple Electronic Projects for the Spectrum — Stephen Adams — £6.45
- ☐ Giant Book of Computer Games — Tim Hartnell — £7.95

Name: .....

Address: .....

**INTERFACE  
PUBLICATIONS**

**We're the experts!**



All books available from computer and book stores, including WHSmiths, Menzies, and Dixons.  
Trade supplied by: The Computer Bookshop, 30 Lincoln Road, Olton, Birmingham B27 6PA (021 707 7544, telex 334361).



## SMASH SOFTWARE

Before the cassette tape there was the record, and those who've been following recent software trends — as opposed to *Duran Duran* — may have noticed a relationship springing up between the two.

So much so in fact that many of the major music publishing companies launched computer-related products in the summer of '83, in the hope of latching on to what they saw as 'micro mania'. EMI released a single by Chris Seivey complete with a B-side program you could pump into your ZX81, and Island Records countered with an LP by ex-Buzzcock, Pete Shelley, called *XL1*. The success (or otherwise) of these records from the point of view of their including a computer program is, according to the respective companies, rather difficult to assimilate. However, Chris Seivey has announced plans to write the programming material for B-sides of other 'name' recording artists, and Pete Shelley is back in front of a computer monitor as well as a microphone — so the feedback couldn't have been that bad.

Indeed, even rock-regurgitator Shakin' Stevens has included a Spectrum program on his latest album. Written by a rather well-known software house, it's difficult to say whether this was purely for the sake of gimmickry — but it's possible to suspect so.

In the forefront of this combination of music and computer technology remain Mainframe, a band from Hemel Hempstead. Lead by John Molloy and Murray Munro, Mainframe produced a single, complete with a program for the Apple computer, as far back as October 1982. The innovation was soon repeated with the release of a second single — one which included programs for both the ZX81 and Spectrum.

With the band's pioneering experience in the area dating all the way back to 1981, Mainframe seems by far the most experienced at using this hybrid concept. But reports from the major music companies is mixed, and it certainly would appear that there were a few problems — not least due to the fact that the recording work was

undertaken by music producers rather than computer technicians. As a result, many record buyers and computer users found themselves out of luck in their attempts to feed the dubbed programs to their computers in a form which would load.

However, things move fast in the music industry and the idea of linking music and computing is far from shelved. Indeed, it's said that EMI is looking to create a broad umbrella for ideas which will interrelate with all the new technologies — music, home computing and videos!

Other music biz names are also in the running to achieve the perfect match of music and computing — especially Virgin and Island Records. Virgin already runs a software house and, with its large distribution chain and wide variety of recording artists, would be in a good position to exploit the idea in 1984. Island Records too has not been idle in its attempts to break into the software market and hungry punters may soon be rewarded with the release of a new range of titles from a company being set up in April, called Island Logic. As well as Pete Shelley, the signs are that many other Island recording artists have been bewitched by the evil eye of the micro monitor, including well-known reggae band, Aswad.

Gimmick or not, with the increasing interest of the major music companies in commercial software and the pioneering work of Mainframe, who knows — 1984 could be the year of the musical software package.

Find out more on Mainframe by writing to MC<sup>2</sup> Music, 24 Missden Drive, Hemel Hempstead, Herts. RM



## ISL 48K SPECTRUM ISL

# 1984

A GAME OF  
GOVERNMENT MANAGEMENT



48K SPECTRUM CHALLENGE  
FROM INCENTIVE SOFTWARE LTD

# 1984

THE GAME OF  
ECONOMIC SURVIVAL

THE BRITISH ECONOMY WITH YOU AT THE CONTROLS! WHAT SORT OF CHANCELLOR WOULD YOU MAKE WITH SEVERAL BILLION POUNDS TO SPEND & FIVE YEARS TO THE NEXT GENERAL ELECTION? GRAPHIC DISPLAYS, HISTOGRAMS & AN ANNUAL PERFORMANCE RATING ARE ALL INCLUDED TO SHOW HOW YOU ARE DOING. HOW MANY YEARS WILL YOU LAST?

FREE INSIDE: Pocket Guide to Running Britain!

N003

£5.50

## MOUNTAINS OF KET ADVENTURE

A MONSTER OF AN ADVENTURE PROGRAM! COMBAT, INTER-ACTIVE BEINGS, MONETARY SYSTEM, MAGIC, EDGAR, SAVE/LOAD FACILITY PLUS MANY OTHER FEATURES.

As well as being a fast ingenious compelling adventure in itself the Mountains of Ket is the first of a 3 part series that builds into a mammoth adventurers challenge.

Incentive: It could be advantageous if you achieve 100%!!

N002

£5.50



48K SPECTRUM ADVENTURE  
FROM INCENTIVE SOFTWARE LTD

## SPLAT!



48K SPECTRUM CHALLENGE  
FROM INCENTIVE SOFTWARE LTD

## SPLAT! ARCADE

ONE OF THE MOST ORIGINAL AND COMPELLING ARCADE GAMES EVER PRODUCED! STARRING ZIPPY!!

"SPLAT! is one of the most addictive games I have ever played on the 48K SPECTRUM. It is certainly the most original!"

Computer & Video Games

NOW AVAILABLE FROM WH SMITH AND BOOKS.

N001

£5.50

All programs run in the 48K ZX SPECTRUM and are available from all good computer shops. In case of difficulty please order direct using the coupon below.

Please send me (tick box(es) required)

1984 ☐ MOUNTAINS OF KET ☐ SPLAT ☐

All at £5.50 each (inclusive of VAT and 1st class postage)

I enclose cheque/P.O. for £ or debit my Access Account No.



Name \_\_\_\_\_

Address \_\_\_\_\_

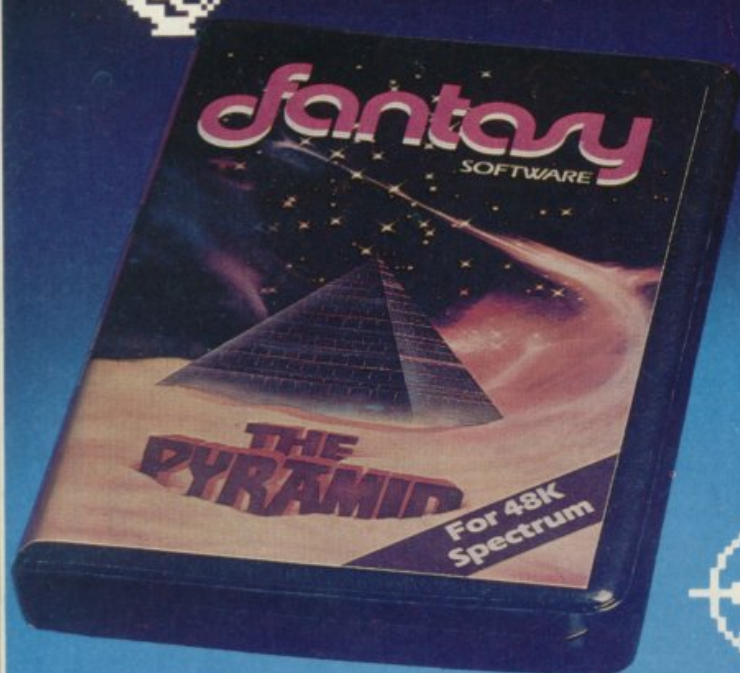
INCENTIVE SOFTWARE LTD., 54 London Street,  
Reading RG1 4SQ. Tel: Reading (0734) 591678



# fantasy

SOFTWARE

The battle could be yours.....  
.....but it won't be easy!



This is 'ZIGGY', shown above, in his exploratory capsule and is a true representation of the on-screen graphics.

## THE PYRAMID

THE PYRAMID is an arcade style game which has a very adventurous feel to it.

The Pyramid contains 120 chambers on 15 levels. In order to get from one chamber to another you must fight off the indigenous aliens to collect an energised crystal which will neutralize the force field guarding the two exits.

The Pyramid is inhabited by a total of 60 weird and exotic alien types, all of which are beautifully animated. You will meet a whole variety of demons, droids, insects and monsters, with a sprinkling of the more unusual, the extra-terrestrial tweezers, galactic strawberry, cosmic claw, mutant eye, plus a whole host of entities that defy rational description. You'll no doubt invent your own nicknames.

You proceed to explore the pyramid from top to bottom with the difficulty generally increasing with the depth of level. Depending on the choice of exit from each chamber you are likely to have a different game every time you play.

Apart from the challenge of trying to achieve the highest score possible the pyramid contains a number puzzle to solve. The more chambers you successfully visit the more information is gathered to enable you to discover the secret numbers of the pyramid. The puzzle won't take you days to solve, it will probably take you a few months.

## DOOMSDAY CASTLE

DOOMSDAY CASTLE consists of a labyrinth of 74 complexly inter-connected Halls and Passages where you will meet a whole host of adversaries serving the infinitely evil Scarthax, the Garthrogs, the Orphacs, the phenomenally nasty Googly Bird and the Urks which manifest themselves in over fifty unbelievably weird and wonderful guises.

Scarthax has scoured the Universe to bring together the six ancient stones of life force. United in Doomsday Castle they are being used to wield an irresistible power over the cosmos, emanating waves of corruption through every galaxy.

To save the Universe, you must battle your way through the Castle to find and collect the six stones and use their force against Scarthax to destroy Doomsday Castle, hopefully escaping yourself before the final cataclysmic explosion.

The task is not easy (saving the Universe never is!) and it will take you many games to unfold the structure of Doomsday Castle and discover the locations of the ancient stones.

The addictive arcade style action will keep you coming back to play but the overall challenge should still keep you occupied for months.

**FANTASY SOFTWARE is available from W.H.SMITHS, JOHN MENZIES, BOOTS, LASKYS, GREENS, RUMBELOWS, SPECTRUM GROUP, COMPUTERS FOR ALL and all other good software retailers.**

**The Pyramid at £5.50 and Doomsday Castle at £6.50 from**

FANTASY SOFTWARE, FALCONBERG LODGE, 27A ST GEORGES ROAD, CHELTENHAM, GLOS GL50 3DT  
despatched by return first class post together with free membership and current newsletter of the Fantasy Micro Club.  
Trade Enquiries welcome – telephone 0242-583661.



## NO JOY!

The article, *Sticking with adjustables*, in your first issue included a review on the Stonechip Programmable Joystick Interface. Unfortunately, looking at the photograph which accompanied the article, I suspect that you reviewed one of the old interfaces.

When the Programmable Joystick Interfaces were first produced, approximately 100 of them contained an error which caused the border to flash, the keyboard to be disabled, etc. These were delivered before the unit's official launch in September. Most of these defective units have now been returned and replaced with the new device.

From September of last year, all the interfaces leaving our factory no longer have these problems, and may I add are selling well. **PJ Mills, Design Engineer, Stonechip Electronics, Aldershot.**

## RADIO ON

I should like to congratulate you on your first issue — I hope you continue with your rather more intelligent approach to the machine than appears to be the general rule.

I would like to take this opportunity to draw your readers' attention to a user group I run called SARUG (Sinclair Amateur Radio User Group). It is a user group in the true sense of the word — not a captive market for someone's products as I fear is becoming more usual these days. Being a non-profit organisation, we can't afford to answer enquiries with an enclosed sae but if any of your readers would like more information on our group, then please write to me at the address given below.

Finally, I hope you will continue to produce objective ('real') assessments of the products available on the market. Having been in the software business for 15 years, I am only too well aware of the vast sea of shoddy rubbish around today. **P Newman (G4INP), 3 Red House Lane, Leiston, Suffolk IP16 4JZ.**

## THE BATTLE CONTINUES...

I feel I must write to thank you for being the first publication to acknowledge our existence in your

# FORUM

**Air your views on the Spectrum scene. All correspondence should be addressed to Forum, Your Spectrum, 14 Rathbone Place, London W1P 1DE. Let's hear from you...**

Frontlines article, *Battle of the tapes*. I hope you will allow me to respond to a few points.

Our first competition was indeed challenging, but you failed to point out that we did provide the machine code routine to do the animation. The response proves that our readership didn't find it that difficult to use.

I do think remarks about 'slavish emulation' should be made with great care, especially by the nth Sinclair specific publication of the year. We each attempt to do different things in different medias, and if we can both do it well then we will provide a useful service.

Also, should any readers of our tape magazine have any problems with loading, please can they get in touch with us — we would be more than happy to deal with their enquiries.

Lastly, I am no longer anonymous — hello!

The best of luck to you in the 'Battle of the rags' in 1984.

**Roger Swift, 16/48 Editor, London W4.**

*Sorry to nit-pick, Rog, but actually YS is the first Spectrum specific publication (paper variety) in Britain — not the nth Sinclair specific. Good luck to you too. Ed.*

## WRITE AWAY!

I found your article on programmable joystick interfaces of considerable interest in your first issue.

However, you neglected to print an address or phone number to which I could direct further enquiries in my quest for an interface from Downsway Electronics. Would it be possible for you to provide this information... it's not a secret, is it? **JS Heslop, Berks.**

*Thank you for our 138th enquiry as to Downsway's whereabouts. There's a sneaking rumour that Downsway are not all that*

*keen for their phone number to be public knowledge at this moment — for more information on this and their joystick interface, you'll have to speak to them on Epsom 27222. Ed.*

## WHOOOPS!

In your first issue as part of the *Spectrum* soft feature, you included a number of excellent screen photographs of the games reviewed.

However, I'm not sure you managed to get them in the right order.

I am particularly interested in two of these programs: *Chequered Flag* and *Race Fun*. I have a feeling that the captions for these two photographs may have been switched. Perhaps you could let me know before I part with my hard-earned cash.

**L Wilkes, Worcs.**

*Actually I'm quite sure we didn't get them in the right order — your surmise was correct. For accuracy, you can swap the two captions you mentioned as well as those for Velnor's Lair and 3D Strategy. Any offers for a beaten-up old magazine designer? Ed.*

## CLUB CORNERED

The *Spectrum* users of the Midhurst Group would like to congratulate you on your first issue.

And with the grovelling done, perhaps we can tell your readers a little of what our club gets up to. We meet on the second and last Thursday of each month, and incorporate two computing groups, one of which caters exclusively for the 10 to 14 year old age group.

The aim of the club is to explore all aspects of microcomputer use. And we would like to invite anyone interested in computing, be they students, dedicated users, professionals or whatever, to contact us for further information. Enquiries should either be addressed to Val Weston, 69

Petersfield Road, Midhurst, West Sussex, or contact myself at the address below. **RMC Armes, One Knock-hundred Row, Midhurst, West Sussex GU29 9DQ.**

## ACID COMMENTS

I have just got through B.A.S.I.C. on my 48K *Spectrum* with a few unknown variables and a syntax error in my space invaders.

What next? Perhaps machine code, but base 16 does seem a bit steep — maybe I've got a thing about six-sided shapes. What about Fourth or Fifth as a language, or perhaps Pascal — or could I go into electronics or robotics? Maybe I should train my *Spectrum* to do tricks, but how do I blow up its nose (maybe its ROM port?).

Which of these would you recommend for a computer expert of tomorrow... or even next Wednesday? **RA Watson, The North.**

PS If all else fails where could I get a good trade-in on a cabbage patch doll.

*Well, er, what can I add... Ed.*

## IT'S AN EDUCATION

Congratulations on the appearance of the first issue of *Your Spectrum* — the staff (and the children!) of our school, Finham Junior Mixed School, found the content very interesting.

Will your magazine be interested in the *Spectrum*'s involvement with education? We are one of the few primary schools in England (a mere 4 per cent) that opted for the *Spectrum* as our school computer under the DoI scheme, and we have to work a little harder trying to find good educational software.

Many software publishers produce exclusively for the BBC Micro (80 per cent of primary schools) or the RML 480Z (16 per cent of primary schools) — and yet we still think we have chosen the right computer for the job! We have four *Spectrum*s in the Junior Computer Department and two in the Infants Computer Department. Both the children and many of their parents are extremely enthusiastic.

We also have visitors from



## UPGRADE YOUR ZX SPECTRUM NOW!

The "CHEETAH" 32K Rampack simply plugs into the user port at the rear of your computer and increases the memory instantly to 48K.

- Fully compatible with all accessories via rear edge connector.
- No need to open computer and invalidate guarantee.
- Why send your computer away and wait weeks for upgrade.
- Fully cased, tested and guaranteed.

### Why wait any longer?

ONLY **£39.95** inc. VAT and p&p



## NOW MAKE YOUR SPECTRUM AND ZX81 TALK!

The CHEETAH "Sweet Talker" just plugs into the back of the computer using the existing power supply. Based on an allophone system you can easily program any word, sentence or phrase. Fully cased, tested, guaranteed and compatible with all accessories via rear edge connectors. Complete with demonstration cassette and full instructions. No more lonely nights!

Simply incredible at **£29.75**

Also available:

16K Rampack for ZX81 ..... **£19.75**    64K Rampack for ZX81 ..... **£44.75**

*Prices include VAT, Postage and Packing. Delivery normally 14 days. Export orders at no extra cost. Dealer enquiries welcome.*

Send cheque/PO now to:-

### CHEETAH MARKETING LIMITED

Dept YS1, 24 Ray Street, London EC1 Tel: 01-278 6954


Please quote when ordering whether Spectrum or ZX owner.

32K Rampack and Sweet Talker available from larger branches of

**John Menzies**



Computers for All dealers.

and **WHSMITH** 









# gives you more games to play... for a package you can pay!



## GAMES FOR COMMODORE 64, DRAGON, SPECTRUM,

Just look at our range . . . and prices! and do not forget, only 3 games are at £7.95 each inclusive of post & packing, all other games are priced at the amazing low price of £3.95! all inclusive.  
Buy any 6 games for the Very Special Price of £19.95 inclusive of post & packing.



### HOW-DE-DO PARTNERS?

YEP FOLKS — IT'S HERE "CALIFORNIA GOLD RUSH"

This here's Prospector Jake, I sure am havin' one helluva time tryin' to peg ma claim with those damned Injuns a hootin' and a hollerin' all over this territory. Ma job gets harder as I move from one Gold Field to another. I know, that is me an' ma stubborn homery ol' Mule here know of 24 rich an' I mean rich seams of pure Gold. All it needs to make this here ol' critter happy is that you help me peg every doggone last one of them claims.

Can YOU help Jake become rich, help him peg his claim, dodge the arrows, avoid the tomahawks, and plant the Dynamite in just the right place? . . . YOU CAN!!!

**YIPPEE** . . . Git yer Picks an' Shovels and join the CALIFORNIA GOLD RUSH . . . NOW  
Amazing Arcade Action . . . Stunning Sound and Graphics  
Available NOW for Commodore 64.

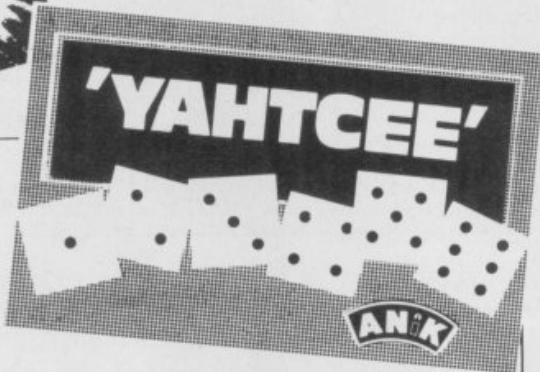
**£7.95** including P & P

### MICROSYSTEMS COMMODORE 64

- \* CALIFORNIA GOLD RUSH: PCN says " . . . could be another Pac-Man" What more can we say!!! (Joystick required) . . . £7.95
- \* YAHTCEE: This is THE version of the traditional dice game. For 1 or more players £7.95

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

- DOZY DODO: Did you know that the Dodo lays it's eggs in mid-flight? Conservation Charlie is doing his best to save the species but is it enough? (Joystick required) . . . £3.95
- SPRITEGEN 64: Define and design your sprites the easy way . . . £3.95
- CHAIN REACTION: Control the atomic reaction in this game of skill. Great graphics — super sound. . . £3.95
- LINK-A-LINE: Make the connection 4 enjoyment! . . . £3.95
- L.A. SUNSET: Could it be the final sunset for L.A. as the returning Space Shuttle goes out of control? . . . £3.95
- STAR TREK 64: Kirk, Spock and Co. beamed down to your 64. (Joystick required) . . . £3.95
- COLOUR ME QUICK: A fascinating game of logic that is highly addictive . . . £3.95
- NAUTILUS NAVIGATOR: Manoeuvre your nuclear powered Sub thro' undersea chasms, vaults and maybe tombs. But what other creatures lurk in the Deep!!! (Joystick required) . . . £3.95



- MOONBASE TOUCHDOWN: Your fuel is low, your Astro-module has an intermittent malfunction, can you reach your base . . . £3.95
- SAFELY!!! (Joystick required) . . . £3.95
- VEGAS SLOT: You'll hand it to this Bandit . . . £3.95
- It's great . . . £3.95



**STOCKING FILLER . . .**  
VIDEO LIBRARY CASES  
Amazing Value at only £1.45 for 3 incl P & P.  
5.25" Disk Library Cases hold 10 disks, blue plastic, just the thing for that extra present.  
Normally £1.98 each.  
Our price: 2 for £1.95 incl P & P.

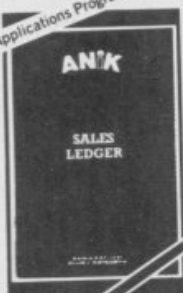
### SPECTRUM

- STARSHIP 2100RD: Repel the invaders from Zenos and thwart their plans to take over the Galaxy . . . £3.95
- POLARIS PATROL: Rid our shores of the dastardly aggressors!!! (Joystick required) . . . £3.95
- USS ENTERPRISE: Boldly go on a dangerous voyage to the very limits of your Spectrum (Joystick required) . . . £3.95
- COSMIC ATTACK: Dorks, Wapraz and Neutra-Zemals in combat!!! (Joystick required) . . . £3.95
- DUMB DUCK: Blow their tiny beaks off!!! (Joystick required) . . . £3.95
- THE SEVEN HILLS: You'll jump at the chance to ski on these slopes. (Joystick required) . . . £3.95
- BATTLE STATIONS: Cosmic attackers threaten Civilisation. Is there no escape, are we doomed? (Joystick required) . . . £3.95
- PANE DAMAGE: People who live in glass houses shouldn't . . . Dynamic action. (Joystick required) . . . £3.95
- PHASOR POWER: The Ultimate weapon. Use it carefully against the planets enemies!!! (Joystick required) . . . £3.95
- HOTHOUSE HELL: Fiery, frantic, furious action with truly brilliant graphics. (Joystick required) . . . £3.95
- ALL SYSTEMS GO: Blast off into the great blue yonder and face the peril that awaits you!!! (Joystick required) . . . £3.95
- VISCIOUS VERMIN: Giant plague carrying rodents turn on the Human race and try to take over!!! (Joystick required) . . . £3.95
- ANIKMAN: Our version of the greedy gulper . . . not to be missed!!! (Joystick required) . . . £3.95
- PIGGOTT'S PONY: We bet this will be winner. You can put your shirt on it!!! (Joystick required) . . . £3.95
- MISSION POSSIBLE: Have you the qualities to cope with tomorrow's technology . . . in Space? (Joystick required) . . . £3.95
- GHOSTLY GHOULS: All kinds of creepies make this game a nightmare!!! . . . £3.95
- THE FORCE . . . BEYOND! Cosmic energy — Anikstyle!!! (Joystick required) . . . £3.95
- \* YAHTCEE: Thirteen ways to roll out a winner. Multi player game — lots of fun . . . if you don't lose!!! . . . £7.95

### DRAGON

- LEAPIN' LANCELOT: Medieval machine magic as Lancelot endeavours to rescue fair Guenevere. (Joystick required) . . . £3.95
- GALLACTIC SURVIVAL PAK: No Astro-traveller should be without this. A collection of 3 of the best astro-games around!!! (Joystick required) . . . £3.95
- MINDBENDERS: 3 puzzles to enthrall and mystify you. Hours of mindbending fun to pass the long Winter evenings . . . £3.95
- \* YAHTCEE: Five times as nice with our Yahtcee dice. For one or more players . . . £7.95
- GEE UP NEDDY: The odds-on favourite with all the Family. (Joystick required) . . . £3.95
- THE SEVEN HILLS: You'll jump at the chance to ski on these slopes. (Joystick required) . . . £3.95
- PHASOR POWER: The Ultimate weapon. Use it carefully against other planets enemies!!! (Joystick required) . . . £3.95
- ANIKMAN: Our version of the greedy gulper . . . not to be missed!!! (Joystick required) . . . £3.95
- BATTLE STATIONS: Cosmic attackers threaten civilisation. Is there no escape, are we doomed? (Joystick required) . . . £3.95
- ALL SYSTEMS GO: Blast off into the great blue yonder and face the peril that awaits you!!! (Joystick required) . . . £3.95
- PANE DAMAGE: People who live in glass houses shouldn't . . . Dynamic action. (Joystick required) . . . £3.95

Serious Applications Programs.



**SALES LEDGER**  
Specification as for Purchaser Ledger.  
SALES LEDGER for CBM 64,  
SPECTRUM, DRAGON . . . £14.95



**DATAHOLD**  
The DBMS for the CBM 64. Up to 15 fields per record. Sort and search by any field. Calculations. Report generation. MAIL LABELLER incl. with DATAHOLD — fully user definable.  
DATAHOLD for CBM 64 . . . £24.95



**PURCHASE LEDGER**  
Fully user definable. Allows for multiple entry, invoicing and payment control. Full search and sort facilities. Print option. VAT account and analysis. Status report generation.  
PURCHASE LEDGER for CBM 64,  
SPECTRUM, DRAGON . . . £14.95

### HOW TO ORDER

To order any games all you have to do is enter the title you wish to receive in the coupon below, write your name and address, enclose your cheque or postal order made payable to ANIK MICROSYSTEMS and post to us. **DON'T FORGET—Buy any six games at £3.95 each and pay only £19.95—SAVE £4!**

Your games will be despatched within 48 hours!



**ANIK MICROSYSTEMS**  
30 KINGS CROFT COURT · BELLINGE · NORTHAMPTON · NN3 4BH  
TEL: (0604) 411013

Post to: ANIK MICROSYSTEMS · 30 KINGS CROFT COURT · BELLINGE  
Please send me the following games for:  
I enclose my cheque/PO. for £  
Name \_\_\_\_\_ Address \_\_\_\_\_  
Tel: (day) \_\_\_\_\_ Tel: (eve) \_\_\_\_\_  
Y5114



# TAKE A RUNNING JUMP

*If you've marvelled at the manic figures zipping around your video screen — then wonder no longer at how it's done. Improve your own arcade games by leaps and bounds with this zappy little routine from machine code maestro, Toni Baker.*

The object of this issue's exercise is to present a machine code routine which may be used in Basic programs for a wide variety of totally pointless — but fun — games. With it in operation you see a little figure on the screen, that at the touch of the left or right cursor keys, will happily run along the screen in a horizontal straight line. A touch of the up cursor key and the mischevious character will jump into the air and land back down again! Don't ask me what for — you're the programmer!

A few simple PEEKs are all that are needed to tell the program where the figure is, and a couple of POKEs will

## Moving Graphics Data

### FIGURES

```
DEFB 00 01 03 03 01 00 01 3F
DEFB 00 80 C0 C0 80 80 C0 E0
DEFB 01 02 02 04 04 38 00 00
DEFB 80 40 20 10 08 38 00 00
```

Data for the left facing figure (1).



```
DEFB 00 01 03 03 01 00 01 3F
DEFB 00 80 C0 C0 80 80 C0 E0
DEFB 01 01 02 04 0F 00 03 00
DEFB 80 80 80 80 F0 90 90 00
```

Data for the left facing figure (2).



```
DEFB 00 01 13 0B 05 02 01 01
DEFB 00 80 C0 C0 80 80 C0 A0
DEFB 01 01 02 04 02 01 03 00
DEFB C0 80 40 40 40 40 C0 00
```

Data for the left facing figure jumping.



```
DEFB 00 00 00 00 00 00 00 00
DEFB 00 00 00 00 00 00 00 00
DEFB 00 00 00 00 00 00 00 00
DEFB 00 00 00 00 00 00 00 00
```

Data for the blank space.

```
DEFB 00 01 03 03 01 01 03 07
DEFB 00 80 C0 C0 80 00 80 FC
DEFB 01 02 04 08 10 1C 00 00
DEFB 80 40 40 20 20 1C 00 00
```

Data for the right facing figure (1).



```
DEFB 00 01 03 03 01 01 03 07
DEFB 00 80 C0 C0 80 00 80 FC
DEFB 01 01 01 01 0F 09 09 00
DEFB 80 80 40 20 F0 00 C0 00
```

Data for the right facing figure (2).



```
DEFB 00 01 03 03 01 01 03 05
DEFB 00 80 C8 D0 A0 40 80 80
DEFB 03 01 02 02 02 02 03 00
DEFB 80 80 40 20 40 80 C0 00
```

Data for the right facing figure jumping.



This data should be entered at the end of the main machine code listing. You should then replace the question marks at the LD BC, FIGURES routine to point to the beginning of the moving graphics data.

Machine Code		Assembler	Comments
FD5678	START	LD D,(A_FLAGS)	Signal 'No move made yet'. Is the figure jumping? Go straight to the 'up/down' routine if so. Note: bit three reset. Scan segment three of the keyboard. A:= 00 if key '5' pressed, 10 otherwise. B:= 00 if key '5' pressed, 10 otherwise. Note: bit four reset. Scan segment four of the keyboard. A:= 00 if key '8' pressed, 04 otherwise. A:= 00 if both key '5' and '8' pressed; 04 if key '5' pressed, but not key '8'; 10 if key '8' pressed, but not key '5'; 14 if neither key pressed. Test for key '5' only. Move figure left if so. Test for key '8' only. Go straight to 'up/down' routine unless pressed.
CBA2		RES 4,D	
C84A		BIT 1,D	
2033		JR NZ,UP/DOWN	
3EF7		LD A,F7	A:= 00 if key '5' pressed, 10 otherwise. B:= 00 if key '5' pressed, 10 otherwise. Note: bit four reset. Scan segment four of the keyboard. A:= 00 if key '8' pressed, 04 otherwise. A:= 00 if both key '5' and '8' pressed; 04 if key '5' pressed, but not key '8'; 10 if key '8' pressed, but not key '5'; 14 if neither key pressed. Test for key '5' only. Move figure left if so. Test for key '8' only. Go straight to 'up/down' routine unless pressed.
DBFE		IN A,(FE)	
E610		AND 10	
47		LD B,A	
3EEF		LD A,EF	A:= 00 if key '5' pressed, 10 otherwise. B:= 00 if key '5' pressed, 10 otherwise. Note: bit four reset. Scan segment four of the keyboard. A:= 00 if key '8' pressed, 04 otherwise. A:= 00 if both key '5' and '8' pressed; 04 if key '5' pressed, but not key '8'; 10 if key '8' pressed, but not key '5'; 14 if neither key pressed. Test for key '5' only. Move figure left if so. Test for key '8' only. Go straight to 'up/down' routine unless pressed.
DBFE		IN A,(FE)	
E604		AND 04	
B0		OR B	
FE04		CP 04	A:= 00 if key '5' pressed, 10 otherwise. B:= 00 if key '5' pressed, 10 otherwise. Note: bit four reset. Scan segment four of the keyboard. A:= 00 if key '8' pressed, 04 otherwise. A:= 00 if both key '5' and '8' pressed; 04 if key '5' pressed, but not key '8'; 10 if key '8' pressed, but not key '5'; 14 if neither key pressed. Test for key '5' only. Move figure left if so. Test for key '8' only. Go straight to 'up/down' routine unless pressed.
2814		JR Z,LEFT	
FE10		CP 10	
201D		JR NZ,UP/DOWN	
CBD2	RIGHT	SET 2,D	Signal 'figure facing right' A:= current x co-ordinate. Are we at the right of the screen? Exit if so. Otherwise change x co-ordinate. Signal 'figure has moved'. Go to the JUMP key test.
3AAF5C		LD A,(POS_X)	
FE1E		CP 1E	
2814		JR Z,UP/DOWN	
FD3475		INC (POS_X)	
CBE2		SET 4,D	
180D		JR UP/DOWN	



# 48K SPECTRUM OWNERS *Read This From* **OCP** ...LET'S GET DOWN TO BUSINESS...

## ★ ★ ★ FINANCE MANAGER ★ ★ ★

**FINANCE MANAGER** is a powerful, flexible and fast MENU DRIVEN general purpose program carefully designed to handle up to 255 separate accounts for domestic and business accounting applications. The magic of MACHINE CODE has enabled us to produce the very latest "on the page" presentation which lets you enter and edit data naturally, as if with a pencil and paper.

These screens are just a sample to show the style of the program:

But that's not all, not by a long way. This program automatically raises a corresponding debit or credit for every entry, and will even open a new account if an entry features an unrecorded account name.

Accounts can be **MERGED, DELETED, ANALYSED, MARKED** as priority, **RENAMED, EDITED** and **SCROLLED**. Transactions can be **RECONCILED, AMENDED, DELETED, PRINTED, DESCRIBED** for analysis and **RENAMED**. Standing orders can be **APPLIED, REMOVED, DESCRIBED, AMENDED, DELETED** and even **DUMMIED** for planning purposes. Other features include **DATE CHANGE, RUNNING TOTALS, 2 KEYBOARD MODES, PRINT PAGE/LINE/BLOCK/FROM END/FROM START/FROM DATE** etc., **LIST BALANCES, FIELD ERASE/INSERT/DELETE, EXIT TO BASIC**. You may not want all these features but they are there just in case.

## ★ ★ ★ ADDRESS MANAGER ★ ★ ★

**ADDRESS MANAGER** utilises the same "on the page" presentation as **FINANCE MANAGER** and offers Spectrum owners a professional standard address filing, indexing and retrieval system. Below are examples of the screen presentations.

**ADDRESS MANAGER** has been carefully constructed to provide the user with a tool that is extremely friendly and easy to use, the speed and presentation of this program are second to none.

**ADDRESS MANAGER** features **MULTIPLE INDEXING** via our 3 way 3 character index, an ability to store over 400 full names and addresses or 1500 individual names/titles.

USES include storing and updating names, addresses and phone numbers, printing out Xmas card lists, etc, mail order work, customer classification by type size (doctors have used this program to catalogue patients by treatment).

## ★ ★ ★ 80 COLUMN-PLUS 80' VERSIONS ★ ★ ★

80 column versions of both these programs are available. These work in conjunction with the Kempston Centronics Interface and Centronics Printer. Write to us for a quotation for the software, the interface and the latest high performance Japanese Dot Matrix Printer — you will find our prices very competitive.

VISIT YOUR LOCAL SOFTWARE STORE NOW AND ASK FOR FINANCE MANGER AND ADDRESS MANAGER BY NAME —

also available from selected branches of WH SMITH, BOOTS and MENZIES



**SOFTWARE ★ ★ ★ SIMPLY THE BEST ★ ★ ★**

If you experience difficulty obtaining your copies of these programs send a cheque or postal order for £8.95 (£19.95 for **PLUS 80** versions) or telephone your details to (0753 888866):

**Oxford Computer Publishing Ltd.**  
**4 HIGH STREET, CHALFONT ST PETER, BUCKS SL9 9QB**



Machine Code		Assembler	Comments
CB92 3AAF5C	LEFT	RES 2,D LD A,(POS__X)	Signal 'figure facing left'. A:= x co-ordinate of the figure.
A7 2805 FD3575		AND A JR Z,UP/DOWN DEC (POS__X)	Is it at the left of the screen? Exit if so. Otherwise change x co-ordinate.
CBE2		SET 4,D	Signal 'figure has moved'.
3EEF DBFE		LD A,EF IN A,(FE)	Note: bit four reset. Scan segment four of the keyboard.
E608 2804		AND 08 JR Z,J__PRESSED	A:= 00 if key '7' pressed, 08 otherwise. Jump if the JUMP key pressed.
CBAA 180A	J__PRESSED	RES 5,D JR JUMP__TEST	Signal 'JUMP key not pressed'.
CB6A CBEA 2004		BIT 5,D SET 5,D JR NZ,JUMP__TEST	Was the key already pressed? Signal 'JUMP key pressed'. Exit unless the key is pressed for the first time.
CBCA CBB2		SET 1,D RES 6,D	Signal 'figure is jumping'. Signal 'figure moving upwards'.
CB4A 281C CBE2 CB72		BIT 1,D JR Z,PRINTOUT SET 4,D BIT 6,D	Is the figure jumping? Exit if not. Signal 'figure has moved'. Is the figure moving up or down?
2809		JR Z,UP	
FD3577 2011	DOWN	DEC (JUMP__HEIGHT) JR NZ,PRINTOUT	Decrease the height above the ground. Jump unless the figure has reached the ground.
CB8A 180D		RES 1,D JR PRINTOUT	Signal 'figure no longer jumping'.
3AB15C 3C 32B15C FE04 2002 CBF2		LD A,(JUMP__HEIGHT) INC A LD (JUMP__HEIGHT),A CP 04 JR NZ,PRINTOUT SET 6,D	A:= height above the ground. A:= new height. Store the new height. Are we at the top of a jump? Exit if not. Signal 'figure now moving downwards'.
FD360200 7A CB4A 2804 E6FE		LD (TVFLAG),00 LD A,D BIT 1,D JR Z,XXX AND FE	Direct PRINT to upper part of screen. A: contains all the flags. Is the figure jumping?
1802		JR YYY	If so then reset the animation flag.
EE01	XXX	XOR 01	Otherwise complement the animation flag.
32B05C CB62 C8 ED5BAC5C	YYY	LD (A__FLAGS),A BIT 4,D RET Z LD DE,(LAST__POS)	Store amended flags. Has the figure moved? Return if not. DE:= previous co-ordinates of the figure.
3E03 CD????		LD A,03 CALL FIGURE	A:= code for a blank space. Print a blank space, overwriting the previous figure.
ED5BAE5C		LD DE,(POS)	DE:= present position (with the figure assumed to be on the ground).
7B		LD A,E	A:= y co-ordinate of the ground.
FD9677		SUB (JUMPHEIGHT)	A:= true y co-ordinate of the figure.
5F		LD E,A	DE:= true current co-ordinates.
ED53AC5C 3AB05C E607		LD (LAST__POS),DE LD A,(A__FLAGS) AND 07	Store these co-ordinates. A: contains all the flags. A:= code for the appropriate figure to print.

move our friend to any part of the screen. Therefore, the Basic is totally interactive with the machine code. It is quite feasible to make some kind of video game out of this routine using no other machine code at all — so, if you feel that particular area is beyond you at present, there's still plenty for you to do in the meantime.

### WHAT'S THE POINT

If you don't understand machine code then a couple of points are worthy of explanation. The left-hand column of the machine code listing is all you need to feed into the computer. The other columns are just there to give additional information. However, you'll notice there are a couple of question marks in the left-hand column of the listing which are not part of the machine code; they are a warning that these are addresses which you'll need to work out for yourself. For instance, where it says CD???? in the left-hand column, and CALL FIGURE in the middle column, it means that the question marks in the left-hand column should be replaced by the *address* of the line of machine code which has the label FIGURE written in the second column. This address must be in hexadecimal, and with the two component bytes in reverse order — so, for instance, if the line labelled FIGURE ends up at address 24962 then the question marks in the line CALL FIGURE will need to be replaced by 8261, since 24962 (decimal) equals 6182 (Hex). If

10 POKE 23724,16	y co-ordinate of the figure.
20 POKE 23725,0	x co-ordinate of the figure.
30 POKE 23726,16	As line 10.
40 POKE 23727,0	As line 20.
50 POKE 23728,0	Reset all flags in A_FLAGS.
60 POKE 23729,0	Reset the height above the ground.
70 RANDOMIZE USR ?????	This refers to the label START in the program.
80 GO TO 70	

Figure 1. The bare essentials of a game, so that you can see the potential of the code in action.

you start the program as a whole at address 6000 (Hex) then this will actually be the case.

The routine makes use of a couple of addresses in the system variables, which you can PEEK and POKE in Basic in order to make the game do whatever you want. These are:

- 23726 The y co-ordinate of the horizontal line along which the figure runs.
- 23727 The x co-ordinate of the figure.
- 23729 The height of the figure above the ground.

In addition, there are three more addresses which you should not use in the course of a game, but which none-





## ROSE SOFTWARE

### EDUCATIONAL SOFTWARE FOR THE SPECTRUM (16K or 48K)

#### YOUNG LEARNERS 2

4 programs for the young computer user: — angles, tables, deduce and capacity. All with excellent graphics. An easy introduction to computer aided learning.

£5.95 per cassette  
(inc. p&p)

#### G.C.E. "O" LEVEL MATHS REVISION GEOMETRY

6 programs of multiple choice questions, covering properties of parallel lines, triangles, various polygons and circles. All questions use generated numbers. An explanation of the correct answer is given.

#### LEARNING TO READ MUSIC

4 teach and test programs: — Treble Clef, Scale Position, Note Values and Keyboard. All with excellent graphics and help facilities.

*We have a large range of educational programs for the Spectrum and ZX81, from infants to "O" level.*

Send sae for catalogue of all our products to:—  
**ROSE SOFTWARE, 148 Widney Lane,  
Solihull, West Midlands B91 3LH.**



## Are your finances driving you mad?

Do you find that working out your finances makes your head buzz?  
Do you see red?

Don't worry, now you can have Hilton's **Personal Banking System** on your side, giving you a clear head start and (hopefully) putting you back into the black!

Maintain permanent records and fully detailed statements of your finances + Search facility. **Bank Reconciliation** module is included to automatically match your Bank Statement to your PBS account.

\* ZX81 £9.95 (16K)  
\* ZX SPECTRUM £12.00 (48K)  
\* DRAGON £12.00 (32K)  
\* BBC £9.95 (32K) PBS only  
guaranteed after sales  
maintenance provided.

#### NEW RELEASES

**SPECTRUM (48K)**  
**GARDEN BIRDS** ..... £6.50  
A captivating introduction to Ornithology and entertaining  
**PLAY TYPE & TRANSPOSE** £9.00  
Compose, transpose key, Play it  
Save it, Print it!  
**DRAGON (32K)**  
**UTILITIES 1** ..... £5.00  
Including Compress, Catalogue  
and Copy  
**DISASSEMBLER** ..... £5.00  
Prints either to screen or printer  
in HEX and MNEMONICS  
**MEMORY MAP** ..... £5.00  
Over 9 A4 pages of Dragon  
Memory locations. INVALUABLE!  
ORDER by POST (specifying machine)  
OR at the POST OFFICE using  
TRANSCASH ACCOUNT 302 9557

Hilton Computer Services Ltd  
(Dept YS) 14 Avalon Road,  
Orpington, Kent BR6 9AX

Ask for the PBS at your local computerstore.



## HEARING IS BELIEVING

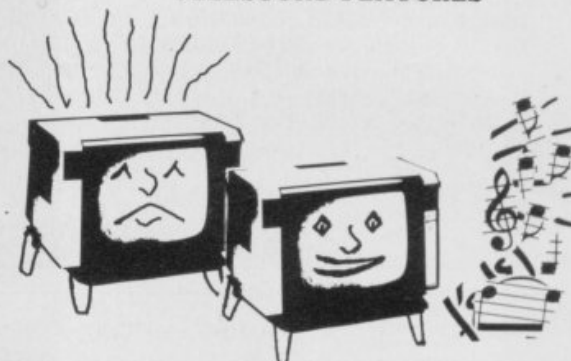
# Tele Sound

## SPECTRUM BEEP BOOSTER

TELESOUND is ready built and tested so that you can get the full sound of your Spectrum through any unmodified television set, black and white or colour. The unit is easy to fit in minutes without any previous experience as full fitting instructions are provided.

TELESOUND has been designed using the very latest ultra miniature components so it's size is an incredible 2 x 1.3 x 1mm. and fits neatly inside the Spectrum. Three easy push-on connections are made to the Spectrum. The connections are clearly shown in a diagram that comes with full fitting instructions.

### TELESOUND FEATURES



- ★ **SOUND AND VISION TOGETHER FOR ADDED REALISM.**
- ★ **BEEP VOLUME CONTROLLABLE FROM A WHISPER TO A ROAR.**
- ★ **KEYBOARD CLICK CLEARLY HEARD TO ASSIST PROGRAM ENTRY.**
- ★ **PROGRAMS CAN BE HEARD WHEN BEING LOADED ★ NO SOLDERING OR CASE CUTTING REQUIRED.**
- ★ **ADDITIONAL AMPLIFIER NOT NECESSARY ★ SEPARATE POWER SUPPLY NOT REQUIRED.**
- ★ **USES NO MEMORY SO WORKS WITH ALL PROGRAMS ★ COMPATIBLE WITH ALL OTHER ADD-ONS INCLUDING MICRODRIVE.**

**TELESOUND** comes complete with easy to follow fitting instructions and cost £9.95 inclusive of post, packing etc. Please state your computer when ordering.

# COMPUSOUND



C  
T  
A



DEPT: YS/12 32 - 33 LANGLEY CLOSE, REDDITCH, WORCESTERSHIRE.  
B98 0ET. TELEPHONE: (0527) 21429 (21439 Answerphone)



Machine Code		Assembler	Comments
8F 2600	FIGURE	LD L,A LD H,00	HL:= code for the figure to print.
29 29 29 29 29 01????		ADD HL,HL ADD HL,HL ADD HL,HL ADD HL,HL ADD HL,HL LD BC,FIGURES	Multiply by 20h. BC:= points to the data for the figures.
09		ADD HL,BC	HL: points to the data for a specified figure.
010800		LD BC,0008	BC:= number of bytes per character square.
CD???? 1C		CALL HALF__FIGURE INC E	Print the top half of the figure. Change y co-ordinate in order to print the bottom half of the figure.
3E16 D7 7B D7 7A D7 CD????	HALF__FIGURE	LD A,"at control" RST 10 LD A,E RST 10 LD A,D RST 10 CALL FIG__SQ	PRINT AT E, D. Print one character square of the figure. (Now to print the second character square. .)
22785C 3E90 D7 09 C9	FIG__SQ	LD (UDG),HL LD A,"Graphic A" RST 10 ADD HL,BC RET	USR "A": points to the data to print. Print one character of the figure. Point HL to the data for the next square. End of the routine.

theless must be POKEd with certain initial values before the game starts. These are:

23724 As 23726 initially.  
23725 As 23727 initially.  
23728 Must be POKEd with zero initially.  
(Note also that 23729 must also be POKEd with zero initially).

Figure 1 shows the bare essentials of such a game. Lines 10, 20 and 50 POKE the initial values required into the system variables, but these addresses needn't be accessed again in Basic. Lines 30, 40 and 60 POKE the variables which you are allowed to PEEK and POKE throughout the game. Lines 70 and 80 are 'the game'. The machine code will only move the figure by one square, if at all, and so between these moves you can put whatever you want, and this will define the game.

#### TRICK OR TREAT?

There is one other trick worth knowing about (one that in a way contradicts what was said earlier). The following subroutine will STOP the figure from falling down again after jumping and should be called whilst the player is in mid-air:

1000 POKE 23726, PEEK 23724  
1010 POKE 23728,0  
1020 POKE 23729,0  
1030 RETURN

Happy programming — may silliness reign supreme! □



DORIC COMPUTER SERVICES PRESENT

## THE ORACLE'S CAVE

The Oracle's Cave is an exciting adventure game containing a unique blend of **HIGH RESOLUTION ANIMATED GRAPHICS** and text which has been designed especially for the

**48K SPECTRUM**

Its many features include:

- ★ Continuously displayed high resolution graphics
- ★ Time limit of five 'days' on every adventure
- ★ Completely new cave layout, monster position and event sequence generated for every game
- ★ All monsters, articles and locations depicted to a level of detail that pushes SPECTRUM graphics to the limit

'The closest yet to a true animated graphics adventure...excellent value for money' *Popular Computing Weekly*

'Superb high resolution with smooth scrolling ... with the nights drawing in this program should give you plenty to think about' *Micro Adventure Dec 83*

'The graphics are smooth, startling and exciting. They show the way for the development of the graphics adventure in the next year' *Sinclair User Annual 84*

'Each quest is selected by you at the beginning of the game and you will have five game days in which to complete it. The time factor is exceptional in adventure games' *Sinclair User Dec 83*

Available from W H SMITH, selected branches of BOOTS and J MENZIES and other leading retailers.

Trade Enquiries welcome  
Telephone 0533 314345



Also available direct at £7.95 (Postage and packing free) from:

**DORIC COMPUTER SERVICES, 3 THE OASIS,  
GLENFIELD, LEICESTER LE3 8QS**





ONLY THE BEST BECOME A...

# FIGHTER PILOT

A SPECTACULAR FLIGHT SIMULATION OF THE WORLD'S MOST EXCITING JET FIGHTER WITH STUNNING 3D COCKPIT VIEW AND THE MOST REALISTIC 3D AIR-TO-AIR COMBAT EVER SEEN ON THE SPECTRUM!

The SUPREME SIMULATION....

it leaves the rest at the runway threshold!!

Based upon the F15 USAF air superiority jet fighter. Includes landing, take-off, steering on the ground, 3-D air to air combat, fully aerobatic performance, airfield attack by the enemy, crosswinds, turbulence, landing in fog, 4 pilot ratings, 4 runways, 8 beacons, ground features, Artificial Horizon, Radar, Flight Computer, ILS, flaps, u/c, system failures, Map, joystick compatible — Kempston, AGF, Sinclair Interface 2, Protek & others. 100% machine code. Complete with full instructions and pilot's notes.

£7.95

48k Spectrum  
Joystick compatible

## Digital Integration

Dept. , 22 Ash Church Road, Ash, Aldershot, Hants GU12 6LX

All prices include VAT and p&p (overseas add 55p per cassette) Trade & export enquiries welcome —

All cassettes carry a lifetime guarantee.

Mail order or check your local computer store.

### NIGHT GUNNER NEW



**NIGHT GUNNER** — the air battle scenario where only aces survive! Each mission pushes you to the limit with enemy fighters attacking from all directions, guns blazing! — explosive 3D ground attack sortie, and there's still the flight home...  
Joysticks — Kempston, AGF, Sinclair, Protek & others.  
48k Spectrum

£6.95

### FOOTBALL League Analysis NEW



**FOOTBALL League Analysis Program** — The easy-to-use Pools Prediction Program with 9 methods of team performance analysis. Simply enter the new fixture list, load your league table data base, and let your Spectrum guide you to your Pools selection.  
48k Spectrum

£7.95

### Taxi! NEW



**TAXI!** — Another passenger awaits at the busy town square. To the hotel? The station? The quicker you are, the bigger your tip and the less petrol you will use. But beware of reckless drivers — they simply hate taxis!!  
A frustrating test of your skills as a taxi driver... fun for all the family!!  
Any Spectrum

£5.50



# THE PROTECTION RACKET

*Have you ever wondered how professional software writers 'protect' their programs from copying and alteration? Simon Goodwin chews over some of the techniques used on the Spectrum, and outlines ways in which these same principles could be incorporated in your own software.*

The first problem of program protection comes when a tape has just loaded. Obviously you don't want the user to type SAVE and produce a new copy — but how can your program take over control of the computer?

Ideally the program will start as soon as it's loaded. On the Spectrum this is quite easily achieved from Basic. If the word LINE is added to the end of the SAVE command, a Basic program will automatically start to run as soon as it's loaded, without the need for the user to type anything. The command SAVE "EXAMPLE" LINE 200 would save a Basic program which will RUN as soon as it has been LOADED. There is a snag, though.

The Spectrum LOAD command is not the only way to read a Basic program into the machine. Sinclair Research provides a MERGE instruction, which fetches a program from tape and then combines its lines with those which were already in the computer. The MERGE command never RUNs a program after it has been loaded, even if the program was saved using the LINE instruction. Consequently, the danger is that it's possible to break into, and list, any Basic program which would normally RUN straight away. Sinclair Research recognised this flaw when the Microdrive was designed — you can't MERGE a Microdrive file which has been saved with the LINE option, although the flaw in the tape system has not been corrected.

All anyone has to do is simply type NEW (so that there are no lines already in the computer) and " " to load the 'protected' program. Once it has loaded there'll be the normal 'OK' message. Finally, typing LIST will enable anyone to examine the program, regardless of any 'anti-break' mechanisms in it. It's a technique that, unfortunately, allows people to intercept the program before it has time to set up protection against STOP or BREAK.

At first sight SAVE " " LINE would seem to be the only way to produce a Spectrum program which will RUN as soon as it is loaded — but experience in the shops will show that this is not the case.

Some programs are able to 'auto-RUN' even though they are saved as machine code blocks of memory. The Spectrum allows users to record the contents of any area of memory with the command SAVE "NAME" CODE START, LENGTH. NAME is the name of the tape file and START and



JOE WRIGHT

LENGTH are the first address of the memory and the number of bytes it contains, respectively.

It is possible to use this command to SAVE any area of memory. If you saved the entire contents of the Spectrum RAM you would be able to save a kind of 'picture' of the state of the computer — since all of the information saved would correspond to the exact state of the computer when the SAVE command was executed. If you then loaded that 'picture' back you would overwrite everything that had been done since the SAVE was carried out. In effect, you would restore the computer

to its state when the SAVE was underway.

The Spectrum stores Basic in an area of memory, just as it stores everything else! The computer also uses 180 bytes of memory to store a description of the current Basic program, including notes on which variables are being used, what line is being executed, and so on. The program below saves itself as a CODE area, while the Basic is running. RUN it — it will save itself and then print a message. Then reset the computer (either by typing RANDOMIZE USR0 or by pulling out the plug). When you load what was saved, you will find that the



# WHERE THE FUN BEGINS...

IT WILL DRIVE YOU...  
**BONKERS**



**FAST ACTION ARCADE GAME**

PROCOM SOFTWARE  
**FOR ANY ZX SPECTRUM**

**BONKERS**  
Try to escape from the upper regions of an alien space station... Fight the deadly Pac-Droids and Baby Droids — but do not relax — there are other aliens waiting!  
\* Arcade Action!  
\* High Score price! for any ZX Spectrum

**£5.50**

DON'T LET THE SLOW START FOOL YOU!

**GRID MASTER**

THE NO.1 BOARD GAME



PROCOM SOFTWARE  
**WORKS ON 48K ZX SPECTRUM**

**GRID MASTER**  
A game for all the family to enjoy. A draw can never be achieved... or can it? Lots of fun!  
for 48K ZX Spectrum

**£4.95**

**TIME IS RUNNING OUT!**



A unique game for the whole family. Guaranteed to amuse and instruct!

**BREAKAWAY**  
by PROCOM

**BREAKAWAY**  
Be the modern Robin Hood! Time based, you have 15 seconds to rescue the damsel in distress... Can you do it? Try!  
Fun for all the family  
for ZX Spectrum 16K/48K

**£5.50**

## FOR THE ZX SPECTRUM

## PROCOM SOFTWARE

\* Bonkers and Breakaway are available from Prism, Woolworths, Rumbelows, John Lewis and Debenhams.

\* Dealer inquiries welcomed

\* Overseas inquiries welcomed

DO YOU HAVE A GOOD IDEA FOR A GAME?  
CALL US!

COMING SOON!

- \* Bricky Micky
- \* Bermuda Triangle
- \* Time Bug
- \* Magic Orchard
- \* Final Frontier

ask for details...



**PROCOM SOFTWARE**

**PROCOM SOFTWARE**  
309 HIGH ROAD · LOUGHTON · ESSEX  
TEL: (01) 508 1216

### HOW TO ORDER

Telephone orders  
(01) 508 1216

Credit Card Holders (Access/Barclaycard only) can purchase by telephone. Please give card no., name, address and items required, and your order will be despatched the same day.

### BY POST

Simply write your requirements in the coupon provided, enclose your cheque/P.O. or use your Access or Barclaycard. Please make cheque payable to: PROCOM SOFTWARE and post to address below. Allow 7 days for delivery.

### IN PERSON

Visit our premises, at the address below for a great selection — we will be delighted to see you.

POST TO: PROCOM SOFTWARE,  
309 HIGH ROAD, LOUGHTON, ESSEX.

Please send me the following items:

- |   |  |
|---|--|
| <input type="checkbox"/> Bonkers (£5.50)        | <input type="checkbox"/> Grid Master (£4.95) |
| <input type="checkbox"/> Breakaway (£5.50 each) | <input type="checkbox"/> List of new games!  |

(Please tick items)

I enclose my cheque/P.O. for £

I prefer to pay with my ACCESS/BARCLAYCARD

(Delete whichever not applicable)

Card No.

Signature

Name

Address

Tel: (Day)

Tel: (Eve)

Credit cards valid if signed by card holder. Address above must be the same as card holder.

VS13/71



Basic will pick up just where it left off. Let's see it:

```
100 PRINT "This appears before the SAVE!"
110 SAVE "DEMO" CODE 23552,1500
120 PRINT "The program goes on. . .";
130 GO TO 120
```

Now we have found a new way of making a Basic program RUN as soon as it is loaded. Of course, we could have started some machine code instead if we had put an appropriate USR call (to the first part of the code) on line 120. The advantage of this technique over SAVE "?" LINE is that you can't disable it with a MERGE instruction. In fact both of these techniques are used quite commonly in commercial software.

There is one other bonus of saving programs as CODE rather than Basic. If you replace the value 23552 with 16384 in line 110, you will create a single file which contains both Basic and the display picture at the moment of the SAVE. This combined file will load more quickly than two separate 'screen' and 'program' files. The only snag is that you have to save the contents of the printer buffer (256 bytes) since that is sandwiched in memory between the 'screen' storage and the Basic.

Unfortunately, it is still possible to break into a program saved as CODE, but it's rather more difficult, especially if the program is a long one. The LOAD " " CODE command allows you to specify a new load address for the taped program, so that you can stop it taking over by loading it into an area of memory where it will not overwrite your loader. This is obviously not easy on a 16K Spectrum.

Another snag of using SAVE "?" CODE rather than SAVE "?" LINE is that the VERIFY command doesn't usually succeed when you try to check the CODE block, even if the SAVE was perfectly successful. This is because our 'picture' saves a few values which are constantly changing without harm to the Basic (the time, for instance) so that VERIFY will find that the file on tape is almost always different from the contents of the memory it came from.

Some software publishers use the three byte internal timer of the Spectrum as a way of detecting whether or not a program has been meddled with — they set the time to a fixed value when the program is saved, and then check for that value when the program runs. If there is a discrepancy of more than a few seconds the program self-destructs!

At least the usual way to foil such protection is rather long-winded. You have to break into the program once it has loaded and find the code which checks the time (search for the value 32673 in memory). Next, you need to examine the code using a disassembler, and disable it by altering or skipping it. Chapter 18 of the Spectrum manual contains a good example of the use of the timer.

### KEEPING CONTROL

We've shown how it's possible to take over control of the computer during a LOAD. But how can a program keep

control after the LOAD is complete?

If we aim to stop the user from saving a copy of our program, we must obviously make it impossible for him or her to get back to the 'OK' prompt, from which a SAVE command could be issued. Normally Basic checks the keyboard 50 times every second, to find out whether or not the Break key is pressed (among other things). We can stop this check quite easily by turning off the Spectrum's 'real time clock' which tells the computer when to examine the keys. Here's how:

```
100 POKE 23296,243
110 POKE 23297,201
120 RANDOMIZE USR 23296
```

This short program clobbers the Spectrum's clock. It temporarily stores a tiny machine code program in the computer's printer buffer, and then the two machine code instructions are carried



out. The first one turns off the clock (243, Disable Interrupts) and the second one returns the user to Basic.

The snag is that the Spectrum needs the clock to survive! If you run the above program you'll find that the computer 'hangs up' (ignores you) as soon as the machine code has been executed. Without the clock, the Spectrum doesn't look at the keys. The INKEY\$ function will still work, but INPUT is disabled. You can't enter any more instructions after the clock has been turned off. Add these lines to the program to turn off the clock before you type RUN, and you will find out the snag:

```
130 PRINT INKEY$
140 GO TO 130
```

If you type BREAK, the computer will stop dead. It's waiting for another 'tick' — but will never hear one, because you've turned off the clock. Disconnect your computer and then plug it back in (be careful with the 9 volt socket, which can become loose with age). Now try to use an INPUT statement after the clock has been turned off.

This technique has other flaws. The clock is temporarily turned off during instructions such as BEEP and SAVE

(otherwise you would hear a ragged sound as the computer keeps stopping to look at the keyboard). Likewise the COPY command turns off the clock temporarily, so that the printer can be served quickly, without interruption. All of these commands turn the clock back on once they have finished — you cannot use them in a program which is designed to work with the clock turned off.

The main advantage of running a program with the clock off is that it will work slightly faster, since the computer no longer has to check the keyboard 50 times a second. In practice, the advantage is not very great. However, this technique of protection is used in quite a few programs.

### SOME FATAL ERRORS

So, another approach is needed to the problem and one interesting idea is to try to alter the way the computer treats 'errors'. The Spectrum classifies use of the Break key or a STOP statement as error, which means that every situation which leaves the user able to type a command such as SAVE is an error. But is it possible to 'intercept' the error before the computer gives the user the chance to SAVE?

Close examination of the Spectrum manual and ROM indicates that all errors are treated in a special way. The computer fetches an address from locations 23613-4 (called ERR-SP in the manual). That address is, in turn, the address of another location in memory. Next, the computer fetches the value in that location, and carries out a machine code GO TO to the address indicated!

This is a rather tangled route, but it allows the computer to get out of an error without losing track of its memory. The mechanism is quite complicated, but it all hinges on the value in locations 23613 and 23614. If we alter those values, we alter the way the Spectrum treats an error.

The next program example forces the Spectrum to jump to location zero whenever an error occurs. If you run the program you'll find that the computer resets itself — destroying the program — as soon as you type BREAK. Here it is:

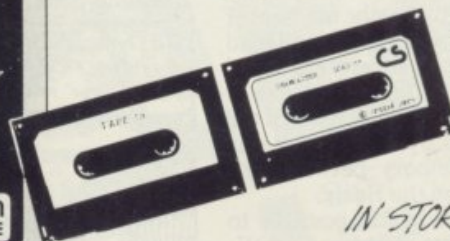
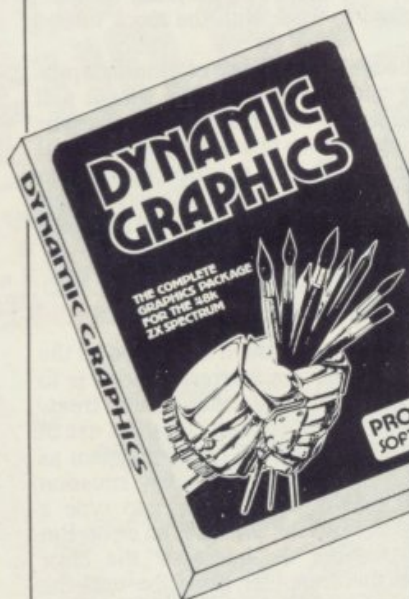
```
100 POKE 23613,2
110 POKE 23614,91
120 POKE 23298,0
130 POKE 23299,0
140 PRINT "?";
150 GO TO 140
```

The program forces Basic to look at addresses 23298 and 23299 — the printer buffer, once again — whenever an error occurs. The computer jumps to the address specified at the start of the buffer when the error is detected. We've specified the address 0 (lines 120 and 130) so that the machine jumps to address 0, the beginning of the ROM, and promptly behaves as if it has just been turned on, scrubbing the program in the process!

In principle, you can alter the program to carry out any other option when



# THE FIRST IN DYNAMIC PACKAGES FROM PROCOM



## WHAT IT IS

Whether you are a beginner or an experienced programmer it will make no difference with the DYNAMIC GRAPHICS package from Procom. You will be able to program professional looking graphics on your Spectrum. DYNAMIC GRAPHICS comes in two cassettes at the price you would normally pay for one. But do not let the low price put you off. DYNAMIC GRAPHICS is by far the most unique and much needed software aid on the market today.

**£14.95**

inc. VAT and P&P

*JUST LOOK  
AT WHAT  
WE HAVE  
IN STORE FOR YOU!*

## TAPE 1

THIS IS A CHARACTER DESIGNER WITH A DIFFERENCE \* FULL SCREEN ANIMATION OF SPRITES \* 27 FUNCTIONS INCLUDING SPRITE HANDLING 96 CHARACTERS WHICH CAN BE SAVED ON TAPE TO USE IN YOUR OWN PROGRAMS \* EASY METHODS OF INCLUDING CHARACTER DESIGNS IN YOUR OWN BASIC PROGRAMS \* NO KNOWLEDGE OF MACHINE CODE NEEDED \* SCREEN SAVING \* SPRITES MAY BE TREATED AS SUPER LARGE CHARACTERS (4 x 4). THE LIST IS ENDLESS. YOU WILL BE ABLE TO DESIGN LITERALLY THOUSANDS OF DIFFERENT CHARACTERS FROM PAC MEN TO SPACE MEN OR SPACE SHIPS TO BATTLESHIPS.

## TAPE 2

THIS IS THE ULTIMATE UTILITY FOR COMPOSING HI-RES GRAPHICS ON YOUR SPECTRUM. AS WELL AS ESSENTIAL HAND DRAW CURSOR CONTROLS (OR JOYSTICK) THERE ARE MANY ADVANCED FEATURES, SUCH AS FAST FILL AND RESCALE. THERE ARE IN ALL OVER 50 COMMANDS. A CONSTANTLY UPDATED STATUS DISPLAY. GENERATED PROMPTS ARE FULLY DISPLAYED. NOW YOU CAN DESIGN SCREENS AS GOOD AS THE SOFTWARE COMPANIES.

- 1 DYNAMIC PROGRAMMING
- 2 DYNAMIC ANIMATION
- 3 DYNAMIC SOUNDS
- 4 DYNAMIC FILING
- 5 DYNAMIC EDITOR & ASSEMBLER

Package for the ZX Spectrum now!  
(Also for the BBC, Electron and CBM 64)

## EASY TO USE

DYNAMIC GRAPHICS is the one that everybody will understand. The instruction manual is simplicity itself. No more strained eyes — the manual has large 10 x 8 pages with plenty of diagrams to make it easy for you.

## YOUR TICKET TO RICHES?

Use DYNAMIC GRAPHICS to make up your own program, and if it's good we will market it for you and maybe make you rich.

# DYNAMIC GRAPHICS

## HOW TO ORDER

Telephone orders  
(01) 508 1216

Credit Card Holders (Access/Barclaycard only) can purchase by telephone. Please give card no., name, address and items required, and your order will be despatched the same day.

## BY POST

Simply write your requirements in the coupon provided, enclose your cheque/P.O. or use your Access or Barclaycard. Please make cheque payable to: PROCOM SOFTWARE and post to address below. Allow 7 days for delivery.

## IN PERSON

Visit our premises, at the address below for a great selection — we will be delighted to see you.

**PROCOM  
SOFTWARE**

309 HIGH ROAD  
LOUGHTON  
ESSEX  
Tel: (01) 508 1216

Post to: PROCOM SOFTWARE, 309 HIGH ROAD,  
LOUGHTON, ESSEX.

Please send me the following items:

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> DYNAMIC GRAPHICS | <input type="checkbox"/> DYNAMIC PROGRAMMING | <input type="checkbox"/> DYNAMIC ANIMATION          |
| <input type="checkbox"/> DYNAMIC SOUNDS   | <input type="checkbox"/> DYNAMIC FILING      | <input type="checkbox"/> DYNAMIC EDITOR & ASSEMBLER |

(Please tick items)

I enclose my cheque/P.O. for £

I prefer to pay with my ACCESS/BARCLAYCARD  
(Delete whichever not applicable)

Card No.

Signature

Name

Address

Tel: (Day)

Tel: (Eve)

Credit cards valid if signed by card holder.  
Address above must be the same as card holder.

Y5284



the Break key is pressed. Alter line 130 to:

```
130 POKE 23299,127
```

and the computer will jump to address 32512 (127 times 256 plus 0) when an error is found. If you don't want to put the address in the printer buffer you can alter the POKEs in lines 100 and 110 so that they specify a different address. At the moment they 'point' to 91 times 256 plus 2, which is 23298 — part of the printer buffer.

If you always want an error to result in a system reset, you can point at a part of the ROM which always contains the address 0. The following example illustrates a simplified routine:

```
100 POKE 23613,4
110 POKE 23614,61
```

These two POKEs will force the computer to reset itself whenever it would otherwise have produced an error message.

Unfortunately, there is a snag with this method of protection. Basic obviously has its own use for the value in ERR-SP. Sometimes the Spectrum will alter the value, removing your protection system. The RUN, CLEAR, GOSUB and RETURN commands all change the value of ERR-SP, so that you cannot use any of them in programs which disable BREAK in this manner. The technique is consequently not much use in complex programs, although it is quite a good way of protecting short routines which call machine code.

## DISPLAY DISMAY

There is another way of protecting programs which doesn't suffer from this problem, although it brings other difficulties of its own.

The Spectrum is an unusual computer in that it splits its display into two areas — the text or graphics area at the top of the screen, and the so-called edit area at the bottom — used for commands, error messages and editing. Each area is treated separately by Basic. If we can stop the computer using the edit area we will be able to stop all modifications and commands.

Luckily the Spectrum manual contains all the information we need to do this. Location 23659, unmemorably called DF-SZ, is used to record the number of lines in the edit area of the screen. This is normally two or more, which is why you can only plot on 176 lines of the Spectrum display, even though there are 192 lines there. In fact, 16 plot lines (enough for two lines of characters) are reserved for the edit area.

When the Spectrum ROM was written, the authors presumably noted that the edit area is never completely empty (zero lines) and programmed accordingly. That was a reasonable assumption to make, and consequently the ROM doesn't check for the case of zero lines.

If we put the statement POKE 23659,0 in a program, we are telling the com-

puter that the edit area is zero lines long. If we try to write into the edit area after that, the computer becomes confused — there are no free lines for the message. The consequence is that the computer hangs — it just sits there, impervious to the user's attempts to disturb it.

Earlier we said that all error messages are printed in the edit area of the screen. After POKE 23659,0 the edit area does not exist, so there is nowhere for the message to be printed. Any attempt to break from a program protected in this way results in the screen being cleared (a side effect of the way the computer tries to tackle the problem) and then the computer hangs.

The only flaw of this system is that it disables the Basic commands CLS and BORDER. You probably know that the command OUT 254,2 has a similar



effect to that of BORDER 2. The OUT command passes the colour code 2 (or any other value 0-7) to the Spectrum ULA, where it is used to specify the colour of the screen border. The difference between this and the BORDER command is that BORDER also controls the colour of the edit area. A BORDER statement issues an OUT command and then colours in the edit area in the same colour as the perimeter of the screen. Finally it stores the new colour in RAM so that subsequent communication with the ULA (reading the keys, for example) will not suddenly change the colour of the border of the display.

The BORDER statement consequently tries to write to the edit area of the screen. If we use BORDER after POKE 23659,0 the computer will hang when it tries to write to the bottom of the screen. Likewise the CLS command clears both parts of the display, writing to the edit area in the process. Thus, we can't use CLS and POKE 23659,0 together.

Luckily it's quite easy to write Basic or machine code subroutines to simulate BORDER and CLS. Our next program example shows how this can be done. Use GOSUB 8000 instead of

CLS, and GOSUB 8100 for BORDER. The CLS routine uses the values of INK and PAPER selected earlier. Adjust the value of the variable BORD to select a border colour. Let's take a look:

```
8000 OVER 0: INVERSE 0
8010 FOR Y=0 TO 21
8020 PRINT AT Y,0,,
8030 NEXT Y
8040 RETURN
8100 LET C=BORD*8
8110 FOR Y=23232 TO 23295
8120 POKE Y,C
8130 NEXT Y
8140 OUT 254,BORD
8150 IF C<=32 THEN LET C=C+7
8160 POKE 23624,C
8170 RETURN
```

The first subroutine is quite simple — it overwrites every line of the display with a blank space in the current colour. Each comma at the end of line 8020 tells the computer to output 16 spaces. Consequently two commas produce 32 spaces, clearing an entire line. The subroutine only alters the top 22 lines (those normally available to the Basic programmer).

The second subroutine is a little more complex. It begins by converting the border colour into the form used in the computer's attributes table, where the PAPER colour is a multiple of eight. Then the appropriate value is stored in the 64 locations which contain the attributes of the lower two lines of the Spectrum display. This will be the entire edit area, unless you typed RUN immediately after editing and deleting a long program line.

The next step is to change the colour of the border. Line 8140 sends the new value to the ULA. Finally we must put the border colour in the computer's working storage. Location 23624 (called BORDER) is the place reserved for this information by the Spectrum ROM. Line 8160 ensures that the computer does not change the border colour back again as soon as it next communicates with the ULA.

We now have another practical way of protecting a Spectrum program from interruption. This scheme is also popular with professional software authors.

## COPY TECHNIQUES

The publishing industry regularly gets upset about the ease with which books and magazines can be photocopied for a fraction of their proper prices. The software industry suffers from similar problems, although the mechanism used for copying is quite different (have you ever wished you could photocopy a cassette or floppy disk?). There are two ways of duplicating software — dubbing and bit-copying.

Dubbing is a simple process which should be familiar to all readers. You simply take two tape recorders and connect them together, playing the original tape and recording direct on to the duplicate. Dubbing is simple, cheap and totally undefeatable. There is no



way to stop people dubbing cassette software, so long as the software can be played back on a standard recorder. If there was, be sure the record companies would have found it by now!

The disadvantage of dubbing is that it's not very reliable. A copy is of worse quality than the master — the original hiss and distortion has been duplicated and new distortion has been added. One educational software supplier in Birmingham has carried out experiments to determine how often a tape can be dubbed before it becomes unusable. Even good-quality recorders failed to produce loadable tapes after the third 'generation' of dubbing.

A *bit-copier* is a program that reads data from a tape without interpreting it in any way. Programs are saved as a succession of musical tones on a cassette. The tones, or their lengths, vary to signify a '1' bit or a '0'. Almost every computer uses different tones or lengths, which is the main reason why computers can't begin to make sense of each other's tapes.

The first bits on the tape usually determine the type of file, its name, where to load it, and so on. The data to be stored then follows, interspersed with other information such as 'check-sums' (the total of bits so far, used to check for loading errors) and other marker information. A bit copier ignores the significance of all of this information. It just reserves a large buffer of memory, and stores bits in the buffer as they are read from tape. Once the entire

file is stored it can be squirted out just as it was read.

Such a copier can make an infinite number of generations of copy, since



each duplicate is identical to the original. They pose a much greater threat to software publishers than dubbing, since they make it possible for enormous numbers of illegal copies of a program to be produced. Luckily it's easy to defeat a bit copier, although surprise to say the combined brains of the UK

software industry don't seem to have worked out how.

A bit copier for a Spectrum won't copy BBC Micro programs — the tones and timings are different, so that the copier would read (say) pairs and triplets of 3.4s and 11s rather than individual 1s and 0s. A program to copy any tape would need to store detailed timing information about each click encountered. Such a program is impractical, requiring very large amounts of memory to copy even a short file.

To fool a bit copier all you need do is store part of your file in a non-standard format. Use different tones or timings. The first part of the file is formatted the usual way, so that the computer can load it. Besides various blind alleys and tricks, it contains a devious program to read the rest.

The only way to make a bit-copy of the whole file is to decode the first part and discover exactly how it works, then write a new copier for the rest of the data. That is hard work — more than £5 or even £50 worth of work. Anyone who can do it would be better off selling his or her skills and buying software, rather than duplicating it!

#### TO CONCLUDE

Complex and costly though it is, it seems that software protection is here to stay. The techniques involved indicate one of the most fascinating aspects of programming — how to alter the fundamental behaviour of a computer. ■

## GEM SOFTWARE

### OH MUMMY !!

Your party of archaeologists enter the pyramid in search of the mummies of the pharaoh's household. There are five burial chambers containing treasure, secret scrolls, keys, royal mummies and some nasty surprises. To pass from one chamber to the next, you must find the key and royal mummy, but beware, you may uncover a guardian, who will chase your group to avenge your desecration!!

A Machine Code game for those with nerves of steel and great courage.

Price (ZX81 & SPECTRUM) £4.95

### MONSTER MINE

Escape from the mine with as much money as you can, but don't get closed in or caught by the prowling monsters. An addictive machine code game, with superb graphics and tape save facility.

Price (ZX81 & SPECTRUM) £4.95

### SUB CHASE

A great machine code game in which you must depth charge the submarines. Sounds easy, but, you must position your destroyer, set detonation depth, fire and hope you can evade the subs' missiles. The problem is, the higher the skill level, the more intelligent the subs become, and you only have a limited supply of depth charges!!

Price (SPECTRUM) £4.95

### SPACE MISSION

Launch from lunar base and fight your way through the steroid belt to do battle with the enemy fleet. This multi-level space combat game, sets new standards in graphic excellence and attention to detail.

Price (ZX81 & SPECTRUM) £4.95

All prices include postage and packing. All cassettes despatched within 48 hours of receipt of order. Access orders welcome.

GEM SOFTWARE, UNIT D, THE MALTINGS, STATION ROAD, SAWBRIDGEWORTH, HERTS.

Telephone (0279) 723567/723518





# QUICKSILVER

...THE YEAR OF THE GAME LORDS.

## NEW RELEASES!

### COMMODORE 64 STING 64 £7.95

Author: **Anton Hinxman**

Hive-cave action!  
Bertie Bee needs help  
defending the hive. Fight off  
the invading swarms, battle  
the bees and defend your  
Queen!

### COMMODORE 64 BUGABOO (THE FLEA) £7.95

Author: **Indescomp**

Itchy action!  
Jump your way out of the  
caves with Bugaboo the flea  
but beware of the fearsome  
Dragon as you jump around  
the exotic vegetation.

### 48K SPECTRUM RAYMOND BRIGGS' THE SNOWMAN £6.95

Author: **David Shea**

An enchanting game based  
around episodes of Raymond  
Briggs' amazingly successful  
book.

### 48K SPECTRUM ANT ATTACK £6.95

Author: **Sandy White**

Battle the Ants in the soft  
solid 3D city of Anteschier.

### 48K SPECTRUM DRAGONS BANE £6.95

Authors: **M. Preston,  
P. Hunt, R. Rose, D. Moore.**

A mythical graphic  
adventure in the dark and  
deadly halls of Earthstone  
Castle. Battle Dragons,  
Vampires, Sphinx, Zombies,  
Skeletons, Gryphons and  
other legendary beasts to  
rescue the beautiful Princess  
Paula.

### 48K SPECTRUM FRED £6.95

Author: **Indescomp**  
Action beneath the  
Pyramids!

Fearless Fred the Intrepid  
Archaeologist searches the  
creepy catacombs below the  
torrid tomb of 'Tootiecarmoon'  
for the terrible treasures  
amidst monstrous mummies,  
ghastly ghosts, bats and rats!

48K SPECTRUM • **TIME GATE** Author: John Hollis £6.95  
COMMODORE 64 • **PURPLE TURTLES** Authors: Mark & Richard Moore £7.95  
VIC 20 + 3K or 8K RAM • **SKYHAWK** Authors: Steve Lee/Chartec £7.95  
DRAGON • **MINED OUT** Authors: I & C Andrew/Incentive £5.95  
BBC MODEL • **THE GENERATORS** Author: Dave Mendes £5.95

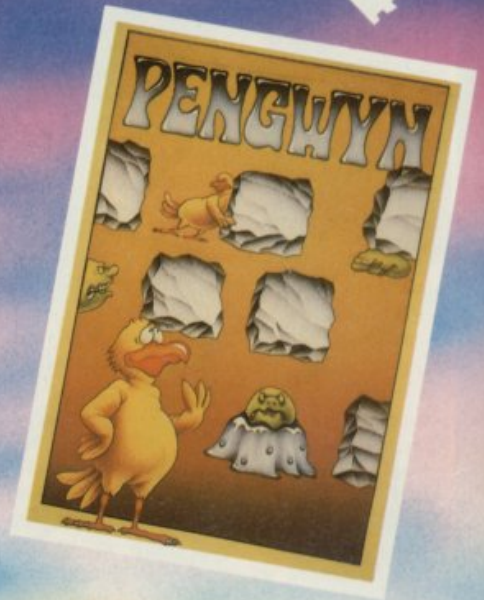
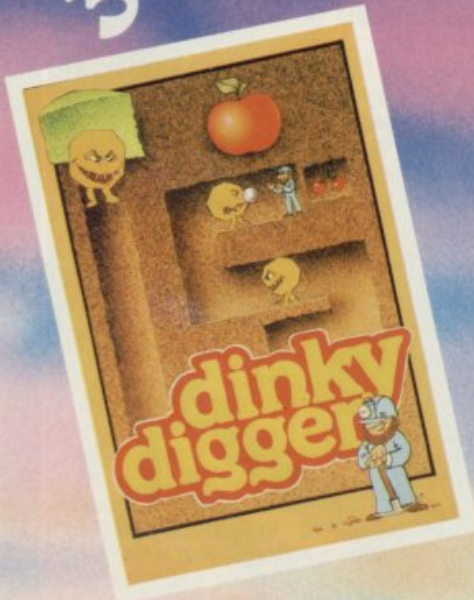
All titles available from Quicksilver Mail Order  
P.O. Box 6, Wimborne Dorset BA21 7PY.

Quicksilver programs are available from: Boots, W.H. Smiths, J. Menzies, Microdealer,  
HMV, Hamleys, John Lewis, Computers for All and all reputable  
specialist computer stockists.

SEND S.A.E. FOR  
FULL COLOUR  
CATALOGUE



# 3 from POSTERN for '84



## 2

## 1

## 3

### DINKY DIGGER

It's super-fast, furious and as mean as they come.  
(Spectrum 48K)

### XANAGRAMS

Over 5,000 permutations in this game of skill for all ages.  
(Spectrum 16K/48K BBC 'B' Electron CBM 64)

### PENGWYN

As the temperature rises, strange happenings begin in Pengwyn's frozen world.  
(BBC 'B' Electron)

## POSTERN



Available nationally from specialist retailers and all good multiples.

Please write quantities required in boxes provided and state computer type.

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

POST TO: Postern Ltd., PO. Box 2, Andoversford, Cheltenham, Glos GL54 5SW. Postern is always on the look out for any new games you might have developed.



### POSTERN

Total £ \_\_\_\_\_ or Access No. \_\_\_\_\_

Please Postern  
People post me:

1

Xanagrams

2

Dinky Digger

3

Pengwyn

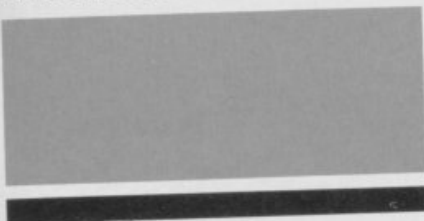
**Price £6.95 each**

(£7.95 for overseas mail order)



# SOFT ROM

Developing a range of software 'goodies', Timedata's Mike Lord divulges the secret of the SoftROM — the circuit which made it all possible.



As anyone who has used machine language will understand, it's a darn sight easier to find out what a machine code routine is doing if you can make temporary changes to it; by adding breakpoints for example, or by jumping into the middle of a routine, or returning prematurely from it. And so, from a

desire to change the contents of the Spectrum's ROM, combined with the knowledge that the contents of a ROM are fixed for ever when the chip is manufactured, came the idea for *SoftROM* — a hardware add-on containing 16K bytes of RAM which can be controlled by a switch to operate in two modes.

In the 'normal' mode, the RAM is located in the low 16K bytes of the Spectrum's address space — where the ROM resides — but only appears when data is written to it. Any data that is read from this area will come from the ROM, so the Spectrum will behave normally. In *SoftROM* mode, however, the Spectrum's ROM is disabled completely, and any read or write to locations in the first 16K will be to the added RAM.

With this add-on in the 'normal' mode, you can copy the contents of the ROM into the corresponding RAM locations. This done, you can then switch to *SoftROM* mode, and the Spectrum should carry on running exactly as it does normally, except that the Basic interpreter, operating system, character dot patterns, and all of the other intriguing routines are now in RAM — there for you to mess with as you will! You might even care to try correcting the known 'bugs' in the Spectrum ROM!

Another use of *SoftROM* would be in developing large machine code programs that entirely replace the Spectrum's ROM and which would

eventually be put into EPROM or even a cartridge that plugs into the Interface II unit. Or alternatively, for the really ambitious who are also able to add a floppy disk drive to their Spectrum, *SoftROM* could be used to implement the CPM operating system, which needs RAM in the area normally occupied by the Spectrum's ROM.

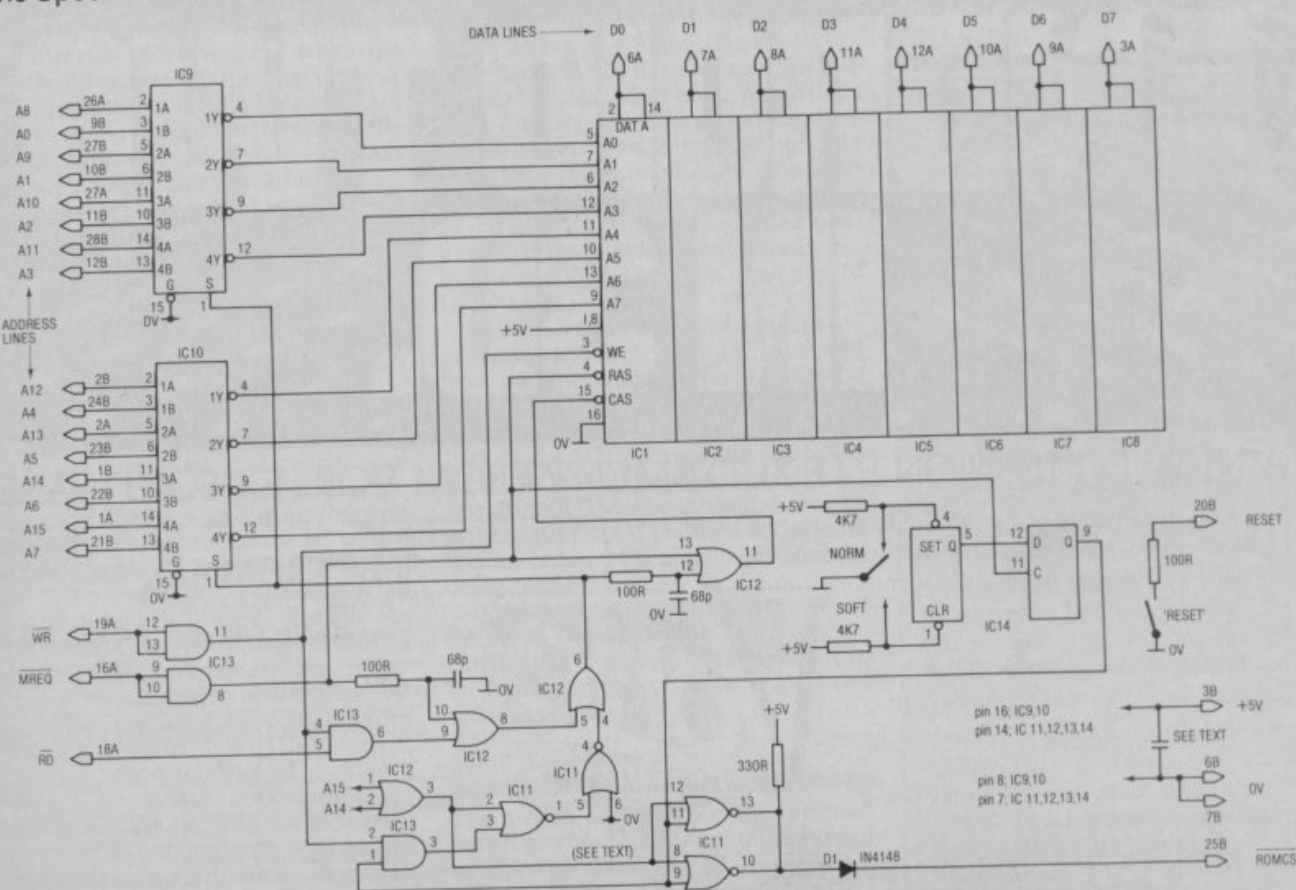
But for those of more modest means, the *SoftROM* circuit can also be used as a normal memory extension add-on, hoisting the 16K Spectrum up to 48K. To do this, all that's necessary is to fit 64K x 1 RAM ICs (4164s) in place of the 16K x 1 types (8118, 4816) and connect pin 6 of IC11 to the Spectrum's address line A15 instead of to 0V. The *SoftROM* board will then contain 64K bytes of RAM, 16K of which are used for the *SoftROM* function, 32K to extend the Spectrum's RAM, and 16K which will not be used at all. Do this and the 32K bytes extension will always be present, regardless of the position of the *SoftROM* mode switch.

One other 'enhancement' is the addition of a push-button Reset switch. Operating this triggers the Spectrum's power-on reset circuit and is guaranteed to get you out of the most horrendous 'crashes' without having to cut the power.

## BUILDING THE BEAST

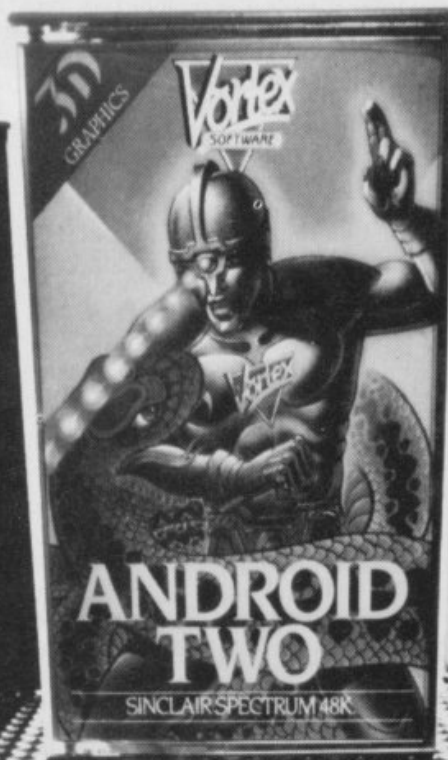
Because of the large number of connections to be made and the potential dif-

## The Spectrum SoftROM Circuit



Mike Lord's favourite method of construction for this type of circuit is to build everything on a piece of bar veroboard to which a 28 + 28 way Spectrum edge connector can be Araldited.





# IT'S HERE. ANDROID TWO IN 3D.

A NEW DIMENSION IN EXCITEMENT FROM VORTEX SOFTWARE.

Stop the advance of the Millitoids. Survive the maze of death, rationalise the paradox zone and overcome the dangers encountered in the flatlands.

Achieve this and return to the transporter capsule before the deadline. But beware. There are lethal Hoverdroids. Bouncers and land mines everywhere.

3D full colour graphic effects, machine code fast action and multi-screen wraparound zones make Android Two a mindblowing action game.

**SEEK OUT ANDROID TWO AT  
ALL THE BEST DEALERS.**



PLEASE RUSH ME:

**SPECTRUM 48K**

KEYBOARD/JOYSTICK OPTION

☐ ANDROID TWO(S) **£5.95 EACH**

**TOTAL VALUE £**

Enclose PO/cheque payable to VORTEX SOFTWARE.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

Send to mail order address:

VORTEX SOFTWARE 280 BROOKLANDS ROAD MANCHESTER M23 9HD.

DEALER ENQUIRIES WELCOME

Vortex are always seeking exciting new programs. Contact us or send sample.



# SOFT ROM

difficulty in tracing faults (it either works properly or not at all!), this project is only really suitable for the experienced constructor. Which means that if you are at all doubtful about your 'hot rod' skills with a soldering iron, then find a friend who is both willing and able — 'nuff said!

One peculiarity of dynamic memory ICs is that they draw large, fast, spikes of current from the supply rails when they are strobed. If the supply rails are not 'solid' and thoroughly decoupled, then the voltages developed by these current spikes flowing along even an inch or two of wire can be enough to upset things. For this reason, the RAM ICs should be mounted as close together as possible to minimise the lengths of the supply lines, and a small (10nF to 100nF) decoupling capacitor should be connected directly between pins 8 and 16 of each RAM IC, again keeping the lead lengths as short as possible. Another two or three capacitors should be fitted between the supply rails near ICs 9-14.

The author's favourite method of construction for this type of circuit is to build everything on a piece of bar veroboard to which a 28+28 way Spectrum edge connector socket can be Araldited. This socket must be fitted with a polarising key in position 5 to prevent the possible disaster of mis-mating when the board is plugged in to the Spectrum. A matching double-sided edge connector plug strip can be fitted to the rear of the board so that other add-ons like printers can hop aboard, piggyback fashion.

IC sockets, preferably with sturdy pins, are then glued on to the veroboard, then the 0V and +5V supply lines wired in using a reasonably heavy gauge wire. To keep noise to a minimum, the 0V line should be laid out in the form of a 'grid' so that the 0V connections between ICs are kept short.

The signal wiring can then be carried out by way of the 'verowire' system. This uses thin enamelled copper wire fed from a handy pen-type tool. To make a connection you wrap the wire two or three times round the IC socket pin, then apply solder and a fine-tipped iron in the normal way. The heat of the molten solder will melt through the enamel insulation on the wire to make a good joint. This may sound like a rather dubious way of wiring up a circuit, but the author has used it successfully for many years, and it must be the cheapest and most compact way of making a 'one-off' board. It's also surprisingly reliable and not too difficult to correct errors or make changes to a board wired in this way.

Finally, before plugging it in to your precious Spectrum, make absolutely sure that there are no accidental short-

circuits between the supply rails and any other of the Spectrum connector pins.

## HOW IT ALL WORKS

The throbbing heart of the circuit is the bank of eight RAM chips, IC1-8. These are 16K bit (or 64K if the board is also to act as a memory expansion unit) dynamic memories, so eight are needed to provide the full 16K (or 64K) bytes, one chip being connected to each of the Spectrum's eight data lines.

As with all dynamic RAM ICs, they need two strobe pulses, RAS and CAS, and their address inputs are 'multiplexed'. That is, the address signals needed to select one of the 16K (64K)

**"For the really ambitions, SoftROM could be used to implement the CP/M operating system."**

bits are fed to the address inputs of the chip in two stages; half when the RAS line is pulsed, then the remaining half when the CAS line is pulsed. The selection of which half of the Spectrum's address lines are to be connected to the RAM chips is done by the quad 2-input multiplexers, ICs 9 and 10.

Dynamic RAM ICs also need periodic 'refresh' cycles if they are to retain their data. Luckily, the Z80 processor used on the Spectrum can provide suitable refresh cycles automatically. The *SoftROM* circuit has been designed to take advantage of this, resulting in the odd-looking order of connection of the Spectrum's address lines to the input pins of ICs 9 and 10.

The RAS and CAS strobe pulses are generated by parts of ICs 11, 12 and 13 from the Spectrum's WR, MREQ and RD outputs whenever a read or write operation is to be done to the *SoftROM*. Part of the IC11 also pulls the Spectrum's ROMCS line high to disable the Spectrum ROM when the mode switch is in the *SoftROM* position and a location in the low 16K of memory space is being read from.

IC14 ensures a 'clean' operation of the mode switch by only letting the circuit change from one operating mode to the other during the dead time between memory accesses.

## USING IT

The switch should be in the 'normal' position when the Spectrum is turned on, so that everything powers up normally. The next step is then to load the *SoftROM* with something sensible. Those wanting to experiment with the

Spectrum ROM routines will find the easiest thing to do is to copy the ROM contents directly into RAM, which can be done with a Basic program such as:

```
10 FOR=0 TO 16383
20 POKE A, PEEK A
30 NEXT A
```

This takes a minute or two to run, so you impatient types may now try writing an equivalent machine code routine to do the job in a fraction of a second.

Once the data has been copied, then it's just a matter of flicking the switch over to run from RAM. And you could also load data into the *SoftROM* from tape, with a command such as:

## LOAD "SUPERROM" CODE

and the switch in the 'normal' mode — provided that you had previously saved the data on to tape with:

## SAVE "SUPERROM" CODE 0,16384

Once in *SoftROM* mode, you can examine and change values with the Basic PEEK and POKE statements, or even use a machine code monitor program such as Picturesque's to set breakpoints, modify, and run parts of the code. But some thought is needed when you do this. The routines you modify may be the very ones that are used to enter data or display the results and with bad luck it's possible to 'crash' the system in some really spectacular ways! Although it's impossible to do any damage to your Spectrum, it is easy to get into a position where the only way to recover is by switching to 'normal' mode and re-setting the system.

## YOU'LL NEED...

IC1-8	16K x 1 5V dynamic RAM : ( 4816 or 8118 ) or 64K x 1 ( 4164 ), see text. (Any speed RAM chips will work.)
IC9,10	74LS158
IC11	74LS02
IC12	74LS32
IC13	74LS08
IC14	74LS74

10 off 16-pin IC sockets  
4 off 14-pin IC sockets

2 off 100R 1/4W 5% resistors  
1 off 330R 1/4W 5% resistors  
3 off 4k7 1/4W 5% resistors

1 off diode 1N4148

1 off push button switch, single pole normally open.

1 off toggle or slide switch, single pole double throw.

10 off small decoupling capacitors, 10nF to 100nF.

28+28 way 0.1 inch double-sided edge connector socket with polarising key in position 5.

Veroboard, wire, solder, etc.



# GET THE RIGHT ANGLE ON YOUR SPECTRUM

Trickstick turns your Spectrum into the most sophisticated games machine in the world. Your fingers rest on the Trickstick's six sensitive pads (four directions and two fire buttons) and the harder you press the faster you go or the harder you turn.

Trickstick works by picking up mains hum from your body and converting it by an ingenious circuit design directly into digital input. Proportionality gives vast possibilities for more interesting games.



- ★ Each Trickstick comes with its own interface included in the price.
- ★ Up to eight interfaces can be stacked into each other for 1-8 simultaneous players. (Own 1-8 player game is Attaktics at £10).
- ★ Works with most Kempston compatible software, and with our new programmable adaptor (£10 for Trickstick owners) it works with ANY software.
- ★ Easy to program, even for proportional games.
- ★ In the shops soon. Now available by mail / telephone order at £34.50.

## TRICKSTICK-

**The revolution that  
Runs Rings round  
ordinary joysticks**



## THE 80k SPECTRUM - £57.50

Upgrade your 16k Spectrum to a full 80k with the SP80 - a 64k expansion kit giving two 32k pages above address 32767. Not recommended for beginners, but ideal for the serious programmer. Pages are switched using software instructions only, and an LED indicates which page you are on. The other page is isolated from the system, but retains all its information until switched back.

The SP80 simply plugs into the sockets in the 16k Spectrum. Full fitting instructions are provided. It is easy to fit and no soldering is required.

See 48/80 FORTH for another angle.

## 48/80 FORTH - £14.95

The latest, best and most complete version of this popular language for the Spectrum FORTH runs many times faster than machine code - a tonic if you're fed up with all those GOTOS.

Each tape includes both a 48k version and an 80k version (for use on Spectrums upgraded with our SP80. SP48 owners are offered a part-exchange price of £18 if they upgrade to 80k).

The manual provides both the normal technical definitions of the language, and an outstanding brief introduction for the beginner. Each tape also includes a superb EDITOR program to give you full control of the 16 (48k) or 32 (80k) disk screens.

A FORTH Toolkit (giving floating point etc) and an extension for the Microdrive will be available shortly. 48/80 FORTH uses standard FIG-FORTH definitions with extensions to exploit the special characteristics of the Spectrum, including BEEP (for real arcade quality sound), DRAW, PLOT and CIRCLE.

## BEYOND HORIZONS - £4.50

This teaching program has already made computing less mysterious for thousands of people. It guides you through the Spectrum 48k memory, teaches you to PEEK and POKE systems variables, shows you how the display file and colour attributes work, how a BASIC program is stored byte by byte, and much much more. Outstanding value for those who get stuck on the second half of the Spectrum manual.

## UPGRADE YOUR ISSUE 2 OR 3 SPECTRUM FOR JUST £23 AND GET A £4.50 COPY OF BEYOND HORIZONS ABSOLUTELY FREE

The SP48 simply plugs into the sockets provided by Sinclair in your Spectrum. Easy to fit, full instructions provided and no soldering. Fits both Issue 2 and Issue 3 machines and gives you a standard 48k Spectrum. And no other expansion kit allows you to upgrade later to the 80k Spectrum. Over 20,000 16k Spectrum owners have already upgraded with the SP48. Join them.

And you get a free copy of BEYOND HORIZONS, so there's yet another angle to look at.

Trickstick £34.50

Attaktics £10.00

SP48 (Issues 2 & 3) £23

SP80 £57.50 (Please specify which Issue)

48/80 FORTH £14.95

Beyond Horizons £4.50

Programmable Interface £10 (with Trickstick)

Postage £0.65

0.65



My Access/Visa number is

I enclose cheque/PO for

Name

Address

East London Robotics Ltd.,  
Gate 11, Royal Albert Dock,  
London E16  
24 Hour Access and Visa  
ordering 01-474 4430

**EAST LONDON  
ROBOTICS**



# SKULL

## It's a monster...

### ...and it's waiting for you

**ENTER THE CATACOMBS ...  
HUNT THE TREASURE ...  
AVOID THE TRAPS ...  
WATCH OUT FOR SKULL!**

**SUPER NEW, ORIGINAL, 3-DIMENSIONAL  
FULL-GRAPHICS MAZE GAME FOR THE SPECTRUM 48K.  
HUNT THE TREASURE THROUGH MULTI-LEVEL MAZES  
AVOIDING HAZARDS AND DEADLY WANDERING SKULLS.  
*THIS GAME WILL BLOW YOUR MIND.  
THERE IS NOTHING ELSE LIKE IT!***

**Write for details on the GRAND HIGH SCORE COMPETITION  
GAMES MACHINE LTD.,  
40 FRETHERNE ROAD, WELWYN GARDEN CITY, HERTFORDSHIRE.  
☎ (07073) 28444/28435**



## GAMES MACHINE

SKULL IS AVAILABLE AT £6.95. Please add 50p to cover post and packing.

I enclose a cheque P.O. payable to GAMES MACHINE LTD., for £

or debit my Access/Barclaycard account no.

Signature

NAME

ADDRESS



	QTY.	£
SKULL		
TOTAL		

PLEASE SEND STAMPED  
ADDRESSED ENVELOPE FOR  
DETAILS OF GRAND HIGH SCHOOL  
COMPETITION

SEND TO:-

BADGES 40p  
postage 75p

GAMES MACHINE LTD.,  
40 FRETHERNE RD.,  
WELWYN GARDEN CITY,  
HERTFORDSHIRE.  
TEL: (07073) 28444/28435

DEALERS AND DISTRIBUTORS REQUIRED. GAMES AND EDUCATIONAL PROGRAMMES WANTED FOR ANY HOME COMPUTERS



# TUNING UP YOUR SPECTRUM

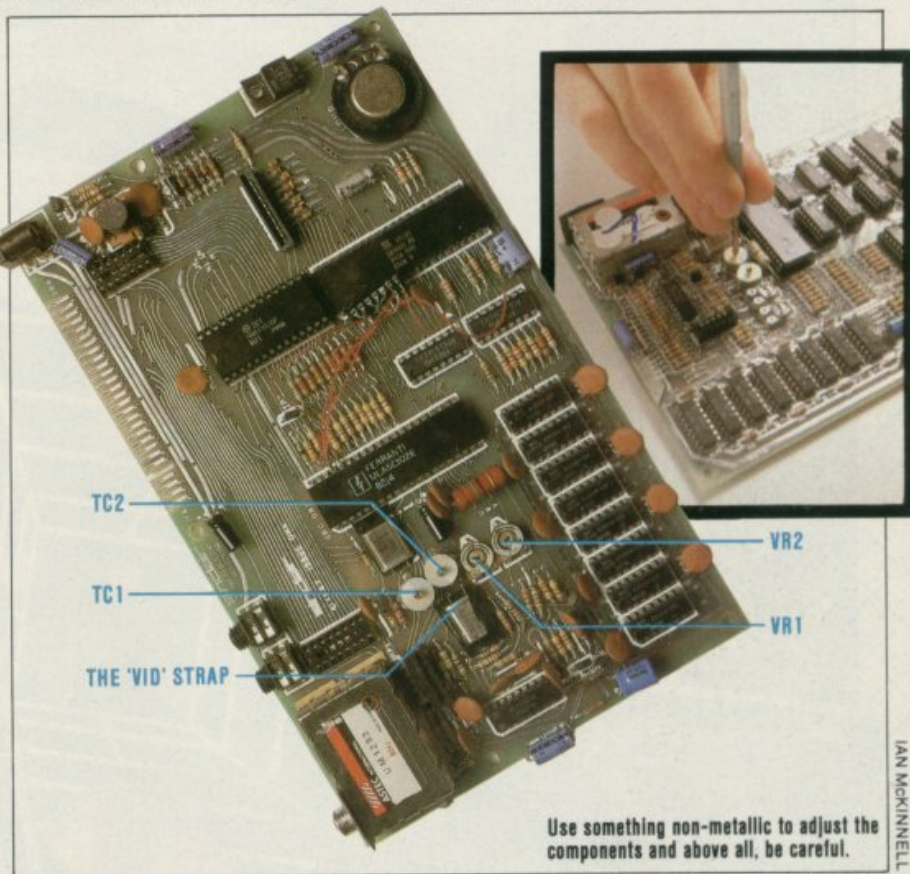
*How do you get the best possible picture on your television from the Spectrum's video output — or even more tricky, on a monitor? Ian Beardsmore completes the picture, and at the same time introduces a forum for readers to knock around ideas.*

One of the idiosyncrasies of our beloved Spectrum, at least of the Issue 1 and 2 models, lies in the flexibility of the display. So far as the vast majority of Spectrum owners are concerned, their computer is not compatible with a monitor. Indeed, the machine will not even be compatible with some home televisions! Only the smug owners of Issue 3s are unaffected by these problems (although they may instead have trouble running some early software).

It's quite common to see Spectrum owners walking around Microfairs looking mystified at the sight of their computers doing the impossible: Spectrums on display being used with Toshiba televisions, and some even linked to the usually unusable Hitachi 14-inch colour portable. In the worst case of impossibility, a Spectrum may even be seen connected to a monitor. The more clued-up amongst us will be able to guess correctly that computers in this latter category have had the same modification as those Spectrums that entered schools under the 'Micros in Education' scheme. Fine for those in the know, but how about Joe User? "What the heck" you may think, "the Spectrum is a good enough bargain as it is". But if so, why the Issue 3?

Probably the most frustrating aspect of all this is that published solutions are not readily forthcoming — even though the 'experts' seem to make the necessary modifications with consummate ease, thus leading to even greater feelings of alienation. But relief is at hand because, in point of fact, the necessary changes are actually quite straightforward, and certainly within the capabilities of any careful Spectrum owner. Of course, there is a catch. Anyone taking the lid off their Spectrum will void the guarantee! So, what you decide to do at this point is up to you. But let us assume a reckless streak has suddenly plunged into the otherwise calm breast of a dedicated user.

What would happen? How would our hero (or heroine) progress? First, of course, the top will have to be unscrewed, then lifted off. (This, in fact, is connected to the printed circuit board by two ribbon cables that are



Use something non-metallic to adjust the components and above all, be careful.

IAN MCKINELL

not long enough to allow the top to be kept completely clear of the rest of the computer. This just makes things more difficult, so take care.) Having thrown caution to the wind and voided the guarantee, the user in search of fine tuning must now locate two variable capacitors and two variable resistors. Not surprisingly (because we are dealing with the display) the area to search is around the modulator.

## FINE TUNING 'TWEAKS'

There are several components worth knowing about in our quest to re-tune the machine to a particular television. And also to be found in this general area is the 'VID' strap, something that will need dealing with if the computer is to be used with a monitor. But more on that later because currently we are interested in the trimming capacitors, TC1 and TC2, and the variable resistors, VR1 and VR2. Working from

top to bottom (see photo) this is what they do.

- |     |                                  |
|-----|----------------------------------|
| TC1 | Controls the shimmer.            |
| TC2 | Tunes the colour in/out.         |
| VR1 | Adjusts the blue/yellow colours. |
| VR2 | Adjusts the red/green colours.   |

First of all, beware . . . when adjusting the trimming capacitors, it's best to use something non-metallic to adjust them with. A matchstick cut to shape is quite suitable. And, of course, added care should be taken anyway because all adjustments have to be made while the computer is turned on — so that the results of 'tweaking' can be seen on the screen.

To begin with, adjust the screw in TC2 carefully in both directions until you find the point of strongest colour — even if this is still too weak. That done, try bringing up the blue/yellow



# ARCADE ACTION & ADVENTURE WITH...

## ..The Guardian

You are at the Gateway to the Anti-Matter World of Migon do you dare enter will you survive?

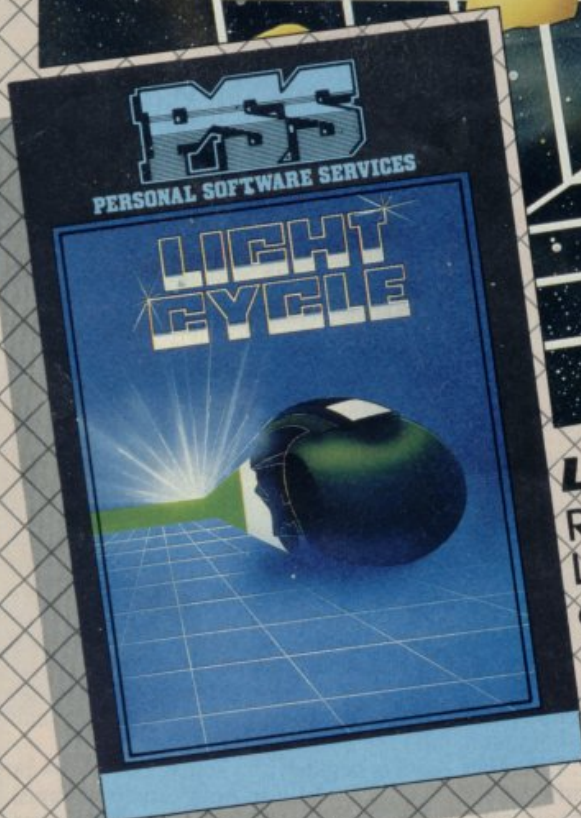
48K SPECTRUM

£5.95

## Krazy Kong

All machine code, super fast action. 4 screens of fireballs barrels & conveyor belts.

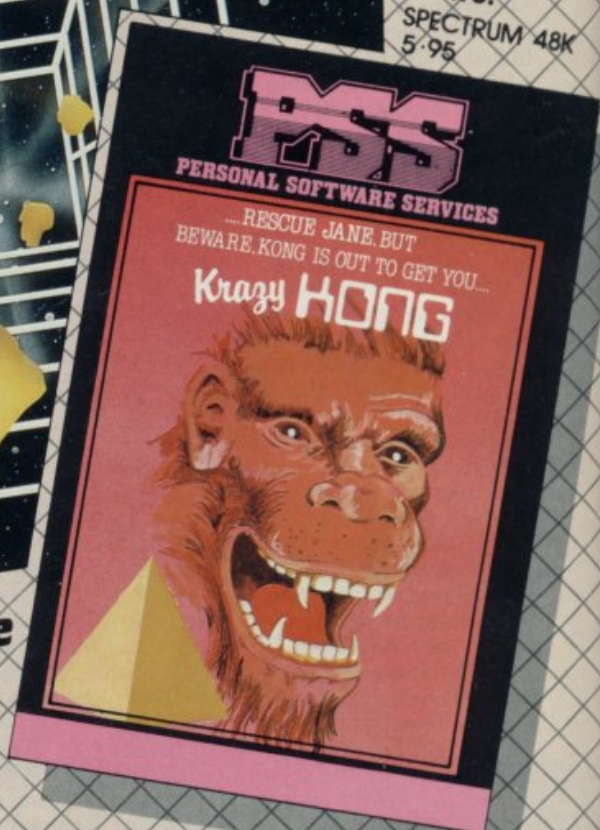
SPECTRUM 48K 5.95



## Light Cycle

Race your Light Cycle on the infamous grid. Fast action all the way

SPECTRUM 16K 48K 5.95





end of the colour range by adjusting VR1. Once you've found the best colour here, bring in VR2 and tune in the red/green end of the colour spectrum. Essentially, what you need to do is balance those three components for the best picture. Again, the watchword is care and, as a precaution, it might be wise to take note of the pre-adjustment settings of the three variable components.

TC1 is the capacitor which controls the shimmer on the screen. Once the colour is as you want it, then this ought to be the final adjustment you make. One thing, however, is that sometimes shimmer can interfere with a viewer's perception of the other colours. It may be that further tiny adjustments of the first three will be needed, once changes have been made to TC1. Complete this juggling act and you should have your Spectrum finely tuned to a particular television.

### THE MONITOR SOLUTION

So far so good for the person who is only interested in re-trimming the computer to another television. However, those thinking of greater things will first need to lash out on a monitor that accepts a composite video input, and then be prepared to do a simple soldering job.

Below the modulator, and just to the left of the gap between TC1 and TC2, there is a small white line marked 'VID'. At one end of this is a small solder point, and at the other, the hole of a through-the-board connection point. In fact, it's not quite as easy as it may seem to access this line because of the line of resistors that stretch out below the modulator.

'VID', in fact, marks a break in the video line between the modulator and the expansion port. Obviously, as there is a break in the line, the signal cannot reach the port; therefore, all you need to do is bridge this gap. How you accomplish this feat is up to you. The simplest (and nastiest) way is to stretch a blob of solder between the solder point and the hole. A short piece of wire is better, but for more ease a longer piece can be used. Whichever way, once done you will have a composite video signal available at the port.

Only two lines are involved at the port, the video line and the 0 volt line. These are placed next to each other, on the middle underside of the port. At the input end, where it enters the monitor, the video line goes to the central pin while the 0 volt line goes to the case. If you want you can adapt the UHF line supplied for use with a normal television. Otherwise, any electrical shop should have what's

needed.

All that remains now is to decide how to take the video line from the port. The most flexible way would be to use a connector and motherboard. On the other hand, it's also possible to take the lines from another port — for example, if you have the printer always connected, this could be used instead. However, be careful here because with some programs, if the printer is left connected, you get a screen dump. Those going as far as a monitor are, on balance, recommended to invest in a connector especially for it.

### COMING SOON

Despite this issue's content, don't run away with the idea that *Spectrolysis* has necessarily to be a hardware section. In fact, the intention really is to create a forum for information exchange about the Spectrum. Anyone with a particular problem (software or hardware) — or those who have discovered some interesting application, or perhaps a routine without an obvious application, or maybe just the solution to someone else's problem — whatever — are all welcome to write in. □

Just drop a line to me, Ian Beardsmore, c/o Your Spectrum, 14 Rathbone Place, London W1P 1DE.

# ADVENTURES

48K SINCLAIR ZX SPECTRUM

AVAILABLE EARLY  
FEBRUARY



You are a Knight of Camelot, searching for Merlin's lost treasure. On your way you will discover the Witches' Tower, rescue a Princess held by the wicked Wizard of Tril. £5.95



You discover the entrance to an ancient pyramid blocked by a rock. Once inside, you discover fire rooms, ice rooms and other traps set by the builders to protect the Pharaoh. £4.95



A rope above a rock fissure is the only way into this Magic Mountain, or is it? Legends tell of vast stores of treasure but also of poisonous spiders, lizards and magic at work. £4.95



An old deserted mining town holds the clues to the location of a lost gold mine. Once in the mine, your problems are not over — the roof creaks alarmingly and might cave in. £4.95



A full war-time escape Adventure. As a prisoner of the Germans, you must escape through the network of tunnels, rooms and chambers. The fence around the camp is electrified and guards are everywhere. £6.95

**\*\*NEW\*\***

Send SAE for full list.

## PHIPPS ASSOCIATES

Prices include postage (outside Europe add £1.00 per item).

Dept R FREEPOST EM463 (No stamp)  
172 Kingston Road, Ewell, Surrey KT19 0BR  
Telephone 01-393 0283. 24 Hour answering.

Access and Visa cards welcome





# EPROM SERVICES

## ZX hardware specialists

Industrial microsystem design and manufacture

### EPROMs for ZX81's

The ZX81 8K EPROM board allows direct access to 4 x 2K 2716 EPROMs or 6116 RAM's. It fits in line with the ZX PRINTER and RAMPACK and contains its own power supply components. The board (or card for use with a mother board) costs £19.95 and comes complete with either EPROM I or II.

Further preprogrammed EPROMs are available priced £9.95 each: EPROM I 40 toolkit routines; EPROM II RAPID SAVE/LOAD, 16K in one minute; EPROM X adds SPECTRUM commands to the ZX81; EPROM IV a machine code monitor; EPROM V a Z80 disassembler.

### EPROMs for ZX SPECTRUMS

The 8K SPECTRUM EPROM board is available complete with one programmed toolkit EPROM at £20.95, and can accept a further three 2K 2716, 4K 2732 EPROMs or 6116 RAM's.

EPROM PROGRAMMER for the ZX81 or SPECTRUM. Program intel 2716, 32, 32A, 64 and 128. ZIF socket £54.95.

### DATA ACQUISITION and CONTROL

A wide range of hardware for control and monitoring purposes, e.g.: 3 analogue output card £27; 8 analogue inputs, in a range of accuracies with or without control lines, from £23.95; IN/OUT cards with 24 control lines and options for status indication, bank switching A/D and D/A conversion, input multiplexing and opto isolation, from £14.50; 3 slot mother boards, complete with all connections and power regulation ZX81 £15.95; ZX SPECTRUM £16.95.

Also available: audio and graphics generators, clocks and timers, auto-starts and communications interfaces.

SPECTRUM, RAMPACK, ADAPTOR, £6.95. Edge cards 75p, connectors £2.50 (23 or 28 way).

## EPROM SERVICES

3 Wedgewood Drive, Leeds LS8 1EF (0532) 667183

Large SAE for details. Export and trade enquiries welcome  
Prices include UK postage — overseas please add as appropriate  
Industrial projects undertaken — please phone for details



## "POOLSWINNER"

THE ULTIMATE POOLS PREDICTION PROGRAM

- |                    |  |
|--------------------|--|
| <b>PREDICTS</b>    | Not just SCOREDRAWS, but NOSCORES, ALWAYS and HOMES.   |
| <b>IT WORKS</b>    | We guarantee the program performs significantly better than chance.  |
| <b>ADAPTABLE</b>   | "Poolswinner" allows the precise prediction formula to be set by the user — you can develop and test your own unique method. Probabilities are given on every fixture — choose as many or as few selections as you wish. |
| <b>EASY TO USE</b> | Fully menu driven, with detailed instruction Booklet.  |
| <b>DATABASE</b>    | The program comes complete with the largest database available — over 20,000 matches. The database automatically updates as results are fed in.  |

SPECTRUM (48K) ZX-81 (16K) £15.00 (all inclusive)

We produce databases for those developing their own prediction program. 2 years results £7.50. 5 years results £12.50.

Also "COURSEWINNER" — Computer aided horse betting — £9.50

Available from dealers, or direct (return of post) from . . .

## Selec Software

37 Councillor Lane,  
Cheadle, Cheshire  
061-428 7425

DEALER ENQUIRIES WELCOME



# AMOEBA SOFTWARE

54 WALDEN AVENUE, CHISLEHURST, KENT

Telephone: 01-857 8999

## LAZE BLAZE

Superb machine code action. Pit your beam against the 2 beams of the computer. Race your opponent for the random fuel dumps. For the very strong of heart, battle to the death in the maze. 9 speed levels. Over 500 Options in this fast moving arena.

48K Spectrum.

£5.95



## TANK TRAX

A TWO player game to stretch your skill. Destroy your opponents tank before he obliterates yours. Choose the battlefield, fire over the mountains or select foothills and have an eyeball to eyeball confrontation. Sounds easy, but don't forget as in all real situations weather plays an enormous part in success or failure. This game is no exception. The wind must be allowed for if you have no desire to blow yourself up.

Uses all the 48K memory of the Spectrum.

£5.95



48K SPECTRUM

Soon to be found in all good software outlets.

## "Games that grow on you"

If you are having trouble buying your copy send a cheque or postal order to: AMOEBA SOFTWARE, 54 WALDEN AVENUE, CHISLEHURST, KENT

Name .....

Address .....

I enclose a cheque/P.O for £

LAZE BLAZE ☐ TANK TRAX ☐ Please tick choice



# THOSE MOODY MICRODRIVES

**The ZX Microdrives are with us, or at least some of us, and have a great deal to offer at a low cost. Unfortunately, there are one or two problems, not least of which are a couple of bugs in the Microdrive ROM. Andrew Pennell presents three short machine code routines to circumvent the major traumas.**

While there's plenty to recommend about Sinclair Research's elusive Microdrive device, as with most innovations there's room for improvement. The first part of this article is for all users and explains the problems and tells how to use the 'cures'; and the second part is for those who know some machine code and who appreciate fuller explanations.

Before presenting the listings, here is a very useful feature that can greatly decrease the loading times of some

code routines; it's loaded into the printer buffer area of memory, at locations 23296-23353. However, the machine code is *position independent*, which means it can be put anywhere that's convenient in memory. Alternative places are the user-defined graphics area and above RAMTOP, and the start location can be altered by changing line 10 of the Basic listing. Do *not* put the code into a REM statement, ZX81 fashion — for technical reasons this is a very bad

place to store Microdrive routines.

The first problem we're dealing with appears as a result of a serious bug in the ROM; this causes the machine to crash if there is insufficient memory space, and a LOAD \*"m" or SAVE \*"m" command is entered. The relevant Microdrive motor switches on, but no SAVEing or LOADing occurs, and you cannot halt the proceedings. The only way out is to remove the plug during rotation, something which might easily damage the cartridge. To get round the problem, before making such a command enter RANDOMIZE USR 23296 (or whatever the value of 'st' in line 10 has been made). If an 'Out of memory' error appears, it means that a SAVE or LOAD to Microdrive is dangerous, so don't try it. If no error message occurs, it means there is sufficient room and all such commands will be carried out.

Another problem can occur when you have a lot of OPENED streams. For each OPENED stream, a certain amount of memory is consumed, ranging from 11 to 595 bytes. The only way to get the use of all the memory is to CLOSE# or CLEAR#, but these sometimes fail to clear the memory, particularly if an error such as BREAK occurs during such a command. The second machine code routine, at st+8 (ie. 23304 if in the printer buffer), is designed to supplement the CLEAR# routine by removing any remaining memory areas of additional streams. Before using it, though, always do a CLEAR# first — for example, CLEAR#: RANDOMIZE USR 23304.

The final routine will prove extremely

```

5 REM Printer buffer
10 LET st=23296
20 RESTORE 100
30 FOR i=0 TO 57
40 READ a: POKE i+st,a
50 NEXT i
60 REM test-room=st
70 REM clear#=st+8
80 REM collapse=st+41
90 REM
99 REM Test-Room
100 DATA 207,49,1,147,2,195,5,3
1
199 REM CLEAR# more
200 DATA 17,240,92,42,79,92,229
,167,237,82,225,196,229,25,42,79
,92,17,20,0,25,235,42,83,92,43,2
6,254,128,196,229,25,201
299 REM Collapse
300 DATA 42,79,92,17,73,163,25,
208,33,240,92,17,182,92,195,229,
25

```

Figure 1. The Basic program containing the Microdrive 'cure-all'.

programs. Say you have a Basic program that loads another file — such as a SCREEN\$ or some machine code. If you SAVE the Basic then SAVE the second file, there may well be a considerable delay when you re-load it between the Basic part, and the second file. This is because two files SAVED directly after one another cannot usually LOAD directly after each other. To be sure of fast loading, after each SAVE, do a VERIFY, then the next SAVE, and so on. This method ensure minimum time taken for loading.

Figure 1 is a listing of a Basic program that contains all the data for the machine

```

10 ; Test-room for
20 ; Microdrive commands
5B00 ORG 23296 ;printer buffer
5B00 CF 40 TESTRM RST B
5B01 31 50 DEFB #31 ;create extra system variables
5B02 019302 60 LD BC,659 ;required space
5B05 C3051F 70 JP #1F05 ;test-room
80 ;
90 ; True CLEAR #
5B08 11F05C 100 CLEAR LD DE,23792
5B0B 2A4F5C 110 LD HL,(CHANS)
5B0E E5 120 PUSH HL
5B0F A7 130 AND A
5B10 ED52 140 SBC HL,DE
5B12 E1 150 POP HL
5B13 C4E519 160 CALL NZ,#19E5 ;reclaim maps if CHANS<>23792
5B16 2A4F5C 170 LD HL,(CHANS)
5B19 111400 180 LD DE,20
5B1C 19 190 ADD HL,DE
5B1D EB 200 EX DE,HL
5B1E 2A535C 210 LD HL,(PROG)
5B21 2B 220 DEC HL
5B22 1A 230 LD A,(DE)
5B23 FE80 240 CP #80
5B25 C4E519 250 CALL NZ,#19E5 ;reclaim channel bytes
5B28 C9 260 RET
270 ;
280 ;set constants
5C4F CHANS EQU 23631
5C53 PROG EQU 23635
310 ;
320 ;
330 ;COLLAPSE to remove extra system variables
5B29 2A4F5C 340 COLAPS LD HL,(CHANS)
5B2C 1149A3 350 LD DE,#A349
5B2F 19 360 ADD HL,DE
5B30 D0 370 RET NC ;return if no variables anyway
5B31 21F05C 380 LD HL,#5CF0 ;end of area
5B34 11B65C 390 LD DE,#5CB6 ;start of area
5B37 C3E519 400 JP #19E5 ;reclaim the area
5B3A 410 END

```

Figure 2. The assembler listing of the three routines presented in Figure 1.



useful for converting certain cassette programs on to Microdrive, particularly those containing machine code in REM statements. Many commercial games contain such REM statements of this kind as the first line in a program, with subsequent commands such as RANDOMIZE USR23760. However, with Interface 1 in use, the location of the first line in a program can, and does, change — which normally makes the machine 'fall over' when it tries the USR statement. The third machine code routine starts at st+41 (23337 in the printer buffer) and removes the extra system variables; thus the first line will be in the same place as it would if there was no Interface 1 connected. Note that any error (except 'OK') and any Microdrive commands will move the line back to its previous position. Written originally for the game, *Valhalla*, the routine has proved useful on a number of other occasions too.

## THE SECOND LEVEL

Those not understanding Z-80 machine code are likely to find the rest of this article something of a closed book — although, of course, you can still use the routines. Figure 2 is the assembler listing of all the routines, and it was produced on the excellent HiSoft *GENS* assembler, which uses the unusual method of signifying hexadecimal numbers by preceeding them with '#'. The first routine starts at TESTRM, and carries out a memory test that the

Microdrive ROM doesn't quite get right. When doing a SAVE \*m or LOAD \*m, a total of 659 free bytes are required, made up of 595 bytes for the CHANS buffer, 32 bytes for the Microdrive map, and 32 bytes for stack usage. Sad to say, the Interface 1 ROM only checks for 627 bytes — the ROM authors having overlooked the stack usage — thus causing the crash. The routine itself is quite straightforward. Firstly hook code #31 is used to make sure the 58 bytes of extra system variables are in existence, then the ROM routine at #1F05 is executed to test for 659 free bytes.

Before we discuss the CLEAR # supplementary routine, it would be useful to examine the relevant section of the Spectrum memory map — see Figure 3.

To remove all the extra memory areas after a CLEAR#, any Microdrive maps (plus any additional channel information) have to be reclaimed from

the memory map, and everything above shifted down, while all the system pointers are altered. The ROM routine at #19E5 is designed to do just that, with the location of the first bytes to be reclaimed in DE, and the first location to be left alone in HL. The routine initially tests to see if CHANS is equal to 23792, and if it does not then any bytes in the Microdrive maps area are reclaimed. Then the byte at CHANS+20 is tested to see if it is the end marker of #80. If it is not then any extra channel information is reclaimed.

The third routine, COLAPS, firstly checks to see if CHANS is less than 23735, and returns if it is. If it is not then it means that the extra system variables exist; these are reclaimed, again using the ROM routine at #19E5. The 58 extra bytes are created by the Interface 1 whenever an error occurs, when an incorrect Basic line is entered, or when an Interface 1 command is entered. □

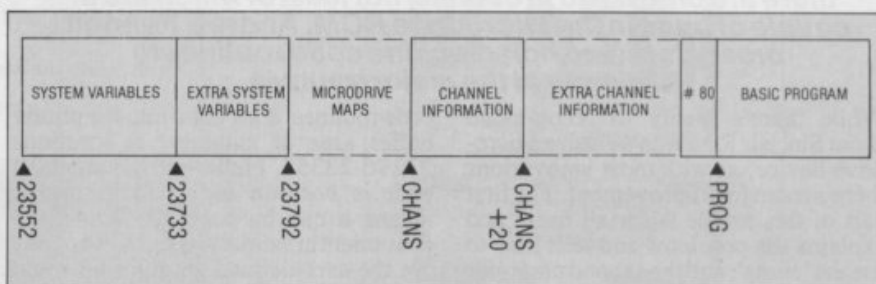


Figure 3. The area of the Spectrum memory map affected by the second of the three routines.

campbell systems

## Masterfile

YES - Microdrive compatible!

Acclaimed as the definitive filing system for the 48K Spectrum — MASTERFILE'S machine coded flexibility gives you 32K (max) per file — 26 fields per record — up to 128 characters per field — multiple level searches for numeric or character comparisons —

PERSONNEL SUMMARY (Sorted by surname)		
Employee	Dept.	Salary
Campbell B.R.	Admin	Secret
Campbell J.R.	Guest	Secret
Campbell S.L.	Program	Secret
Davidson L.A.	Admin	13545
Ding J.	Admin	9000
Ewing J.R.	Chairman	90000
John	Sales	15500

EXAMPLE ONE RECORD PER PAGE...		
Southmore Ranch, Dallas, Texas, USA.		
NAME Ewing J.R.	DEPT Chairman	SALARY £90000
STOCK OR	GRADE X	DISASSEMBLER
Press H for next page or... Press G twice to see full menu Press H then 1-4 to switch to another report		

Data presentation in any one of 36 user-defined displays which may be sequenced by any field — multiple level searches for numeric or character comparisons — USER BASIC for tailored processing.

Stock Summary sorted by Part Ref			
Ref	Description	Cost	Quant
DUT	Udgel, size 5	20.55	145
ARM	Antigravity rods	99.99	0
DR	Disassembler	5.95	50
GR	GULPHAN Gase	5.95	2400
MR	Hunt holes	.10	25000
P13	13-Rsp Plugs	1.00	800
SNP	MASTERFILE	15.00	540
SHU	SNP Update	2.00	1000

SUMMARY BY DEPARTMENT	
Admin	Campbell B.R.
Admin	Keats J.
Admin	Davidson L.A.
Admin	Zimmerman R.
Chairman	Ewing J.R.
Guest	Campbell J.R.
Programming	Campbell Systems
Sales	Harrods

"... the most comprehensive of the data-bases..."  
Sinclair User June 1983

With example file and detailed manual £15.00

The very best in machine code for the ZX Spectrum

NEW!  
with MYRMIDONS  
Micro-Print 42/51  
up to 51 columns!

Spectrum 48K

## Drawmaster

Spectrum 48K

DRAWMASTER is the ultimate DRAW AND PAINT utility for the Spectrum — compose your own HI-RES pictures with 8 direction 2 speed hand draw keys — fast fill — enlarge/reduce facility for all or part of the screen plus all the Spectrum colours and attributes — over 50 commands in all.



With detailed instructions £6.95

## DLAN DISPLAY LANGUAGE

Spectrum 16/48K

DLAN ('dee-lan') DISPLAY LANGUAGE is a powerful machine coded interpreter for generating DYNAMIC TEXTUAL DISPLAYS for advertising and education — all commands are single letter or symbol —



THEN  
CYCLES  
YOUR  
DISPLAY  
FOR AS  
LONG AS  
YOU  
NEED...

With 4-way scroll of 11 specially designed typefaces through user-defined windows — With detailed manual £7.95

All programs mailed 1st class by return.  
Prices include VAT and postage within  
Europe. SAE for full list.

Dept. (YS) 15 Rous Road, Buckhurst Hill,  
Essex, IG9 6BL England 01 504 0589







# HEWSON CONSULTANTS

## 3 GREAT NEW ZX SPECTRUM TITLES

### DI-LITHIUM LIFT

The year is 2934. Di-Lithium crystals are humanity's most prized possession because they are the energy source of every space cruiser. The Seiddab, humanity's enemies, have an enormous stock of crystals in vacuum vaults, buried beneath their military HQ. The crystals are held in structured arrays, guarded by laser-armed Droids, pending their transfer to an invasion fleet.

You have been smuggled into the vaults with a limited oxygen supply. Your orders are to LIFT the crystals before the Droids cut you down. . .

7 screens, 3 lives, high score table, arcade quality, fast machine code action, choose your own keys, Kempston Joystick compatible. For the 16K or 48K ZX Spectrum.

**£5.95**



### KNIGHT DRIVER

I'm late, I'm late, I have got to get there. Just put my foot down and hope. What a bend, I'll never make it. Up the kerb - that's slowed me down.

I'm off the road completely now. Nice scenery around here. Pretty flowers and a lake. What am I doing? I must get back on the road. Oh, this is hard. I'll never do it.

Steer your car round a tortuous circuit of roads, braking and accelerating as you go. Avoid the kerb, islands and parked cars. Learner and professional levels. Kempston joystick compatible.

48K ZX Spectrum only.

**£5.95**

### FANTASIA DIAMOND

The magnificent Fantasia Diamond, heirloom of your household has been stolen and taken to an imposing fortress. You called on the services of Boris the masterspy, but he has been caught and imprisoned by the Guardian, who patrols the rooms and corridors of the Fortress, looking for intruders.

Now you must go and retrieve the Diamond and rescue Boris. On the way you will meet many characters, some evil and some friendly. You will have to learn to elicit the help of the friendly ones in order to complete your task, but remember they have their own lives to lead, so they may not always do as you ask.

A most enjoyable and challenging graphic adventure for the 48K ZX Spectrum.

**£7.95**



Are you looking for a publisher for your programs? If so, why not drop us a line or better still send in a sample of your work, for fast evaluation and prompt reply.

Mail order to:

HEWSON CONSULTANTS  
60A ST MARY'S STREET  
WALLINGFORD  
OXON OX10 0EL

Selected titles available from BOOTS,  
JOHN MENZIES, W H SMITHS  
and all leading micro-  
computer software  
retailers.



# ANIROG SOFTWARE



## MISSILE DEFENCE

# SPECTRUM

## ANIROG SOFTWARE

8 HIGH STREET, HORLEY, SURREY.  
24 HR. CREDIT CARD SALES HORLEY (02934) 6083  
PAYMENT BY CHEQUE, P.O., ACCESS/VISA  
50p post & packaging

### MISSILE DEFENCE

Brings the well known arcade game to life on the Spectrum screen in glorious colours. Defend your cities from the missile attack and smart bombs. 10 skill levels.

KB/JS 16K/48K £5.95

### SLAP DAB

An exciting game based on the arcade game Painter which combines fast action with strategy. Giant insects hiding under the old paint surface are released by your paint brush. You require fast action and quick thinking to outwit them and finish the panel. The game is 100 percent machine code and HI-RES. Graphics also includes Hi-score and running score.

KB/JS 16K/48K £5.95

### GALACTIC ABDUCTORS

A stunning action packed game with superb large animated graphics. Giant Space Hawks whirl and weave in intricate patterns as they drop their deadly homing mines which will destroy your base on contact. While you are busy defending yourself the Hawks will feed on your helpless population returning only their skulls. All M/C game complete with high score table that will blow your mind with its graphics and sound effects.

KB/JS 16K/48K £5.95

### FROGRUN

Popular arcade game. All machine code with brilliant colour graphics and sound effect. Features include snakes, crocodiles, lady frogs, turtles, cars, lorries and logs.

KB/JS 16K/48K £5.95

### TINY TOT'S SEVEN

Super games pack for younger children with bright colour graphics and sound effects. Everybody's favourite Simon plus Super Snap O's and X's. Word Jumble. Bomber. Duck Shoot and Mad Drivers.

KB 16K/48K £4.95

KONG	KB/JS	£5.95
XENO II	KB/JS	£5.95

TRADE ENQUIRIES 29 WEST HILL, DARTFORD, KENT. (0322) 92518



# KELWOOD

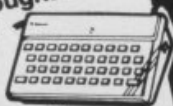
**ADD-ITS  
FOR SINCLAIR  
ADDICTS**

## GENATIONALS **KELWOOD COMPLETES YOUR COMPUTER** POWER BASE

It's so good, Clive should have thought of it!!

- ON/OFF switch for instant screen clearing
- LOAD/SAVE switch
- All wires included
- Angled for easier use
- Saves wear and tear on connections
- Real value for money

Spectrum Ref **PBS1** £13.50 ZX81 Ref **PBZX1** £13.00.



## WEAR SAVERS

- Cuts out wear and tear on plugs and sockets
- Switching for SAVE/LOAD and 9 volts ON/OFF

Spectrum Ref **WSS** £9.95  
ZX81 Ref **WSZX** £9.75

## MICROSTATION

The compact way to work

- Room for all essential peripherals
- Ideal for use in restricted spaces
- Allows the computer etc to be moved around with the minimum of effort

Ref. **MS** £7.50



## AND ALSO **SOUND POWER BASE** GET REAL SOUND FROM YOUR SPECTRUM

All the features of the Power Base plus built-in variable sound amplifier Ref **SPB1**  
Amazing value at ONLY £19.95

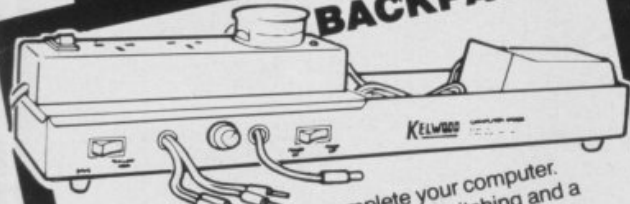
## SUPER SOUND SPEC-AMP

The great Spectrum sound improver

- Fully adjustable Spectrum Sound Amplifier
- Simply plugs into mic. socket

Ref **SSS** ONLY £7.00 (PP3 Battery included)

## BACKPACKS

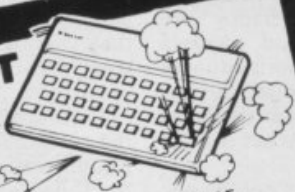


Six versions of this indispensable unit complete your computer. All have SAVE/LOAD and ON/OFF switching and a housing for the transformer.

Ref **BP1** - Fully variable sound amp - 3 x 13 amp sockets, switch and neon indicator - cable and plug ..... £27.50  
Ref. **BP2** - as BP1 but no sockets, cable and plugs. Has room to fix your own 'Duraplug' sockets ..... £19.50  
Ref. **BP3** - as BP1 but no sound ..... £21.50  
Ref. **BP4** - as BP1 but no sound or sockets ..... £13.05  
Ref. **BP5** - ZX81 version inc. sockets, mains switch neon, cable and plug ..... £20.85  
Ref. **BP6** as BP5 but no cable or sockets ..... £12.85

## COOL-IT UNIT

Takes the heat out of your computer. Lets your Spectrum or ZX81 run much cooler.



Separate Cool-it Unit Spectrum Ref **SC** £11.85  
ZX81 Ref **ZXC** £11.65  
Other Kelwood add-its with Cool-it unit built in  
Power Base (Spectrum) Ref **PBSIC** £18.55  
Power Base (ZX81) Ref **PBZIC** £19.35

- Sound Power Base (Spectrum only) Ref **SPBIC** £25.00
- Back Pack 1 Ref **BP1C** £32.55
- Back Pack 2 Ref **BP2C** £24.55
- Back Pack 3 Ref **BP3C** £26.55
- Back Pack 4 Ref **BP4C** £18.60
- Back Pack 5 Ref **BP5C** £26.90
- Back Pack 6 Ref **BP6C** £18.90
- Wearsaver (Spectrum) Ref **WSSC** £16.00
- Wearsaver (ZX81) Ref **WSZX** £15.80

## ZX81 RAM-PACK WOBBLE? **KELWOOD WOBBLE STOPPER**

SOLVE IT WITH A

- Firmly clamps Ram-Pack to computer
  - No glue
  - No solder
  - Easily removed
- Flat: Ref **SW** £5.25. Tilted: Ref **STW** £6.25  
Extra long for printer - Flat: Ref **LW** £5.75. Tilted: Ref **LTW** £6.75

## KELWOOD <sup>almost</sup> WIRELESS WORKSTATION

- Mains ON/OFF switch
- 4 x 13 amp sockets inside
- Supreme quality
- All wires stow away
- Carrying handle
- Easily stored
- Sturdily built in stove enamelled steel
- Ideal for schools
- Suitable for most micros including Sinclair and BBC
- Acres of room for all peripherals



Desk top model Ref **CW1** £49.00  
Accessories for above  
Power Base Ref **PBS2** £11.00  
Power Base Ref **PBZX2** £10.50  
Legs Ref **LCW** £11.00  
Keyboard Dust Cover Ref **KDC** £2.50

All prices include VAT and postage and packing

Name \_\_\_\_\_  
Address \_\_\_\_\_

Access/Barclaycard No

**KELWOOD COMPUTER CASES** Downs Row, Moorgate, Rotherham Tel: (0709) 63242

QUANTITY	REF	AMOUNT

Please send me further information with no obligation ☐ Tick if required

TOTAL ENCLOSED



## INTERVIEW

# THE ANT MAN COMETH

Every now and then, the software market blossoms and an incredibly different hybrid evolves. Always, just when you think it's safe to banter about the banality of the current software selection on the high street shelves, something new comes along heralded by the fanfare of enthusiastic reviews from all and sundry. Such a program was Quicksilver's *Ant Attack*. Or perhaps more in keeping with the recent trend towards the 'software superstar', one should say Sandy White's *Ant Attack*.

When asked about himself, Sandy modestly replied, "I'm hard to categorise really, but I do have a degree in sculpture." Indeed, Sandy is the first to admit surprise over the attention thrust upon him, for this time last year he was an unknown sculptor. After five years attendance at the Edinburgh College of Art, Sandy was happiest constructing electronic 'story-telling' gizmos which his lecturers were quick to tell him were not art!

A little disheartened at his progress in the art world, Sandy borrowed a friend's Acorn Atom to "fiddle about with a few graphics routines". After experimenting in Basic and machine code, he was about to give up... when inspiration struck. Excited by the computer graphics simulations in Walt Disney's movie *Tron*, Sandy set about using the routines he had created to emulate some of the features included in the big screen on to his monitor.

The knowledge to construct his soft-solid graphics certainly owed a lot to his college days. "I'd written big programs before, but *Ant Attack* was my first game — up until then all the software I'd written was linked to my work at college."

Not being a follower of arcade fashions, Sandy started to approach the game proper at a slow pace — having bashed out the code for the soft-solid graphics routines in an incredible two-week period, he needed ideas on how to implement the results of his labours as a popular game. So, after looking at a selection of 3D games already on the market, "I went to a lot of people I knew were keen on games software, and asked them about the ones they enjoyed the most."

It was at this stage that Sandy returned his friend's Atom and looked to the Spectrum's Z-80 to produce the miracles he had in mind. "The biggest problem with *Ant Attack* was making sure it was fast enough — some of the mathematical algorithms were really cumbersome. The game had to be fast enough to keep it

Overseeing the ins and outs of our competition this issue, Sandy White found time to rap about the fame and fortune of being caught up on the front page of the software scene.



IAN MCKINNELL

Behind you!!! Sandy White gets a taste of his own medicine.

reasonably exciting to play, while still maintaining the 3D aspects as well as could be allowed. Of course it's possible to do the most incredible 3D simulations on the Spectrum — as long as you're prepared to wait half an hour between moves!"

Indeed, it was 15 weeks of solid programming before Sandy was happy with the game. His close friend, Angela Sutherland, did a lot of the formatting of the structure for the final product; she was responsible for most of Antescher's design and also the characters who act out the adventure.

Completing the game was not, as one might suspect, the final hurdle in the game's development — for if Sandy knew little of the available games he had to compete with on the software market, he knew absolutely zilch about the methods by which an unknown could get software out on to the market. Where should he start? Difficult question... easy answer (or so he thought!).

"Yes, it's true, I first sent a copy of *Ant Attack* in action on video tape to Sinclair Research," laughs Sandy. "And after a couple of weeks, I gave them a bell as I was really keen to see the game published by Christmas '83. A secretary there said she was sorry but they hadn't got a video tape machine — so they sent it back... unseen!"

Following the brush-off from his self-confessed 'hero', Sandy was at a loss at what to do with his programming masterpiece. Psyching himself up, he placed a call to Quicksilver. "I phoned up Quicksilver," explained Sandy, "but I gathered fairly quickly that they've obviously got a lot of people phoning up and proclaiming that they've written the best game ever.

The only thing to do was to go really over the top about the game and hope that they would listen. I ended up jumping up and down on the spot while explaining what I had done — and eventually they said they would have a look at my video tape. I was amazed at how difficult it was to get through to people — the only thing I can suggest to new programmers who think they've got something worth raving over is simply to rave about it yourself... and persist!"

Following Quicksilver's inspection of the video tape, Sandy was on a plane to Southampton the next day to sign a contract. And at 23, Sandy is in the enviable position of having his first foray into commercial games-writing heralded by most reviewers as the 'program of the year'.

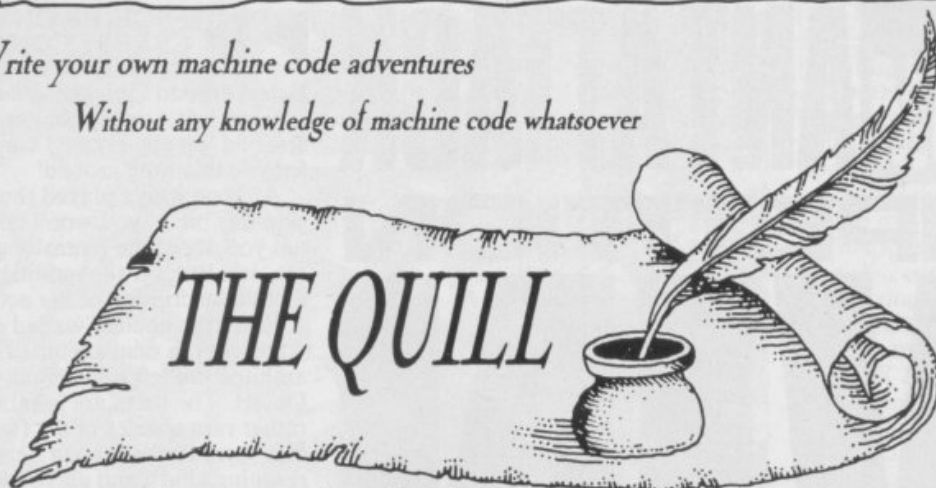
Looking to the future, rest assured you've not heard the last of Sandy White. When *YS* spoke to him after the launch of *Ant Attack*, he happily chatted about his plans to write "a kind of adventure, not necessarily involving text — instead of entering a room and reading about the contents and typing out what you want to do, how about actually interacting with the room's contents in real-time..." How about that indeed! However, on a recent trip to the *YS* offices, Sandy was coy about his plans for the future. Yes, they did include writing a new game, but no, he would rather not comment on the structure or design of the program. Could it be we're in for another classic... watch these pages for future developments. □

**Turn to Page 52  
for Your Spectrum's  
amazing Ant Attack  
competition!!**



Write your own machine code adventures

Without any knowledge of machine code whatsoever



*THE QUILL* is a major new utility written in machine code which allows even the novice programmer to produce high-speed machine code adventures of superior quality to many available at the moment without any knowledge of machine code whatsoever.

Using a menu selection system you may create well over 200 locations, describe them and connect routes between them. You may then fill them with objects and problems of your choice. Having tested your adventure you may alter and experiment with any section with the greatest of ease. A part formed adventure may be saved to tape for later completion. When you have done so *THE QUILL* will allow you to produce a copy of your adventure which will run independently of the main *QUILL* editor, so that you may give copies away to your friends.

*THE QUILL* is provided with a detailed tutorial manual which covers every aspect of its use in writing adventures.

**FOR THE 48K SPECTRUM AT £14.95**

Now available in W H Smith, and from many computer shops nationwide, or direct from us by post or telephone.

SAE for full details of our range.

Dealer enquires welcome.

**GILSOFT**

30 Hawthorn Road  
Barry  
South Glamorgan  
CF6 8LE  
☎(0446) 732765

Credit Card Order line  
Personally manned for 24 hours  
☎0222 41361 Ext430



THE FABULOUS CASSETTE



VALUE that's  
out of this world

ONLY  
**£9.95**  
(INC. P&P and VAT)

**50 GAMES ON ONE CASSETTE**

DRAGON BBC A/B Spectrum Apple ATARI ORIC-1 ZX81 VIC-20

It is impossible to tell you everything about the 50 games on CASSETTE 50 but they include many types such as maze, arcade, missile, tactical and logic games, to suit most tastes in computer game playing. CASSETTE 50 will appeal to people of all ages and the games will provide many hours of entertainment for all the family at a fraction of the cost of other computer games.

**EXPRESS DELIVERY-  
ORDER NOW**

Name \_\_\_\_\_  
Address \_\_\_\_\_  
Post Code \_\_\_\_\_  
Country \_\_\_\_\_

Dealers & Stockists enquiries welcome.

Please send me by return of post, Cassette 50 at £9.95 per tape. I enclose a cheque/postal order for

£ \_\_\_\_\_ made payable to  
Cascade Games Ltd.

Please debit my ☐ No. \_\_\_\_\_

SPECTRUM ☐ ORIC-1 ☐ ZX 81 ☐ VIC 20 ☐  
BBC A/B ☐ DRAGON ☐ ATARI ☐ APPLE ☒

Cascade Games Ltd.,  
Suite 4, 1-3 Haywra Crescent, Harrogate,  
North Yorkshire, HG1 5BG, England.  
Telephone: (0423) 504526.



YS 1/83



# YOUR SPECTRUM ANT ATTACK

## COMPETITION

# WIN

OVER

# 1,000

## SOFTWARE PACKAGES

AND

## A DREAM SYSTEM TO RUN THEM ON!!!

SPONSORED BY

**PRISM**

### ▶▶ PROF. BRAINSTAWN'S CREEPY CONTEST

Based around Quicksilver's chart-topping *Ant Attack*, have we got one son of a 'creepy crawly' competition for you this time around!

Anyone who's played the game can skip this bit — you won't need us to tell you about the fantastic graphics, etc, etc. But, for the uninitiated, here's a brief description of the action.

Enter the ancient walled city of Antescher, a mausoleum of architecture left to decay in the Great Desert. The ruins are inhabited by a rather rare species of ant (whose main diet seems to be human beings of the rescuing kind), and all you know is that your soulmate has been stashed away somewhere within the maze of buildings.

So, armed to the teeth with grenades, your task is to climb over the wall and battle with the ants in an attempt to foil your partner's kidnappers. But, once you've rescued one dumb friend, you find that yet another has managed to get lost in the maze; and so the rescuing continues, on through ten levels.

### ▶▶▶▶ READ CAREFULLY

As you move from level to level (assuming you don't get eaten alive), you'll find your soulmate can be located in any one of four 'random' sites in Antescher. Therefore, for part one of our competition, all you have to do is to locate the four possible sites on the *tenth* level. (Yes, that does mean you'll have to play the game to the tenth level at least four times!)

Just to get you off to a flying start in your quest, *Your Spectrum* is proud to present *YS* readers with a free colour poster depicting the entire architectural layout of Antescher. Designed by Sandy White and Angela Sutherland, this exclusive poster comes complete with all the author's own names for the locations of interest in the city.

As well as being an essential reference guide for anyone playing *Ant Attack*, you'll need the names of each location from the poster so that you can enter our Creepy Contest. Each time you discover one of the four rescuing sites on the tenth level, you'll have to locate the area on the Antescher poster and make a note of its name. Find all four locations and you're well on your way to winning Prof. Brainstawn's blockbuster prize.

Of course, this gives rather an advantage to those who already own a copy of *Ant Attack* and to whom the perils of the tenth level mean nothing. For this reason, there is a second part to the competition — one that will slow the frontrunners down for a while and allow newcomers to catch up.

The final part of our Creepy Contest will be found in the classified





ads section of either **The Guardian** or **Daily Telegraph** newspapers on **Friday, March 30, 1984**. Look for the headline, **Ant Attack — YS**, and you'll find all the information necessary for completing the competition, plus a phone number to ring us your answers. That telephone will be linked up to an automatic answering machine which will be ceremonially switched on at 12 noon on March 30.

The first caller to give us the four correctly-named locations of the missing persons on the tenth level of **Ant Attack**, and also the answer to the question given in the newspaper, will be declared the winner of the competition. Entrants must also give their name and address — otherwise we won't know who to send all the goodies to!

### ▶▶▶ THIS IS WHAT YOU GET

Before you rush off to begin your errand of mercy, hang on a bit and find out what you could win.

You may have heard the name Prism rear its head recently over the launch of the world's first generation of personal robots. But the company's perhaps better known in the computing field for its Micronet 800 system, and more importantly as the UK's largest distributor of Spectrum

(and other) software. And it's to Prism that YS extends its thanks for providing such a superb prize.

For the winner of our Creepy Contest will be taking away over 1000 (count 'em) packages of Spectrum software. That should be quite sufficient to keep someone quiet for the rest of 1984!

On top of that, the winner will also receive a complete Spectrum outfit, comprising a pristine 48K model Spectrum, ZX Printer, ZX Interface 1 and 2 units, and the much sought-after ZX Microdrive. To compliment this dream system, YS must also extend its thanks to Fuller, Kempston, Currah, RP Products, East London Robotics and Basicare, for providing a professional keyboard, a Centronics printer interface, a MicroSpeech unit, a Sureshot joystick, a Trickstick, and a complete range of Basicare add-ons, respectively. Truly, a treasure trove of delights! And what's more, our lucky person will be invited to the splendid offices of *Your Spectrum* to receive the gear (what a treat — Ed.).

But there's still more. For the next three correct answers given over the phone, each will receive £100 worth of Spectrum software. And after that, the next 25 correctly-answered phone entries will be given a year's supply of *Your Spectrum* completely free. So, don't hesitate to call — there's a good chance it'll be your lucky day!

So, that's it! Up with the poster, on with the Specy, boot up *Ant Attack* and get searching for those missing persons. □

## 1000 PRINT "PRIZE LISTING"

Obviously we haven't got room to list all of the software we're giving away for the first prize — but to whet your appetite, take a look at this lot:

**3D Tanx • Yomp • Centibug • Hunchback • Jet Pac • Arcadia • Pssst • Mr Wimpy • Meteroids • Kong • Schizoids • Starfire • Cookie • Pogo • Sheepwalk • Dictator • Spawn Of Evil • Alchemist • Royal Birkdale • Stonkers • Tranz Am • Golf • Lojix • Atic Atac • Biorhythms • Conversion • Jumping Jack • Lunar Jetman • Digger Dan • Racing Manager • Eskimo Eddie • Sound FX • Invaders • Jawz • Quetzalcoatl • Robber • Road Toad • Fruit Machine • Maziacs • Gold Mine • Spectron • Games 1 • Hard Cheese • Planetoids • Space Raiders • Lost • Hungry Horace • Horace Goes Skiing • The Island • Star Trek 3000 • Horace And The Spiders • Angler • Speed Duel • Planet Of Death • Ghost Town • Munch Man • The Ship Of Doom • Inca Curse • Apple Jam • Rider • Espionage Island • Tron • Dr Franky And The Monster • Embassy Assault • The Hobbit • Flight Simulation • Personal Finances • Backgammon • Scrabble • 2003-A Space Oddity • Reversi • Diet • Chess • Flicker Puzzle • Cyrus IS Chess • History 1 • Geography 1 • Inventions 1 • Music 1 • Jumbly • English Literature 1 • Galaxians • Forth • VU-Calc • VU-File • VU-3D • Small Business Accounts •**



On the face of it, the software market oozes sweetness and light — but it's the warts and boils that often prove more interesting. Ron Smith takes a behind-the-scenes look at the power struggles.

# RUMBLES

Hollywood, once famous for its moguls and *prima donna* stars, has long since gone into a glittering decline. But nowadays, there's another world of fantasy ready to take its place — the world of microcomputer software production. Young programmers can, and often do, become overnight successes by writing a bestseller, while the software houses that market the goods can make veritable fortunes and their owners become Havana-smoking tax exiles with even more indecent taste than many a moviemaking predecessor. And that, in short, is just what this page is all about: the people, the companies and the products that go to make up the popular software business.

## MANIC MATTHEW JOINS THE JET SET

One of the biggest shocks to reverberate through the industry of late has been Matthew Smith's decision to sever his connections with Bug-Byte, one of this country's largest software houses. Matthew, author of the best selling *Manic Miner* game for the 48K Spectrum, agrees that "Bug-Byte had the contract to both produce and market" this popular game, but that in his opinion "their marketing techniques were not all they should have been".

Matthew has therefore decided to quit his contract with Bug-Byte and move over to Software Projects — a company including himself and Bug-Byte ex-employee, Alan Maton. All, however, may not be well within the portals of SP, for the embryo company's new game *Jet Set Willy*, which has been promised for some time now, "is still not completely written", claims Matthew. But he urges, "it won't be long now", and promises that *Your Spectrum* will

be one of the first to see a pre-production copy as soon as one can be cobbled together. Watch these pages for further developments on that one.

What does seem a little strange, though, is that if Bug-Byte had its ace programmer under contract, how then has he managed to break himself free so easily? The answer is now clear. Matthew Smith had made his decision to move on, and according to Bug-Byte's Tony Baden, "*Manic Miner* had passed its peak, and we really didn't feel like taking a 17 year old to court". Under the circumstances, it obviously seemed better to just let Matthew and his program go.

So, what about Bug-Byte's future? Tony Baden reveals he has registered *Manic Miner*, and intends launching a new improved version for the Commodore 64 in the near future. However, once bitten, twice shy, etc, etc, and Tony adds that after the experience with Matthew, "We're definitely put off using people under 18 in the future". Perhaps there's a lesson there for you would-be micro geniuses.

## TROUBLE 'T MILL

Still on the subject of wayward programmers, Carnell Software too has had one or two problems of late. It all started with what was intended to be a series of programs known as *Starforce 1, 2, 3*, etc. A programmer was put to work, but instead of coming up with the expected supersmooth arcade game where the players find themselves at the edge of a maze with the unlikely task of getting to the centre in order to destroy the computer, what was actually produced was something a lot less than perfect. Indeed, so much so that Roy Carnell and fellow director, Stuart Galloway, felt moved to "give him a right \*\*\*ing for writing such a \*?!!\* program, then throw him off the project". But commercial pressures cannot be ignored

and Carnell, after a quick re-think, decided to reinstate his fallen genius, giving him just two days to improve the product. This we're told he managed to do, although just how welcome his stay will be as a result of all this is open to speculation. Gee, it's tough at the top!

Carnell Software is also currently working on two new programs, one adventure and one arcade. The adventure, a sequel to *Volcanic Dungeon*, will consist of three programs and these will come supplied with a 200-page book (giving the history of the Third Continent, a guide to the monsters and over 100 handy spells to help players overcome various hazards). The arcade game, *BobaJob*, will be the only one of its type, requiring two programs to play the game. Apparently, it features a boy scout who has various jobs to do for a number of grannies. Expect these on your high street shelves soon. . .

## BLACK BISHOP ZAPS RED QUEEN

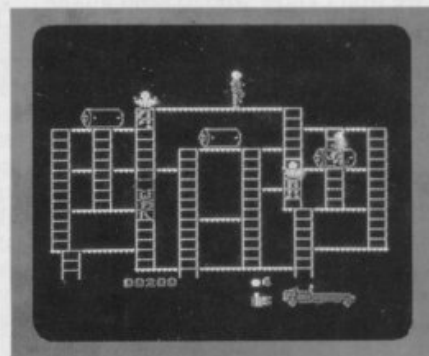
If the idea is anything to go by, then it's probable that Artic Computing will score with its latest project — based around the ancient game of chess. Ho humm, you may say, but this is not just another old chess game.

Artic's spokesperson, Chris

Clark, reports that, "It's to be called *Death Chess 2000* and will include all the fun of the board game, with plenty of highly entertaining arcade action". All of which sounds a little strange, but nevertheless, rather interesting. Let's hope it doesn't turn out to be a case of protecting your king from the invading lesser pieces. Once complete, claims Chris, "the game will include eight or nine levels of arcade fun". Chris also drew our attention to their new widely-advertised (but not yet available) *Bear Bovver* game. Check out the screen photograph for a glimpse of what's to come.

Board games are a popular source of inspiration for program writers at the moment, and A&F Software has recently signed the rights to a new title, launched recently at the Earls Court toy fair. Computerisation is under way and it'll be interesting to see which achieves the better sales — the program or the original board game. Cagey Mike Fitzgerald, having said this much (and avoiding the temptation of giving anything else away), then went on to talk about A&F's move to new offices in Greater Manchester. He says they are "bigger, nicer and unfortunately more expensive." And being based in Rochdale, he firmly denies industry rumours by saying, "There's absolutely no truth in the rumour that we're being called the Rochdale cowboys — *pardner!*".

If you go down to the wood today... watch out for Artic's *Bear Bovver*.





# RICHARD SHEPHERD SOFTWARE

ELM HOUSE, 23-25 ELMSHOTT LANE, CIPPENHAM, SLOUGH, BERKS.

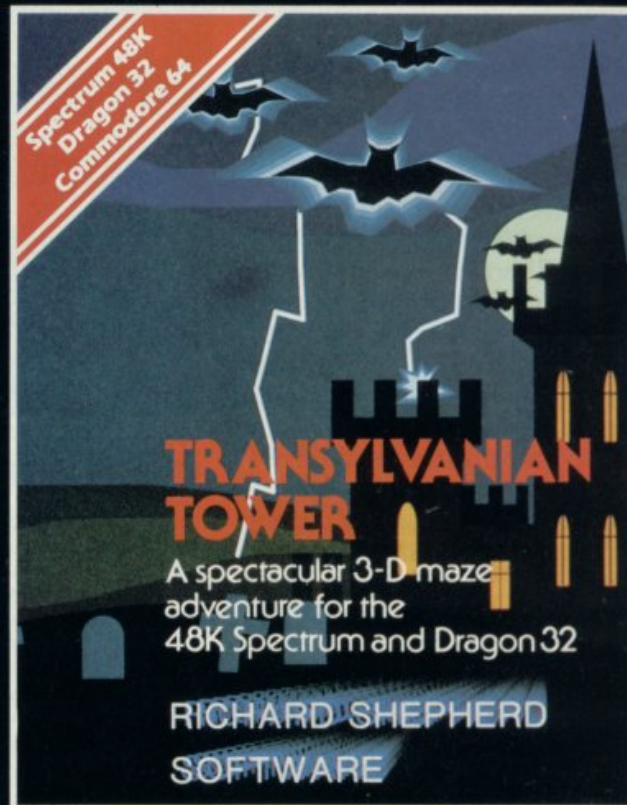
CREDIT CARD HOTLINE 06286 63531



## Invincible Island by Peter Cooke

An intriguing split screen graphic and text adventure for the 48K Spectrum

RICHARD SHEPHERD  
SOFTWARE



## TRANSYLVANIAN TOWER

A spectacular 3-D maze adventure for the 48K Spectrum and Dragon 32

RICHARD SHEPHERD  
SOFTWARE

### Invincible Island by Peter Cooke

Exhaust your ingenuity in the quest to find The Seven Parchments of Xaro and their meaning! Will they lead you to undreamt of treasures or eternal doom? Explore the mysteries of the stockade and puzzle within the Pagoda! A spectacular split screen graphic and text adventure to braintease you for weeks! Adventurous graphics for every location. Save routine. £6.50.

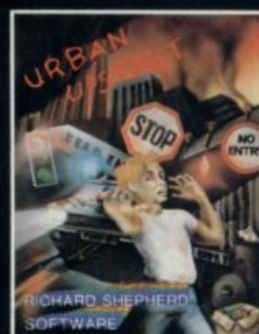
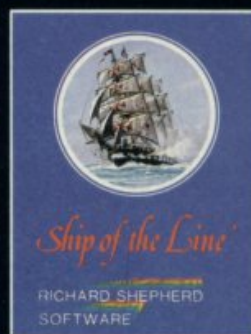
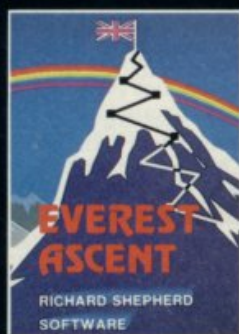
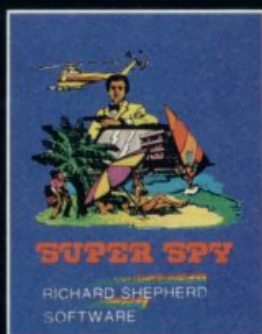
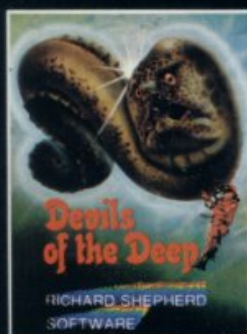
### Transylvanian Tower

A spine chilling adventure... enter via the dungeons... navigate your way through 500 3-D rooms... survive the swooping vampire bats... reach the terrifying top... confront and kill Count Kreepie, ridding the world of this Transylvanian Terror. Can you survive the Top of the Tower? £6.50.

SELECTED TITLES AVAILABLE FROM

**W.H. SMITH, JOHN MENZIES, BOOTS  
AND ALL LEADING COMPUTER STORES**

"ADVENTURES INTO IMAGINATION"



NEW DEALERS WELCOME — RING (06286) 63531 FOR DETAILS

All programs are sold subject to the condition that they may not, by way of trade or otherwise, be lent, hired out, resold or otherwise circulated without the written permission of Richard Shepherd



Starting this issue Your Spectrum will be touring computer clubs up and down the country in an effort to find dedicated games enthusiasts who will give us their impressions, thoughts and feelings on the current selection of new releases. Little do they know it, but these unsuspecting souls will be contributing a large slice of our regular review section in the future.

This month we visited the Stanwell Computer Club (which meets weekly at the Stanwell School, Short Lane, every Friday evening from 7-10pm). Five of the resident 'freaks' were enlisted to tell us (and you) what was good or bad about the programs we gave them to play around with. In some cases comment was justifiably harsh, and in others they could hardly contain their glee at coming across a really well thought-out game.

The guinea-pig five whose comments appear below, are all members of the club, and they are (in alphabetical order): Corrie Brown, Stephen Cathrall, Ryan Davis, Stewart McPherson and Peter Shaw. Peter, by the way, is also Secretary of the Stanwell Club. Them we do thank.



**SPECTRUM SAFARI**  
CDS MICROSYSTEMS/£5.95

A semi-adventure where you wander round the screen coming across various animals which all ask you to play games, or solve riddles. Really, a sort of compendium of games rolled into one.

**Peter** This is a collection of bad 'magazine type' programs thrown together, with less than spectacular graphics and an average choice of colours. And because it's written in Basic, it's not particularly fast.

**Stewart** There's an overall strategy theme, with varying speeds for each section — although it's never dazzlingly fast. You'll find such items as gorilla-gambling, snake-shooting and guessing games.

**Stephen** This is a sort of adventure, but the player need not be too skilful at arcade games to succeed.



**XARK**  
CONTRAST SOFTWARE/£5.95

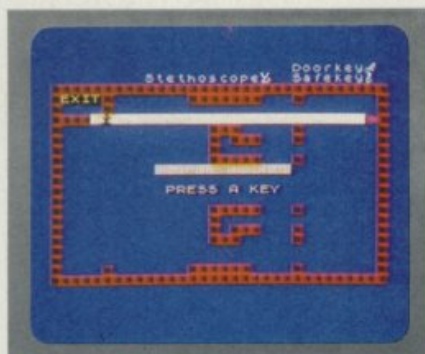
A *Defender*-type game in which you are (according to the classic game theme) the last survivor of the planetwide attack, and as the last one left, it is up to you to save the rest of the planet.

**Peter** Speed, colour and graphics are all just above average, but perhaps the graphics could have been a little better considering this is a 48K game. Overall, a poorly presented *Defender* conversion.

**Stewart** It's quite fast, but slows down considerably if the player fires continuously. And there's little variation between the four screens, which makes it boring in a matter of minutes.

**Ryan** Could become a best seller! Only one complaint — and that's the choice of keys.

IAN MCKINNELL



**ROBBER**  
VIRGIN GAMES/£5.95

An original idea that involves you in stealing the loot, and avoiding the searchlight as it scans the screen.

**Peter** Although this program was put together using the Softek compiler, it's still awfully slow and the graphics have taken a backward leap in time to the simple block graphics of the ZX81. It did seem that Virgin Games were improving their software selection . . .

**Stewart** Unbelievably slow, this game is a long way behind the times graphically, and generally leaves a lot to be desired.  
**Corrie** Basically, very slow. Not bad overall and an original idea but frankly, a rotten presentation.



**DOOMSDAY CASTLE**  
FANTASY SOFTWARE/£6.50

A graphics adventure in the true sense of the word. You control a little man who zooms around the castle, collecting various objects, etc. It's similar in style to *Atic Atac*.

**Stewart** The nasties are nicely designed, and their movement is delightfully smooth. Constant attention is demanded by the 'Urks' and 'Carthogs' as they rush around the screen.

**Peter** Here is a very colourful arcade game with an adventure-type aim. Very enjoyable and well worth a look.

**Stephen** Quite a slow response to the player's directions, even when using a joystick. Otherwise, I liked it.



**PAT THE POSTMAN**  
MIKRO-GEN/£6.95

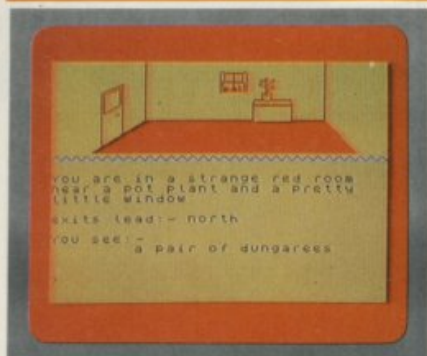
The concept of this game is simple; all the player has to do is to help Pat — the amnesiac postman — collect parcels from various houses and take them to the Post Office.

**Peter** Good colour, bad graphics and very slow. But the worst part about this game is the lack of instructions, which makes it a bit difficult to find out what's going on.

**Stewart** Simple block graphics and average use of colour are the extent of this game's presentation.

**Ryan** Definitely not one of Mikro-Gen's best efforts. There are much better games around for the money.





#### URBAN UPSTART

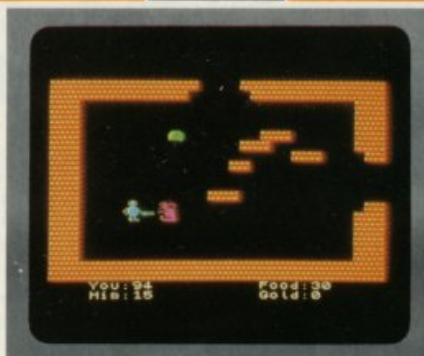
**RICHARD SHEPHERD SOFTWARE/£6.50**

A truly graphic adventure, with a picture for each location you wish to visit. You are wandering around Scarborough and, like everyone else, your main aim in life is to escape!

**Corrie** The graphics are quite exceptional in this program, and there's no fuzziness where the colours meet. Definitely a good adventure, and one that I highly recommend.

**Stewart** Graphic representation of each location can be found in this program, and these vary from simple line drawings to some quite detailed scenes. Generally I prefer to see adventures use up memory for ideas rather than pictures, but at least the program does it competently.

**Peter** The response time is not as fast as it could be, but the use of colour and graphics are very good. An extremely entertaining game.



#### THE CRYPT

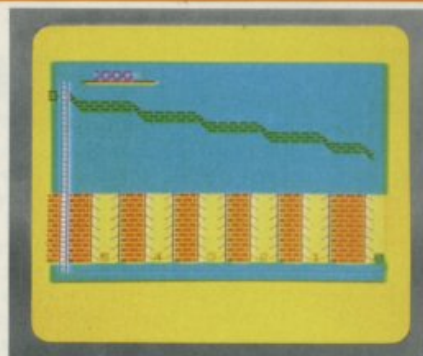
**CARNELL SOFTWARE/£4.95**

A very graphical adventure, in the same style of *Atic Atac* (in that you look down upon the action from above). You can choose your weapons, etc, by picking them up off the floor of the crypt. An extremely complex game, with graphics and text.

**Peter** The graphics are used imaginatively throughout this game, and the response time isn't bad. Overall, it's a very nice graphical adventure.

**Stewart** The speed of this game is adequate, given that it is essentially an adventure game. I would describe the use of colour and graphics as average. A complex adventure, but I found ways of cheating quite easily.

**Stephen** You can select which level you wish to play and, at the end, the game refuses to tell you the secret of the Crypt!



#### BARREL DROP

**GAMES MACHINE/£5.95**

You have to catch barrels as they drop from the top of the screen, aided only by your dog. Your name is Flash and the dog's name is Gordon — shouldn't it be the other way round?

**Peter** Written in Basic, this game is slow, the graphics are unexciting and the colour is bad. It's a very tedious game and the riddles between rounds only seem to increase the tedium.

**Corrie** I've seen better 16K games designed to run on old tin boxes! Well, not really — but this isn't too good.

**Stewart** Having achieved success in the first game, the player must answer a riddle or get through a mini-arcade game in order to move on to the next round. But subsequent rounds don't vary, even in speed, and riddles are often repeated, even when answered correctly first time round.



#### McKENSlE

**SOFTWARE PROJECTS/£5.95**

This is a text adventure based on the world famous explorer Captain Vito who, while on a scrounging mission for lithium crystals to fuel his spacecraft, has managed to be captured by space bandits. He has just one hour to escape before the air supply runs out.

**Peter** Response time is average, which is just as well because there's a limit of one hour set on the game. It would have been more enjoyable had a little more humour been introduced.

**Stewart** Location descriptions are brief to the point of being terse, and the accepted commands are very specific, with not many clues supplied. Funny, but the player takes the part of Captain Vito — so who on earth is McKensie?

**Corrie** If you like adventures, but you are just a beginner, I would suggest you try something a bit easier.



#### MR WIMPY

**OCEAN SOFTWARE/£5.90**

This is a version of the arcade game *Burger Time*, and you take the place of a chef desperately trying to find the ingredients required to make a beefburger. Numerous attempts are made to stop you fulfilling your cooking quest.

**Stewart** Starts off slowly, but soon speeds up to an acceptable level. The graphics are a treat, and the burgers are actually burger-coloured, adding that extra touch of realism. A very nice game in all, but arcade games need to be better than brilliant nowadays.

**Ryan** Very addictive, and lots of fun. Definitely worth the money.

**Peter** After playing the game for some time, three short descriptions sprang to mind — very good, excellent, and b\*\*\*\*y marvellous. Building burgers is great fun!



#### IT'S ONLY ROCK 'N' ROLL—

**TOMB OF DRACULA**

**K-TEL/£6.95**

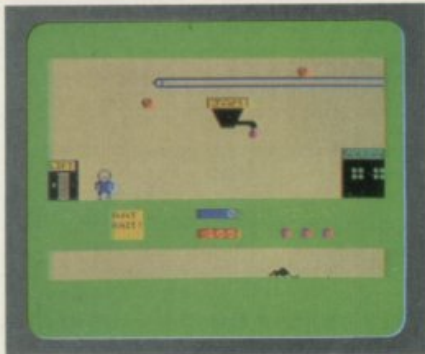
The first of this pair is a strategy game where you take charge of a rock'n'roll band and try to take them to the top of the heap. *Tomb of Dracula* is a graphics adventure set in a 3D maze.

**Stewart** *It's Only Rock'n'Roll* is a text-based strategy game. I like the excerpts of the concert or the tour, but it's a shame about the music (I don't think they're going to make it to the top twenty!). *Tomb of Dracula* is an unexciting game, with too many obstacles.

**Peter** Both programs use colour quite well in places but completely neglect this aspect in others.

**Corrie** Both games on this tape are quite acceptable, but they're not as good as they could be. *It's Only Rock'n'Roll* is by far the best.





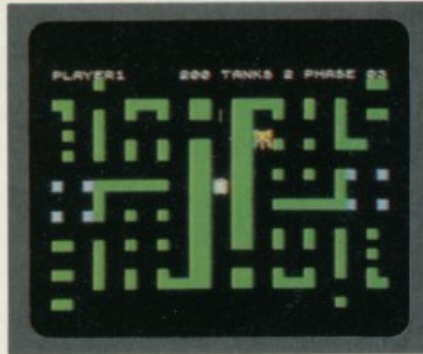
**APPLE JAM**  
DKTRONICS/£5.95

An original arcade game in which you have to eat as much jam and apples as you can without getting into trouble with wandering rats and bees.

**Peter** Most of the displays are pretty impressive and colourful, but that's not to say they couldn't have been improved upon. Overall, pretty good.

**Stewart** Particularly impressive are the man and rats, who grow in size the more apple and jam they eat. For a 16K program, this package contains an amusingly different theme and has some great features. For instance, lift journeys can be quite fun, especially if you judge its descent so that you squash a rat!

**Stephen** Play starts off very slowly, and gradually increases as progress is made. I would have liked it a bit better if the initial speed of the game had been set a little faster. That said, the game makes good use of colour and sound, and is certainly original.



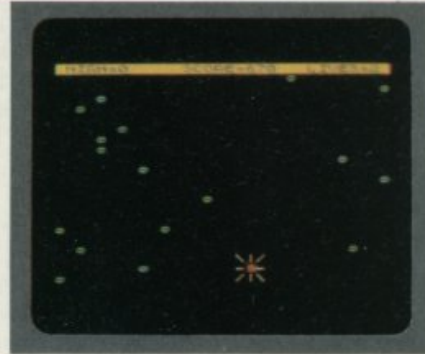
**BRAIN DAMAGE**  
SILVERSOFT/£5.95

This is an arcade game set in a maze, in which the idea is to shoot your opponent before you are yourself get blasted. Your opponents are the Electron Panzers, the Centurion and the Marauder.

**Stewart** Yet another maze game, this time with you in a tank that's being pursued by baddies who must be shot. Unfortunately, they shoot back — usually, and perhaps a little unfairly, with greater effect. Graphics are unexciting and use of colour average, but it does get progressively faster.

**Peter** Another arcade game that's similar to the 'Tanks' level of *Tron*, and one which I'm afraid got a little boring after 15 minutes or so.

**Corrie** Excellent, and with very professional graphics. I especially like the gun turret which can be turned to fire in any direction. *Brain Damage* is an excellent game with brilliant graphics and good sound.



**ALIEN SWOOP-DOMAIN**  
SPACE AGE SOFTWARE/£5.95

*Alien Swoop* is a *Galaxians*-type game where you must shoot the aliens in their ranks, and also the ones that peel off and swoop down towards you. *Domain* is a version of the old chestnut, *Kingdoms*. You take the place of a country's king, and try to run the surrounding realm successfully.

**Peter** The use of graphics in *Alien Swoop* is very poor, while in *Domain* they're not too bad. Speed and use of colour, however, leave a lot to be desired in both games.

**Stewart** *Alien Swoop* is an extremely poor *Galaxian* simulation which is painfully boring. *Domain*, on the other hand, is a little better. It's a classic strategy game where you must rule a Norfolk village for 10 years, guarding against floods, brigands and starvation.

**Ryan** It's nice to see one arcade and one strategy game on the same tape, but there's plenty of room for improvement in both of them.



**APOCALYPSE**  
RED SHIFT/£9.95

A strategic wargame, based upon an original board game under licence. The plot centres around four opponents attempting world domination.

**Stewart** A cross between a computer-assisted wargame and a sort of graphical strategy that uses block graphics. The game requires at least two players and could, in theory, last for years! I'd say it has only limited appeal.

**Peter** Very colourful, with cleverly-used block graphics, although it would have been nice to have seen more detailed pictures thrown in for good measure.

**Stephen** Unimpressive graphics, with the use of colour reaching the same mediocre standards.



**SPECIAL AGENT**  
HEINEMAN-FIVE WAYS/£9.00

This is an educational adventure where players travel around Europe gathering clues and information. Its main aim is to teach geography to the 8-12 year old age group.

**Peter** There's a hi-res map of Europe which is very good, with the other displays also being very well laid out. It's professional and well presented.

**Stewart** There's a good map of Europe, and the various tables are clearly laid out — which all helps to make this a highly professional package in both presentation and program content.

**Ryan** The speed of the game is rather slow, but this is only to be expected in an educational adventure.



**PAINT BOX**  
PRINT 'N' PLOTTER PRODUCTS/£7.50

*Paintbox* is a graphics utility which enables the user to create user-defined graphics and SCREEN\$, allowing hi-res sketching with your UDGs.

**Peter** The presentation of this program is very good, and the demonstration pictures are excellent. It's very quick to respond, and one of the most outstanding programs I've seen this year.

**Stewart** A very impressive graphics utility program which enables quite stunning hi-res pictures to be drawn, saved and used within your own programs.

**Stephen** The demonstration contains the best graphics I've ever seen on the Spectrum. To be recommended. □



48K  
SPECTRUM

# Regardez!

BBC  
acorn  
electron

## LANGUAGE LEARNING AIDS FOR FRENCH, GERMAN & SPANISH

Already in use in numerous schools and colleges, these programs provide an immensely powerful aid to foreign language learning. The cassettes include extensive vocabulary lists arranged as a series of lessons, each covering a different subject. A tuition control program enables individual lessons to be loaded and used as required.

Words, phrases etc are presented first in one language, then the other complete with all necessary accents and special

characters. Masculine, feminine and neuter words appear in different colours to encourage gender learning. All lessons can be run in three different ways, i.e. learning only, self-test or speed and accuracy test.

The programs are suitable for pupils of all ages as simple commands enable new lessons in vocabulary or grammar to be entered by the user. These may then be edited as required and stored on cassette for later use. Invaluable for homework and exam revision!

Level A Cassettes: Contain the tuition control program and 16 comprehensive lessons for general vocabulary learning.

Level B Cassettes: Contain the tuition control program and 16 lessons including verb lists, adjectives, adverbs and phrases.

Available from dealers, large stores or mail order.

Also Available "THE SPANISH TUTOR"

### kosmos Software

1 Pilgrims Close, Harlington, Dunstable, Beds. LU5 6LX Tel: 05255 3942



Kosmos Software, 1 Pilgrims Close, Harlington, Dunstable, Beds LU5 6LX.

Please supply the following programs for the . . . . . computer (BBC/SPECTRUM/ACORN ELECTRON) (Prices include postage & packing)

The French Mistress Level A @ £9.95    The French Mistress Level B @ £9.95    ☐  
The German Master Level A @ £9.95    The German Master Level B @ £9.95    ☐  
The Spanish Tutor Level A @ £9.95    The Spanish Tutor Level B @ £9.95    ☐

Mr/Mrs/Miss .....

Address .....

Post code .....

I enclose a cheque/postal order value £ .....

payable to Kosmos Software

## ADS. THE ULTIMATE IN PERIPHERALS FOR THE SPECTRUM, JUPITER ACE & BBC MICROCOMPUTERS

"Highest quality peripherals at the lowest possible prices" — that's the philosophy at Advanced Digital Systems. Our team of highly experienced designers use the very latest techniques to produce adaptable home computer peripherals — at a price you can afford.

- Boards are designed using CAD/CAM, giving a neat optimum layout.
- Gold plated connectors are used, wherever possible, to ensure good electrical contact.
- All products carry a 12 month guarantee.
- All units are "Plug in and go".

### 1 PRINTER INTERFACE 1

Centronics Interface for the Sinclair Spectrum. £34.50 inc. VAT. Comes complete with approx 1 metre of cable, centronics plug and software.

- Software recognises LLIST and LPRINT enabling Print-outs direct from Basic. Also adaptable COPY routine for graphics printers.

### 2 PRINTER INTERFACE 2

Centronics Interface for Jupiter Ace. £39.95 including VAT and Software. Same unit as the Spectrum Interface but with adapter card.

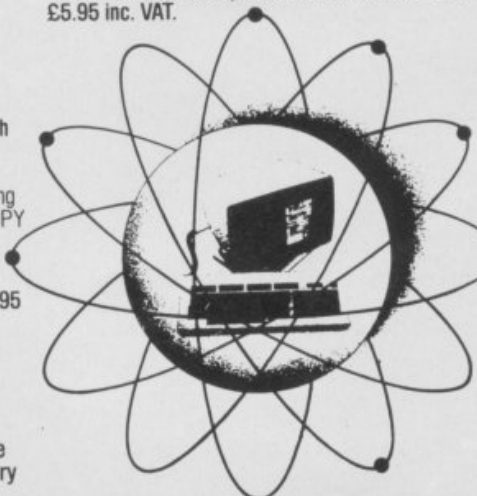
### 3 PERIPHERAL INTERFACE 3 — ZX ACE

Package Using the adapter card and the Software supplied, the Sinclair ZX Printer can be connected to the Jupiter Ace. Special Introductory Offer £9.95 inc VAT.

### 4 PERIPHERAL INTERFACE 4

ZX BBC Adapter £24.95 inc. VAT.

Enables the connection of Sinclair Peripherals to the BBC Model B. First Software package included gives an amazingly cheap entry into printing on the BBC model B by allowing you to use the ZX Printer — ideal for listings. Please allow 28 days for delivery. Unit requires 1.2 Amp power supply: either the ZX P.S.U. or the equivalent available from us at £5.95 inc. VAT.



## NTERSPRINTERSPRINTI

Advanced Digital Systems are now able to supply the following range of printers at amazing prices.

EPSON • FX 80 — £400    • MX 100/3 — £453  
• RX 80 — £278    • FX 100 — £532  
• RX 80 FT — £306    • TRACTOR FEED  
• MX 80 T/3 — P.O.A.    MECHANISM FOR THE  
FX 80 — P.O.A.

SEIKOSHA • GP 100 A — £197    • TEC BUSINESS  
• GP 100 VC — £206    PRINTERS —  
• GP 250 X — £246    P.O.A.  
• GP 700 A (colour printer) — £399

MANNESMAN • MT 80 with Parallel Interface £270  
TALLY • MT 80 with Serial Interface £312

Prices include VAT and delivery

Please send me the items as ticked.

I enclose cheque/order for ..... Total  
(Include £1.00 for post and packaging).

Cheques payable to Advanced Digital Systems Ltd.

Centronics Base Unit for Sinclair Spectrum £34.50 inc. VAT & Software ☐  
Jupiter Ace Version Base Unit and Adaptor £39.95 inc. VAT & Software ☐  
ZX Ace Adaptor and Software £9.95 inc. VAT ☐  
1.2 Amp P.S.U. £5.95 inc. VAT ☐  
ZX BBC Adapter Unit £24.95 inc. VAT and Software ☐

EPSON ☐ SEIKOSHA ☐  
FX 80 — £400 ☐ GP 100 A — £197 ☐  
RX 80 — £278 ☐ GP 100 VC — £206 ☐  
RX 80 FT — £306 ☐ GP 250 X — £246 ☐  
MX 100/3 — £453 ☐ GP 700 A (colour printer) ☐  
FX 100 — £532 ☐ — £399 ☐  
FX 100 — £532 ☐

MANNESMAN MT 80 with Parallel Interface £270 ☐  
TALLY MT 80 with Serial Interface £312 ☐

PRINTERS — Inc. VAT & Delivery

Name .....

Address .....

Send order to ADVANCED DIGITAL SYSTEMS LTD.  
9 Bonchurch Road, Portsmouth, Hampshire PO4 8RY. YS/2/84

## Advanced Digital Systems Ltd.

MANUFACTURERS AND DESIGNERS OF  
MICROCOMPUTER PERIPHERALS

9 Bonchurch Road, PORTSMOUTH,  
Hampshire PO4 8RY. Telephone (0705) 823825.

For International Enquiries (0705) 754160. Prestel Account No. 705-823825



# WAVE

48K SPECTRUM





# VALHALLA

**MOVi  
SOFT**



# LEGEND

VALHALLA is supplied on a 48K Spectrum program cassette, with VALHALLA player manual and presentation box. As VALHALLA uses the full 48K RAM, microdrives and full-size printers are not supported. ZX printer optional.

VALHALLA is normally available from stock, and orders are despatched by return. If, for any reason we are unable to fulfil your order within 14 days of receipt, we will notify you.

VALHALLA cassettes carry an unconditional lifetime replacement guarantee.

**TO ORDER:** (UK Orders Only) Simply complete the coupon, and FREEPOST with your cheque/P.O. made payable to LEGEND (UK Mail Order).

Credit Card Orders: By phone 9-5.30 Mon to Fri, stating name and address, Card No. and item(s) required.

**RETAILERS:** Please contact your regular distributor or LEGEND (Trade Distribution) at the address below.

**LEGEND (UK Mail Order) FREEPOST**  
1 Milton Road, Cambridge CB4 1UY  
(0223) 312453

MOViSOFT OPERATING SYSTEM UNDER LICENCE

Post to:- LEGEND (UK Mail Order) FREEPOST  
1 Milton Road, Cambridge CB4 1UY

Please send me.....Copy/copies of  
VALHALLA for the 48K Spectrum.

I enclose cheque/P.O. for £.....  
(£14.95 each incl. VAT and P&P).

Or I wish to pay by Access/Barclaycard/Visa

Card No.....

Please print name and address

Name.....

Address.....

.....

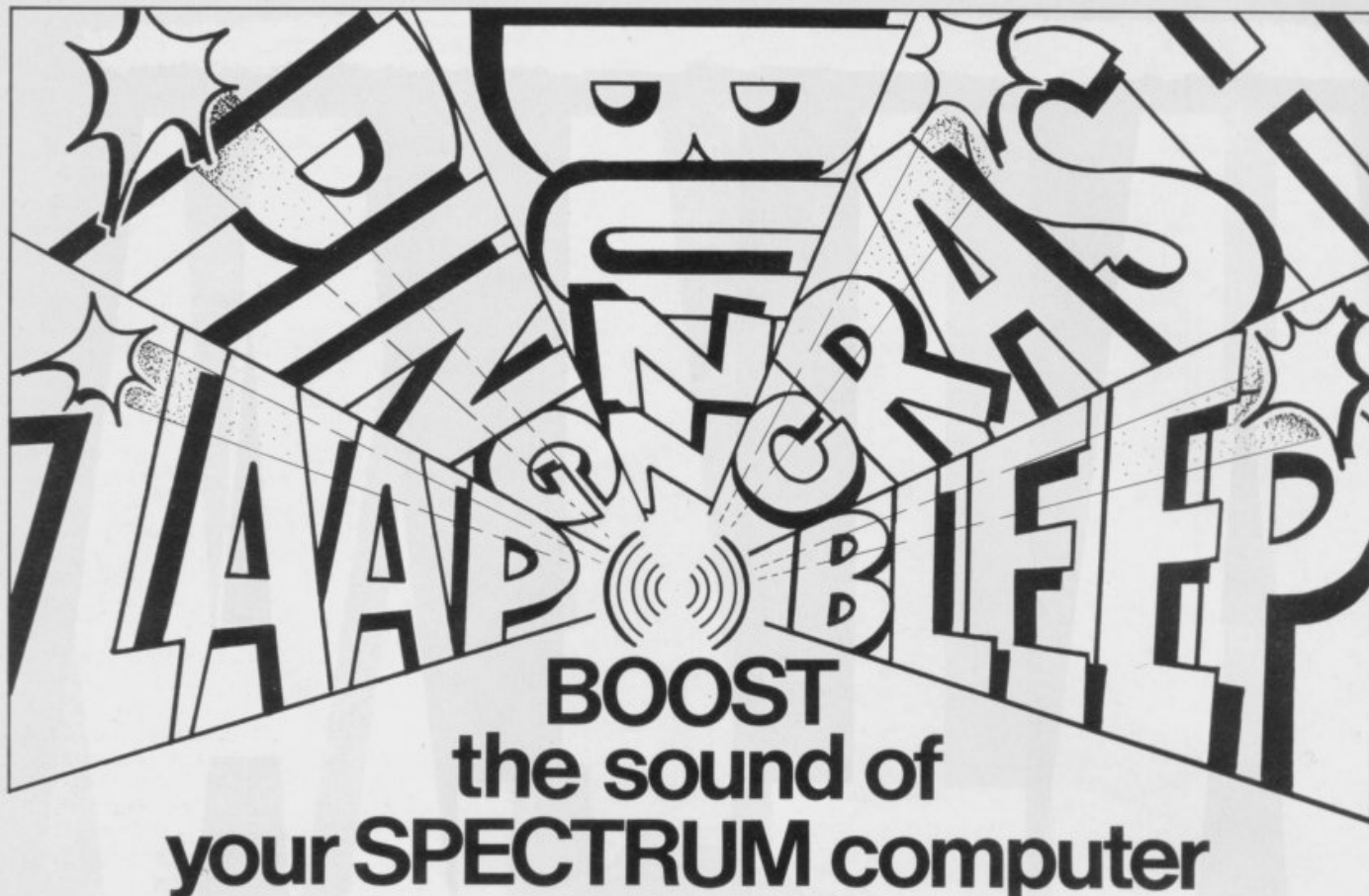
.....

Credit Card holder's signature.....



YS 2





# BOOST the sound of your SPECTRUM computer

**SOUND AMPLIFIER.** Enhance the quality of your Spectrum programmes and games with the Pinnacle Sound Amplifier. This battery powered amplifier/speaker simply connects to your micro, producing good quality sound necessary for the full enjoyment of music programmes and games with sound effects.

## FEATURES:

- )) Simple to connect — no internal connections
- )) Self powered by standard batteries — eliminates additional cables
- )) LED Indicator
- )) Two output levels
- )) Provides audible response when inputting from keyboard
- )) Independent from video signal — does not affect receiver tuning

AROUND  
**£7.99**

**PINNACLE**

**PINNACLE ELECTRONICS LIMITED** Pinnacle House, Oasthouse Way, Orpington, Kent BR5 3QJ. Telephone (0689) 27000

AVAILABLE FROM									
<b>AVON</b> Weston-Super-Mare <b>BEDS</b> Bedford	Peter Castell	Clacton-on-Sea Colchester Southend <b>GT. MANCHESTER</b> Bury Eccles Manchester <b>HANTS</b> Basingstoke Fareham Gosport Havant Portsmouth	W. A. Baker Mr. Said Golden Disc K. S. Electronics Play Inn Shude Hill Supplies	<b>LEICESTERSHIRE</b> Leicester Loughborough Market Harborough <b>LINCS</b> Boston	Mays R. S. C. Murcotts Market Harborough Computer Centre	<b>NORTHUMBERLAND</b> Blyth <b>NOTTS</b> Binham Eastwood Hucknall Long Eaton Nottingham (Arnold) Nottingham <b>OXON</b> Henley Oxford Witney <b>SALOP</b> Shrewsbury	A. Bell	<b>N. YORKS</b> Bridlington Driffield Scarborough Selby Wetherby <b>S. YORKS</b> Barnsley Sheffield	Dixons Dixons Dixons Studio Two Horton and Hollender
	Software Centre Carlo Radio Hobbs Components	Thirwell & Allen Direct Audio Systems Electrotrade Electrotrade R. D. S. Computer Services R. A. Fraser (Drayton) Squibb Electronics Afflecks	Thirwell & Allen Direct Audio Systems Electrotrade Electrotrade R. D. S. Computer Services R. A. Fraser (Drayton) Squibb Electronics Afflecks		Mellors Yates & Greenhoff J. H. Wand Holbeach Music Yates & Greenhoff Yates & Greenhoff		Family Computers P. H. Electronics Witney Audio Centre		Greens Telecom Just Micro Cork & Green
Luton <b>BERKS</b> Windsor <b>CAMBS</b> Kimbolton Dundie Peterborough Sawston Wistich <b>CHESHIRE</b> Chester Ellesmere Port Latchford Warrington	Castle Computers W. J. Watson Oundle Sound Suite Robertsons Vindis & Son Bardells	Southampton	Leapfrog Records Field Electronics Monty Radio Component Centre	Bourne Holbeach Horncastle Skegness Spilsby <b>LONDON</b> S.E. 8 Deptford Harrow E.C. 4 N.W. 1 N.10 Muswell Hill S.W. 16 Streatham Stammore W.2 Edgware Road <b>MERSEYSIDE</b> Heswall (Wirral) <b>NORFOLK</b> Gt. Yarmouth (Gorleston) Hartlepool <b>NORTHANTS</b> Northampton	Garland Bros. Odson Radio Sternoway Electronics Station Radio Electronics Andys Electronics Francis Typewriters A. H. Radio R.S.C. Thornguard Ltd.	Henley Oxford Witney <b>SALOP</b> Shrewsbury	Microtronics Filmville Ltd.	Wakelield <b>SCOTLAND</b> Aberdeen Annan (Dumfries) Edinburgh	Empire Electro Centres Woods Townsend Computers Micro-Sell Computer Systems R.S.C. H. Claston
<b>CLEVELAND</b> Middlesbrough	RSC Ben Williams Bond & Mason	<b>HERTS</b> Bishops Stortford Boreham Wood Royston Watford <b>HUMBERSIDE</b> Hull Scunthorpe <b>KENT</b> Herne Bay Maidstone	Tomorrow's World Johns Music H. T. V. Services Baldocks Scan Electronics (Kingswood)	Merseyside Heswall (Wirral) <b>NORFOLK</b> Gt. Yarmouth (Gorleston) Hartlepool <b>NORTHANTS</b> Northampton	Norfolk Video Sight & Sound H. G. Radkin South East Midlands Co-op Richard Reeves Alpha Nu Leisuretime	Nottingham (Arnold) Nottingham <b>OXON</b> Henley Oxford Witney <b>SALOP</b> Shrewsbury	Microtronics Filmville Ltd.	Fort William Glasgow <b>WALES</b> Newport Swansea	Micro Shack Alec Biard R.S.C. Hi-Fi Repair Shop F. W. Patterson R.S.C. J. & P. White Telefix
Stockton-on-Tees <b>CUMBRIA</b> Barrow in Furness <b>DERBYSHIRE</b> Belper Bolsover Derby Ilkeston <b>DEVON</b> Tiverton <b>ESSEX</b> Basildon	Video Shop S. H. TV S. L. Smith R. F. Potts K. Freer Roy Hart Rival Records	<b>LANCS</b> Accrington Blackpool Cleveleys Fleetwood Lytham St. Annes	P. V. Tubes Melody House Electronic Services Microchip Shop R. Seedle Ltd.	Raunds Weston Favell	Tamworth Tamworth (Fazeley) <b>SURREY</b> Cobham Guildford	Nottingham (Arnold) Nottingham <b>OXON</b> Henley Oxford Witney <b>SALOP</b> Shrewsbury	Microtronics Filmville Ltd.	Wakelield <b>SCOTLAND</b> Aberdeen Annan (Dumfries) Edinburgh	AND OTHER LEADING HOME COMPUTER SHOPS



# GETTING INTO PRINT

*Good as it is for the price, many users are bound to be disappointed with the output from Sinclair Research's own printing device. For those toying with the idea of upgrading their Spectrum system with a professional printer, Henry Budgett takes an in-depth look at the technology involved and the plethora of interface devices now available.*

Regardless of what one actually thinks about Sinclair Research's ZX Printer, it's impossible to ignore the fact that it really does work. For the price and performance that it offers there's no equal anywhere. But despite that, there are users who need something a little more professional. Software houses developing programs, small businesses using the ZX Spectrum or just a serious user who demands something better than a sheet of aluminised paper that is, at best, just legible after a few days' handling.

We're fortunate in having a number of commercially available interface units that allow the ZX Spectrum to be connected to the growing range of low-cost printers. In the main, these units convert the signals provided on the expansion connector into those which conform to the industry standard Centronics interface. There are two stages to this conversion: that of altering the electrical characteristics

of the output from the ZX Spectrum and that of converting the character codes from Sinclair Research's own internal format to true ASCII.

The alterations to the electrical signals are handled in a variety of ways by the interfaces reviewed here; some use very sophisticated chips to handle the work, others tackle the task by using more of the simple ICs. Only one of the interfaces in this review offered the possibility of connecting to a serial printer but, in theory at least, the problems involved are tackled in much the same way.

All the interfaces were supplied with software drivers of one sort or another (see the individual panels for further details) and in general, these all work by intercepting the ZX Spectrum's printer routine vector. This is the location in memory that stores the address of the routine which controls data being sent to the printer by LLIST and LPRINT. By changing this address to that of the new driver

all the data is re-routed through one of the OUT ports to the interface. On their way, each of the characters passes through a 'code converting' routine held somewhere in memory. While the normal alphanumeric codes closely follow the standard ASCII set, all the control codes, pre-defined graphics and Basic tokens must be intercepted. In the case of the tokens, these are converted back into strings of ASCII letters before being listed. Because many of the currently available printers use sequences of control codes to change character fonts or to select graphics, provision must also be made to allow these codes to be sent without being trapped.

The test equipment to which the various interfaces were connected comprised a Tandy CGP-115 four-pen plotter printer and an Epson FX-80 dot matrix printer. Unfortunately, the Epson turned out to be 'Dead on Arrival' and the author's Apple Dot Matrix Printer was substituted. As this printer is based on a TEC chassis, it proved impossible to check the graphics dump facilities on all but one of the interfaces. However, there is no evidence to suggest that the software provided wouldn't operate correctly with the appropriate hardware and indeed, the Kempston interface unit has been seen elsewhere to function perfectly with both the RX-80 and FX-80 printers.

### Kempston Centronics Interface



IAN MCKINNEL

**Hardware:** A very neat and specially designed casing houses the single printed circuit board. Featuring just two ICs (an 8255 and 4071) the unit is constructed from high quality components and mounts vertically behind the ZX Spectrum, contact being made through a gold-plated edge connector. No provision has been made for other units to cascade from the rear of the interface. The interface cable is detachable but not keyed at the interface end; it might therefore be possible to connect it upside down.

**Manual:** The accompanying documentation consists of just four pages, A5 sized. All the necessary





**"GET AWAY FROM IT ALL"**

**NEW!! FREEZ' BEES (48K)**  
Penguin Pulvirizin!

**NEW!! SAM SPADE**  
The Fastest Digger around.

**NEW!! ROBOT RIOT (48K)**  
Metal Mayhem at the  
ACME ROBOT CO.

**MISSION IMPOSSIBLE**  
It certainly IS.

**EXTERMINATOR**  
Last of the ROBOTRONS

**ARMAGEDDON**  
Get your Apocolypse NOW!

**BRAIN DAMAGE**  
Crashed out CPU.

# **WITH OUT OF THIS WORLD SPECTRUM GAMES**

Selected titles available from Boots,  
W.H.Smiths, J.Menzies and all  
good computer stores.

Dealer Enquiries welcome Tel: 01-748-4125

**All games just £5.95 inc VAT and P&P**

Silversoft Ltd, London House, 271/273 King St,  
London W6

**SILVER  
SOFT**



# GETTING INTO PRINT

information to attach and operate the unit is given although the quality of the photocopy is poor in places.

**Software:** Four programs are provided on cassette to support the interface and all reside in the printer buffer when loaded. The main program is a simple text-only driver which supports LLIST, LPRINT, PRINT AT, TAB AND '. All the standard ASCII characters are coped with and all keywords are de-tokenised; control codes can be sent by LPRINTing the appropriate CHR\$(x). In addition to these standard features the software supports a TEXT COPY, called by RANDOMIZE USR 23370, and allows the number of characters per line to be set. Also included, and very useful too, is the facility to enable or disable the Line Feed character after each Carriage Return.

Kempston also provides, on the same tape, three high resolution copy programs. These effectively replace the text driver's TEXT COPY with a screen graphics copy, all other facilities remaining the same. The first program is for all the standard Epson printers, but programs for the Seikosha GP80/GP100 and the Seikosha GP250X are also provided.

**Price:** £45.00 all inclusive.

**Summary:** An excellent product and one which, in a commercial software environment, has proved to be totally reliable. The instructions are short and sweet, no problems would be encountered by even the newest of newcomers.

## Euroelectronics ZX LPRINT MkII



**Hardware:** This unit was the only horizontally fitted interface of the range under review. A single PCB is sandwiched inside a small, standard 'plotting' box; the result is not particularly attractive. A detachable ribbon cable, just over one metre in length, plugs on to the rear of the unit and

although no key is provided at the unit end, it would be difficult to plug it in the wrong way around. On the review sample, the plastic frame of the PCB-mounted header had been cracked but no problems resulted.

Interestingly, this interface does the COPY processing internally — a ROM contains suitable software for the printer chosen. Of the six remaining ICs, two had had their idents removed and as they all appear to be common devices, the reason may be that they are rejects — which could bode ill for long-term reliability.

**Manual:** It seems almost churlish to call a single side of A5 paper a manual! However, further information is provided 'on-screen' once the software is loaded. Interestingly, there is no mention of LLIST anywhere, yet it works!

**Software:** The driver consists of a short (109 byte) routine that forces itself to the top of memory and then resets RAMTOP. All the rest of the processing is carried out by the ROM in the interface. To prove that it really works, the tape includes a demo picture to dump — one of those highly magnified views of a pimple! The COPY program supplied with the review sample was suitable for driving the Epson range as well as the Star DP510 and 515 printers and the Shinwa CP80.

Alternative software is available for the Seikosha GP100 and GP250X printers, the Microline series and the latest offering is for the Tandy CGP-115 and MCP40 printer plotters which can provide (very slowly) copies in four colours. A new version of the interface is due out shortly with a range of software built in as standard.

**Price:** £34.50 plus £10.45 for the cable.

**Summary:** Despite its rather shabby looks, the LPRINT worked well and the provision of software in ROM makes for faster operation. When your author passed comment on its appearance to a friend he replied that he expected interfaces to look like that! The price of the cable is very high and it might be worth making your own. But apart from that it offers good value for money.

## Morex Peripherals Centronics/RS232 Interface

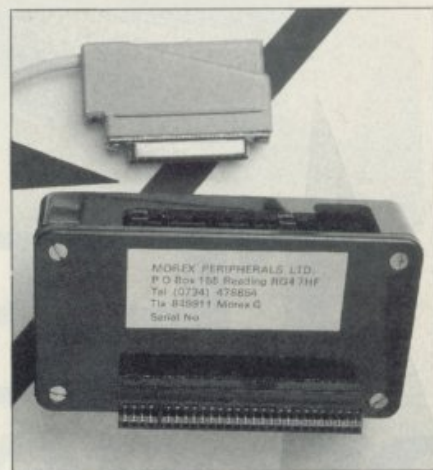
**Hardware:** The vertically mounted box is functional rather than attractive, and the cut-out appears at first sight to have been made by a hungry rabbit! Even more important than mere aesthetic quality is the fact that the casing partially covers the power socket on the ZX Spectrum; also, the plug has to be forced in and is very prone to dropping out again. As far as design goes, this doesn't. However, the unit was also the only one in the survey to allow other units to be attached in cascade — although the way in which the edge connector is

soldered leaves a little to be desired.

Inside, however, the circuitry consists of just four ICs, which is a very compact design considering the inclusion of the serial interface. Both parallel and serial cables are detachable; the parallel cable is keyed but because it's BBC Micro compatible it appears to go in the wrong way. The serial interface socket, a conventional DIN type, is not very firmly anchored to the PCB and heavy use could fracture tracks.

The serial interface is not a full RS232 implementation, although 'handshaking' is provided. While it will suffice to handle printers or display terminals, it's possible that problems may occur with more sophisticated equipment such as modems. The interface performed perfectly with the CGP-115 in serial mode.

**Manual:** No less than 15 A5 pages accompany this interface. Just about everything is provided: pin-outs of all



the connectors, routine addresses within software and hints on getting problematical equipment moving. Also supplied are a couple of example screen prints and a copy of Tasword, probably the most popular ZX Spectrum wordprocessing package.

**Software:** As provided, the driving software is configured to produce screen copies on the NEC range of printers; however, a simple POKE will set it up for the Epsoms. The LLIST and LPRINT commands work with any of the common devices. Morex also provides the information on enabling or disabling token printing and automatic Line Feeds.

The serial interface can be configured in much the same way with a wide range of baud rates being catered for. Once the software has been adapted the altered program can be SAVED as a permanent copy.

The screen copy software allows both 'single-size' and 'double-size' copies of the screen to be made; the latter are really very impressive.

**Price:** £48.60 including one cable. £13.40 for second cable. £4.80 for alternative software.

**Summary:** Despite its ragged appearance, the Morex unit offers the



THE WORLD'S FINEST  
PROGRAMMING TUTORIAL FOR ONLY  
**£12.95**



# THERE'S NO PRESENT LIKE THE FUTURE.

Thousands who own, or would like to own home computers have yet to experience the feeling of discovery that comes when you write your own programs. Yet learning programming can be easy.

'Learn Basic' from Logic 3 is the ultimate development of the method first devised at Strathclyde University – a straightforward, easily understood tutorial written by Professor Andrew Colin and Veronica Colin, authors of Britain's best-selling tutorial package.

Using the method tested by university students and used successfully by over 200,000 home computer users, 'Learn Basic' runs on your own computer and explains everything in clear non-American English without jargon or computertalk. In a matter of hours, you will be writing programs that work.

Essentially, 'Learn Basic' and the rest of the 'Learn Computing' Series that will follow soon are designed for people who want to keep abreast of the computer age. For people who realise that understanding computers is the key to future success, at school, at work and as a parent.

Make your future, and your family's future, richer this Christmas. Get 'Learn Basic' by Logic 3 – two tapes and a full-size manual for Spectrum or Dragon (others soon) at just £12.95. – the key to the world of tomorrow.

At that price, it's a gift.

Buy the Logic 3 'Learn Computing' Series at computer shops and major retail stores all over Britain. In case of difficulty, write to Logic 3 in Windsor.

TO: Logic 3 Ltd, Mountbatten House, Victoria Street, Windsor SL4 1HE.

If you would like to know more about using and programming a computer in your home, send this coupon for your free copy of our 16-page explanatory booklet "100 things you wanted to know about computers."

It will help you cut through the jungle of computer jargon, and give you news about software developments – even games. ☐

Or send for our software catalogue (tick either or both). ☐

Name

Address

**LOGIC 3**

I have already/intend to get a  microcomputer  
(delete as inapplicable)

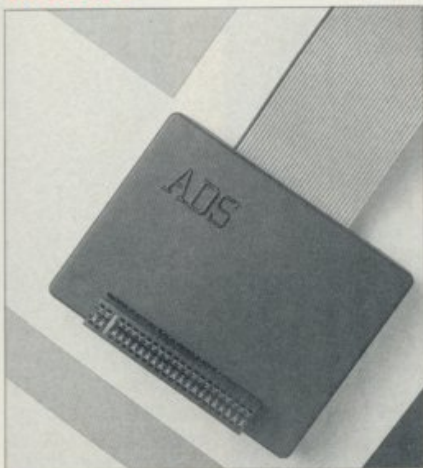


# Y.S. HARDWARE REVIEW:

## GETTING INTO PRINT

user both serial and parallel interfaces at a very attractive price. It's also the only unit to offer a really thorough manual and, given that you need both types of connection, this interface rates very highly indeed.

### ADS Centronics Interface



**Hardware:** A slim, vertical mounting unit housed in a custom-made casing. Even neater to look at than the Kempston, the interface is excellently constructed internally. The attention to detail is very high; the power supply to each of the seven ICs is filtered by its own capacitor, but on the sample submitted some of the soldering left a little to be desired. The interface lead is some 1.5 metres long and not detachable from the interface. Also, no provision has been made for other interfaces to cascade from the rear of the unit.

**Manual:** Four A4 pages of matrix quality printout provide a substantial amount of detail, although some of it needs reading two or three times. It gives a full explanation of where the software is located and hints are provided on how to alter the COPY routine to suit printers other than Seikoshas.

**Software:** Two routines are provided on tape: one to do simple text listings and the other to give high resolution screen dumps on to a Seikosha GP250X printer. The text printing routine allows the token expansion to be suppressed in order to send control codes. As the software is fully relocatable, it's possible to fit it anywhere, though normally it loads into memory and then relocates to the

top before setting RAMTOP to protect itself. ADS is currently working on an upgraded version of the high resolution dump software to give full colour screen images through the Seikosha GP700A printer.

**Price:** £34.50, all inclusive.

**Summary:** A superb unit, equal in many ways to the Kempston, but slightly let down by the provision of supporting high resolution dump software for only one range of printers.

### Hilderbay Professional Printer Interface



## Y.S. HARDWARE REVIEW PRINTER INTERFACE SUMMARY

	KEMPSTON	ADS	LPRINT	MOREX	HILDERBAY
<b>FACILITIES</b>					
Parallel (Centronics)	●	●	●	●	●
Serial (RS232)				●	
Extender				●	
Vertical mount	●	●		●	●
Horizontal mount			●		
Detachable lead	●		●	●	
LLIST	●	●	●	●	●
LPRINT	●	●	●	●	●
Programmable CR/LF	●			●	●
Spoole facility					●
Microdrive compatible	●	●	●	●	●
<b>GRAPHICS DUMP SOFTWARE</b>					
Epson RX/FX series	●		●	●	LISTING
Star DP 510/515	●		●	●	
Shinwa	●		●	●	
Seikosha GP80/GP100	●		AVAILABLE		LISTING
Seikosha GP250X	●	●	AVAILABLE		
Seikosha GP700A		AVAILABLE SOON			
NEC				●	
Tandy CGP115/MCP40			AVAILABLE		LISTING
Juki daisywheel					LISTING
Microline 80			AVAILABLE		

**Hardware:** Housed in the same kind of box as the Morex interface, this vertically mounted unit also suffers from the aesthetic point of view. However, it more than makes up for that by the features it includes. Equipped with two Centronics leads, one short and the other a generous 1.5 metres, it also acts as a printer spooler.

The internal design is messy and the attention to detail during construction looks poor; at least two of the internal straps were in danger of shorting out to IC legs. The chip count is small: an 8255, a 4071 and an unidentified device are all that reside on the PCB. A 3.5mm socket is also provided on the unit; this intercepts the EAR lead to the ZX Spectrum and does away with the hassle of having to remember to unplug it each time you do a SAVE.

**Manual:** Seven A4 pages cover everything about the interface, including the various graphics dump routines (although quite who would have the patience to wait while a Juki daisywheel printer does a screen dump is beyond me!).

**Software:** The review sample came with a full driver which resides in normal memory and a smaller mini-driver which lives in the printer buffer. The penalty paid for using the smaller version is that all the control codes are trapped, so specific POKES must be issued to get the printer to operate in other fonts or modes.

A second tape, together with two sheets of documentation, covered the use of the interface as a spooler. Here





## WANTED! PROGRAMMERS WITH IDEAS!

Artic Computing, the makers of Gobbleman, Galaxians, Ship of Doom, Combat Zone, Voice Chess and many other bestselling home computer games are looking for programmers with bright ideas!

### **Have you got the game of the decade locked away inside your head?**

Could you invent another Pac.Man? Or the 1980's answer to Space Invaders?

If you can devise new games and write them into workable

programs for a wide range of home computers then you could be the person we're looking for.

### **££££££s for Programs!**

Artic will purchase your new programs as well as guarantee high royalties on all subsequent sales. If the game you devise is even moderately successful this could mean considerable earnings for you.

### **Unlimited technical support!**

If we think your ideas have

potential we will provide you with full technical support — all the hardware you need, assistance with program development and advice on how to create even more popular programmes.

All negotiations in strictest confidence. Please write to Managing Director.

**Artic Computing Limited,  
396 James Reckitt Avenue,  
Hull, North Humberside,  
HU8 0JA.**



# GETTING INTO PRINT

the ZX Spectrum is used as a printer buffer for a larger computer. When conventional microcomputers are dumping text files on to a printer, the machine cannot do anything else; in fact, while this review is being printed out by my Apple IIe, there really is time to make a cup of coffee. What's needed is a large memory store into which the entire contents of the text file can be loaded. Control of the computer is then restored to the user while the text is being fed to the printer from this buffer. The ZX Spectrum offers a fairly low cost alternative, by using it in conjunction with the Hilderbay interface.

The printer spooler idea can be taken even further by allowing the ZX Spectrum to perform some post processing on the text that it's storing. One such program is being developed to allow true justification with proportionally spaced text. Developed for Diablo-type daisywheel printers, it unfortunately doesn't allow buffering at the same time... still, you can't have everything.

**Price:** £99.00 all inclusive.

**Summary:** For reasons known entirely to itself, the Hilderbay unit

declined to operate as a spooler with an Apple DMP, although its performance as a standard interface was flawless. As the great strength of the professional unit is that it can operate as a spooler, this was a little disappointing.

While the interface as it stands is as good as any of the others, it's the possibility of using it as a buffer that makes it stand out from the crowd. If you already own a bigger computer and just use the ZX Spectrum for games or for children to learn on, then this interface offers both real printing on the ZX Spectrum and time saving for your bigger machine.

## Overall Summary

Of the three standard units — Kempston, ADS and LPRINT Mk II — the latter inherently has the advantage of on-board software, giving it greater speed and more flexibility. Between the other two the ADS is slightly the neater but the Kempston is supplied with a better range of driver software and virtually everything works with it directly.

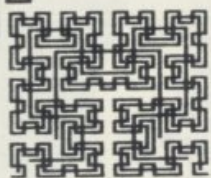
The two 'up-market' units both have advantages in their own ways. For serial printers there is no option but to choose the Morex unit. It offers parallel as well and comes complete with an excellent manual; if pushed, it probably represents the 'Best Buy'.

It's a shame about the packaging — fit a nice box around it and you'd have a real winner.

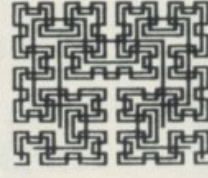
The Hilderbay unit stands or falls on its usage. If there is a need in your life for a printer buffer — and you already have a ZX Spectrum — then this interface will satisfy both requirements. It's also rather cheaper than having to fork out £230 for a 64K printer buffer! As a standard interface it offers nothing special, apart from direct compatibility with all of Hilderbay's software.

There are other printer interfaces around — for instance, Softest offer one especially for the Tandy CGP-115. However, as it's a serial-only interface and all the others seem to drive the device quite well, I'm not sure about its value. Unfortunately, the promised review unit failed to appear by the deadline for this survey so no further comment is possible.

The interface you choose should really reflect the uses to which it is going to be put. If all you want is a simple-to-use means of getting a proper printout then the ADS, LPRINT Mk II and Kempston units offer just what you are looking for, provided that the driving software is available. More sophisticated users will find the Morex unit well worth a look and those with other computers to support will find the Hilderbay device attractive from the printer spooler viewpoint. □



# HISOFT PASCAL DEV PAC



## Quality ZX SPECTRUM\* Software

### HISOFT PASCAL 4T

"... I haven't seen any other compiler that could match Hisoft's Pascal" ... *Using the Spectrum Micro - Autumn 1983*  
"This is a very impressive product... of benefit to any Benefit to any Spectrum programmer..." David Bolton ZX COMPUTING Aug/Sept 1983

Just two comments from full length reviews of our powerful and virtually full implementation of Standard Pascal. The advantages of using Pascal are well-known — fast, self-documenting, and above all, structured programs and now, with Hisoft Pascal, you can reap all these benefits on a wide range of home computers, including the 48K Sinclair Spectrum! Hisoft Pascal produces programs that run typically 40 times faster than equivalent ZX BASIC programs and, sometimes, up to 1,000 times faster!

Hisoft Pascal supports FOR... DO, WHILE... DO, REPEAT... UNTIL, CASE... OF, INTEGERS, REALs, CHARACTERS, RECORDs, POINTERs, SETs, ARRAYs etc, etc. — it is not a Tiny Pascal but a virtually full implementation of the language allowing the user to develop true high-level language skills while attaining execution speed close to that of machine code. Complete with a 70-page manual.

#### Price:

Hisoft Pascal 4T (ZX SPECTRUM) £25 inclusive  
(NewBrain, SHARP MZ700 etc) £35 plus VAT

Hisoft Pascal and DEV PAC are also available in a wide range of disk formats. Please write for details.  
\*\*\*STOP PRESS\*\*\* Hisoft Pascal for the SPECTRUM Now comes with a Turtle Graphics package allowing fast and easy production of complex graphic displays. Hisoft Pascal and DEV PAC are now available for the Sinclair ZX Microdrive. Please write for details.

### HISOFT DEV PAC 3

"... DEV PAC is most highly recommended. The documentation is first class." *Your Computer May 1983*  
"... if you write programs in machine code, buy DEV PAC — it is the best currently on the market." Adam Denning, ZX SOFT in Which Micro September 1983

Two comments from reviews of earlier versions of DEV PAC — now we have DEV PAC 3 available: a powerful Z80 assembler with conditional assembly, assembly from tape (to enable generation of very large code files), ORG, EQU, DEFB, DEFS, DEFW, DEFM, labels of any length — in fact all you need for fast (3,000 lines per minute) and powerful assembly programming. But it doesn't stop there: DEV PAC 3 also includes an incredible debugger/dis-assembler giving you a 'front panel' display of the Z80 system and allowing extensive debugging of your machine-code program, including single-stepping programs **EVEN IN ROM!!** Open up the secrets of low-level programming with DEV PAC 3.

#### Price:

Hisoft DEV PAC 3 (ZX SPECTRUM) £14 inclusive  
(NewBrain) £25 inclusive



# HISOFT

13 Gooseacre, Cheddington  
Leighton Buzzard, Beds. LU7 0SR  
Tel: (0296) 668995



\* and others



A lifetime of  
games in one program!

# CREATE & PLAY YOUR OWN ARCADE GAMES! Simple to use

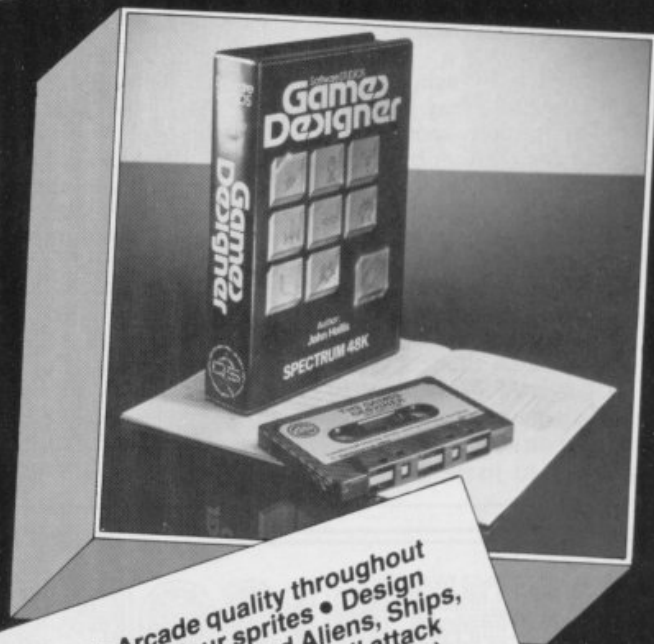
Software STUDIOS

## Games Designer

By John Hollis

Author of Time Gate, Aquaplane and Meteor Storm.

*Invaders format Asteroids format  
Defender format & Beserk format*



### 8 GREAT GAMES INCLUDED:

*Turbo Spider-Tanks  
a lot-Halloween-  
Attack of the  
Mutant Hamburgers  
Cyborg-Reflectron-  
Splot and Q-Bix*

Smooth Arcade quality throughout  
using full colour sprites • Design  
your own fully animated Aliens, Ships,  
Missiles, Explosions • Full attack  
wave design (8 waves per game)  
• Moving background option • Full  
sound generation • Full movement  
control and scoring • Save and load  
YOUR OWN games to and from tape!

# £14.95

## SPECTRUM 48K

Dealer enquiries welcome.

#### Marketed exclusively by Quicksilva

Games Designer	£14.95
Time Gate (48K Spectrum)	£6.95
Aquaplane (48K Spectrum)	£6.95
Meteor Storm (16K Spectrum)	£4.95

I enclose cheque/P.O. for

Please send me details of the  
Quicksilva Game Lords Club ☐  
My Game Lords Club membership  
number is

Name

Address

Cheques payable to Quicksilva Ltd.

Send to Software Studio,  
Quicksilva Mail Order,  
P.O. Box 6,  
Wimborne, Dorset BH21 7PY  
Telephone: (0202) 891744

Boots, W.H. Smiths,  
J. Menzies, Microdealer,  
HMV, Hamleys, John Lewis  
Computers for All  
and all reputable  
specialist computer  
stockists.

**SPECIAL  
OFFER**

**Quicksilva Game Lords Club Members**  
£1.00 off Games Designer and £1.00 off Aquaplane  
and other NEW Quicksilva Games – call for details. Quote  
your secret membership No. on the order coupon.

Exclusive chance to  
Quicksilva Games Lords Club members  
to have their OWN games design published!  
Details coming soon!





# AGF

## PROGRAMMABLE JOYSTICK INTERFACE

for Spectrum or ZX81

ONLY  
26.95  
+£1.00 p.p

MICRODRIVE  
COMPATIBLE

### AGF PROGRAMMABLE INTERFACE

Recognised as the only true Hardware Programmed joystick interface this product offers all the features associated with such a design.

You can use any Atari-compatible joystick controller with any software for your Sinclair Spectrum or ZX81, not just those with a joystick option.

Movement of the joystick is recognised by the computer *exactly* the same as pressing the appropriate control keys, and can therefore give the most immediate response to that movement. The hardware programmed design works with *all* possible key-reading methods, both BASIC and Machine Code.

Eight directional movement, with or without the fire button being pressed, can be achieved by only programming the left, right, up, down and fire keys required by the game.

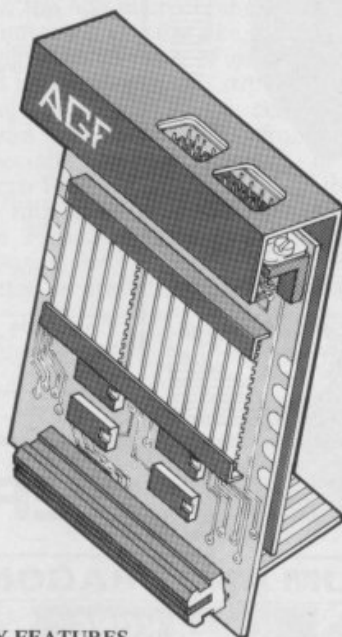
Programming is achieved by a two-digit code, which is looked up on the Programming Chart supplied, for each direction and firing button. These two numbers are then selected on a pair of leads which are clipped onto appropriately numbered strips on the interface.

Once configured this can be marked onto a Quick Reference Programming Card for storing with the game. As the programming is *not* power dependent the interface can be immediately used when next switched on.

The keyboard remains fully functional and can be used simultaneously with the joystick.

An integral rear expansion connector means there is no need to remove the interface to connect other peripherals.

NB. A recent design improvement now means that the AGF Programmable Interface works with the new Quickshot II rapid "Auto Fire" feature.



### KEY FEATURES

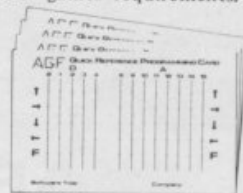
- ★ Programmable design gives TOTAL software support.
- ★ Accepts Atari, Competition Pro, Wico, Starfighter, Quick Shot, Le Stick etc.
- ★ Rear extension connector for all other add-ons.
- ★ Free demo program and instructions.

### PACKAGE CONTENTS SUPPLIED

- Programmable Interface Module as illustrated, complete with clip-on programming leads.
- Self adhesive programming chart detailing how to define which key is simulated by UP, DOWN, LEFT, RIGHT, and FIRE.



- One pack of ten Quick Reference Programming Cards for at-a-glance setting to your games requirements.



- 12 months guarantee and full written instructions.

ONLY  
16.95  
+£1 P&P



## Quickshot II® JOYSTICK

NEW IMPROVED GRIP : BUILT-IN STABILIZING SUCTION CUPS

TRIGGER FIRE BUTTON : RAPID AUTO FIRE SWITCH : TOP FIRE BUTTON

FROM: MR/MRS/MISS

ADDRESS

SEND C.W.O. (NO STAMP NEEDED) TO: A.G.F. HARDWARE, DEPT.YS.

FREEPOST, BOGNOR REGIS, WEST SUSSEX, PO22 9BR.

QTY	ITEM	ITEM PRICE	TOTAL
	PROGRAMMABLE INTERFACE	27.95	
	JOYSTICK(S)	17.95	
	PACK(S) QUICK REFERENCE CARDS	1.00	
ZX81 <input type="checkbox"/> ZX SPECTRUM <input type="checkbox"/> Please tick		FINAL TOTAL	
DEALER ENQUIRIES WELCOME		EXPORT PRICES ON APPLICATION	



# IF YOU OWN A ZX81 or ZX SPECTRUM YOU NEED THE ABACUS CONTROLLER

Developed to eliminate tedious swapping of plugs when  
LOADING or SAVING programs on cassette.

## ZX SPECTRUM CONTROLLER

Single switch selection of  
SAVE, LOAD & AMP modes.  
Built in amplifier and  
loudspeaker boosts  
Spectrum sound output.

Price £14.95 incl.

## ZX81 CONTROLLER

Single switch selection of  
TALK, SAVE, CUE & LOAD  
modes. Built in microphone/  
loudspeaker for fast and  
reliable program naming and  
cueing.

Price £9.95 incl.

Money - back Guarantee!



716 Llangyfelach Road  
Treboeth, Swansea SA5 9EL  
Telephone: (0792) 799193

"Of all the Spectrum hardware items  
I have reviewed, this one most  
impressed me and is the only one I  
shall always use."  
Quote from PCW.

Your Spectrum - ZX81 - is  
incomplete  
without it.

ONLY  
£16.00  
+£2.00 p&p  
(inc VAT)



THE P.H. SCIENTIFIC COMPUTER DESK turns your Sinclair Spectrum  
or ZX81 into a really professional computer console:

\* Made of tough black plastic \* Snug-fitting computer recess \* Transformer  
hollow concealed under the TV area \* Safe, strong TV backstop \* Printer well  
\* Tape storage space \* All cables accommodated by special internal routing  
holes \* Twin cable clips provided \* Provision for multi-plug socket at back.

Send off now and complete your Sinclair computer for just £16.00 plus  
£2.00 p&p (inc VAT). State whether desk is for Spectrum or ZX81.

P.H. Scientific Products,  
9 Southfield,  
Welwyn Garden City,  
Herts.

Tel: (07073) 20241

PROGRAMS  
WANTED  
SEND  
NOW

## BLABY COMPUTER GAMES

PROGRAMS  
WANTED  
SEND  
NOW

FOR SPECTRUM AND DRAGON SOFTWARE

### BARMY BURGERS SPECTRUM 48K



BLABY COMPUTER GAMES

#### BARMY BURGERS

Baps, Burgers, Cheese and Lettuce — they are  
all there, all you have to do is put them  
together. It sounds easy doesn't it, but not  
when you are being chased by a fried Egg and  
Sausages!

48K M/C £5.50

#### DODO

Starring Dodo and the Snow Bees — You are  
the last surviving breed of Dodos alone in the  
Antarctic, surrounded by Ice Blocks and Snow  
Bees. Slide the Ice Blocks onto the Snow Bees  
or electrify the walls to kill them.

£5.95

#### PLUGGIT

Young Percy Pluggit must get back to his  
Circuit Board in time, please help him to find  
the right keys.

48K M/C £5.50

#### CHOPPER RESCUE

Scientists are being entombed under Radio  
Active waste, can you as a Helicopter Pilot,  
rescue them all in time?

48K M/C £5.50

### KILLER KONG SPECTRUM 48K



BLABY COMPUTER GAMES

#### KILLER KONG

Featuring five screens of arcade action —  
Elevators — Kong — Mario Barrels —  
Hamburgers — and even Mario's Girl.

48K M/C £5.50

### 'GOTCHA' SPECTRUM 48K



BLABY COMPUTER GAMES

#### GOTCHA

After escaping from the local Nick, Ernie is  
soon back up to his old tricks again!

48K M/C £5.50

#### DISTRIBUTORS

CENTRE SOFT  
BIRMINGHAM  
021-520 7591

LIGHTNING RECORDS  
LONDON  
01-969 5255

PCS SOUTH WEST  
EXETER  
0392 50434

#### HIGHRISE HARRY

Featuring Harry Highrise and the Rust Bugs —  
Guide Harry the Painter along the Girders, up  
the Ladders, onto the Lifts, but mind the Slides.  
Five Whacky screens.

48K M/C £5.50

#### CONFUSION

You are totally confused and are being  
attacked from both sides by the most nastiest  
Aliens known in the Universe.

48K M/C £4.95

#### RETAIL OUTLETS

WH SMITHS  
CRASH MICROS  
AND ALL  
MAJOR SOFTWARE  
OUTLETS

BLABY COMPUTER GAMES \* CROSSWAYS HOUSE \* LUTTERWORTH ROAD \* BLABY \* LEICESTER \* TEL: 0533 773641  
TELEX: 342629 JRHHG

DEALERS PLEASE ASK ABOUT OUR VIDEO TAPE WHICH CONTAINS OUR FULL RANGE OF GAMES



*Machine code is often the stumbling block that stands in the way of those looking to take a more serious approach to Spectrum programming. Books there are a' plenty, but as ever it's horses for courses. Gary Marshall looks at the form.*

# CRACKING THE CODE

It's an indisputable fact that the Spectrum can be made to do just about everything that's possible by programming it in machine code. A claim like that is much harder to make for other programming languages, for instance Basic, because although any computational task can be described, it may not always be performed fast enough.

A program written in any other language than machine code must first be translated into code by the computer before it can be executed — a task which inevitably takes some time. And speed of execution can be reduced further still in circumstances where the computer's translated code has failed to achieve the standards set by an expert human machine code programmer. Consequently, when it comes to speeding things up a bit, machine code is still the best answer. There's also the added advantage that machine code programs are a good deal harder to copy.

Input machine code programs to your Spectrum and you are presenting instructions direct to the Zilog Z-80 microprocessor in the language it understands. The number of instructions in this language is fairly limited and corresponds to the number of operations the microprocessor can perform. But the point is that the programmer deals directly with the electronic hardware, without any recourse to the Basic interpreter. That alone is a very good reason why Spectrum owners should get their hands dirty and find out exactly what's going on in that nifty little box of tricks.

But if all this sounds a bit complicated, not to worry because considerable benefits can be acquired without necessarily going the whole hog. Most Basic programs contain sections which take up a high proportion of the processor's time — elements known as 'critical segments' in the jargon. Programs can be speeded up considerably just by writing these critical segments in machine code.

Finally, before examining the outpourings of various writers on learning the art of machine code programming, it may be worth speculating on whether we ought to be using machine code at all!

In the non-microcomputer world of mainframes and the like, the trend is away from the use of machine code and more towards the structured high level languages. There could be a lesson to be learnt from this, especially with the launch of the Micro Prolog package — a version of the fifth generation language, Prolog (see *Frontlines* this issue). Overall, however, it's fair to say the facilities offered at present by the fifth genera-

tion languages are not entirely suitable for the Spectrum user — so there are still one or two good reasons for learning how to program in machine code.

## MAKING THE INTRODUCTIONS

There are already a large number of books available to help enthusiasts program the Z-80 processor, mostly written by electronics engineers and hobbyists. A starter book for Spectrum owners should be as good as these, while at the same time staying relevant to the Spectrum and showing readers how to manipulate the hardware.

And, as always, the newcomer also needs a finely structured and carefully paced presentation of reliable information. Of course, encouragement to actually set the fingers tapping is another basic necessity — the best way to learn program writing is not by sitting down and reading about it. Motivation is another problem area





# MOREX PERIPHERALS LTD

## CENTRONICS/RS 232 INTERFACE INTERFACE ANY PARALLEL OR SERIAL PRINTER TO YOUR SPECTRUM

Compatibility with SINCLAIR'S Interface 1 and Micro-drives!

★ The MOREX Interface has been welcomed by amateurs and professionals alike because it enhances the SPECTRUM's potential by incorporating TWO Interfaces (CENTRONICS and BI-DIRECTIONAL RS 232) in the same box. It comes fully assembled and tested with driver software on cassette. The software offers:

- Variable line and page length.
- Programmable printer control codes.
- User defined codes for International Char. sets.
- Split speed operation for RS 232 interface.
- Compatibility with Interface 1.
- Menu driven options.
- High resolution screen copy in single or double size for a large number of printers.
- Compatibility with TASWORD TWO.

FULLY INCLUSIVE PRICE (I/F + cable + drvier)

£48.60

The above package including TASWORD TWO

£62.50

## COMPLETE WORD PROCESSING WORK STATIONS: SAVE ££££!

WP1 ...	MOREX I/F, Parallel cable, Driver, Tasword 2, SHINWA CP 80 printer	£290 incl.
WP2 ...	As above but with the amazing 18 cps, 120-180 cpl Daisy-Wheel printer DAISY STEP 200	£382 incl.
WP3 ...	As per WP1 but with the 100 cps, 132 column, STAR DP515 printer. (2.3K buffer etc)	£306 incl.
WP4 ...	As per WP1 but with the MANNES MANN TALLY MT80 printer (friction/tractor, graphics)	£360 incl.
WP5 ...	As per WP1 but with the sophisticated 20cps, 220 Chars/line Daisy-Wheel JUKI 6100	£550 incl.
WP6 ...	As per WP1 but with the excellent BROTHER HR15, Daisy-Wheel printer.	£550 incl.
WP7 ...	As per WP1 but with the well-known, high quality EPSON RX80 graphics printer	£360 incl.

A vast range of printers is also available at unbeatable prices.

## THE FIRST HIGH CAPACITY, USER FRIENDLY FLOPPY DISK SYSTEM FOR THE SPECTRUM!

MOREX PERIPHERALS LTD are pleased to announce their long awaited PROFESSIONAL Floppy Disk System for the SPECTRUM computer offering Double Density storage of 200K to 3200K and a sophisticated, SINCLAIR BASIC compatible, self-loading Disk Operating System. Reading and Writing at 250 Kbits/second, it maintains a proper and very informative Directory, Loads/Saves/Merges/Erases/Auto-runs etc WITHOUT Messy USR calls and handles ALL tape related keywords and data formats.

WATCH THIS SPACE! SEND SAE for more information.

Please send your order to:  
**MOREX  
PERIPHERALS LTD  
Dept. YS3  
172B KING'S ROAD  
READING, BERKS  
RG1 4EJ  
Phone: (0734) 584238  
Telex: 849911  
MOREX G**

ACCESS/VISA welcome.

## ZEAL SOUND BOOSTER FOR SPECTRUM

- PLUG IN AND USE-NO INTERNAL CONNECTIONS
- NO BATTERIES NEEDED
- GOOD, CLEAR SOUND
- OUTPUT CONTROL
- LOAD/SAVE FACILITY BUILT IN
- FULLY GUARANTEED

Please send me (enter quantity in box)

- ☐ SOUND BOOSTER @ £14.00
- ☐ COLOUR MONITORS (SPECTRUM COMPATIBLE) @ £265
- ☐ RAMPACKS FOR ZX81 @ £17.50

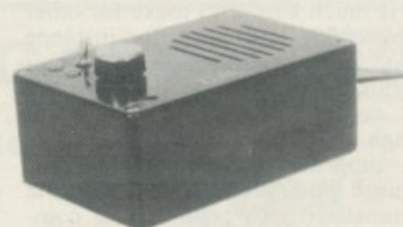
ABOVE PRICES INCLUDE VAT/P&P/CARRIAGE

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

I ENCLOSE CHEQUE/P.O. FOR £

ZEAL MARKETING LIMITED  
VANGUARD TRADING ESTATE, STORFORTH LANE,  
CHESTERFIELD, S40 2TZ. TEL. 0246-208555



BRING THE SOUNDS OF  
YOUR GAMES TO EXCITING  
LIFE FOR JUST

**£14.99**  
(INCL. VAT & P&P)

**16K RAMPACK FOR ZX81**  
**£17.50** (INCL VAT & P/P)

**NEWSFLASH**  
**14" MICROVITEC**  
**COLOUR MONITOR**  
**SPECTRUM COMPATIBLE**  
**£285** (INCL. VAT & CARRIAGE)



— learning about machine code programming is no bed of roses and even the most manically keen can become discouraged.

*Introducing Machine Code* by Ian Sinclair provides a gently paced introduction that takes Basic programming as its starting point. Then, by showing how Basic programs are stored and run, it carries on to cover the same areas for machine code. The book introduces a wide range of instructions which are illustrated by way of programming examples. Unfortunately, these example programs rarely turn the spotlight on aspects specific to the Spectrum; in fact, many seem downright incestuous as they are used to examine Basic programs.

The *Ultraviolet* assembler from ACS Software gets a mention and although its use is quite well demonstrated, a more detailed treatment of hand assembly methods would have been better still. Nevertheless, this book would certainly take the reader from zero knowledge to the point where the more advanced machine code texts could take over.

Another introductory tome comes from James Walsh in the shape of *Spectrum Machine Code Made Easy, Volume One*. He includes a number of potentially useful machine code programs for activities specific to the Spectrum — such as scrolling the screen and manipulating colours. He's also not afraid to make good use of some intelligent machine code tricks.

However, despite the quality programming, it would have been better if the author had taken the reader further into the subject. The coverage is not very well structured and the pacing leans towards the erratic; for example, after being lulled into the false sense of security that machine code is *really* easy, after 30 pages the unprepared reader is abruptly launched towards the fairly weighty concepts of Carry, Borrow, Minuend, Subtrahend and two's complement notation!

Most of the programs use instructions before they've been properly introduced and some are not covered at all. For this reason, *Volume One* on its own is rather limited. *Volume Two* (surprise, surprise) is the second and more advanced tutor in the series, which provides much of the necessary reference material you need to fully understand *Volume One*.

In fact there's something of a striking contrast between *Volume One* and *Two* in the *Spectrum Machine Code Made Easy* series. Whereas *Volume One* strolls at a leisurely pace, and is very chatty and highly inventive in its risqué chapter and section headings, Paul Holmes' *Volume Two* proves altogether more brisk and workmanlike. It comes packed with

machine code routines, and that alone makes it a valuable source of information. The only worrying aspect is whether *Volume One* is fully able to prepare new riders of the machine code plains for the coming demands of *Volume Two*.

But for the complete novice, there's *Spectrum Machine Language For the Absolute Beginner* and although little of it is in fact specific to the Spectrum, the book's treatment of Z-80 code is entirely adequate and there's some useful reference material thrown in for good measure. The text is well sprinkled with examples of machine code used well, and also includes a sizeable games program, along with valuable notes on its development. Your author, however, will decline entering it without an assembler!

Toni Baker's *Mastering Machine Code On Your Spectrum* proclaims itself as championing those who, although familiar with Basic, have no knowledge at all of machine code. But the text fairly rattles along, covering acres of material in a relatively brief time. While there's absolutely nothing wrong with this kind of approach, the feeling is that, rather than a beginner's book, this is for people who know rather more than they're letting on.

Toni conjours up some good programs with interesting applications, including one that produces music from the Spectrum's own speaker. Incredible!

Before moving on to the more advanced titles, there is one last text that you may like to consider should you be starting your machine code career. Tony Woods' *Learn And Use Assembly Language On The ZX Spectrum* provides a complete course in Z-80 assembly language, complete with many illustrative program examples.

## MOVE ON UP

The programmer who has paid his or her base level machine code dues may well like the idea of a book that includes ideas for further programs and new techniques, as well as providing a good source of reference. If you manage to find it, let us know! The trouble is that budding beginner's book start to branch out and a great degree of specialisation occurs.

Ian Logan and Frank O'Hara explain exactly what's inside every Spectrum ROM in their book *The Complete Spectrum ROM Disassembly*. It's all there, from how the screen is handled to the way Basic actually works. The book shows the location of all the routines in the ROM, so that programmers are able to call them into their own programs. And because the programs are all listed, the book is also a storehouse of programs and techniques.

Another publication that strikes the same vein is *The Spectrum Machine Code Reference Guide*. Although it

didn't arrive in time for review here, the word is it contains a full disassembly listing of the 16K Spectrum ROM as well as a machine code programmer's guide to the Microdrives and Interface 1 unit; it sounds as if it could be worth a look.

Much of the material in Ian Logan and Frank O'Hara's ROM disassembly book appears again in Dr Logan's *Understanding Your Spectrum*. However, there's also useful stuff on how to use subroutines in the ROM, and by far the best reference section on the Z-80 instruction set your author has seen. The text also provides valuable data on the available assembler and disassembler packages.

Last of all in our round-up, there's *Super Charge Your Spectrum* by David Webb. This is essentially a library of machine code programs, on hand for liberal sprinkling into Basic programs as and when required. Included amongst this amazing collection is a routine for developing Basic programs, and a number of useful utilities, for instance, a renumberer.

## CONCLUSIONS

Your author has to admit a slight disappointment with the beginners' books. None seemed as good as the 'professional' Z-80 texts available, although in fairness this is compensated by the fact that they are specifically designed to be used with the Spectrum.

The more advanced books, however, have no apologies to make. They show exactly what the Spectrum can do, and how it can be made to do it, and all are intimately linked to the Spectrum. If ever you feel in need of encouragement as you stumble slowly through the early steps, check out the more advanced titles and see what you're missing. Inspiration and motivation should soon follow. □

## WE LOOKED AT...

*Introducing Spectrum Machine Code* by Ian Sinclair, Granada, ISBN 0 246 12082 7, £7.95  
*Spectrum Machine Code Made Easy, Volume One* by James Walsh, Interface Publications, ISBN 0 907563 43 0, £5.95  
*Spectrum Machine Code Made Easy, Volume Two* by Paul Holmes, Interface Publications, ISBN 0 907563 44 9, £5.95  
*Spectrum Machine Language For The Absolute Beginner* by William Tang, Melbourne House, ISBN 0 86161 110 1, £5.95  
*Mastering Machine Code On Your Spectrum* by Toni Baker, Interface Publications, ISBN 0 907563 23 6, £9.95  
*Learn And Use Assembly Language On The Spectrum* by Tony Woods, McGraw-Hill, ISBN 07 084705 3, £6.95  
*The Complete Spectrum ROM Disassembly* by Ian Logan and Frank O'Hara, Melbourne House, ISBN 0 86161 116 0, £9.95  
*The Spectrum Machine Code Reference Guide* by Richard Ross-Langley, Interface Publications, ISBN 0 907563 51 1, £4.95  
*Understanding Your Spectrum* by Ian Logan, Melbourne House, ISBN 0 86161 111 X, £6.95  
*Super Charge Your Spectrum* by David Webb, Melbourne House, ISBN 0 86161 112 8, £5.95



# COMING SOON

## MULTI TASKING FORTH FOR THE SPECTRUM.

FOLLOWING OUR SUCCESSFUL ZX81 FORTH ROM WE ARE COMPLETING DEVELOPMENT OF THE SPECTRUM VERSION. IF YOU ARE INTERESTED IN RECEIVING DETAILS THEN PLEASE SEND IN YOUR NAME AND ADDRESS ON THE COPON BELOW. WHEN DEVELOPMENT IS COMPLETE YOU WILL BE SEND SPECIFICATION DETAILS AND CAN THEN PLACE ORDERS FROM OUR FIRST PRODUCTION BATCH.

*PLEASE WRITE TO:*  
**DAVID HUSBAND**  
**SKYWAVE SOFTWARE**  
**73, CURZON ROAD**  
**BOSCOMBE**  
**BOURNEMOUTH BH1 4PW**

I AM INTEREST IN RECEIVING DETAILS ON SPECTRUM FORTH.

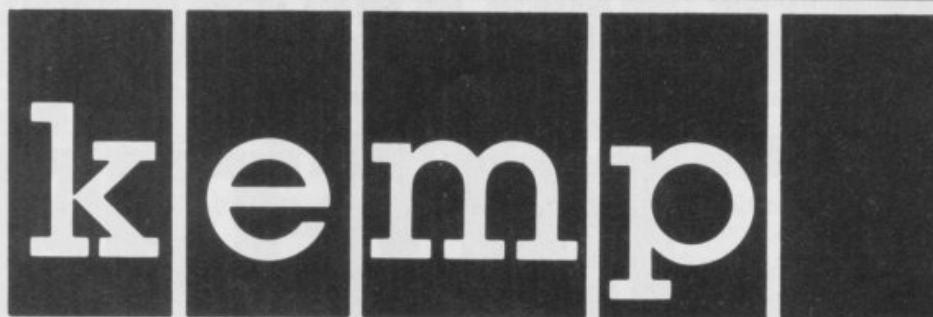
NAME .....

ADDRESS .....

.....

SEND NO MONEY NOW. DEPT YS.





**THE BEST BUSINESS SOFTWARE  
ON ANY HOME MICRO**

*“On a large computer system a file of this nature would cost between £150-£700.”*

*P.C.S. Distribution*

<b>Sales Ledger</b>	Up to 1200 entries per month
<b>Purchase Ledger</b>	”
<b>Stock Ledger</b>	”
<b>Stock Control</b>	Unlimited entries

*Only £14.95 each (48K Spectrum only)*

Available at Selfridges and at all good computer shops.

**Nationwide wholesale distribution by Microdealer U.K. and P.C.S. Distribution.**

Kemp Limited, 43 Muswell Hill, London N10 3PN.

**Hotline 01-444 5499**



The system variables are bytes in the Spectrum ROM which allow the computer to know all the things it should do to operate in the way you've come to expect. The information, such as how the Spectrum's memory is laid out, is held in the system variables in these addresses so that the computer can get hold of it and update it as and when required.

We can make use of the information stored in these memory locations in our programs, either by reading information already there or changing it to make the computer do something it might not otherwise do, or sometimes do it more easily.

Not all of them are that much use to us. And certainly not all of them ought to be changed. Some will cause the computer to crash, or the computer may simply ignore you. Some can be happily changed under certain circumstances only, and most within strict limitations. I hope to give you some guidelines as to what can and can't be done, but hopefully you will learn your own little PEEKs and POKEs in time as well.

### **23552 to 23559 KSTATE reading the keyboard**

When the processor is interrupted (50 times every second in the UK normally) one of the things done is to read the keyboard and store the results here. The bytes have different uses. Not all can be practically used by the programmer. You can use this program to examine what's going on in the eight bytes of KSTATE. Run it and press various keys to see what effect individual keys have, such as the Shift keys, and what effect going from one key to another has.

```
10 FOR A=23552 TO 23559
20 POKE 23692,0: REM KEEP SCROLLING
30 LET B=PEEK A
40 PRINT A; TAB 10;B; TAB 20; CHRS B AND
  B>31
50 NEXT A
60 GO TO 10
```

The first four bytes of KSTATE deal with something called 'two key rollover' which allows you to press a second key before you actually let go of the first. The descriptions given to the main four bytes, 23556 to 23559, will apply to the first four also as long as you bear in mind that these only come into operation for two key rollover. PEEK 23556 can return the code of the upper case version of the key pressed, so if you pressed Symbol Shift A you would get the code of 'A', not the code of 'a' nor the code of 'STOP'.

This may be useful where it is essential that upper case be entered, etc. The effect of pressing a key is temporary and lasts only as long as the key is being pressed. The value in 23556 would be 255 if no key was being pressed at the time the interrupt had occurred. For the Enter key, a value of 13 is returned. For the Space key, a value of 32 is returned.

# VARIABLES ON A THEME

**System variables are bytes in memory which help the Spectrum remember certain things it needs to know about itself — if you like, the housekeeping routines. Delve deeper into the Spectrum ROM with Dilwyn Jones in this, the first of two articles which investigate the complete available set of system variables, giving comprehensive guidelines as to what you can and can't do with them.**

## PART ONE

Pressing both Shift keys simultaneously produces 14. This program will demonstrate this:

```
10 LET A=PEEK 23556
20 POKE 23692,0
30 PRINT A, CHRS A AND A>31
40 GO TO 10
```

23557 is used for timing to prevent intermittent key contact, etc, causing problems — known as keyboard debouncing.

23558 is the auto repeat timer which times the pause before the keys start repeating, then the pause between repeats once the key has actually started repeating. The delays used are those in the system variables that hold these delays (23561/2).

23559 contains the code of the last character pressed on the keyboard. This depends on whether the Shift keys were pressed or not. The numbers produced are those that would be returned by PRINT CODE INKEY\$ except that these are the last key pressed and not necessarily the key currently being pressed. Try this program to display what can happen — RUN it and try pressing various keys making use of the Shift keys.

```
10 LET A=PEEK 23559
20 POKE 23692,0
30 PRINT A, CHRS A AND A>31
40 GO TO 10
```

See also under 23611 FLAGS.

### **23560 LASTK Newly pressed key**

Every time the keyboard is scanned, a key is found to have been pressed and proved valid, the value of this system variable is updated. Its content is the code of the last key pressed.

This system variable does not really

do much you could not do with INKEY\$, except that it could be used to type ahead one character. If you try this program, you will find that if you press a key when invited to do so, the key is indicated on the screen in a short while even though the program may not have got as far as line 50 when you pressed a key. The code of the last key pressed is stored here and stays here until another key is pressed. It is possible to test for a newly pressed key by examining bit 5 of the system variable FLAGS 23611. This would be '1' for a key just pressed.

```
10 PRINT "Press a key now"
20 FOR A=1 TO 900
30 NEXT A
40 CLS
50 LET A=PEEK 23560
60 PRINT A: IF A>31 THEN PRINT CHRS A
```

This could be used for testing for a y/n (yes or no) type situation — if you knew one was coming up, you could indicate your response before the program got there and the program would respond when it got round to it. Also, if two keys were pressed simultaneously, the program would respond if one were released without having to wait for the keyboard to be released completely.

Control characters can be generated using Caps Shift in conjunction with the number keys. Enter returns 13. Pressing both Shift keys together returns 14. To see this, try this program:

```
10 LET A=PEEK 23560
20 PRINT A, CHRS A AND A>31
30 GO TO 10
```

### **23561 REPDEL Repeat delay**

This system variable contains the length of time that a key must be held down before it starts to auto-repeat. The time



# RICHARD SHEPHERD SOFTWARE

## A HOME BUDGETING & BANKING SYSTEM THAT REALLY MAKES YOUR 48K SPECTRUM WORK!



A professional style multi function Cash Controller program that can load and make an entry in just **90 SECONDS** ... thanks to its **ZX MICRODRIVE COMPATIBILITY**. If you're not ready to upgrade to Microdrive yet, this easy to use cassette program can handle up to 400 transactions with your Spectrum, almost filling the 48K memory of your computer.

### BANK ACCOUNT

- Statements on demand from any date to date.
- Holds up to 400 transactions.
- Standing order facility.
- All transactions can be automatically coded to allocate up to 16 budget headings.
- Search facility for any single item by description or amount.

### HOME BUDGETING

- 16 budget headings, e.g. Gas, Rates, Car, Tax - you can choose the headings
- Highlights under/over spending
- Full budget expenditure breakdown
- Budget "re-think" facility

### LOAN/MORTGAGE CALCULATOR

All you ever wanted to know but didn't like to ask! Calculates:

- Interest rates
- Payback periods
- Capital sum
- Period of loan

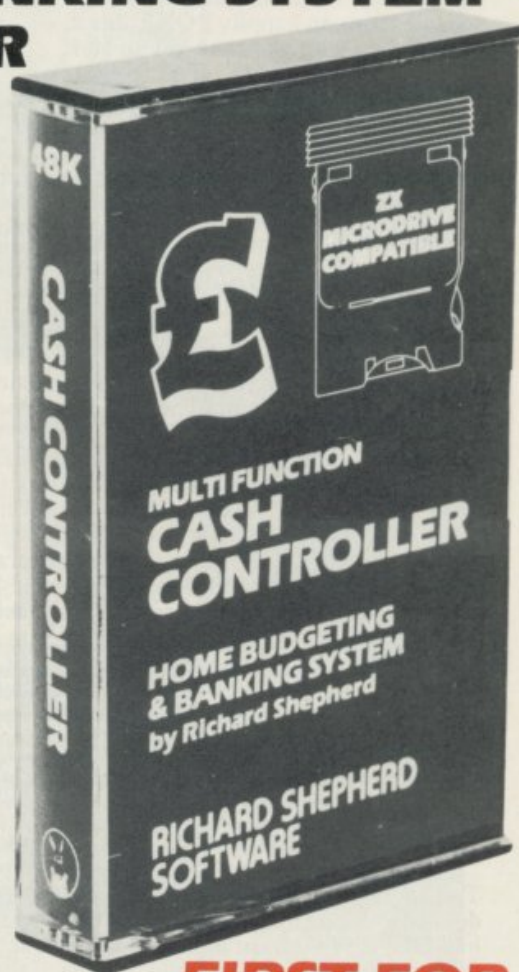
**REMEMBER THIS CASSETTE CAN ALSO BE USED WITH ZX MICRODRIVE**

### ● PRINTOUT FACILITY USING ZX PRINTER

### ● FULL SECURITY WITH PERSONAL PASSWORD

### ● FULL SAVE PROGRAM ONTO CASSETTE OR MICRODRIVE

Available from good computer stores or direct by mail order... **at a price that won't upset the Bank Manager!**



## FIRST FOR MICRODRIVE

Dealer enquiries welcome. Generous discounts.

### PRIORITY MAIL ORDER

Please send me \_\_\_\_\_ CASH CONTROLLERS at £9.95 each including post & packing (overseas orders add £1.50).

Name \_\_\_\_\_

Address \_\_\_\_\_

I enclose cash/cheque/P.O. payable to Richard Shepherd Software.

Or credit my Access/VISA Card Number

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Signature \_\_\_\_\_ YSI

**MICRODRIVE CARTRIDGE NOT INCLUDED**

**Credit Card Hotline (06286) 63531**

## RICHARD SHEPHERD SOFTWARE

ELM HOUSE, 23-25 ELMSHOTT LANE, CIPPENHAM, SLOUGH, BERKS. TEL. (06286) 63531



# VARIABLES ON A THEME

delay in the UK is one-fiftieth of a second and starts off at 35/50 of a second. You can happily POKE this if, for instance, you want the key to start repeating immediately. The cursors become rather difficult to control if you, say, POKE 23561,1. POKE 23561,0 effectively turns off the auto-repeat, actually giving a delay of about five seconds like POKE 23561,255.

## 23562 REPPER delay between repeats

This system variable controls the length of time between repeats once the auto-repeat has actually begun. The time is in fiftieths of a second in the UK. If you effectively want to turn off the auto-repeat for any reason, POKE 23562,0 or POKE 23562,255 gives about five seconds between repeats. If you wish to edit long program lines (eg. a long PRINT statement) then POKE 23562,1 will speed up moving the cursor to the right place. But beware of changing 23562 too much at the same time or you may speed up the cursor so much it becomes difficult to control. Its normal value is 5/50 to a second or one tenth of a second.

## 23563/4 DEFADD

The address of the argument of a user-defined function in a program, ie. if you had DEF FN A(B) in a program line, the value in 23563/4 would be the address of the letter B in the brackets in that line while only the function is being used. The best way to PEEK into 23563/4 to show this is to put the PEEK as a part of the FN to be evaluated as there is always a zero there unless the function is being evaluated. So the line:

```
10 PRINT PEEK 23563+256*PEEK 23564
```

would always return zero. On the other hand:

```
10 DEF FN A(B)=PEEK 23563+256*  
PEEK 23564  
20 PRINT FN A(999)
```

would return the address of the B in line 10. The 999 is not significant, just something to actually give a value to B to prevent an error. In the case of a function with no argument:

```
10 DEF FN A()=PEEK 23563+256* PEEK  
23564  
20 PRINT FN A()
```

this would print the address of the closed bracket symbol.

## 23568 to 23605 STRMS

The first 14 bytes on a basic Spectrum contain addresses relating to channels and streams. Streams -3 to +3 are stored in two bytes each.

## 23606/7 CHARS

This system variable has as normal values:

```
23606 contains 0  
23607 contains 60
```

This system variable points to the start of the character set that the computer uses for printing on the screen and the printer. SCREEN\$ also uses this system variable. The normal address pointed to is 15360 which is 256 less than the address of the start of the ROM character set. (256 less because the character generator is accessed by something similar to PEEK 23606 + 256 \* PEEK 23607 + CODE "A" \* 8 and since the first character is a space, and the code of a space is 32 you can see that 8 \* 32 is 256.) The character generator is 768 bytes long, so if you wish to set up a new character set you must set aside this number of bytes in case it is overwritten by Basic — you wouldn't get a crash, you'd just end up with gibberish.

Mention was made of SCREEN\$ using this system variable — in fact, you may be aware of the problem that SCREEN\$ does not recognise user-defined graphics normally, unless they happen to be similar to an existing Spectrum character. In fact, SCREEN\$ works by picking up the address of the start of the character generator and looking through the table until it finds a matching character. Now since the Spectrum screen is bit-mapped rather than memory-mapped like some computers, once anything is printed on the screen it stays the same even if you change the character in memory. So we could temporarily change the pointer to the character set to point to the user-defined graphics and look up there.

One snag is that although there is a system variable that tells us where the user-defined graphics start, this address is 256 or more — so we must subtract 256. This conveniently means we subtract one from the high byte. This program should demonstrate:

```
10 FOR X=144 TO 164  
20 PRINT AT 0,0: CHR$ X  
30 POKE 23606, PEEK 23675  
40 POKE 23607, PEEK 23676-1  
50 PRINT AT 20,0: SCREEN$ (0,0)  
60 PAUSE 40  
70 POKE 23606,0  
80 POKE 23607,60  
90 NEXT X
```

What we did was make the computer think the user-defined graphics are the normal character set. SCREEN\$ will still produce characters with codes of 32—127, although this is easily overcome with a bit of fiddling. Since SCREEN\$ starts off with CHR\$ 32 and the UDGs start off at 144, we would need to add 112 to return charac-

ters in the range of the user-defined graphics.

Here is one way to do this. X is the x co-ordinate across the screen and Y and y co-ordinate down the screen of the location SCREEN\$ is to examine. A check is first of all made that SCREEN\$ does not find one of the normal characters there, then returns if one is found. The character at Y, X is returned in A\$. Line 8025 is needed only if you are using a character set other than the ROM one. If you are using the ROM character set, then delete line 8025 and replace lines 8070 and 8080 with the alternative versions that follow.

```
8000 REM SCREEN$ FOR UDG'S  
8010 LET AS=SCREEN$ (Y,X)  
8020 IF AS="" THEN RETURN  
8025 LET A=PEEK 23606: LET B=PEEK  
23607  
8030 POKE 23606, PEEK 23675  
8040 POKE 23607, PEEK 23676-1  
8050 LET AS=SCREEN$ (Y,X)  
8060 IF AS="" THEN LET AS=CHR$  
(CODE AS+112)  
8070 POKE 23606,A  
8080 POKE 23607,B  
8090 RETURN  
  
8070 POKE 23606,0  
8080 POKE 23607,60
```

The story does not finish there. There are only 21 user-defined graphics — if SCREEN\$ does not find a match, it will continue looking up past the user-defined graphics until it has finished looking for the 32 to 127 range it thinks it's looking for. This could be embarrassing if there just happened to be some data stored above the UDGs for any reason which resembled any character. To help prevent this happening, although the UDGs are normally at the top of RAM anyway, this line could be added:

```
6065 IF AS>CHR$ 164 THEN LET AS=""
```

Incidentally, you should ensure that 23606/7 always points to the right character set when PRINTing, LISTing, etc, is done.

## 23608 RASP

Controls the duration of the buzz that sounds to warn you that you are running out of memory. At switch-on, this has a value of 64. This can be altered, but there seems little point. POKE 23608,0 gives a very short click rather than a buzz — useful if you hate the buzz that satirically mocks you when you run out of memory. Alternatively, POKE 23608,255 gives a very long buzz which immobilises the keyboard, preventing you typing any further than when the buzz sounded.

## 23609 PIP

Controls the length of the click emanated when a key is pressed in command mode or during an INPUT. It starts off at zero but may be changed. Any value between 30 and about 130 gives a pleasant, more audible bleep rather than the quieter click normally given. Values high than 130 tend to noticeably slow

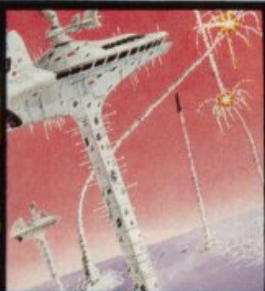




**Pat the Postman**  
Really original. All Pat has to do is collect parcels whilst avoiding obstacles – like cars, fires, trains, etc. Skill level and Hall of Fame.  
48K Spectrum. £6.95



**Deffendar**  
Earth is under attack from mutant aliens in an accurate implementation of a top arcade game – and one of the most difficult to survive in!  
48K Spectrum. £6.95



**Cruise Attack**  
Save the city from annihilation in this wonderful version of an arcade favourite. Nine skill levels, bonus points for attack ships.  
48K Spectrum. £6.95



**Nanas**  
Catch the bananas, miss the coconuts. Easy? Try it and see. Simple in concept, hilariously entertaining – it'll drive you bananas.  
16K Spectrum. £5.95



**Timequest**  
A warp-space accident spreads your capsule across time. As you land in each new era, fresh perils face you. A very skillful graphic adventure  
48K Spectrum. £6.95



**One Hundred & Eighty**  
That famous shout tells you what it's all about! A good implementation of a difficult game – doubles, trebles, twenty-five and bull all possible.  
48K Spectrum. £6.95



**Land of Sagan**  
A quest to find the long lost Staff of Health. Is it in one of the castles? Or in the Tower? There are plenty of problems – and plenty of opponents – in this great graphic adventure.  
48K Spectrum. £6.95



**Creepy Crawler**  
An authentic version of one of the most addictive arcade games devised. All the usual features (Centipede, Spider, Bug, etc) with full use of Spectrum graphics and sound.  
16K Spectrum. £5.95



**Mad Martha II**  
Great sequel to the best-selling Mad Martha. Hilarious graphic adventure, with hero Henry in sunny Spain, beset by wacky waiters, mad bulls and the wrathful Martha.  
48K Spectrum. £6.95



**SAS Assault**  
Your mission – rescue the Russian ambassador from terrorist kidnappers, before the Kremlin declares war. Loads in two parts – your rating in the second depends on your skill in the first.  
48K Spectrum. £6.95



**Star Trek**  
Defend the star systems against the Klingon attack. Runs in real time – so you have to make the right decisions fast!  
48K Spectrum. £6.95



**Drakmaze**  
Find your way round Dracula's domain. A game to get your teeth into!  
48K Spectrum. £6.95



**Laserwarp**  
Invaders, Aliens, this game has the lot – and you have to survive to destroy the Master! Simple controls, far from simple task.  
48K Spectrum. £6.95



**Knockout**  
No aliens, lasers, invaders or rockets – just simple but absorbing fun which up to 4 players can enjoy.  
48K Spectrum. £6.95



**Galakzions**  
Watch out as the Galakzions break formation to attack in such force that no mere human can survive!  
16K Spectrum £5.95

See them at  
Lightning, PCS,  
Tiger, Co-op,  
Menzies, W H Smith  
& other leading  
retailers

**PHONE YOUR VISA  
OR ACCESS  
NUMBER**

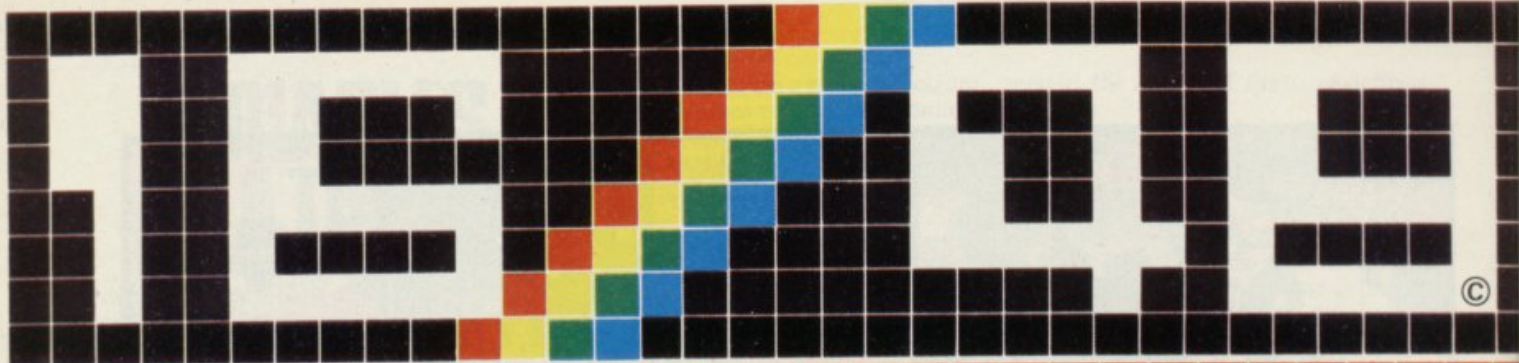
**Other great new Mikro-Gen programs coming soon – watch out for them!**

Please make cheques/PO payable to 'Mikro-Gen' and add 40p post & packing per order.

# MIKRO-GEN

Mikro-Gen, 1 Devonshire Cottages, London Rd, Bracknell RG12 2TQ Tel: 0344 27317





THE MONTHLY CASSETTE MAGAZINE  
FOR THE 16K & 48K ZX SPECTRUM  
TAPE Ø4 MARCH 84 £2:99

ADVENTURE  
/ THE LONG WAY  
HOME  
PART 2: THE  
MARY CELESTE

COMPETITION  
/ SOFTWARE  
PRIZES

PROGRAM  
AIDS  
/ 64 CHARACTER  
PRINT  
USRPROGEN

REVIEWS  
/ ASSEMBLERS

EDUCATIONAL  
/ RESCODE

GAMES  
/ PIRHANA  
PONTOON



We wish to apologise to printer owners for turning on their motors with "D&G" in Issues 2 and 3. Avoid this by editing line 1400 to change the two OUT statements to OUT 254 instead of OUT 154. Sorry! (OUT 154, 4 will turn it off).

This is where you will find Issue 4  
of the magazine  
which you can read, play and USE.

This month we even have a program which writes  
another program and then deletes itself!

You can make sure of your copy and save money with  
our special UK Subscription Rates.  
**6 ISSUES £15 12 ISSUES £28**

Please send me \_\_\_\_\_ issues of 16/48 starting with Issue No \_\_\_\_\_

NAME \_\_\_\_\_ ADDRESS \_\_\_\_\_

POST CODE \_\_\_\_\_

Post to 16/48 Magazine Ltd, 10 Barley Mow Passage, Chiswick, London W4 4PH



# VARIABLES ON A THEME

down the keyboard response (since computing stops as the bleep is sounded). Usually, the one to use is POKE 23609,100.

## 23610 ERR NE

Controls error report number and normally has a value of 255 unless an error arises, when it contains one less than the error report codes printed, eg. for error 4, out of memory, it would contain a three. The message printed out is contained in ROM starting at address 5010 decimal. The end of the message is signified by the last character in the message having bit 7 set to a one. After the error message comes the '© 1982 Sinclair Research Ltd.' message that you see after switch-on or NEW. You can POKE 23610 to generate an error to stop the program, but since the message printed is fixed and in ROM, you may end up with garbage.

If you wanted to simulate an 'out of memory' error you would end a program with POKE 23610,3. This would not work as any program line; you'd have to ensure that it was the last line, as once a condition arises to end a program, only then is 23610 looked at to determine what is printed.

## 23611 FLAGS

This system variable contains various flags controlling the Basic system and generally should not be POKEd. However, some of the flags can be usefully PEEKed.

**Bit 0:** Being a one indicates no space to be printed before the next keyword.

**Bit 1:** This bit being set to a one indicates that the print output is to be sent to the printer. A zero would mean it is to be sent to the TV screen.

**Bit 5:** Any newly pressed key is indicated by its code being stored in 23560 (the LASTK system variable) and bit 5 of 23611 (FLAGS) is set to indicate that a new key has been pressed.

**Bit 7:** Syntax flag.

These will be of more use when using ROM routines in a machine code program.

## 23613/4 ERR-SP

Keeps track of the address on the machine stack where the appropriate return data lies. Try calling a few GOSUBs with no matching RETURNS and watch this point down the memory. Now you can see what happens and why this occurs when you run out of memory in a situation like this. Also, try PEEK-

ing the contents of the three addresses (the base of which is pointed to by 23613/4) to see what return data actually consists of.

```
10 LET A=PEEK 23613+256*PEEK
  23614
20 PRINT PEEK A; TAB 10; PEEK (A+1);
  TAB 20; PEEK (A+2)
```

## 23617 MODE

Specifies cursor. Values zero, one, two or four specify the L/C mode, E mode, G mode or K mode respectively. POKE-ing this system variable will affect the appearance of the cursor — it may appear as a flashing letter, number, symbol or even a keyword. This is most apparent during an INPUT statement. The value is reset when the need arises, eg. a mode change made normally from the keyboard. So if you get into difficulties, press both Shift keys for E mode and then the same again to get back to normal L/C mode.

Try this program which POKes all possible values into 23617. Most are variants on the four cursors, ie. you will find yourself in a particular mode after the POKE, such as everything coming as graphics as in G mode. 252 will give an L/C mode flashing '<' to point to

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
FLASH lower screen	lower screen BRIGHT		BORDER colour and lower screen PAPER				lower screen INK

Table 1. The bits of system variable 23624 control the attributes of the lower screen and the BORDER colour.

where you're typing . . .

```
10 FOR A=0 TO 255
20 PRINT A
30 POKE 23617,A
40 INPUT AS
50 NEXT A
```

## 23618/9 NEWPPC and 23620 NSPPC

23618/9 is a two-byte system variable containing the line number of the line to be jumped to. 23618 contains the lower byte of the line number and 23619 the higher, so the line number contained is read as PEEK 23618 + 256 \* PEEK 23619. To POKE a line number in, say line X:

```
POKE 23618, X-256*INT (X/256)
POKE 23619, INT (X/256)
```

We now come to system variable 23620. With 23618/9 and 23620, we could actually simulate a GOTO command to a statement within a program line, should that ever be necessary. GOTOs cannot access individual statements within long program lines.

To jump to statement four in line X, first go through the motions described above then POKE 23620,4 and the jump is executed.

## 23624 BORDCR

The bits of this system variable control the attributes of the lower screen and the

BORDER colour. Take a look at Table 1.

By POKEing various values into this system variable you could achieve a flashing, bright, multicoloured lower screen, or make both PAPER and INK the same colour to prevent other people getting at your programs — however, any alteration would have to be made blind. You could also make INPUTs extra bright to stand out.

## 23627/8 VARS

The pointer to the start of the variables store. Apart from finding your way into the variables area, you can find the length of the Basic program with this expression. This excludes screen, system variables, stacks and variables.

```
LET bytes=PEEK 23627+256*PEEK 23
628-PEEK 23635-256*PEEK 23636
```

## 23629/30 DEST

The address of the variable when it is assigned to. If the variable had been set up before, it would point to the start of where it was stored in the variables area. If it was being defined for the first time, it would point to the address of the start of the name of the variable in the

program, eg. in 10 LET A = 5, it would point to the address of the letter A.

It can also be used to find the memory address of a numeric variable, if you use something like LET A = A as in the following program:

```
10 LET A=5
20 LET A=A
30 PRINT PEEK 23629+256*PEEK 23630
```

## 23631/2 CHANS

Stores the address of where the channel information area starts.

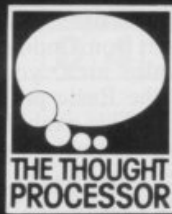
## 23633/4 CHURCHL

The address of INPUT/OUTPUT information used at that moment. It normally points during an INPUT/OUTPUT operation to a five byte block of data in the channel information area. Use this program to examine the contents.

```
1 FOR X=0 TO 3: PRINT #X: PEEK
  23633+256*PEEK 23634: NEXT X:
  PAUSE 0: STOP
```

This article is extracted from Dilwyn Jones' book, *Beyond Simple Basic — Delving Deeper Into Your ZX Spectrum*. This book was first published by Interface Publications, 9-11 Kensington High Street, London W8 6EJ, and is priced at £7.95.





# MICROL<sup>®</sup>

**THE NAME  
ON THE  
WORLD'S  
FINEST  
SOFTWARE**



# PLAY POWER!

*Spectrums at the ready for some financial fun with Peter Young and a riotous road race with Danny Sheehan. And just in case you don't want to miss that vital appointment, you'd better key in Ian Turtle's machine code gem first.*

## STOCKMARKET

Fancy yourself as a budding financial genius — well, here's your chance to prove it. Dealing in stocks and shares, your task is to make a veritable fortune anticipating the 'bears' and 'bulls' in the stock market.

There are four skill levels to the game, and these determine how much prices have changed independently of the information given to the players. Depending on the number of players involved, you should choose your level carefully. Playing alone, you would be wise to opt for level four; for two players, level three would be the best bet; for three players try level two; and if there are four or more players then level one is for you.

You specify how many rounds you require (a good game would comprise six rounds) and, complete with £1000 to play the market, each player gets to study the seven companies available for speculation and decides which shares to buy. You can 'cheat' a little as you're provided with three rumours as to what might happen, with the option of a fourth which has to be bought. Of course, if you get found out trying to bribe an official, you could find yourself in hot water!

You'll notice that the shares in Akran, Belso, Cobra and Dobro will not fluctuate too much each round, whereas speculations on Elsat and Finet will turn out a lot more lucrative. The final company, Bchip, represents the kind of share which never actually falls in value, but whose gradual rise in price will never make you a Nelson Rockefeller.

All prompts for the buying and selling of shares are indicated on-screen, and the program is error-trapped should you decide to type in a lot of nonsense! When all players have completed their various transactions, the Spectrum will list any changes of share values and inform those unlucky enough to let their funds go down to £0 that they'd better reserve themselves a place on the window-ledge.

You are presented with a chart detailing the seven companies, along with their respective share prices and the rumours you should base your speculations on. Who knows, you could end up a Nelson Rockefeller — of course, it's not so far to Skid Row either!

COMPANY	VALUE	AVAIL	HOLD	BUY	SELL
AKRAN	£ 15	100	0	N	0
BELSO	£ 15	100	0	N	0
COBRA	£ 15	100	0	N	0
DOBR	£ 15	100	0	N	0
ELSAT	£ 15	100	0	N	0
FINET	£ 15	100	0	N	0
BCHIP	£ 10	100	0	N	0

PROMPT: FINET TO BE SUSPENDED  
LIFT SUSPENSION

ENTER COMPANY "BELSO"

Should a company be dissolved, all shares in this enterprise will be discontinued and you stand to lose all your cash. However, you will find that the company will re-emerge due to

an influx of government subsidy and trade will continue with the share prices being set to their original starting price of £15. After the final game turn, the program converts all shareholdings into cash and gives each player his or her final tote — the winner, of course, being the one who has made the biggest fortune.

```
1 REM stock market by P.YOUNG
10 INK 0: PAPER 7: BORDER 7: CLS : POK
E 23609,50: POKE 23658,8
15 PRINT AT 10,3: PAPER 1: INK 6:"STOC
K MARKET P.YOUNG 1983"
```

Lines 1-15 Initialise screen colours, POKE Caps Lock and keyboard bleep, and finally PRINT the game title.

```
20 LET BRIBEAtempt=0: LET GAMETURN=1
```

Line 20 Sets the initial values of the bribe attempt and the game turn.

```
21 PRINT £1:"SKILL LEVEL (1-4) ?": GO
SUB 9100: LET LEVEL=VAL K$: PRINT £1:CH
R$: K$
22 PRINT £1:"NUMBER OF PLAYERS ?": GO
SUB 9100: LET NUMOFPLAYERS=VAL K$: PRIN
T £1:CHR$: K$
23 PRINT £1:"NUMBER OF GAME TURNS ?":
GO SUB 9100: LET GAMELENGTH=VAL K$: PRI
NT £1:CHR$: K$
```

Lines 21-23 Get the details of the number of players, skill level, and the number of game turns required. The subroutine starting at line 9100 (called no less than three times within this short routine) reads the keyboard.

```
25 RANDOMIZE : GO SUB 8000
30 GO TO 100
```

Lines 25-30 Call the variable subroutine and jump to the main program.

```
40 BEEP .3,0: BEEP .3,3: BEEP .3,5: BE
EP .3,0: CLS
42 PRINT AT 0,0: INVERSE 1:"SHARE VAL
UE AVAIL HOLD S TRND"
43 LET L=1
45 FOR R=3 TO 15 STEP 2: PRINT AT R,0:
N$(L): AT R,7: "": AT R,9: S(1,L): AT R,29: S
(3,L): IF S(4,L)<>1 THEN PRINT AT R,27:
S(5,L): PRINT AT R,26:"S": GO TO 48
46 PRINT AT R,26:"N"
48 LET L=L+1: NEXT R
60 RETURN
```



```

100 REM MAIN LOOP
105 GO SUB 40
110 FOR N=1 TO NUMOFPLAYERS: GO SUB 120
: GO SUB 150: GO TO 210
120 PRINT AT 1,10: PAPER 5: "PLAYER ";N
125 LET HOLD=1
130 FOR R=3 TO 15 STEP 2: PRINT AT R,14
: S(2,HOLD): AT R,21: P(HOLD,N): " ": LET H
OLD=HOLD+1: NEXT R
140 PRINT AT 16,26: " ": PRINT AT 16
,2: PAPER 5: "READY CASH ON TURN ": GAMETU
RN: " ": P(8,N): RETURN
150 PRINT AT 18,0: PAPER 6: "RUMOURS": F
OR R=18 TO 20: GO SUB 6000: NEXT R
152 PRINT AT 21,10: "
"
155 LET BRIBE=10+5*INT (RND*5)
160 PRINT £1; AT 1,0: "BRIBE OFFICIAL FOR
": BRIBE: " ? ": GO SUB 9100: LET Y#=K#
165 IF Y#<>"Y" AND Y#<>"YES" AND Y#<>"N
" AND Y#<>"NO" THEN GO TO 160
170 IF Y#="Y" OR Y#="YES" THEN LET BRI
BEATTEMPT=1: LET R=21: GO SUB 6000
180 LET BRIBEACTION=0
190 RETURN
210 GO SUB 5000
220 NEXT N
225 GO SUB 4000: FOR N=1 TO 6: IF S(5,N
)<>0 THEN LET S(4,N)=2
227 NEXT N
230 LET S(3,7)=INT (RND*3): REM BCHIP I
NCREASE (IF ANY)
240 FOR N=1 TO 7: LET S(1,N)=S(1,N)+S(3
,N): IF S(1,N)<=0 THEN GO SUB 7000
245 IF S(1,N)>40 THEN LET S(1,N)=40
250 NEXT N
260 FOR N=1 TO 6: IF S(4,N)=2 THEN LET
S(5,N)=S(5,N)-1: IF S(5,N)=0 THEN LET
S(4,N)=1: REM CHECKS SUSPENDED SHARES
270 NEXT N
280 GO SUB 40: PRINT AT 1,10: PAPER 5: "
NET MOVEMENT": PRINT AT 17,3: PAPER 6: "P
RESS ANY KEY TO CONTINUE": PAUSE 0
300 LET GAMETURN=GAMETURN+1: IF GAMETUR
N=GAMELENGTH THEN PRINT AT 19,10: INVER
SE 1: "LAST TURN COMING UP"
310 IF GAMETURN>GAMELENGTH THEN GO TO
9000
320 FOR N=1 TO 6: LET S(3,N)=INT (0.5+(
.5*S(3,N)): IF S(1,N)=40 THEN LET S(3
,N)=0
330 NEXT N: LET S(3,7)=0: GO TO 105

```

Lines 100-330

Main program loop. This is called once per turn for each player. This portion of the code prints the screen, rumours, and bribe attempts if necessary.

```

4000 REM COMPUTER RUMOURS
4010 CLS : PRINT AT 3,0: PAPER 5: "RUMOUR
S UNKNOWN TO PLAYERS"
4020 FOR R=7 TO 6+LEVEL: LET RAN1=1+INT
(RND*47): GO SUB 6012: NEXT R
4025 PAUSE 150
4030 RETURN

```

Lines 4000-4030

Unknown rumours routine. This routine calculates the extra rumour.

```

5000 REM PLAYER ACTIONS
5010 PRINT AT 17,0: PAPER 2: INK 7: " TYP
E "E" TO FINISH THIS PHASE "
5020 PRINT £1; AT 0,0: "

```

TRANSACTION- SELL OR BUY

```

": GO SUB 9100: LET Y#=K#
5025 IF Y#="E" THEN PRINT £1; AT 1,0: "D.
K. -YOUR TURN OVER ": PAUSE 150
: RETURN
5027 IF Y#="S" OR Y#="B" THEN GO TO 503
0
5029 GO TO 5020
5030 INPUT "NUMBER OF SHARES ": NUM
5040 INPUT "COMPANY NAME ": LINE C#: FOR
L=1 TO 7: IF C#<N#(L) THEN GO TO 5050
5045 NEXT L: PRINT £1; AT 0,0: "NO SUCH CO
MPANY AS ": C#, " -TRY AGAIN": PAUSE 150:
GO TO 5020
5050 IF S(4,L)<>1 THEN PRINT £1; AT 1,0:
"SHARES SUSPENDED ": PAUSE 150: GO TO
5020
5055 IF Y#="S" THEN GO TO 5100
5057 IF Y#<>"B" THEN GO TO 5020
5060 IF NUM>S(2,L) THEN PRINT £1; AT 0,0
: "THERE ARE NOT ": NUM, " SHARES AVAILABLE
": PAUSE 150: GO TO 5020
5070 IF P(8,N)<S(1,L)*NUM THEN PRINT £1
: AT 0,0: "YOU HAVEN'T ENOUGH MONEY": PAUS
E 150: GO TO 5020
5080 LET S(2,L)=S(2,L)-NUM: LET P(L,N)=P
(L,N)+NUM: LET P(8,N)=P(8,N)-(S(1,L)*NUM
): BEEP .25,0: PRINT £1; AT 0,0: NUM: " SHA
RES BOUGHT IN ": C#: " COST- ": S(1,L)*NU
M: PAUSE 200
5090 PRINT AT 1+L*2,14: S(2,L): " ": PRIN
T AT 1+L*2,21: P(L,N): " ": GO SUB 140: G
O TO 5020
5100 IF NUM>P(L,N) THEN PRINT £1; AT 0,0
: "YOU DO NOT HAVE ": NUM: " SHARES IN ", C#
: " TO SELL": PAUSE 150: GO TO 5020
5110 LET P(8,N)=P(8,N)+NUM*S(1,L): LET S
(2,L)=S(2,L)+NUM: LET P(L,N)=P(L,N)-NUM:
PRINT £1; AT 0,0: NUM: " SHARES SOLD IN ":
C#: " FOR ": S(1,L)*NUM: PAUSE 200: GO TO
5090

```

Lines 5000-5110

Contain the buying and selling of shares routine. Each player is asked if they want to buy or sell shares. Checks are made on the number of shares available and the amount of cash the player has — this information is used to stop 'illegal entries', i.e. cheating.

```

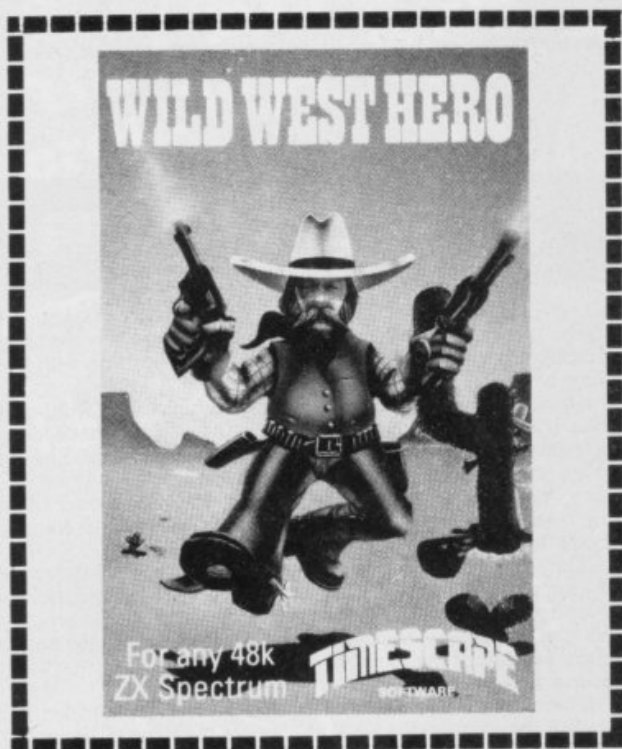
6000 REM INFO GIVEN TO PLAYERS
6005 IF BRIBEACTION=1 THEN LET P(8,N)=
P(8,N)-BRIBE: GO SUB 140: IF RND>.8 THEN
GO TO 6180
6010 LET RAN1=1+INT (RND*49)
6012 IF RAN1>32 THEN GO TO 6070
6015 LET RAN1=1+INT (RND*8)
6020 IF M(RAN1)>0 THEN LET W#="UP": GO
TO 6040
6030 LET W#="DOWN"
6040 LET RAN2=1+INT (RND*4)
6050 LET S(3,RAN2)=S(3,RAN2)+M(RAN1)
6060 PRINT AT R,10: N#(RAN2): " ": W#: " ":
ABS M(RAN1): " ": RETURN
6070 IF RAN1>42 THEN GO TO 6120
6080 LET RAN1=9+INT (RND*5)
6090 IF M(RAN1)>0 THEN LET W#="UP": GO
TO 6110
6100 LET W#="DOWN"
6110 LET RAN2=5+INT (RND*2): GO TO 6045
6120 IF RAN1=43 THEN FOR L=1 TO 6: IF S
(4,L)=1 THEN LET S(3,L)=S(3,L)+2: NEXT
L: PRINT AT R,10: "ALL SHARES UP '2
": RETURN
6130 IF RAN1=44 THEN FOR L=1 TO 6: IF S
(4,L)=1 THEN LET S(3,L)=S(3,L)-2: NEXT
L: PRINT AT R,10: "ALL SHARES DOWN '2
": RETURN

```



# WILD WEST HERO

For the 48K ZX Spectrum



**"Very Impressive Graphics"** – *Tim Hartnell, author of many top selling books*

**"A blimin' good mega zap"** – *Jeff Minter, Top VIC20 & CBM 64 Games Programmer*

**"Very Smooth . . . I'll have one"** – *Andrew Pennell, Author of 'Master your ZX Microdrive'*

Wild West Hero Captivates you in the fastest, meanest, noisiest battle you will ever experience in these times. Up to 80 Bandits on screen at one time all moving smoothly, makes this game a thriller.

Wild West Hero uses full colour graphics, hi-res, smooth movement, dramatic sound effects, 100% Machine code, High score, Two play option, Attract mode, and is compatible with the Kempston Joystick Interface.

## TIMESCAPE SOFTWARE

COMING SOON

## DUSTMAN

ZX Spectrum 48K

In the small suburban town of Chipping Sodbury there was a dustman whose name was Alfred. But little did the residents know that Alf was no ordinary dustman, he was a Hyper intelligent mega dustman whose favourite lager was seeking revenge with the aid of the rubbish, that thought it was about time Alf met his doom. Meanwhile 'Friends of the Binless' try to help Alf destroy the rubbish by using force to fight force! Confused? You won't be on December 20th when we release Dustman for the 48K ZX Spectrum

SEE DUSTMAN AND WILD WEST HERO AT THE  
YOUR COMPUTER CHRISTMAS FAIR, STAND 216

## DEALERS CONTACT

TIGER DISTRIBUTION, CENTRESOFT LTD

PAUL HOLMES 041-956 5058

SEND TO: TIMESCAPE SOFTWARE (YS1)  
1 VIRGINIA GARDENS, FAIRWAYS, MILNGAVIE  
GLASGOW G62 6LG

NAME .....

ADDRESS .....

SEND ME .....

I ENCLOSE .....

COPYING, LENDING OR HIRING CASSETTES PROHIBITED



```

6140 IF RAN1>=48 THEN GO TO 6160
6150 LET RAN2=1+INT (RND*6): LET S(5,RAN
2)=2+INT (RND*3): PRINT AT R,10;N$(RAN2)
;" TO BE SUSPENDED": RETURN
6160 PRINT AT R,10;"LIFT SUSPENSION- ":
INPUT "ENTER COMPANY ";Y$: FOR L=1 TO 6:
IF Y$=N$(L) THEN GO TO 6175
6170 NEXT L: PRINT AT R,27;"NONE": RETUR
N
6175 LET S(4,L)=1: LET S(5,L)=0: PRINT A
T R,27;Y$: PRINT AT 1+L*2,26;"N ": RETUR
N
6180 LET RAN1=1+INT (RND*4)
6190 LET P(8,N)=P(8,N)-50*RAN1
6200 PRINT AT R,10;"FINED `";50*RAN1;" F
OR BRIBERY": PAUSE 100: GO SUB 140
6220 RETURN

```

**Lines 6000-6220** Calculate and print information on the rise and fall of shares, and also the suspension of shares.

```

7000 REM BANKRUPT COMPANY
7010 FOR L=1 TO NUMOFPLAYERS: LET P(N,L)
=0: LET P(N,L)=0: NEXT L
7020 LET S(1,N)=15: LET S(3,N)=0: LET S(
4,N)=1: LET S(2,N)=100: LET S(5,N)=0
7030 BEEP .4,0: BEEP .3,0: BEEP .2,0: BE
EP .4,0: BEEP .4,3: BEEP .2,2: BEEP .3,2
: BEEP .2,0: BEEP .3,0: BEEP .2,-1: BEEP
.4,0: PRINT AT 18,0;"SHARES IN ";N$(N);
" LOST-BANKRUPTCY": PAUSE 130
7040 RETURN

```

**Lines 7000-7040** Check to see if a company is bankrupt, and plays a merry little ditty when all is lost.

```

8000 REM INITIALISATION
8010 DIM M(14): DIM N$(7,5)
8020 FOR N=1 TO 14: READ M(N): NEXT N
8030 DATA -4,-3,-2,-1,1,2,3,4,6,4,2,-10,
-8,0
8040 FOR N=1 TO 7: READ N$(N): NEXT N
8050 DATA "AKRAN","BELSO","COBRA","DOBRO
","ELSAT","FINET","BCHIP"
8110 DIM S(5,7): DIM P(8,NUMOFPLAYERS):
DIM W$(4)
8120 FOR L=1 TO 7: LET N=1
8130 LET S(N,L)=15
8140 LET S(N+1,L)=100
8150 LET S(N+2,L)=0
8160 LET S(N+3,L)=1
8165 LET S(N+4,L)=0
8170 NEXT L
8175 LET S(1,7)=10
8180 FOR L=1 TO 7: FOR N=1 TO NUMOFPLAYE
RS
8190 LET P(L,N)=0: NEXT N
8200 NEXT L
8210 FOR N=1 TO NUMOFPLAYERS: LET P(8,N)
=1000: NEXT N
8220 RETURN

```

**Lines 8000-8220** Initialisation of variables.

```

9000 REM END OF GAME
9005 CLS : PRINT AT 1,10: PAPER 6;"END O
F GAME"
9010 LET R=4
9020 FOR N=1 TO NUMOFPLAYERS
9030 FOR L=1 TO 7: LET P(8,N)=P(8,N)+S(
1,L)*P(L,N): NEXT L
9040 PRINT AT R,0;"PLAYER ";N;" FINISHED
WITH `";P(8,N);: LET R=R+4
9050 NEXT N
9060 STOP

```

**Lines 9000-9060** The 'end of game' routine. This prints details of who has what at the end of the game, cashing shares and announcing who has made the most of their opportunity.

```

9100 REM GET KEY
9110 PAUSE 1: PAUSE 0
9120 LET K$=INKEY$
9130 RETURN

```

**Lines 9100-9130** Wait for a key to be pressed, returning to the main program with the string, K\$, holding the necessary data.

```

9997 REM Do not type in lines 9997-9999
9998 CLEAR : ERASE "m";1;"Stocks"
9999 SAVE *"m";1;"Stocks"

```

**Lines 9997-9999** A SAVEing routine for those of you who have purchased ZX Microdrives. Do not type in these lines unless you have Microdrives.

## ROAD RACER

Careering along in first place in a 600 mile road race, your white 'turbo' car hits disaster and a call into the pits is demanded. Starting off again, you find yourself in tenth position with everything to go for.

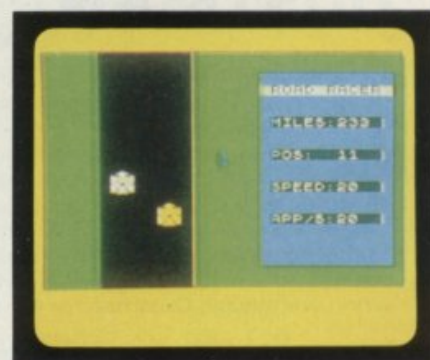
On-screen, you will see the road stretching out in front of you, plus a dashboard which provides you with all the necessary information you'll need to catch the cars in front. The dash gives you your current speed (0-99 mph); your position in the race; the speed of the approaching car; and the number of miles the leader has to finish the race — so you'll know exactly what kinda' trouble you're in.

The secret of success is to be aware at all times of the speed of the approaching cars — and also, how to handle the cars behind you that want to overtake (sorry, no oil slicks in this program!). As you get nearer the leader, take special care as the cars will make hazardous manoeuvres to stop you overtaking — you have been warned!

There are two levels of skill, and it might be an idea if you choose the easy option until you've got the hang of the controls. Obviously, the game ends when the 'Miles' indicator reaches zero and someone has won the race. Of course, it could end a lot quicker (know what I mean?).

If you find it all a little daunting to begin with, try altering the value of M in line 400 to 300 for an easy life...

On-screen, your dashboard indicates how many miles you have left to race, your position, your car's speed and how fast the car behind is approaching. Care should be your watchword as you hurtle along the open road, for when you start to overtake the leaders you'll find they're not so friendly.



```

9 REM
Print Instructions & Obtain Skill level
10 GO SUB 7000: REM Set Up UDG's
20 BORDER 0: PAPER 0: INK 7: CLS : REM
Initial screen attributes
25 GO SUB 7100: REM Draw title screen
30 PRINT AT 9,2;" Your engine stalls i
n the middle of the Road Race while
your in tenth position, with only 300 mil
es to the finish! Regain the lead using:
"
40 PRINT AT 16,0;" 'y' for speed 'g'

```





# The LAUGHING SHARK

proudly presents our FAB RANGE of SPECTRUM releases



**RACING  
MANAGER**  
by Mark Alexander  
SPECTRUM 48K  
VGC 1005  
All the thrills of  
the racing world.  
£5.95



**LOJIX**  
by Steve Webb  
SPECTRUM 48K  
VGC 1006  
An intriguing  
intellectual puzzle  
- beat the puzzle,  
win the money.  
£5.95



**QUETZAL-  
COATL**  
by Gareth Briggs  
SPECTRUM 48K  
VGC 1007  
Trapped in an  
Aztec temple your  
only means of  
escape is through  
the passages  
risking the  
vengeance of the  
Aztec Gods.  
£5.95



**ROBBER**  
by Keith Mitchell  
SPECTRUM 48K  
VGC 1008  
A 3 part criminal  
escape to warn  
you off a life of  
crime!  
£5.95



**SPECTRON**  
by Mark Kirkby  
SPECTRUM 48K  
VGC 1009  
Your only aim in  
life is to survive  
100% M/Code  
action.  
£5.95



**The  
Island**  
by Martyn Davies  
Spectrum 48K  
VGC 1015  
Find the  
treasure - a full  
48K adventure  
with action  
sequences.  
£5.95



**Rider**  
by Roy Poole  
& Terry Murray  
Spectrum 48K  
VGC 1014  
Parachute into  
the enemy  
territory and  
ride the  
mined roads.  
£5.95



**Ghost  
Town**  
by John Pickford  
Spectrum 48K  
VGC 1013  
An intriguing  
graphical  
adventure  
£5.95



**Angler**  
by Dirk Olivier  
Spectrum 48K  
VGC 1012  
Fishy fun for  
all ages - but  
don't catch a  
crab!  
£5.95



**LOST**  
by John Hunt  
SPECTRUM 48K  
VGC 1010  
Lost and alone you  
must scavenge off  
the land to help  
you survive  
£5.95

Also available ...

Other titles in this VIRGIN GAMES range for SPECTRUM are: VGC 1001-YOMP by Terry Murray and Roy Poole for 16K and 48K  
Command the paras and take on the impossible. VGC 1002-STARFIRE by Martyn Davies for 48K Rid the galaxy of the  
Xtardan battle cruisers - a game of strategy and skill. VGC 1003-SHEEPWALK by Gregory Trezise for 48K A sheepdog  
trial in your living room! VGC 1004-GOLF by David Thompson for 16K and 48K Championship golf in your own home.

## MAIL ORDER

All our programs are available at normal retail price  
including postage and packing direct from our "MY  
LOCAL DEALER STILL DOESN'T STOCK YOUR  
PROGRAMS DESPITE THE FACT THAT THEY'RE  
REALLY GOOD DEPARTMENT" at 61-63 Portobello  
Road, London W11.

## THE "I WANT TO BE RICH AND FAMOUS DEPARTMENT"

We are always keen to receive any original entertaining  
programs with good graphics at our now famous "I WANT  
TO BE RICH AND FAMOUS DEPARTMENT" from any  
of you programming mega-stars out there. Don't delay -  
send today!

## COLOUR CATALOGUE

If you want a copy of our sixteen page colour catalogue

## FREE listing details of all our games, please write to the "GAMMEE A CATALOGUE QUICK GAMMEE DEPARTMENT" enclosing an A4 SAE (with 17p stamp).

Our GANG is growing in numbers all the time and  
everybody who buys one of our NEW GAMES will  
RECEIVE:

- a year's FREE MEMBERSHIP of the GAMES GANG;
- FREE ENTRY in the next VIRGIN DAY OUT - a trip  
DRAW;  
● 6 FIRST PRIZES, consisting of a VIRGIN DAY OUT - a trip  
on the VIRGIN GAMES FUN BUS to the VIRGIN MANOR  
RECORDING STUDIO in Oxfordshire. And then be our guest  
at the famous KENSINGTON ROOFTOP NIGHTCLUB,  
"THE GARDENS";
- 50 SECOND PRIZES of VIRGIN GAMES POSTERS.
- 100 THIRD PRIZES of VIRGIN GAMES POSTERS.

## GAMES AVAILABILITY

A selection from our range of FUN-TO-PLAY GAMES  
are available from larger branches of WH SMITH, BOOTS,  
MENZIES, DIXONS, THE GAMES CENTRE,  
LASKEYS, VIRGIN RECORDS and all good computer  
shops everywhere.

**WATCH OUT for the  
VIRGIN GAMES FUN BUS -  
on tour NOW**





# LORDS OF TIME

Joins our range of acclaimed pure-text puzzle adventures, at £9.90, for:

**BBC** 32K **COMMODORE 64** **SPECTRUM** 48K **LYNX** 48K **NASCOM** 32K **ORIC** 48K **ATARI** 32K

## ADVENTURE 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... I am extremely impressed... The Level 9 Adventures are superbly designed and programmed, the contents first rate. The implementation of Colossal Cave (Adventure) is nothing short of brilliant; rush out and buy it. While you're at it, buy their others too. Simply smashing!"

— *SOFT, Sept 83*

"I found Dungeon exceedingly well planned and written, with a fast response. There are well over 200 locations and the descriptions are both lengthy and interesting. The objects number about 100. It could therefore take some months to explore the whole network, giving many hours of enjoyment in the process."

— *C&VG, Sept 83*

"The descriptions are so good that few players could fail to be ensnared by the realism of the mythical worlds where they are the hero or heroine... great fun to play."

— *Which Micro?, Aug 83*

"My appetite has been whetted and I intend to get my own copy (of Snowball) to play."

— *What Micro?, Dec 83*

## ADVENTURE REVIEWS

"This has to be the bargain of the year. If adventures are your game then this (Colossal Adventure) is your adventure."

— *HCW, 5 Sept 83*

"Colossal Adventure is simply superb. Anyone who wishes to use adventures in an educational setting really must use and see this program as it emulates Crowther and Wood's masterpiece so well. For those who wish to move onto another adventure of similar high quality, Dungeon Adventure is to be recommended. With more than 200 locations, 700 messages and 100 objects it will tease and delight!"

— *Educational Computing, Nov 83*

Colossal Adventure is included in Practical Computing's Top 10 games choice: "Poetic, moving 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 # 1.3*

"Colossal Adventure... For once here's a program that lives up to its name... a masterful feat. Thoroughly recommended"

— *Computer Choice, Dec 83*

"wholly admirable"

— *Your Computer, Sept 83*



## MIDDLE EARTH ADVENTURES

### 1: COLOSSAL ADVENTURE

A complete, full size version of the classic mainframe game "Adventure" with 70 bonus locations added.

### 2: ADVENTURE QUEST

Centuries have passed since the time of Colossal Adventure and evil armies have invaded The Land. The way is long and dangerous; but with cunning you can overcome all obstacles on the way to the Black Tower, source of their demonic power, and destroy it.

### 3: DUNGEON ADVENTURE

The trilogy is completed by this superb adventure, set in the Dungeons beneath the shattered Black Tower. A sense of humour is essential!

## THE FIRST SILICON DREAM ADVENTURE

### 1: 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 massive game with 7000 locations.

## THE LORDS OF TIME SAGA

### 7: LORDS OF TIME

Our congratulations to Sue Gazzard for her super design for this new time travel adventure through the ages of world history. Chill to the Ice-age, go romin' with Caesar's legions, shed light on the Dark Ages etc. etc. We'll be selling this game mail-order from January 1st.

**Price: £9.90 each (inclusive)**

Level 9 adventures are available from good computer shops, or mail-order from us at no extra charge. Please send order, or SAE for catalogue, to:

## LEVEL 9 COMPUTING

Dept L, 229 Hughenden Road, High Wycombe, Bucks HP13 5PG

Please describe your Computer



```

to brake";AT 18,0;" 'z' for left & 'x'
for right"
50 PRINT AT 21,0; INK 1;" Skill Level:
1=(AM) 2=(PRO) ?"
55 PRINT #1;AT 1,5; INK 1;" Written by
D.Sheehan."
60 IF INKEY#="1" THEN LET sk=1: GO TO
100
70 IF INKEY#="2" THEN LET sk=2: GO TO
100
80 GO TO 60

```

Lines 9-80

Print instructions and obtain skill level.

```

99 REM Set up screen and variables for
start of game
100 BORDER 6: PAPER 4: INK 0: CLS : LET
c=5: LET d=2: LET s=0: LET a=11: LET b=
6: LET pos=10
200 FOR n=0 TO 21: PRINT AT n,0;" k
: NEXT n: FOR n=2 TO 19
: PRINT AT n,19; INK 5;" : N
EXT n
250 INK 0: PRINT AT 3,19; PAPER 7;" RDA
D RACER ": DRAW 255,0: DRAW 0,175: DRAW
-255,0: DRAW 0,-175
260 PLOT 151,15: DRAW 98,0: DRAW 0,145:
DRAW -98,0: DRAW 0,-145
270 GO SUB 2000: REM set up computers c
ar variables: REM
300 INK 7: PAPER 0: PRINT AT 6,20;"MILE
S: ";AT 9,20;"POS: ";AT 12,20;"SP
EED: ";AT 15,20;"APP/S: "
310 RESTORE 7080: FOR n=0 TO 9: READ q:
FOR w=0 TO 8: BEEP .008,q: NEXT w: NEXT
n: REM engine noise

```

Lines 99-310

Print the game display, assign the variables, draw a large square around the screen and a smaller one around the 'dashboard'. The BEEPs simulate the engine noise. The 'k' characters in line 200 are, in fact, user-defined graphics characters. (UDGs are obtained by pressing Caps Shift/9, and then pressing the character you want — in this case, the K key.)

```

399 REM main program loop
400 FOR m=300 TO 0 STEP -1
500 PRINT AT a,b; INK 7;" ";AT a+1,b;"
"
550 LET b=b+(INKEY#="x" AND b<11)-(INKE
Y#="z" AND b>5)
580 PRINT AT a,b; INK 7;"ab";AT a+1,b;"
cd"
590 GO SUB 3000: REM move and print com
puters car
599 REM check for crash
600 IF ATTR (a,b)<>7 THEN GO TO 4000
610 IF ATTR (a,b+1)<>7 THEN GO TO 4000
620 IF ATTR (a+1,b)<>7 THEN GO TO 4000
630 IF ATTR (a+1,b+1)<>7 THEN GO TO 40
00
640 PRINT AT 6,26;m;" ";AT 9,26;pos;" "
;AT 12,26;s;" ";AT 15,26;app;" "
660 LET s=s+(INKEY#="y" AND s<=98)-(INK
EY#="g" AND s>=1)
670 GO SUB 1100: REM print and move tre
e
680 NEXT m

```

Lines 399-680

Main program loop. The FOR/NEXT loop 'm' controls how long the race will continue (here it is set to 300, and reduced by one every time the loop goes round). Lines 600-630 check to see if the car has crashed.

```

999 REM end of game
1000 PRINT AT 6,26; FLASH 1;"000": FOR n
=0 TO 50: BEEP .005,30: BEEP .01,0: NEXT

```

```

n: IF pos=1 THEN GO TO 1050
1020 PRINT AT 1,0;"The leading car has w
on the race": BEEP .5,-10: BEEP .7,-20:
IF pos=2 THEN PRINT AT 9,5; FLASH 1; IN
K 3;" :AT 10,5;"
1030 GO TO 1080
1050 PRINT AT a+2,5; FLASH 1; INK 3;"
:AT a+3,5;" : PAUSE 50
1060 PRINT AT a,b;" :AT a+1,b;" :AT
x,y; INK cc;" :AT x+1,y;"
1070 PRINT AT 1,0; FLASH 1; PAPER 2;"
1ST PLACE ! ": FOR n=0
TO 3: BEEP .5,15: BEEP .2,5: NEXT n
1080 PRINT AT 21,3;"Press any key to pla
y again": IF INKEY#="" THEN GO TO 1080
1090 GO TO 15

```

Lines 999-1090

Evaluate your position at the end of the game, print the grid and, if requested, re-start the game. Again, user-defined graphics are employed in line 1060.

```

1099 REM print and move tree
1100 PRINT AT c,d; PAPER 4;" ";AT c+1,d;
" ": LET c=c+(s/30)
1130 IF c>=18 THEN LET c=1: LET r=RND:
LET d=INT (RND*3)+1: IF r>.5 THEN LET d
=INT (RND*3)+14
1140 PRINT AT c,d; INK 1; PAPER 4;"i";AT
c+1,d;"j": RETURN

```

Lines 1099-1140

Print the tree character on the side of the road, and move it according to the speed of your car.

```

1999 REM set up computers car
2000 LET app=INT s+INT (RND*sk)-5: LET a
pp=app+INT (RND*20)-INT (RND*20): IF app
<=20 THEN LET app=20
2010 LET ac=0+(1 AND RND<(sk/10)+.1)-(1
AND RND>.7)
2020 LET cc=INT (RND*5)+2
2100 LET y=INT (RND*6)+6: LET x=2: IF ap
p>s THEN LET x=18
2110 IF pos=1 THEN LET x=18
2120 LET pos1=pos: LET pos2=0+(pos-1 AND
x=2)+(pos+1 AND x=18)
2130 LET x1=x: RETURN

```

Lines 1999-2130

Update the variables of the other cars in the race.

```

2999 REM print and move computers car
3000 PRINT AT x,y;" ";AT x+1,y;" ": IF
s>app THEN LET x=x+1: IF s-15>app THEN
LET x=x+1
3010 IF s<app THEN LET x=x-1: IF s+15<a
pp THEN LET x=x-1
3020 IF RND>(pos/10) AND y>=6 THEN LET
y=y-1
3030 IF RND>(pos/10) AND y<=10 THEN LET
y=y+1: IF RND>.5 THEN LET app=app+INT
(RND*2)-1
3100 PRINT AT x,y; INK cc;"ab";AT x+1,y;
"cd": LET app=app+ac: IF app<=20 THEN L
ET app=20
3120 IF x<3 OR x>18 THEN PRINT AT x,y;"
";AT x+1,y;" ": GO SUB 2000
3150 IF x1=2 THEN LET pos=0+(pos2 AND x
>=a)+(pos1 AND x<a)
3160 IF x1=18 THEN LET pos=0+(pos1 AND
x>a)+(pos2 AND x<=a)
3200 RETURN

```

Lines 2999-3200

Print the computer's car according to the relation between its speed and the speed of your car. The position of your car is also calculated.

```

3999 REM print crashed car and restart g
ame

```



Brrr! Deep in the confines of the frosty blue maze Pengy is pushing his way out of trouble. Pengy's frozen wasteland is a random maze constructed of blue ice blocks raided by the dreaded Sno-bees. The sno-bee's sting is deadly, but Pengy can retaliate by squashing them with the ice blocks that he pushes around. Pengy is based on one of this year's arcade successes, and this version captures all the action and addiction of the original. Packed full of features, super smooth graphics, flashing and bonus blocks, double score bonuses, dizzy bees, and hours of entertainment!

ANY SPECTRUM.

# PENGY



## TUTANKHAMUN

48K SPECTRUM ONLY—The treasures of TUTANKHAMUN are awesome—but so are the creatures that guard them. Explore the pharaoh's tomb which is a very large series of scrolling mazes separated by locked doors. You have a limited time to unlock the doors with the keys, and escape with the treasure. Luckily you are armed with lasers and smart bombs as you will have to face a horde of guardian cobras, spiders, skulls, monsters and mummies. TUTANKHAMUN is what you'd expect from Micromania—fast, furious arcade action packed full of arcade features: 100% machine code, fast, smooth, hires arcade action; tomb is over 40 "screens" long, opening doors, keys, treasures, maps, level selection, sound effects and tunes.



## CYBOTRON SPECTRUM GAMES



The fastest, meanest robot shoot-out game ever. Based on the arcade game that made Defender look tame, CYBOTRON is impossible to beat—only speed and skill can save you from the chaotic robots. Packed full of features: Four types of robots, bombs, multi-directional plasma lasers, up to 50 robots on screen, 100% machine code, a game that will test your reactions to the limit. ANY SPECTRUM.

keyboard only operation

100% machine code, fast, smooth, hires arcade action. Kempston, cursor key, joystick or keyboard operation. Games available direct £5.95 inc. p. + p. 24 HOUR DESPATCH, or from good software outlets. Trade enquiries invited. Good programs always wanted.

## MICROMANIA

14 LOWER HILL ROAD, EPSOM, SURREY KT19 8LT

## GHOST'S REVENGE



ANY SPECTRUM. Full arcade features: realistic gobbling, four coloured ghosts, dot and power pods, very intelligent chasing/running ghosts, eat blue ghosts for bonuses, tunnel, normal or INVISIBLE maze, 10 different selectable levels. 100% machine code action, excellent fast graphics, sound effects and tunes.

## HIRE SPECTRUM SOFTWARE

### CHOOSE FROM OUR VAST RANGE

FREE 24 page CATALOGUE with full details of our range of over 220 different programs for the ZX SPECTRUM. All hired with the consent of the publishers. Whether you prefer to ZAP aliens, get lost in an adventure game, EDUCATE your children, CALCULATE the family finances or COMPILE machine code programs WE HAVE THE RIGHT TAPES FOR YOU TO HIRE.

### FAST SERVICE

We stock several manufacturers original copies of each tape, and can normally despatch your tapes the day we receive your order, and we always use first class post.

### LOWEST PRICES

We believe our prices are the lowest of any library, yet we offer the LARGEST range of titles. TWO WEEKS HIRE OF ANY TAPE COSTS JUST 80p (plus 40p p&p).

### FREE TAPE HIRE

For a limited period, we will send your first tape (your choice) FREE, so join our library now. You can't afford NOT to!!! If you've tried another library and are wary of our claims send a stamp and we'll gladly send you a copy of our catalogue - we're confident you'll join when you see it!!!



## NATIONAL SOFTWARE LIBRARY

200 Mulgrave Road,  
Cheam, Surrey SM2 6JT

I enclose cheque for £6.00 for LIFE MEMBERSHIP and I understand that my first tape hire will be FREE. If, within 28 days, I'm not delighted with your service you'll refund my membership fee.

Name \_\_\_\_\_

Address \_\_\_\_\_

YS1



## WIN THE POOLS?

48k

## SPECTADRAW 2 — THE BEST SELLING POOLS PREDICTION PROGRAM FOR THE 48K ZX SPECTRUM

The program looks at the recent form of the teams playing in each week's English and Scottish football league matches and then refers to a large database to see what has happened in the past when teams with similar form met. By combining the lessons learnt from the past with the teams' current league position, the program generates a draw probability factor for each match. It can then identify the matches which are likely to yield draws and output suitable predictions. It will also output the least likely draws for the benefit of those who prefer the fixed odds lines on coupons.

Program, 8000 match database (both on high quality cassette) and instruction manual £12.95 inclusive.

### NEW!!! SPECTASORT — THE PERM GENERATION PROGRAM

Spectasort takes the 14 most likely and 10 least likely draw predictions and produces ten 8 from 10 full over perms, enabling you to complete your pools coupon directly from the screen. The program will run on its own in 16K, using your own predictions, or has the unique feature of being able to merge with SPECTADRAW 2 to provide a complete Pools Prediction package!!

Spectasort program on high quality cassette £4.95 inclusive.

(Cheques / POs payable to B.S. McAlley)

## SPECTADRAW

1 Cowleaze, Chinnor, Oxford OX9 4TD



**Lines 3999-4010** Print crashed car and re-start game. UDGs are used in line 4000.

```

6999 REM Set up UDG's Cars ABCD Tree iJ
Road K
7000 FOR b=1 TO 7: READ a$: FOR n=0 TO 7
: READ a: POKE USR a$+n,a: NEXT n: NEXT
b: RETURN
7010 DATA "a",3,15,3,247,255,255,255,247
7020 DATA "b",192,240,192,239,255,255,25
5,239
7030 DATA "c",30,252,255,255,251,247,247
,15
7040 DATA "d",120,63,255,255,223,239,239
,240
7050 DATA "k",0,60,0,60,0,60,0,60
7060 DATA "i",16,16,24,56,84,124,186,214
7070 DATA "j",84,186,214,124,56,16,16,56
7080 DATA 0,.2,.5,.8,1.2,2,3,2,1,0,-1: R
EM data for engine sound

```

```
7099 REM print title screen
7100 LET a$="      .    .    .    .    ."
7110 LET b$="    .   .   .   .   ."
7120 LET c$="    .   .    .   .   ."
7130 LET d$="    .   .   .   .   ."
7140 LET e$="    .   .   .   .   ."
7150 PRINT AT 0,8;" R O A D"
7160 LET i=INT(RND*7)+1:PRINT AT 2,4;
INK i;a$;AT 3,4;b$;AT 4,4;c$;AT 5,4;d$;A
T 6,4;e$
7170 FOR n=156 TO 119 STEP -4:PLOT 0,n:
DRAW OVER 1;INK i;255,0:NEXT n
7180 RETURN
```

```
7189 REM saves and auto-run program
7190 SAVE "ROAD RACER" LINE 10
```

```
9997 REM Do not type in lines 9997-9999
9998 ERASE "m";1;"ROAD RACER"
9999 SAVE *"m";1;"ROAD RACER" LINE 10
```

# CLOCK THIS

The Basic program which performs this amazing feat includes two machine code routines as well as a self-performing checksum, which should ensure that you type the program in correctly. However, just to take all precautions, it would be wise to SAVE the program once typed in, before running it.

If you'd like a continuous on-screen printout of the time remaining before the alarm goes off, type in this Basic one-liner:

```
10 CLS : CLEAR 65119: RESTORE 300
```

```
15 PRINT TAB 4;"Alarm Clock1.D.Turtl  
e" TAB 5; FLASH 1;"Loading machine code  
"
```

```
20 LET sum=0: LET i=1
```

**Line 15-20** Print the on-screen message, and set the checksum and data counters.

```

30 READ a: IF a>255 THEN GO TO 50
40 LET sum=sum+a: POKE 65119+i,a: LET
i=i+1: GO TO 30
50 IF sum<>a THEN GO TO 200
60 LET sum=0: LET i=1

```

**Lines 30-60** Read the machine code for the interrupt routine and POKE it into memory. When all the interrupt machine code is installed, check to see whether an error has occurred.

```

70 READ a: IF a>255 THEN GO TO 90
80 LET sum=sum+a: POKE 65128+i,a: LET
i=i+1: GO TO 70
90 IF sum<>a THEN GO TO 200

```

**Lines 70-90** This area of the program carries out the same task as lines 30-60 for the alarm call machine code.

```

100 PRINT "O.K.": PRINT "How long before alarm?"
110 INPUT "hours";h: POKE 65532,h
120 INPUT "mins";h: POKE 65533,h
130 POKE 65534,0
140 POKE 65535,0

```



## SPECTRUM MECHANICAL JOYSTICK

### AT LAST - a joystick with no interface

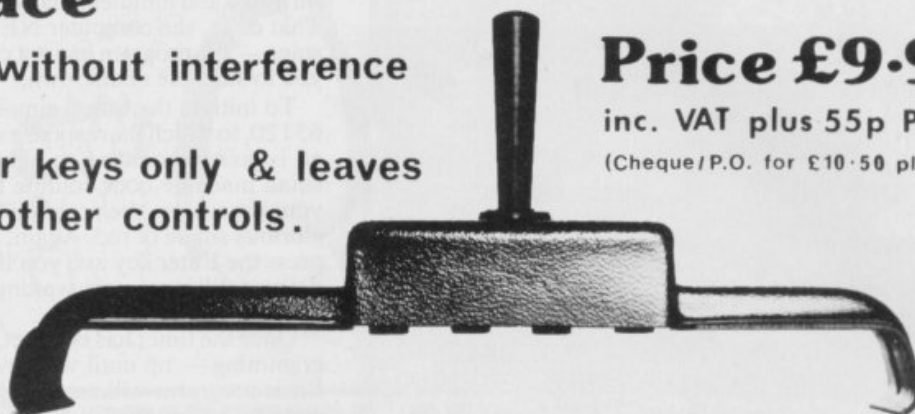
Clips on & off without interference to plug-ins.

Operates cursor keys only & leaves hand free for other controls.

**Price £9.95**

inc. VAT plus 55p P & P.

(Cheque/P.O. for £10.50 please)



Please order to:

E.E.C. Ltd. 1 Whitehouse Close,  
Chalfont St. Peter, Bucks, SL9 0DA

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

\_\_\_\_\_ POSTCODE \_\_\_\_\_



# ADVERTISERS

Advanced Software.....	59	Fantasy Software.....	16	Quicksilver.....	33
Ameba.....	44	Games Soft.....	40	Richard Shepherd.....	55
Anirog.....	48	Gilsoft.....	51	Redshift.....	4
Artic.....	OBC/68	Incentive.....	15	Rose Software.....	24
Calpac.....	62	Interface.....	14	Selec.....	44
Campbell.....	46	Kelwood.....	49	Silversoft.....	IFC
Carnell Software.....	12/13	Kemp.....	77	Software Projects.....	8/9
Cascade.....	51	Kosmos.....	59	Stack.....	32
CDS.....	IBC	MicoL.....	84	16/48.....	82
Computersound.....	24	Micromania.....	92	Time Scape.....	87
David Husband.....	76	Mikro Gen.....	81	Valhalla.....	69/61
DJL Software.....	10	National Software Library.....	92	Virgin.....	89
Digital Integration.....	26	Phipps.....	43	Vortex.....	36
Doric.....	25	Postern.....	34	Zeal.....	94
East London Robotics.....	38/9	Procom.....	28/30		
Eprom.....	44	PSS.....	42		

# INDEX



```

150 PRINT ""Don't forget to"" INVERSE
1;"RANDOMIZE USR 65120"
160 PAUSE 200
170 NEW
200 PRINT "Error in data"
210 LIST 9998: STOP

```

**Lines 100-210** Set the alarm time, POKE it into memory and then NEWS the computer.

```

300 DATA 62,9,237,71,237,94,201,911

```

**Line 300** The machine code for the interrupt routine.

```

310 DATA 255,243,245,58,255,255,254,0,4
0,6,61,50,255,255,24,76,62,49,50,255
320 DATA 255,58,254,255,254,0,40,6,61,5
0,254,255,24,58,62,59,50,254,255,58
330 DATA 253,255,254,0,40,6,61,50,253,2
55,24,40,62,59,50,253,255,58,252,255
340 DATA 254,0,40,6,61,50,252,255,24,22
,62,2,205,155,34,62,23,50,141,92
350 DATA 205,77,13,205,107,13,62,62,237
,71,237,86,241,251,201,11903

```

**Lines 310-350** The machine code for alarm call routine.

Here is a disassembled listing of the main service routine, which is included in lines 310-350 of the Basic program.

The alarm call routine

Machine Code	Assembler	Comments
10	CLOCK	RST 56
20		DI
30		PUSH AF
		Performs the keyboard scan which had been diverted. Disable the interrupts, ie. ensure this routine cannot be interrupted, and save the only register used onto the stack. The addresses used are: 65532 —count of hours remaining. 65533 —count of minutes remaining in the present hour. 65534 —count of seconds remaining in the present minute. 65535 —count of 1/50 of a second remaining in the present minute. Check if the 1/50 of a second counter has gone down to zero. If so, jumps to line 100 onwards which causes a decrement in seconds. If not, simply decrements the 1/50 of a second counter and jumps to the returning part of the routine (lines 430-450).
40		LD A,(65535)
50		CP 0
60		JR Z,BMPSEC
70		DEC A
80		LD (65535),A
90		JR END
100	BMPSEC	LD A,49
110		LD (65535),A
120		LD A,(65534)
130		CP 0
140		JR Z, BMPMIN
150		DEC A
160		LD (65534),A
170		JR END

Machine Code	Assembler	Comments
180	BMPMIN	LD A,59
190		LD (65534),A
200		LD A,(65533)
210		CP 0
220		JR Z,BMPHOU
230		DEC A
240		LD (65533),A
250		JR END
260	BMPHOU	LD A,59
270		LD (65533),A
280		LD A,(65532)
290		CP 0
300		JR Z,ALARM
310		DEC A
320		LD (65532),A
330		JR END
340	ALARM	LD A,2
350		CALL #229B
360		LD A,23
370		LD (23693),A
380		CALL #0D4D
390		CALL #0D6B
400		LD A,62
410		LD I,A
420		IM 1
430	END	POP AF
440		EI
450		RET

For those in the know, the data in line 300 of the Basic program generates a short routine to set up the interrupts, its task being to make the computer service the routine at address 65129. Here is the disassembled listing.

The interrupt routine

```

10 LD A,9
20 LD I,A
30 IM 2
40 RET

```

OP PRESS STOP PRESS STOP PRES  
OP PRESS STOP PRESS STOP PRES  
FROM THE APRIL ISSUE,  
WE ARE PLEASED  
TO ANNOUNCE THAT

**YOUR  
SPECTRUM**

**WILL BECOME  
A MONTHLY MAGAZINE**

For details on how to subscribe to **Your Spectrum**,  
make sure you don't miss the April issue.

OP PRESS STOP PRESS STOP PRES  
OP PRESS STOP PRESS STOP PRES  
OP PRESS STOP PRESS STOP PRES  
OP PRESS STOP PRESS STOP PRES  
OP PRESS STOP PRESS STOP PRES





**Nigel Searle, the managing director of Sinclair Research, is usually to be found standing on the edge of Sir Clive's 'white heat' limelight, leaving the public relations work to his dynamic boss. Your Spectrum's Phil Manchester tracked him down to a West London hotel and asked what it was like standing in the shadow of genius.**

**YOUR SPECTRUM:** How would you describe working alongside Sir Clive?

**NIGEL SEARLE:** It's obviously very stimulating. The biggest difference you'd find compared with working for anyone else is that Clive is not a conservative character in business terms. He doesn't mind taking risks. In many other companies you would be forced to play safe — which is something we at Sinclair Research rarely do. And you get the opportunity to do some pretty exciting things that you just wouldn't get elsewhere.

**YS:** Can you be more specific?

**NS:** Well, we were trying to put a deal together with American Express. I was in the US handling the negotiations and they suggested that we should share some of the up-front risk. It required us to make a decision to spend about \$1.7 million. I was talking to them on the phone from Boston to New York and felt that it was something I should consult Clive about. So I called him in England and talked to him on the phone — literally for less than a minute. He wanted to know how much and I told him. Then he asked how I felt about the deal and I said it seemed good to me but it wasn't my money. He said it sounded all right to him too and I phoned American Express back within five minutes and said "Yes". I could tell over the phone that they were amazed any organisation could take that sort of decision so quickly.

**YS:** That's certainly positive enough, but surely working for someone like that must also have its negative side?

**NS:** Well, he obviously has very strong opinions of his own — but I don't think he undervalues other people's opinions either. You'd hardly be surprised to hear that he is very ambitious and demands a lot of other people. And, like many of us, he gets very impatient when things don't move along as quickly as he'd like them to. But the main thing is if you've got an opposing opinion and back it up with a good argument, then he'll listen.

**YS:** Your approach to launching products seems a strange mixture of secrecy and hints about what might be coming.

**NS:** Things happen for different reasons.

For instance, the Microdrive was announced the same day as the Spectrum — and we announced it because we thought it was a highly innovative mass storage system and that it would be a prime reason for people to buy the Spectrum rather than any other product. The Spectrum had no disks, so we wanted to make it clear that something was coming that would offer the same sort of thing. So it was done for pre-emptive reasons in April '82. We knew that it was not there and deliverable in April; we never suggested it was.

We did believe in all sincerity that it was going to be available in autumn '82 — but a number of things happened to delay it. One was that we had trouble getting the Spectrum into large volume production, and a lot of engineering effort that would have gone into the Microdrive was diverted to the Spectrum. Also, some of the problems that had to be resolved — the speed and capacity — took longer to solve than we had anticipated.

**YS:** Is it true that you had to install two extra phones at your head office to handle early complaints about the Microdrive?

**NS:** No. The only thing we decided to do with some early Microdrives — the first hundred or two hundred we sent out — was to include a special letter to the customers explaining that they were literally getting the first Microdrives. And we gave them, I think, only a single telephone number — but maybe it was two — for contacting the engineers who worked on the Microdrive. We invited customers to use those numbers in the case of any problems or if they felt they needed any advice.

**YS:** The Spectrum has come in for its share of criticism especially for the design of keyboard. Was this purely an economic decision?

**NS:** I think the main consideration was cost. When we designed the Spectrum a couple of years ago, the keyboard offered us a major opportunity to save on costs. In fact, it doesn't matter quite so much nowadays because the price differential between what you find on the Spectrum and a more typewriter-like keyboard is not so great. But it's interesting that IBM has used a Spectrum-like keyboard for its PC Junior, just announced, which is going to sell for \$669. I think they are

going to have a tough time defending the keyboard at that kind of price.

**YS:** Did you go for a function-based keyboard because it cut down on the typing?

**NS:** In some ways we did, but it was more because we saw the Spectrum as a ZX81 with colour. We deliberately chose a design which emphasised the programming side of the machine. At the time it seemed that Atari had the games machine side of things sewn up so it was ridiculous to try and compete with them. Of course, things have worked out very differently.

**YS:** You obviously had to offer a machine with Basic, despite the criticism the language receives. Did it occur to you that you could have improved on it?

**NS:** In retrospect I think we could have done more to improve it. In fact we have a project going on within the company now to develop a version of Basic which will get rid of most of the disliked features. The problem is that by the time you do that I'm not sure it's Basic anymore. Perhaps we should just design the language people really want — and then say it's Basic so that they will buy it. But I think the new version will be a significant step forward. Basic is not dead — it's just got a lot of things wrong with it which are fixable. *(The new version of Basic Nigel Searle is alluding to is the command language, Super-Basic, which is present on Sinclair Research's QL computer. For more details on this new device, look no further than QL User in this issue. Ed.)*

**YS:** Can you explain the thinking behind the decision to modify the early Spectrums with the so-called 'cockroach'?

**NS:** When you get a problem of that type, if you stop and wait for the new component — a new uncommitted logic array (ULA) — then you've got a hold-up of several months. I think people would rather have a product that works with a 'cockroach' in it than have nothing at all.

And again, times have changed. We were the first company to use the ULA on the ZX81 and I think our use of it showed our lack of experience. I don't think we'll make that mistake again. □



# The CDS experience, more action...more adventure...

This is Timebomb a brand new Arcade Adventure game from CDS. Just one of a new range of exciting programs....



new...  
Spectrum  
Education

**£5.95**  
**Currah  $\mu$  Speech**  
**compatible**



## CDS Micro Systems

ONLY £5.95 each at W.H.Smiths, \*Boots, John Menzies and other leading Computer Stores, or... direct from CDS Micro Systems  
Send Cheque or P.O. To CDS 10, Westfield Close, Tickhill, Doncaster DN11 9LA. Tel: (0302) 744129. (Trade enquiries welcome)

\* Selected titles only



# BEAR BOVVER



It's no  
picnic!

