

# POPULAR Computing WEEKLY

35p

16/23 December 1982 Vol 1 No 35

## This Week

### ZX81 QSave

Stephen Adams looks at QSave — a hard and software device that speeds up loading and saving on the ZX81. See page 13.

### Vic20 skeleton

Asghar Ahmed provides a lesson in anatomy with this program for the Vic20 on page 27.

### Singalonga Dragon

Keith and Steven Brain explain how to play Christmas carols on the Dragon 32. See page 29.

### BBC Computer Programme

David Kelly talks to David Allen about the BBC's 2nd Computer Programme which will go on the air in January. See page 11.

**STAR**  
Santa Claus  
on Spectrum  
and Dragon.  
**GAME**

## News Desk



Members of the BMMG outside No 10 Downing Street.

## Sinclair critical of BMMG stance

SINCLAIR Research has reacted critically to last week's proposals to protect the UK micro-computer industry from 'unfair' foreign competition put forward by the British Microcomputer Manufacturers' Group.

Instead the company — a member of the group — has proposed its own help formula.

The main BMMG proposal — a twelve-month embargo on US and Japanese micro-computer imports — is rejected by Sinclair. Clive Sinclair, in a written statement, said: "We do not believe that the BMMG package represents the most helpful way forward. Essentially it seeks to solve problems — caused by

Continued on page 5

## Independent authority for cable tv

THE government has decided to set up an independent authority to govern the introduction of cable television in Britain.

The new authority, which will be completely separate from the Independent Broadcasting Authority, was announced by Information Technology Minister Kenneth Baker during a Commons debate on cable television. A White Paper detailing the authority's terms of reference will be released early next year.

Kenneth Baker also revealed the government's preference for a "switched star" system as opposed to "tree and branch". He conceded that this option would be more expensive, but said it had more potential for interactive communication.

The government also expressed a preference for fibre-optic cable as against the conventional copper co-axial cable.

## Classified

### Computer Swap 01-930 3266

Free readers entries to buy or sell a computer.  
Ring 01-930 3266 and give us the details.

ATARI VCS CARTRIDGES, Black Jack, Video Olympics, Brain Games, Break Out, Air-Sea Battle, £12 each. Space Invaders £15. Video Chess, £35. Tel: 01-790 7511.

VIC SUPER expander cartridge, brand new, unopened, £30. Tel: Kidderminster 515285.

## Classified

SWAP 16K ZX81 external keyboard. New style printer, sound board, I-O port (eight relays), £50. Or software tapes, cassette deck, manuals, magazines, etc for 12+12 Atom, £150 ono. Tel: 01-789 4260.

SPECTRUM 16K, 6 tapes + book, £130 for immediate delivery. Tel: 01-318 7136.

VIC20, Data cassette, 3K RAM, super expander, programmers aid, 3 software cartridges, £50 of cassette software, joystick, into Basic part one, books, £350. Tel: Ware 870273.

ATARI 400, 32K, mint condition, includes programme recorder, manuals, joystick and several games programmes, £275. Tel: 041-959 4455.

## Classified

VIC20, cassette deck, ARFON expander, 16K RAM cartridge, super expander, joystick, £80 of software, £30 of books, mint condition, £375 ono. Richard, Hurstpierpoint 833255.

FULLY EXTENDED ATOM, 12K + 16K, toolbox, Rom, FP Rom, colour board, PSU, VIA, bus buffers, £200.00 ono. Tel: Daytime 0494 23598, evenings 0844 216323, Mr G. Marsh.

VIC20. Data set, books, 16K, super expander cartridges and cassettes, worth £550.00, selling for £300.00. Tel: 0978 822505.

SPECTRUM 16K. Hardly used, still in box with magazines plus two cassettes, £130.00 ono. Tel: Basildon 553963 (David Edwards).

## Classified

PET 4008. New Rom 8K, manual, books plus software, including games with touch-sensitive controls, programs aid and assembler cassette deck, original packaging, £400.00 ono. Tel: 0702 558414.

OSBOURNE 1 COMPUTER plus software, Olivetti ET121 electron typewriter with RS 232 communications which doubles as printer for the Osborne. Both as new, £750.00 + £550.00 respectively or £1,200.00 for both. Tel: Rossett (0244) 571063.

APPLE II, intelligent interface board RS232, Serial, £90. Tristel printer + manual as new, £110. Tel: Camberley 24706.

Continued on page 32

## BATTLESTAR IS COMING



# ABERSOFT

7 MAESAFALLEN, BOW ST, DYFED, SY24 5BA

## ZX81 & Spectrum Games

**Chess 1.4:** Ten levels m/c graphic screen display.

16K ZX81 £8.95

**Invaders:** Very fast m/c action. Includes mystery ship and increasingly difficult screens.

16K ZX81 £4.45

**Mazeman:** A fast action m/c game that reproduces the spirit of the original. The Spectrum version includes excellent graphics.

16K ZX81 £4.45 - Spectrum £4.95

Can also be used with AGF joystick.

**Adventure 1:** Based on the original game by Crowther, this game was the start of the Adventure craze. Reviewed Sinclair User, issue 2. Features Save game routine as the game can literally take months to complete.

16K ZX81 £8.95 - 48K Spectrum £9.95

See us at the 5th ZX Microfair.

We have full stock of all programs and supply by return of post (which is included in the price)

campbell  
systems

THE VERY BEST IN MACHINE CODE  
FOR THE ZX SPECTRUM & ZX81

**SPECTRUM 16K GULPMAN** game of the '.....man' variety with 15 mazes, 4 chasers, laser defence, 9 grades, 9 speeds, demo mode, choice of joystick control. "An extraordinarily good program" raves Boris Allan for Popular Computing Weekly. We think you will agree. £5.95

**SPECTRUM 48K MASTERFILE** business/domestic filing and reporting system. So flexible that it is equally usable for your mailing lists, catalogues, stock control, text extracts ..... applications are endless. Fully user-defined data and report display formats, dynamic variable-length file, records and data items. Fully menu-driven with powerful search facilities, sorting, total/average, update, multiple independent files, printing. Yes, we aim to support microdrive when Uncle delivers. Nearly all the 8K we use is machine code, so you get 32K per file. Comes with example file and 22-page manual. £15.00

**SPECTRUM 16K SPDE** Disassembler and Editor, as used by other ZX professionals, and we used it to develop the above. £5.95

**ZX81 16-48K THE FAST ONE** is the predecessor to MASTERFILE and is in use all over the world now. Specification is very similar to MASTERFILE. £12.00

**ZX81 16K GULP 2** almost identical spec to GULPMAN. £4.75

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

CAMPBELL SYSTEMS  
(Dept. PC)  
15 ROUS ROAD  
BUCKHURST HILL  
ESSEX IG9 6BL  
ENGLAND 01-504-0589



# THE SPECTRUM POCKET BOOK

160pp  
**£6.50**

Trevor Toms, best selling author of the ZX81 Pocket Book and the Sinclair Learning Lab, turns his attention to the ZX Spectrum — the book you have been waiting for! All the material in the book is totally new.

### Programs

- Castle walls; boiling oil and lovely slurping noises
- Great Fire of London; try and change the course of history
- Chase; outwit the pursuing robots and lead them to their doom
- Truly amazing; generate a new maze puzzle every go
- Reversi; the classic oriental strategy game with board screen display
- 3D Maze; race against time and three dimensions to escape.

**Also Available** ZX81 Pocket Book 138pp ..... £5.95  
ZX80 Pocket Book 128pp ..... £4.95  
Atom Business 110pp ..... £7.50

### Hints & Tips

Discover new ways of using PRINT; INSTR functions, VAL, PRINT USING, hexadecimal conversion, upper case conversion, load and save arrays. BEEP with sliding tones, automatic scroll and how to use all the machine features within machine code.

### Machine Code

All the tools you need to write machine code effectively. Graphics tool kit — debug monitor — symbol assembler (with labels, all ED commands, ORG statements, forward and relative jumps) — disassembler (with label assignment); now you can really dig into the Sinclair ROM! This section alone would be stupendous value for money!

**Cassettes** Spectrum games as opposite ..... £5.00  
Spectrum machine code as above ..... £5.00  
**for ZX81** Nowotnik Puzzle, Demolition & Tenpin ..... £5.00  
3 Adventures: Greedy Gulch,  
Magic Mountain, Pharaohs Tomb ..... £5.00  
**Prices** include VAT ZX81 Pocket Book Cassette ..... £5.00

## PHIPPS ASSOCIATES

Dept FREEPOST EM463 (No stamp required)  
99, East St, Epsom, Surrey KT17 1BR.  
Telephone 03727-21215. 24hr phone service.

Prices include postage but for air mail delivery in Europe add 90p (outside Europe add £2.20) per item.

Access and Barclaycard accepted





## The Team

### Editor

Brendon Gore

### News Editor

David Kelly [01-930 3271]

### Sub-editor

Ninette Sharp

### Editorial Secretary

Theresa Lacy

### Advertisement Manager

David Lake [01-839 2846]

### Advertisement Executive

Alastair Macintosh [01-930 3260]

### Managing Editor

Duncan Scot

### Publishing Director

Jenny Ireland

*Popular Computing Weekly*,  
Hobhouse Court, 19 Whitcomb Street,  
London WC2  
Telephone: 01-839 6835

Published by Sunshine Publications Ltd.

Typesetting, origination and printing by  
Chesham Press, Chesham, Bucks

Distributed by S M Distribution  
London SW9. 01-274 8611. Telex: 261643

© Sunshine Publications Ltd 1982

### Subscriptions

You can have *Popular Computing Weekly* sent  
to your home:  
UK Addresses

26 issues ..... £9.98  
52 issues ..... £19.95

Overseas Addresses

26 issues ..... £18.70  
52 issues ..... £37.40

### How to submit articles

Articles which are submitted for publication  
should not be more than 3,000 words long. The  
articles, and any accompanying programs,  
should be original. It is breaking the law of  
copyright to copy programs out of other maga-  
zines and submit them here — so please do not  
be tempted.

All submissions should be typed and a double  
space should be left between each line. Please  
leave wide margins.

Programs should, whenever possible, be  
computer printed.

We cannot guarantee to return every submit-  
ted article or program, so please keep a copy. If  
you want to have your program returned you  
must include a stamped, addressed envelope.

### Accuracy

*Popular Computing Weekly* cannot accept any  
responsibility for any errors in programs we  
publish, although we will always try our best to  
make sure programs work.

## This Week

### News 5

Sinclair criticises BMMG.

### Letters 7

Of horses and donkeys.

### Santa Claus 8

A new game for 16K Spectrum and  
Dragon 32 by David Lawrence.

### Street Life 11

David Kelly talks to David Allen of the  
BBC.



### Reviews 13

Stephen Adams looks at QSave.

### Open Forum 16

Six pages of your programs.

### Programming 27

Asghar Ahmed takes a look at the  
human skeleton with his Vic20.

### Spectrum 28

Unifile — module 6.

### Dragon 29

Singalonga Dragon.

### Machine Code 30

Crashing and multiplying.

### Peek & poke 31

Your questions answered.

### Competitions 35

Puzzle, Ziggurat, Top 10, Losers.

## Editorial

Christmas is traditionally a time for  
looking back over the past year and  
reflecting on the various successes  
and disappointments. However, rather  
than bore you with a list of achieve-  
ments and failures that is all too  
familiar, I would prefer to concentrate  
on some of the wider implications of  
cheap, readily available, micro-  
computers.

The micro revolution is undoubtedly  
upon us, though it has arrived almost  
unnoticed. Like the motor car, the  
micro will change the way in which we  
live forever. But, as with the motor car,  
it is difficult to predict what will be  
happening in two or three years time,  
never mind twenty or thirty.

What does seem certain, however,  
is that more people than ever before  
will own or have access to a computer.  
At this time last year some 200,000  
people in Britain owned their own  
micros. The comparable figure this  
year is at least 600,000 and probably  
much greater. By next year the figure  
is likely to be in the millions.

Just as the industrial revolution  
brought unparalleled opportunities, so  
the micro revolution is opening up a  
whole new world for our generation. It  
is up to us to make the most of it.

A Merry Xmas to all our readers.

## Next Thursday

Following our combined issue this  
week, there will be no issue of *Popular  
Computing Weekly* next week — but we  
will be back with another action packed  
edition on December 30.

Mike Grace will take another look at  
some of the latest software for the  
Vic20 while David Angier will present a  
disassembler program for all 6502  
based machines.

## Subscribe to Popular Computing Weekly

I would like to subscribe to *Popular Computing Weekly*.

Please start my subscription from the ..... issue.

UK Addresses: ☐ 26 issues at £9.98 ☐ 52 issues at £19.95

Overseas Addresses: ☐ 26 issues at £18.70 ☐ 52 issues at £37.40

Please tick relevant box

☐ I enclose my cheque to *Popular Computing Weekly* for .....

Name .....

Address .....

Please send this form, and cheque, to *Popular Computing Weekly*, Subscription Dept., Hobhouse Court, 19  
Whitcomb Street, London WC2 7HF.



## COMPUTERS—WEST WALES

### BBC MICRO'S IN STOCK NOW

MODEL A — £299

MODEL B — £399

#### FEATURES INCLUDE:

- ★ 73 KEY FULL TRAVEL KEYBOARD
- ★ HIGH DEFINITION COLOUR GRAPHICS
- ★ 3 VOICE MUSIC SYNTHESIS PLUS 'NOISE'.
- ★ 10 USER DEFINABLE FUNCTION KEYS

### PLUS MUCH, MUCH MORE

#### EXPANSION OPTIONS (MODEL B) INCLUDE:

- ★ DISC ★ COLOUR MONITOR ★ PRINTERS
- ★ SPEECH SYNTHESIS ★ PADDLES
- ★ THE 'TUBE'

A/B UPGRADES (SAME DAY BY APPOINTMENT)  
£106

WE ALSO STOCK THE ATOM AND ZX81 MICRO'S

ALL PRICES INCLUDE VAT AT 15%  
SECURICOR DELIVERY £10. POST £3

\*\*\*\*\*  
CALL IN AND SEE THIS GREAT MICRO AT OUR SHOP IF YOU  
LIVE IN OUR DISTRICT, OR SEND SAE OR PHONE FOR FULL  
DETAILS OF CURRENT STOCKS.

## CARDIGAN ELECTRONICS

CHANCERY LANE (NEAR WOOLWORTHS)

CARDIGAN, DYFED

TEL: 0239-614483

CLOSED ALL DAY WEDNESDAY

## MILLSOFT.

### QUALITY SOFTWARE

FOR ATARI, BBC, 48K SPECTRUM

#### DATAPAD

For ATARI 400/800. On CASSETTE

With Datapad you can create your own personal computerised database. Names and addresses, phone numbers, etc. All added or recalled with ease. Typical capacity 16K: 65 names and addresses; 32K: 135 names and addresses; 48K: 200 names and addresses. Only £6 inc. CASSETTE.

#### RISE & FALL + SAFECRACKER

For 48K Spectrum

This popular business challenge plus the chance to rob the boss, both on one cassette.  
SPECIALLY OFFERED FOR CHRISTMAS  
at only £3.50 inc.  
MUST BE A BARGAIN FOR TWO GREAT GAMES.

#### MAZESCAPE

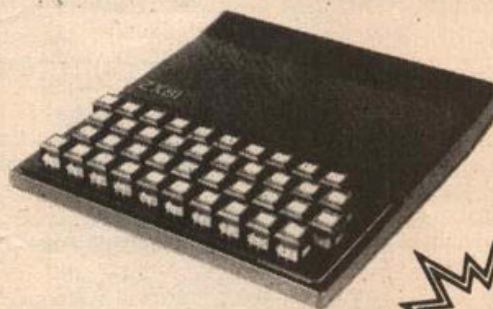
For 32K BBC machines

A fast-moving 3D maze game. Features skill selection, colour options. See if you can escape from this one.  
Only £6 inc.

Cheques or POs to: Millsell, Clock Mill,  
Measham, Burton-on-Trent DE12 7JG

## KEMPSTON MICRO ELECTRONICS ZX KLIK - KEYBOARD

- Fits on to the ZX81.
  - No soldering needed on the assembled version (just plug in)
  - No trailing wires.
  - No special case required.
  - Positive feedback from keys.
  - Full two colour legends supplied.
  - Full back-up service offered, including fitting.
- This is a genuine 40-key, push button keyboard which fits into the recess formed after peeling off the existing touch sensitive keypad.  
41 key version available at £26.50  
New ZX-81 Auto Repeat module (like the Spectrum) £6.95.



£26.00

### KEMPSTON (Micro) Electronics

180A Bedford Rd. Kempston, Bedford MK42 8BL

#### Price Breakthrough!

Spectrum Joystick complete with its own purpose built interface which simply plugs into the back of the Spectrum for only £19.50 inc. VAT.

Supplied with sample software and a full set of instructions for use in your own basic programs.

At last you can play true arcade type games without fumbling for keys.





## Sinclair's way

Continued from page 1

regulations — with new regulations. It would be more in keeping with the spirit of the present government to dismantle existing controls which inhibit initiative and growth."

Three courses of action are proposed by Sinclair Research:

- Present government procurement policy should be overhauled to ensure equal opportunities for UK manufacturers.

- The present 17 percent duty on many imported electronic components should be substantially reduced. It compares unfavourably with the 6-8 percent duty on fully-assembled products imported, and discourages UK manufacture.

- Government should exert maximum diplomatic pressure to remove hidden UK export controls. According to the Sinclair statement many foreign governments regularly breach EEC or GATT international trade regulations.

Sinclair Research is understandably not keen to see any import restrictions applied to the UK because of possible reprisals by other countries. A substantial proportion of the company's computer production is exported. The ZX81 sells well in the competitive Japanese market and the new Timex 1000 is much sought-after in the US.

## Spectrum goes on sale at W H Smith

THE Sinclair ZX Spectrum is now available over the counter at selected W H Smith stores. Previously, it was only available by mail order.

W H Smith, which already stocks the ZX81, began selling the Spectrum at 65 branches last week.

Stewart Binnie, W H Smith merchandise controller, said: "Demand exceeds supply at present, but we anticipate large deliveries as Christmas approaches. First deliveries of the 16K Spectrum begin this week to 65 branches which already have the 48K Spectrum."

"Initial quantities of Spectrum software are now available."



## Sord takes the plunge

THE SORD M5 computer goes on sale in the UK in late February 1983.

It will sell both through major high-street stores and the dealer network that the company has been developing since opening its UK office a little over two months ago.

Priced at £169, the M5 machine is supplied with power pack, leads and three Rom

cartridges — Basic 1 and two games cartridges. Other games cartridges, FALC (a version of Sord's Pips for the M5) and joysticks will go on sale simultaneously but so far no prices have been agreed.

The Z80-based M5, with 8K Rom, 4K Ram and 16K video Ram, went on sale in Japan in October and America in November.

## January computer show

LONDON Home Computer Show will be held at the Royal Horticultural Society Old Hall in Vincent Square, London from 7 to 9 January, 1983. The show will be open from 10 am to 6 pm on Friday and Saturday and from 10 am to 4 pm on Sunday.

The main emphasis of the show will be on microcomputers selling for less than £200 — although material for the Lynx and BBC machines will be included. Entry will cost around £1.50.

More details from Neil Johnson (01-437 1002).

## Vics use Pet peripherals

INTERPOD is a new unit which allows Pet peripherals to be used by either the Vic20 or Commodore 64 machines.

The device attaches to the serial bus of the Vic20 or 64 and provides IEEE and RS232 interfaces. So these machines need not be restricted to using the 174K of the Vic 1540 single disc drive.

Use of a wide range of peripherals including the Pet 4040 (1/2M), 8050 (1M) and 9090 (10M) disc units is possible. The Interpod has two IEEE ports so a printer or graph-plotter can also be used. The RS232 output has selectable baud rate (between 50 and 7,200 baud), parity and device numbering.

Mark Clark from Oxford Computer Systems who produce the unit explained: "The interpod just plugs straight in, and no alteration of the Vic software is necessary to operate it. As long as there is no device number clash, up to seven disc drives can be connected at the same time. In fact, up to 28 devices can be



driven simultaneously, using the Interpod unit."

Interpod is available from Oxford Computer Systems Ltd, The Old Signal Box, Hensington Road, Woodstock, Oxford, priced at £125 plus VAT.

## Talk dispenser

COCO-COLA is to introduce video-game vending machines in the US.

The company plans to install new machines which give customers a free play of a video game with every purchase made. The dispensers give a choice of two games, played on built-in screens, which last for about 30 seconds.

The new selling strategy is a follow-up to the introduction last year of talking Coke dispensers.

## Ace gets users group

A JUPITER Ace Users group has been formed by the Brighton-based software house, Remsoft.

Members paying the £7 subscription fee will receive three issues of a newsletter including hints, tips and special offers. John Noyce, co-founder of the group said: "The Ace is a lovely little machine, but it will need programs for its current unexpanded 3K form before users can fully benefit from its uniqueness."

As of January, production of the Jupiter Ace in Bury St Edmunds is being stepped up to 3000 units per month.

## Commodore profits up

COMMODORE sales for the year to June 30, 1982, have risen to over £189m — 63 percent up on the previous year.

The company has also announced profits up to £25.2m. from last year's total of £15.5m.

Sales of microcomputer systems now account for 75 percent of the company's sales — the Pet range continues to sell well and the Vic20 has recently become the world's best selling microcomputer. Commodore UK is one of the company's largest divisions, accounting for 25 percent of world sales.

By far the biggest growth of micro sales was seen in the US, where an increase of some 190 percent was seen. Over 800,000 of the 1m Vic20 machines so far sold were bought in America. In the rest of the world microcomputer sales rose by a comparatively modest 34 percent.

In the UK the upward trend seems set to continue. British sales in the first quarter of 1982-3 showed a 120 percent increase over the same period in 1981-2.

## Everything but a computer or the kitchen sink

A NEW wristwatch from Seiko incorporating both a 3cm tv screen and an FM radio is to go on sale in Japan this month — costing around £267.



NEW . . . BIGGER . . . BETTER

## BUFFER micro shop

We are MOVING up the road to

310 STREATHAM HIGH ROAD,  
LONDON, SW16

★ ★ ★ ★ ★

The world's oldest Sinclair-orientated  
software shop packed with goodies for

## ZX81 & SPECTRUM

★ ★ ★ ★ ★

Try before you buy — continuous demonstrations

Open 10.30 am to 5.30 pm

Tuesday to Saturday (closed Monday)

★ ★ ★ ★ ★

Please send large S.A.E. for catalogue  
and indicate for which computer

MEANWHILE, we are still at

374a Streatham High Road, London,  
SW16

Telephone: 01-769 2887

# GEMINI SOFTWARE

## ZX81 (16K) SPECTRUM (48K) STARTREK

Features an 8 x 8 Galaxy, Klingons and Starbases, short and long  
range scans, Torpedoes and Phasers, Computer etc.

PLUS Normal or Hyperdrive: choose your speed but watch the  
energy level.

Galaxy Map: keep track on where you have been. Also, shows  
whether any Klingons remain there, and where the starbases are.

Visual display of Enterprise's position and movement.

Visual display of photon torpedo.

Messages from crew members.

5 levels of play. And much more.

Cassette plus full instructions.

ZX81 £4.95

Spectrum £5.95 (colour and sound too)

Good software wanted.

## GEMINI SOFTWARE

36 BADMINTON ROAD, LEICESTER LE4 7RQ  
TEL: (0533) 64915

# ROMIK SOFTWARE

24 Church Street, Slough SL1 1PT. Telephone: Slough (STD 0753) 71535

### SHARK ATTACK

For unexpanded Vic20

You are in shark-infested waters after being  
thrown overboard from a pirate ship. Your  
only protection being an atomic net which you  
trail behind you, trying to cover all the visible  
ocean and ensnare the sharks at the same  
time. Beware of stopping or covering your  
tracks for too long, if you do, then the sharks  
will escape and come after you. Watch out for  
the ever increasing deadly octopuses (some-  
times the sharks will eat part or all of one!)

### MOONS OF JUPITER

For expanded Vic20, 3K, 8K or 16K

You are the Commander of a fleet of des-  
troyers looking on from the safety of a mother  
ship, you send in one destroyer at a time to  
blast a passage through the MOONS OF  
JUPITER. Your destroyers have to dodge,  
and blast the UFOs . . . Watch out for the  
Gologs they can smash your destroyers, but  
you cannot harm them.

### A Machine Code

Arcade Quality Game

### SEA INVASION

Unexpanded Vic20

Fight off the attacking sea creatures for as  
long as you can. Shoot the whale for a  
surprise score, watch out for the crabs,  
starfish and octopuses.

### MARTIAN RAIDER

For unexpanded Vic20

Skim as close as you dare to the surface of  
the planet, devastating the Martian cities,  
destroying ammunition dumps (gaining more  
time), shooting down the ground-to-air mis-  
siles.

### SPECIAL OFFER . . .

C4 COMPUTER CASSETTES

£2.50 for 10; £20 for 100

Available post free from the above address  
only

ROMIK PROMISE  
A MINIMUM OF  
ONE NEW GAME  
EVERY MONTH



### MULTISOUND SYNTHESIZER

For the unexpanded Vic20

The Vic Multisound Synthesizer is very flexi-  
ble and can be played in more ways than can  
ever be explained here, to create music and  
special effects. For example, create any tune,  
up to 255 notes (after following appropriate  
instructions), then press "F1" or "F3", then  
key "9" and enjoy the added effect. Now hit  
"+", listen to the difference. For a surprise  
— hit "—". Now add a melody over the top —  
hit key "8" then "7" — now play a melody,  
or experiment. Have fun!

### MIND TWISTERS

For unexpanded Vic20

Four games to stretch your brain  
Blackjack, Decipher, Four Thought and Teas-  
er are our computerised versions of very  
popular home games and will test your  
mental agility and skill for many a long hour.

### Machine Code

Arcade Quality Game

### SPACE ATTACK

For the unexpanded Vic20

Space Attack is a game of skill. You as the  
pilot of an intergalactic battleship have to fight  
your way through wave after wave of various  
alien spaceships.

ALL PROGRAMS ARE £9.99

### ROBOT PANIC

A fantastic high-speed game on cartridge.  
The price is yet to be announced, but around  
£16 . . .

OUR GAMES ARE AVAILABLE FROM ALL  
GOOD HOME COMPUTER STORES.

## Avenger for the ZX Spectrum (16/48k RAM)



### FEATURES

- ARCADE ACTION
- Eight different types of target.
- Rapid manoeuvring of ship.
- Quick firing of bombs and lasers.
- "Intelligent" alien interceptors.
- Realistic bombing trajectory.
- Continuous display of MISSION TIME, SCORE, SHIELD & LASER TEMPERATURE.
- End of mission report.
- Five levels of play.
- Full use of sound effects and colour.

□ Written by Kevin Flynn.

Send cheque or P.O. for £5.00 including P&P to:



### ABACUS PROGRAMS

186 St. Helens Avenue,  
Swansea, W. Glam. SA1 4NE

only  
£5 inc.





## Some talk of a gift horse

I am writing to you, unfortunately, to complain. I have just had a personal computer bought for me by my parents. Unfortunately, due to the fact that it was for my birthday, they did not consult me about what make I wanted.

It is an Atari 400 and I am very pleased with it, but I have been trying to get some of your programs to run on it. I have not met with any success even when trying to convert it over to Atari 400 basic.

I have been collecting your magazine since No 2 and am extremely disappointed to see you do not print programs for my computer. It is a very popular computer and it has been featured in other magazines. Please could you print some games occasionally that will work on it and by this will attract a lot more readers.

Paul Harvey  
16 Castle Road  
Epsom  
Surrey KT18 7NZ

We have been expanding our coverage recently to include a slightly wider range of micros. Our first review of Atari software was published in our December 9 issue.

We will be publishing a few Atari games in the New Year, depending on demand.

## Goodwill and the agent

As service agents for W H Smith & Son Ltd, we feel a reply is needed in respect of the letter you published from Mr Alan Jones in your November 25 issue.

As long established service agents for various organisations, we have always operated on the basis that damage to a product cannot be covered by a guarantee; a fairly common principle. After all, guarantees are for protection against manufacturing defects, not subsequent damage.

The ZX81 keyboard can be damaged by pressing it with a hard object and in the past we have felt justified in charging for replacing these where damage was obvious. However, W H Smith & Son Ltd have asked that we now adopt a more lenient attitude towards their customers. As a result, such

repairs are now being carried out at no charge and are being returned with a pictorial explanation to avoid a recurrence.

Unfortunately, Mr Jones's repair took place before this instruction from W H Smith was given, although we still maintain there was nothing unfair about our actions.

He will be receiving a refund and as such will be benefiting from his suppliers' (W H Smith) desire to go beyond the requirements of the Sale of Goods Act to ensure their customers' goodwill.

In this particular instance, the keyboard was so badly damaged that this was noticed and recorded by our clerical staff before being passed to our engineers.

M H Wright  
Interservice Electronics Ltd  
87-91 Park Street  
Southend-on-Sea  
Essex

## From No byte to byte mode

In reply to K Robertson's letter in Vol 1 No 29, I can confirm that the listing, as published, works. It looks as if his program has gone from No byte mode to byte mode. Addresses 66 to 72 should have been:

66 or L	181 ASN
67 JRNZ,72	32
	37
69 INC (IY+64)	253 CLEAR
	52 4
	64 @
72 PUSH BC	197 OR
	if in Byte mode.

E A Kissack  
43 St Georges Road  
Wittering  
Peterborough  
Cambs

## Confused by error messages

The Vic20 must surely be one of the most bug-free computers available. That said, and although the Vic20 file handling is excellent, it can become a little confusing when faced with error messages that are unknown even to Commodore. Try these short examples:

Enter VERIFY """,2. This gives "Illegal device number". How about For H = 3 to 255:Open H,H:Next giving "Too many files".

Run this: 10 Open 1,0:Input 1,K then type a string and Return. A "File data" error occurs instead of "Bad data" listed in the manuals. Enter Verify """,6. This gives "Missing file name". Also, when the Vic encounters an end of tape marker, it replies with "Device not present" error instead of "File not found".

Maybe these anomalies do not occur with all versions of the Vic, but they do with my early Japanese machine. Now let us see if anyone can find any more Vic20 error messages.

Colin McCormick  
29 Randwick Park Road  
Plymouth  
Devon PL9

## Dragging it out by the roots

Thank you for starting the Dragon page. As the sometimes proud owner of a Dragon 32 and being a novice at programming/using micros, I was beginning to despair and slowly losing more hair!

I am now waiting with bated breath for the manual of that "well-known colour computer" (why couldn't you say Tandy?), in the hopes of becoming enlightened.

I have just finished reading a piece in an Australian magazine about the other machine and there are two points which will be of interest and perhaps use to other owners.

1. The maximum size of an array used with Get/Put commands is 1,400 elements.
2. If you want to increase the speed of this already fast beast, use Poke 65495,0. It really does work but be warned — do not use cassette statements and be prepared for Sound and Play commands to be rather strange, although still acceptable as sound effects.

The problem with the speed increase is that the only way I have found of turning it off is by manually resetting the machine! Peeking the location returns a value of 126 — always. I have tried Poking it with all sorts of numbers, but it always says it contains 126. This is a shame because, if resettable, it would provide a simple method of having two levels of speed in games.

I have tried using it on the Flying Saucers game (Popular Computing Weekly, November 4) and it makes it very difficult to win (I think my wife is going to see her solicitors). Perhaps someone could solve this for me and allow my hair to grow again!

Dickon Smith  
Flat 1  
Bridge Garage  
Main Street  
Grove  
Wantage OX12 7HR

## Fastening the donkey's head

In your magazine dated October 28, there was a program called "Donkey" for the ZX81. I would like to enter this program, but the first couple of lines have been missed out. So, please could you send me a copy of the complete program.

Tim Read  
23 Laurel Drive  
Bradwell  
Great Yarmouth  
Norfolk NR31 8PB

You are quite correct. Somehow we inadvertently left out the first three lines of the program. The missing lines are:

1 LET S=0  
10 POKE 16418,0  
11 LET G=1000

## A rather higher score

Re: Stewart Douglas — Popular Computing Weekly, November 4.

Sorry Stewart, but since I saw the Scramble program and typed it in, I have played it regularly. My highest score is just over 4,000 points with over 220 miles travelled. I regularly score over 2,500 points. I have also typed in a high score, a detailed account of score and a high score for travelling the greatest distance, all in 3.5K on my Vic20.

M N Ariss  
79 Coldy Road  
Aintree  
Liverpool L9 4RZ

If you have an opinion you want to express, or have spotted an error that needs correcting, write to: Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2.



# Santa Claus

A new game for 16K Spectrum and Dragon 32 by David Lawrence

Many of the most intriguing games that can be played on a micro depend for their fascination on the effective simulation of a very natural phenomenon like the curve of the thrown ball. This simple Christmas game depends upon the simulation of presents thrown from a height into chimneys of varying elevation. In a flush of the Christmas spirit, the game is offered for both the 16K Spectrum and the Dragon 32.

It needs only a very cursory examination to see that the game is, in fact, very short in terms of the sections needed to actually play. But, in both versions these parts are almost doubled by the lines needed to provide the instructions and to set up the simple graphics initially. It is in relation to the graphics that the major differences arise between the two versions.

In the Spectrum game, the chimneys down which presents are to be tossed are each made up of four user defined characters, loaded into the memory by the module at line 3000. Since the user defined character facility is not available on the Dragon, and to *Draw* the 98 chimneys would be too slow, the five different chimney types (actually dice faces) are loaded into arrays using the *Get* command and simply printed to the screen using *Put*. This procedure is made more cumbersome by the fact that a separate array must be declared for each of the five types of chimneys.

Once the graphics are set up, the Spectrum is far more economical in the manner in which it can print the graphics to the screen in the module at line 3500. On the other hand, the Dragon's flexible *Draw* command allows small touches like the representation of the presents remaining by tiny 4x4 pixel squares.

Both versions of the game share some simple calculations, relating to direction of throw and speed (modules at 2000 and 2200) and the rate of descent compared with horizontal distance covered (2500).

In both versions the game is played on a screen completely devoid of text. The chimneys are displayed in the form of an 11x9 grid of dice faces. Each turn begins with a line being drawn around the grid, starting in the bottom left-hand corner. The line can be stopped at any point by pressing a key — this determines the direction of the throw from the centre of the screen.

This is followed by the generation of a horizontal line between two markers on either side of the screen. This line, too, is stopped by pressing any key — it represents the initial velocity of the throw. The meaning of the actual values represented will only become apparent as you play.

Having entered the direction and the velocity, the horizontal track of the throw will begin to be plotted on the grid. On the

right of the screen, a line descending from the top indicates the height of the present as it falls. Six marks at the bottom right of the screen indicate the floor and the relative heights of the five chimney types.

If the horizontal track is over a type five chimney when the height line hits the top marker, then the present has landed in that chimney. Chimneys can only be entered from the top, so that if the height marker is at less than the level of a type five chimney when the horizontal track tries to enter a type five square, the present crashes and is lost.

Each time a present enters a chimney which has not been entered before, two things happen. Firstly, the player's score is incremented by six minus the type of the chimney — that is to say the lowest chimneys score highest. Secondly, on each subsequent turn the representation of that chimney will be inverted and will not score if it is entered on subsequent turns.

One final complication is that the height from which the presents are thrown decreases with every second turn. This makes it increasingly difficult to hit low chimneys on the outside of the grid which are masked by higher chimneys. Such inaccessible chimneys need to be attempted early on, as you have only 40 presents per game.

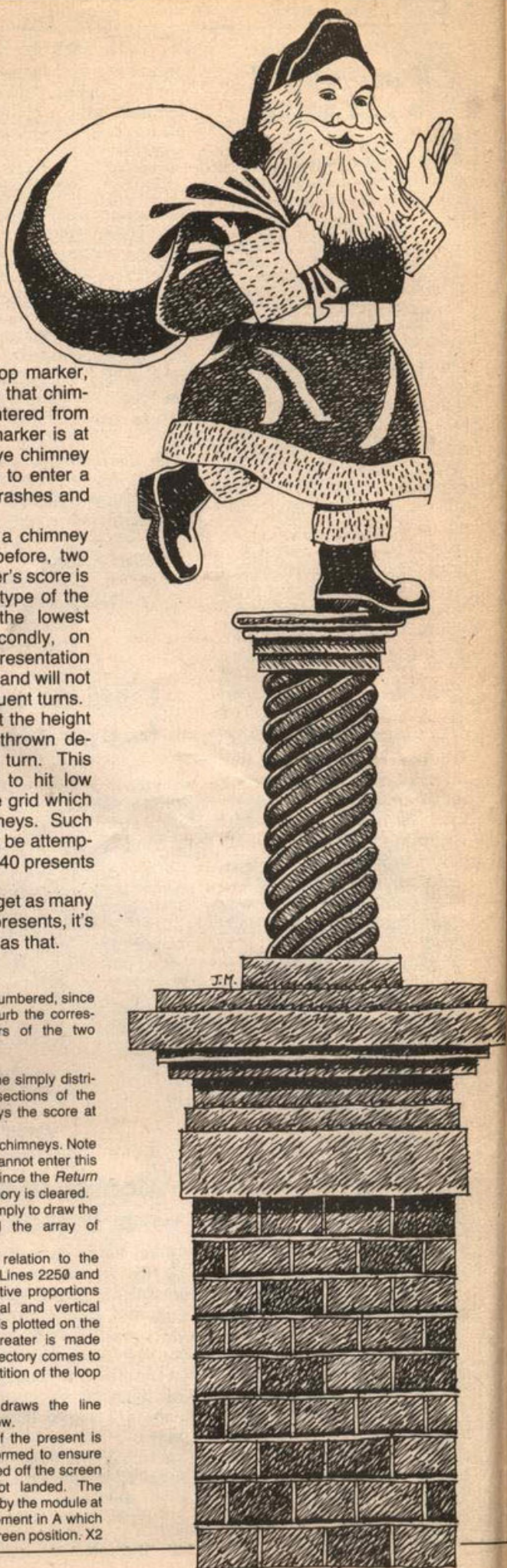
The object of the game is to get as many points as possible with the 40 presents, it's as simple — and as difficult — as that.

## Commentary

The lines of both versions are untidily numbered, since to renumber either or both would disturb the correspondence between the line numbers of the two versions.

Lines

- 1000 The module beginning at this line simply distributes tasks among the other sections of the program during play and displays the score at the end.
- 1200 This module sets up the array of chimneys. Note that in the Dragon version you cannot enter this module by means of a *Gosub*, since the *Return* destination is lost when the memory is cleared.
- 2000 The purpose of this module is simply to draw the direction indicator line around the array of chimneys.
- 2200 The angle of the direction in relation to the centre of the grid is calculated. Lines 2250 and 2260 simply determine the relative proportions of the increments to horizontal and vertical co-ordinates every time a point is plotted on the trajectory. Whichever is the greater is made equal to 1 so that when the trajectory comes to be printed by a loop, every repetition of the loop plots (or *Psets*) a fresh pixel.
- 2310 The loop commencing here draws the line indicating the velocity of the throw.
- 2500 In this module the trajectory of the present is plotted. Various tests are performed to ensure that the trajectory has not passed off the screen and that the present has not landed. The variables *X1* and *Y1*, calculated by the module at line 4000, indicate the array element in *A* which is represented by the current screen position. *X2*





and Y2 simply record the array element in which the last point fell in. If a landing is made and X2,Y2 are not equal to X1,Y1 then the present has actually crashed into the wall of a chimney. The formula at 2580 simulates the effect of gravity on the present. If a valid landing is made the value of the array element is multiplied by -1.

3000 (Dragon) In this module three things happen. Firstly, five arrays are dimensioned to hold the five dice faces. This is clumsy but unfortunately a three-dimensional array of the form B(5,16,16) is not permitted. Secondly, strings are defined which will draw the square surrounding the dice

face and the dots. Thirdly, the five combinations are drawn on to a graphics page (they are not seen on the screen since we have not called up the graphics screen yet) and put into the five arrays using Get. Note the use of the qualifier 'G' in the use of the Get command — this is because the resulting pictures stored in the arrays will be sometimes printed in inverse form and tend to produce unexpected results if the optional 'G' is not used.

3000 (Spectrum) A fairly standard module for loading user defined characters into the memory. Each group of four data lines defines a single dice face.

3500 (Dragon) In this module the graphics screen is cleared of the dice faces which were placed on to it in the last module and called up. Dice faces corresponding to the value in each element of the array A are Put on to the screen at 16-pixel intervals horizontally and vertically.

3500 (Spectrum) A much simpler module since it is possible to manipulate the character to be printed by reference to the value contained in the relevant element of the array A without recourse to On..Gosub.

4000 This module simply calculates the array element corresponding to the current position of the present on the screen.

## Santa on Spectrum

```

1000 REM *****
1010 REM MAIN PROGRAM
1020 REM *****
1030 CLS : PRINT : PAPER 2: INK
7: "
1040 PRINT "DO YOU WANT INSTRU
CTIONS (Y/N)?": INPUT Q$: IF Q$=
"Y" THEN GO SUB 4500
1090 CLS : GO SUB 1250
1095 GO SUB 3000
1097 FOR H=300 TO 100 STEP -10:
FOR G=1 TO 2
1100 GO SUB 3500
1120 GO SUB 2000
1140 IF INKEY$="" THEN GO TO 114
0
1150 CLS : NEXT G: NEXT H
1160 CLS : PRINT : PAPER 2: INK
7: "
SANTA'S POSTAL SERVICE
1170 PRINT "YOUR SCORE WAS ";S
CORE
1180 STOP
1200 REM *****
1210 REM INITIALISE
1220 REM *****
1230 DIM A(9,11)
1300 FOR I=1 TO 9: FOR J=1 TO 11
1310 LET A(I,J)=INT (RND*5)+1
1320 NEXT J: NEXT I
1330 LET X2=5: LET Y2=5
1340 LET SCORE=0: LET A(5,6)=0
1350 RETURN
1400 REM *****
1410 REM DETERMINE ANGLES
1420 REM *****
1430 LET SANTA1=111: LET SANTA2=
112
1460 LET X=8: FOR Y=16 TO 174
1470 PLOT X,Y
1480 IF INKEY$<>"" THEN GO TO 22
0
1490 NEXT Y
1500 FOR X=8 TO 214
1510 PLOT X,Y
1520 IF INKEY$<>"" THEN GO TO 22
0
1530 NEXT X
1540 FOR Y=175 TO 17 STEP -1
1550 PLOT X,Y
1560 IF INKEY$<>"" THEN GO TO 22
0
1570 NEXT Y
1580 FOR X=215 TO 8 STEP -1
1590 PLOT X,Y
1600 IF INKEY$<>"" THEN GO TO 22
0
1610 NEXT X
1620 REM *****
1630 REM ANGLE AND VELOCITY
1640 REM *****
1650 FOR I=1 TO 200: NEXT I
1660 LET H1=X-SANTA1: LET V1=Y-S
ANTA2
1670 IF ABS V1>ABS H1 THEN LET
V2=SGN V1: LET H2=ABS (H1/V1)*5G
N H1
1680 IF ABS H1>ABS V1 THEN LET H
2=SGN H1: LET V2=ABS (V1/H1)*5G
N V1
1700 FOR U=8 TO 240
1720 PLOT U,0: IF INKEY$<>"" THE
N GO TO 2400
1730 NEXT U
1740 RETURN
1750 REM *****
1760 REM PLOT COURSE
1770 REM *****
1780 LET T=(255-U)/1000
1850 FOR I=1 TO 100
1840 LET X=INT (SANTA1+INT (I*H2
)): LET Y=INT (SANTA2+INT (I*V2
))
2550 IF X<0 OR X>255 OR Y<0 OR Y

```

```

>175 THEN RETURN
2560 PLOT OVER 1;X,Y: GO SUB 400
0
2580 LET H3=H-5*(T*I)+2: IF H3<=
0 THEN RETURN
2590 IF X1=X2 AND Y1=Y2 AND X1<>
0 AND Y1<>0 THEN IF H3<ABS A(Y1,
X1)*20 AND A(Y1,X1)<0 THEN LET S
CORE=SCORE+6-A(Y1,X1): LET A(Y1,
X1)=A(Y1,X1)+1
2610 IF X1<>0 AND Y1<>0 THEN IF
H3<ABS A(Y1,X1)*20 THEN RETURN
2615 LET Y2=Y1: LET X2=X1
2620 IF H3/2<=175 THEN PLOT 252,
175: DRAW 0,-(175-H3/2)
2700 NEXT I: RETURN
3000 REM *****
3010 REM CHIMNEY SQUARES
3020 REM *****
3030 RESTORE : FOR I=1 TO 20: FO
R J=0 TO 7: READ A: POKE USR CHR
$(143+I)+J,A: NEXT J: NEXT I: R
ETURN
3038 REM *****
3040 DATA 255,128,128,128,128,12
8,128,129
3050 DATA 255,1,1,1,1,1,1,129
3060 DATA 129,128,128,128,128,12
8,128,255
3070 DATA 129,1,1,1,1,1,1,255
3080 REM *****
3090 DATA 255,128,128,152,152,12
8,128,129
3100 DATA 255,1,1,1,1,1,1,1
3110 DATA 128,128,128,128,128,12
8,128,255
3120 DATA 1,1,1,25,25,1,1,255
3130 REM *****
3140 DATA 255,128,128,152,152,12
8,128,129
3150 DATA 255,1,1,1,1,1,1,129
3160 DATA 129,128,128,128,128,12
8,128,255
3170 DATA 129,1,1,25,25,1,1,255
3180 REM *****
3190 DATA 255,128,128,152,152,12
8,128,129
3200 DATA 255,1,1,25,25,1,1,1
3210 DATA 128,128,128,152,152,12
8,128,255
3220 DATA 1,1,1,25,25,1,1,255
3230 REM *****
3240 DATA 255,128,128,152,152,12
8,128,129
3250 DATA 255,1,1,25,25,1,1,129
3260 DATA 129,128,128,152,152,12
8,128,255
3270 DATA 129,1,1,25,25,1,1,255
3280 REM *****
3290 REM PRINT CHIMNEYS
3300 REM *****
3310 FOR I=1 TO 9: FOR J=1 TO 11
3320 LET INV=0: IF A(I,J)<0 THEN
LET INV=1
3330 IF I=5 AND J=6 THEN GO TO 3
370
3340 LET CH=ABS A(I,J)+4
3350 PRINT INVERSE INV;AT I*2-1,
J*2+1;CHR$(143+CH-3);CHR$(143+
CH-2)
3360 PRINT INVERSE INV;AT I*2,J*
2+1;CHR$(143+CH-1);CHR$(143+CH
)
3370 NEXT J: NEXT I
3380 FOR I=0 TO 5: PLOT 250,I*10
: DRAW 5,0: PLOT 250,I*10+1: DRA
W 5,0: NEXT I
3390 FOR I=1 TO (H-100)/5+3-0: P
LOT 0,I*3: DRAW 5,0: NEXT I
3400 PLOT 8,0: DRAW 0,5: PLOT 9,
0: DRAW 0,5: PLOT 240,0: DRAW 0,
5: PLOT 241,0: DRAW 0,5
3700 RETURN
4000 REM *****
4010 REM CALCULATE LANDING

```

```

4020 REM *****
4030 LET X1=INT ((X-23)/16)+1
4040 LET Y1=INT ((167-Y)/16)+1
4050 IF X1>11 OR X1<1 THEN LET X
1=0
4060 IF Y1>9 OR Y1<1 THEN LET Y1
=0
4100 RETURN
4500 REM *****
4510 REM INSTRUCTIONS
4520 REM *****
4530 CLS : PRINT PAPER 2: INK 7:
"SANTA'S PARCEL DELIVERY SERVICE"
4540 PRINT "IS IN DEEP TROUBLE."
4550 PRINT "THE PARCELS ARE LAT
E AND THE REINDEER ARE RUNNIN
G OUT OF PUFF. YOU CAN HELP
BY DELIVERING ONE BATCH OF PARCEL
S. SINCE YOU ARE INEXPERIENCED Y
OU WILL NOT GET AROUND THE WHOL
E TOWN SO PLEASE CONCENTRATE
ON THE POORERHOUSES--THE ONES UI
TH THE LOWER CHIMNEYS."
4560 PRINT "TO HELP YOU, THE TO
UNSFOLK HAVE NUMBERED THEIR CHIM
NEYS LIKE DICE--THE LOWER THE
NUMBER THE LOWER THE CHIMNEY."
4570 PRINT "PRESS A KEY WHEN YO
U WANT TO KNOW MORE."
4580 IF INKEY$="" THEN GO TO 458
0
4590 CLS : PRINT "TO DESPATCH A
PARCEL YOU HAVE TOPRESS A KEY O
N THE CONTROL BOARDWHEN THE AUTO
MATIC SCANNER IS INDICATING TH
E RIGHT DIRECTION."
4600 PRINT "THE SCANNER IS A LI
NE WHICH RACES AROUND THE TOW
N--YOU ARE ABOVE THE SPACE IN TH
E MIDDLE OF THE TOWN."
4610 PRINT "HAVING SET THE DIRE
CTION YOU MUST SET THE STRENG
TH OF THE LOB WHILE THE LAUNCH
H INDICATOR MOVES ACROSS THE 50
TTOM OF THE SCREEN."
4620 PRINT "THIS TOO IS DONE BY
PRESSING A KEY."
4630 PRINT "PRESS ANY KEY FOR M
ORE."
4640 IF INKEY$="" THEN GO TO 464
0
4642 CLS : PRINT "THE OTHER HEL
P YOU HAVE IS A HEIGHT INDICA
TOR WHICH SHOWS THE HEIGHT OF TH
E PRESENT AS IT FALLS TOGETHE
R WITH THE HEIGHT OF THE 5 TYPE
S OF CHIMNEY."
4650 PRINT "UNFORTUNATELY--AS HE
NTIONED--THE REINDEER ARE GETTIN
G TIRED. THIS MEANS THAT YOU ARE
LOSING HEIGHT--MAKING IT HARDER
TO LOB OVER THE HIGHER CHIMNEYS
--SO GET INACCESSIBLE CHIMNE
YS FIRST."
4660 PRINT "TO GET A PRESENT IN
TO A CHIMNEY IT MUST ARRIVE ON T
HE SQUARE OCCUPIED BY THE CHI
MNEY AT ABOVE THE CHIMNEY HEIGHT
AND THEN FALL IN."
4670 PRINT "PRESS ANY KEY FOR M
ORE."
4680 IF INKEY$="" THEN GO TO 468
0
4690 CLS : PRINT AT 8,0: "TO HELP
SANTA ASSESS YOUR WORK YOU ARE
GIVEN A SCORE AT THE END OF YOUR
DELIVERIES. THE MORE LOUCHINNEY
S YOU MANAGE, THE HIGHER YOUR SC
ORE--GOOD LUCK."
4695 PRINT "PRESS ANY KEY TO ST
ART"
4697 IF INKEY$="" THEN GO TO 469
7
4700 CLS : RETURN

```

## Santa on Dragon

```

1 GOTO5
2 FORI=1TO3:FORJ=1TO2000:NEXTJ:CSAVE
"SANTA":NEXTI:STOP
5 REM
1000 REM*****
1010 REM MAIN PROGRAMME
1020 REM*****
1030 CLS:PRINT @ 35,"SANTA'S POSTAL
SERVICE"
1035 PRINT @ 67,STRING$(22,CHR$(101))
1040 PRINT:INPUT "DO YOU WANT INSTRUCTIONS
(Y/N):";Q$:IF Q$="Y" THEN GOSUB 4500
1090 CLS:GOTO 1200
1095 GOSUB 3000
1097 FOR H=300 TO 100 STEP -10:FOR G=1
TO 2
1110 GOSUB 3500

```

```

1120 GOSUB 2000
1140 IF INKEY$="" THEN GOTO 1140
1150 CLS:NEXT G,H
1160 CLS:PRINT @ 35,"SANTA'S POSTAL SER
VICE":PRINT @ 67,STRING$(22,CHR$(101))
1170 PRINT:PRINT "YOUR SCORE WAS ";SCORE
1180 STOP
1200 REM*****
1210 REM INITIALISE
1220 REM*****
1230 CLEAR:PCLEAR4
1280 DIM A(9,11)
1300 FOR I=0 TO 8:FOR J=0 TO 10
1310 LET A(I,J)=RND(5)

```

Turn to page 10



from page 9

```

1320 NEXT J,I
1330 LET X2=6:LET Y2=5
1340 LET SCORE=0:LET A(4,5)=0
1350 GOTO 1095
1400 GOTO 1095
2000 REM*****
2010 REM DIRECTION
2020 REM*****
2030 LET S1=119:LET S2=96
2060 LET X=16:FOR Y=175 TO 17 STEP -1
2070 PSET (X,Y)
2080 IF INKEY#("<") THEN GOTO 2200
2085 NEXT Y
2090 FOR X=16 TO 222
2100 PSET (X,Y)
2110 IF INKEY#("<") THEN GOTO 2200
2120 NEXT X
2130 FOR Y=16 TO 174
2140 PSET (X,Y)
2150 IF INKEY#("<") THEN GOTO 2200
2160 NEXT Y
2170 FOR X=223 TO 16 STEP -1
2180 PSET (X,Y)
2190 IF INKEY#("<") THEN GOTO 2200
2195 NEXT X
2200 REM*****
2210 REM ANGLE AND VELOCITY
2220 REM*****
2230 FOR I=1 TO 500:NEXT I
2240 H1=X-S1:V1=Y-S2
2250 IF ABS (V1)>ABS(H1) THEN LET V2=SGN
(V1):LET H2=ABS(H1/V1)*SGN(H1)
2260 IF ABS(H1)>ABS(V1) THEN LET H2=SGN
(H1):LET V2=ABS(V1/H1)*SGN(V1)
2310 FOR V=8 TO 240
2320 PSET (V,3):IF INKEY#("<") THEN GOTO
2500
2330 NEXT V
2350 RETURN
2500 REM*****
2510 REM PLOT COURSE
2520 REM*****
2525 LET T=(255-V)/1000
2530 FOR I=1 TO 100
2540 LET X=INT(S1+INT(I*H2)):LET Y=INT
(S2+INT(I*V2))
2550 IF Y<0 OR Y>191 THEN RETURN
2560 IF PPDIPT(X,Y)<0 THEN PRESET(X,Y)
ELSE PSET(X,Y)
2570 GOSUB 4000
2580 LET H3=H-S*(T*I)^2:IF H3<=0 THEN
RETURN
2600 IF X1=X2 AND Y1=Y2 AND X1<>999 AND
Y1<>999 THEN IF H3<ABS(ACY1,X1)*20 AND
ACY1,X1>0 THEN LET SCORE=SCORE+6-ACY1,
X1:LET ACY1,X1=ACY1,X1*-1
2610 IF X1<>999 AND Y1<>999 THEN IF
H3<ABS(ACY1,X1)*20 THEN RETURN

```

```

2615 LET Y2=Y1:LET X2=X1
2620 IF H3/2<=191 THEN LINE(252,0)-(252,
191-(H3/2)),PSET
2700 NEXT I:RETURN
3000 REM*****
3010 REM CHIMNEY SQUARES
3020 REM*****
3030 PCLS:PMODE4
3032 DIM B1(16,16):DIM B2(16,16):DIM B3
(16,16):DIM B4(16,16):DIM B5(16,16)
3038 DIM B#(3):LET A#="BM1,1,R15,D15,L15,
U15,"
3040 LET B#(1)=A#+"BR7,BD7,R1,D1,L1"
3050 LET B#(2)=A#+"BR3,BD3,R1,D1,L1,BD7,
BR8,R1,D1,L1"
3060 LET B#(3)=A#+"BR11,BD3,R1,D1,L1,BD7,
BL8,R1,D1,L1"
3070 DRAW B#(1):GET (1,1)-(16,16),B1,G
3080 DRAW B#(2):GET (1,1)-(16,16),B3,G
3090 DRAW B#(3):GET (1,1)-(16,16),B5,G
3100 PCLS:DRAW B#(2):GET (1,1)-(16,16),B2,G
110 DRAW B#(3):GET (1,1)-(16,16),B4,G
3200 RETURN
3500 REM*****
3510 REM PRINT CHIMNEYS
3520 REM*****
3525 PMODE4:PCLS:SCREEN 1,1
3530 FOR I=24 TO 152 STEP 16:FOR J=32 TO
192 STEP 16
3535 IF I=88 AND J=88 THEN GOTO 3570
3537 LET I1=(I-24)/16:LET J1=(J-32)/16
3540 ON ABS(AC(I1,J1)) GOSUB 3710,3720,
3730,3740,3750
3550 IF AC(I1,J1)<0 THEN PUT(J,I)-(J+15,
I+15),B1,NOT
3570 NEXT J,I
3600 DRAW "BM250,191":FOR I=1 TO 6:DRAW
"R5,U1,L5,BM+0,-10":NEXT I
3610 DRAW "BM5,186":FOR I=1 TO (H-100)/
5+3-G:DRAW "D2,R2,U2,L2BM+5,+0":NEXT I
3620 DRAW "BM8,0,D5,R1,U5,BM240,0,D5,R1,U5"
3700 RETURN
3710 PUT(J,I)-(J+15,I+15),B1,PSET:RETURN
3720 PUT(J,I)-(J+15,I+15),B2,PSET:RETURN
3730 PUT(J,I)-(J+15,I+15),B3,PSET:RETURN
3740 PUT(J,I)-(J+15,I+15),B4,PSET:RETURN
3750 PUT(J,I)-(J+15,I+15),B5,PSET:RETURN
4000 REM*****
4010 REM LANDING?
4020 REM*****
4030 LET X1=INT((X-31)/16)
4040 LET Y1=INT((Y-23)/16)
4050 IF X1>10 OR X1<0 THEN LET X1=999
4060 IF Y1>8 OR Y1<0 THEN LET Y1=999
4070 RETURN
4500 REM*****
4510 REM INSTRUCTIONS
4520 REM*****

```

```

4530 CLS:PRINT:PRINT"SANTA'S POSTAL SERVICE IS IN DEEP TROUBLE."
4540 PRINT:PRINT"DELIVERIES ARE OVERDUE AND THE REINDEER ARE RUNNING OUT OF
PUFF."
4550 PRINT:PRINT"CAN YOU HELP?"
4560 PRINT:INPUT "PRESS 'ENTER' TO FIND OUT MORE":Q#CLS
4570 PRINT:PRINT "IF YOU DO WANT TO HELP,SANTA WILL GIVE YOU 40 PRESENTS TO
DELIVER."
4580 PRINT:PRINT "SINCE THAT ISN'T ENOUGH TO COVERTHE WHOLE TOWN,THE IDEA IS THAT
YOU TOSS THEM DOWN THE CHIMNEYS OF THE POOREST HOMES--YOU CAN TELL THEM BECA
USE THEY HAVE THE LOWEST CHIMNEYS."
4585 PRINT:INPUT "PRESS 'ENTER' TO FIND OUT MORE.":Q#CLS
4590 PRINT:PRINT "TO HELP YOU IN YOUR TASK THE TOWNSFOLK HAVE LABELLED THEIR
CHIMNEYS LIKE DICE--THE LOWER THE NUMBER THE LOWER THE CHIMNEY."
4600 PRINT:PRINT "IN TOSSING THE PARCELS YOU HAVE TWO FORMS OF CONTROL. YOU CAN
CHOOSE THE DIRECTION AND THE STRENGTH OF YOUR THROW."
4610 PRINT:INPUT "PRESS 'ENTER'":Q#CLS
4620 PRINT:PRINT "YOU CHOOSE THE DIRECTION BY PRESSING ANY KEY WHILE THE
DIRECTION INDICATOR LINE IS TRAVELLING AROUND THE TOWN. THE LINE WILL STOP
AND YOUR THROW WILL TRAVEL FROM YOUR POSITION ABOVE THE BLANK SQUARE IN THE"
4630 PRINT "MIDDLE OF THE TOWN,TOWARDS THE END OF THE LINE."
4640 PRINT:INPUT"PRESS 'ENTER'":Q#CLS
4650 PRINT:PRINT "TO CHOOSE THE STRENGTH OF YOUR THROW YOU MUST WAIT UNTIL THE
STRENGTH INDICATOR LINE TRAVELS ACROSS THE TOP OF THE SCREEN,THENSTOP IT BY PRE
SSING ANY KEY. THE LONGER YOU LET IT GO THE HARDER THE THROW."
4660 PRINT:PRINT "AS THE PRESENT FALLS TOWARDS THECHIMNEYS ITS HEIGHT IS INDICAT
EDBY A LINE ON THE RIGHT OF THE SCREEN."
4670 PRINT:INPUT "PRESS 'ENTER'":Q#CLS
4672 PRINT:PRINT "TO GET A PRESENT DOWN A CHIMNEY IT MUST ENTER FROM THE TOP."
4674 PRINT:PRINT "ONCE A PRESENT HAS BEEN DELIVERED TO A PARTICULAR
CHIMNEY IT CHANGES COLOUR SO THAT YOU DON'T WASTE ANOTHER PRESENT ON IT."
4676 PRINT:INPUT "PRESS 'ENTER'":Q#CLS
4680 PRINT:PRINT "ONE FINAL PROBLEM--AS MENTIONED,REINDEER ARE GETTING TIRED. TH
ISMEANS YOU ARE LOSING HEIGHT,SO BETTER TRY AND HIT THE FURTHEST CHIMNEYS FIRST
--LATER ON YOU MAYNOT BE ABLE TO!"
4690 PRINT:PRINT "AT THE END OF YOUR 40 PARCELS YOU WILL RECEIVE A SCORE
REFLECTING YOUR SUCCESS IN REACHING THE LOWEST CHIMNEYS."
4700 PRINT:INPUT "PRESS 'ENTER' TO START":Q#CLS:RETURN

```





Ian McNaught Davis (left), Presenter, and (right), David Allen, Producer, of BBC television's forthcoming computer programme.

## Getting down to Basics

David Kelly talks to David Allen, producer of BBC tv's second computer programme series.

The question of whether or not the BBC should ever have become involved in the manufacture and marketing of a micro-computer is still subject to debate.

Detractors are keen to point out that, not only did the failure of Acorn to satisfy delivery schedules do the BBC's reputation harm, but the offending machine had virtually no part to play in the television series, *The Computer Programme*.

A year later the tables have been turned — the Acorn machines are readily available and a second series on micros called *Making the Most of Your Micro*, focusing on programming and applications is due to be broadcast from next January.

"The first series was designed for people with no experience of microcomputing," says David Allen. "But, somewhere along the line, people got the idea that we were doing a series dealing with programming a micro, which was not at all what the first programmes were about."

"However, that is pretty much how we see the new series. It will be for those already with machines and will deal directly with programming techniques. But without the first series, this new one would not have been possible."

The 10 new programmes will concentrate on what can be achieved with a computer — the emphasis being firmly on the practicalities involved. "Each programme will take a theme and concentrate on what you can do with your machine — hence the series title — *Making the Most of Your Micro*."

"Obviously, people have different machines. We shall have Pets, ZX81s and so on, but for the studio demonstrations of programming techniques we shall use the BBC micro."

"As far as possible we shall try to deal

with common ground on the different machines. But, there comes a point when we have had to say 'The actual detailed code will be different from this on other machines, though the principles are the same'. So yes — it is difficult to please everyone and yes it is a compromise — but there is no way round that."

"What we hope to do is to send out the programs we develop, both in cassette form and over the air using Ceefax. When we do this we will develop versions for most machines."

January will see the launch of a new telesoftware service to coincide with screening of the television programmes.

Each programme in the new series will have a main theme around which the various items in the 30-minute show will centre. The series will be presented by Ian McNaught Davis with contributions in each episode from a selection of experts. The plans for the series break down as follows.

**Part 1. The Versatile Machine.** This first one acts as a shop window for the rest of the series. It gives a brief idea of just what is possible with low-cost microcomputers. It begins with a remarkable item on Richard Gomm, severely disabled with cerebral palsy, who finds a micro-computer invaluable in his studies for a PhD in philosophy. Then John Coll of Acorn briefly tours the components that go to make up a micro and Ian McNaught Davis steps inside a computer to walk around the main hardware accoutrements on the printed-circuit board.

**Part 2. Getting Down to Basics.** Whatever dialect of Basic your machine uses, there are still only three central programming structures — sequential, branch and loop. The concept of numerical variables is also introduced.

**Part 3. String handling.** Introduces procedures and sub-routines. Looks at an example of good and bad programming technique.

**Part 4. Graphics.** This programme attempts to describe simple graphics programming techniques, introduces the idea of machine-code and shows how to address individual pixels in an 8 x 8 one-character area. Different levels of resolution are considered, as are the commands *Move*, *Draw* and *Plot*. An animation cell is shown which is developed to explore in-betweening and other more advanced animation techniques, and takes a brief look at commercial computer-aided graphics like those seen in the film, *Tron*.

**Part 5. Databases.** This part looks at simple file handling — date processing, searching and sorting. Shows how to construct a simple database.

**Part 6. Business Applications.** Considers the ways in which low-cost home micros can be used in a small business. Shows a typical spread-sheet financial modelling program. Briefly considers word-processing programs and illustrates some of the main pitfalls of writing your own software.

**Part 7. Getting Away From Basic.** Looks particularly at the idea of artificial intelligence.

**Part 8. Control.** Using a micro to control external apparatus. A BBC Buggy will be displayed (which will be available to buy) and operated from the BBC micro. It is 'intelligent' in that it senses its environment and builds up a picture of where it has been. It will be able to draw lines and will incorporate a bar-code reader and light sensor.

**Part 9. Computer-aided Design and Music.** Considers further methods of non-keyboard input to the computer, and also non-screen output. Sound and joystick control. Shows how to draw and manipulate a three-dimensional line drawing on the screen. Shows hidden-line removal, rotation and shading.

**Part 10. Communications.** Deals with telesoftware. Explains the BBC's Ceefax system. Much of the software developed in the series will be made available for a range of machines using this system.

The BBC microcomputer comes into its own in the new series. "Having a dynamic relationship with one company — Acorn — has been invaluable" says David Allen. "With them we have been able to develop software for the programmes and produce the vital special board which enables us to put up the computer's output clearly on the screen."

"In fact, even the sub-titles which appear on screen — as in the first programme — are generated from the machine."

*Making the Most of Your Micro* will be broadcast in 10 programmes beginning on January 10. Each episode will be shown three times as follows: Mondays BBC2 3.05 pm; Mondays BBC1 11.25 pm; and Sundays BBC 1 12.35 pm.





# GEM SOFTWARE DRAGON PROGRAMS

22 PRESTWICK DRIVE, BISHOP'S STORTFORD, HERTS CM23 5ES. Telephone: 0279 52401

**MONSTER MINE** by W. E. MacGowan  
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 save facility.

£7.95

**GOLF** by Pete Allen

Over 20K of Basic, giving you full 18-hole golf course with handicaps, choice of clubs, golfing weakness must be specified, full colour graphics and sound including score card.

£7.95

## GAMES PACK 1

Space Wars by John Line.  
Torpedo by Erik Pattison.  
Sheepdog by Erik Pattison.  
Snake by Christopher Hunt.

£7.95

## GAMES PACK 2

Landing by Peter Chase.  
Hangman by Christopher Hunt.  
Speedboat by Peter Chase.  
Battleships by C. A. Castle.

£7.95

## CHARACTER GENERATOR

by John Line

Create and use your own symbols and character sets on the Dragon's high resolution graphics screens. Written in Basic for ease of use, comes with complete ASCII character file and demonstration program.

£9.95

**MONSTER MINE** by W. E. MacGowan  
Also available for the ZX81 and Spectrum.

£4.95

ALL THE ABOVE CASSETTES AVAILABLE, MAIL ORDER THROUGH GEM SOFTWARE OR  
CALL IN AND SEE OUR RANGE OF SOFTWARE AND HOME COMPUTERS

AT

# MicroWorld

WE ARE CURRENTLY  
LOOKING FOR TOP QUALITY  
SOFTWARE FOR DRAGON  
AND LYNX

TRADE ENQUIRIES  
WELCOME CONTACT  
GEM SOFTWARE

2 CRAWFORD ROAD, HATFIELD, HERTS 07072 64137

"OPENING SOON"

BISHOP'S STORTFORD BRANCH OF MICROWORLD

"OPENING SOON"



## PIMANIA

THE ADVENTURE GAME THAT'S FOR REAL! £6,000 PRIZE!

Will you be the first to locate the Golden Sundial of Pi in time and space, and be rewarded with the original? Exquisitely crafted by the winner of the De Beers Diamond International Award, from gold, diamond and the most precious of the earth's riches.

PIMANIA - where saxophones turn into hangliders, where music meets madness and where the Pi Man rules supreme! He'll talk with you, he'll befriend you, he'll betray you, he'll even do the 'Hokey Hokey'! Animated cartoon graphics! Full musical score! Spectacular colour and sound effects! Includes free hit single 'Pimania', with vocals by Clair Sinclair and the Pi Man!

It could take you a week to play, it could take you a lifetime! PIMANIA, the best evidence that computer gaming has come of age - an adventure enthusiast's dream! (Computer & Video Games)

An investment at £10 (48K Spectrum) £8 (16K ZX81)



AUTOMATA Ltd. (P)  
65a Osborne Road  
Portsmouth PO5 3LR  
England

# E.T.A.

A DEFENCELESS EXTRA-TERRESTRIAL HAS CRASH-LANDED ON EARTH. ONLY YOU CAN HELP HIM. E.T. IS LOST, AFRAID AND IS SUFFERING FROM AMNESIA. YOU MUST DISCOVER WHAT HE LOOKS LIKE. HELP HIM TO REMEMBER HIS NAME AND FIND HIS SPACE CRAFT BEFORE THE WILD DOGS AND EVIL MILITARY CATCH HIM.

FULL CARTOON GRAPHICS, COLOUR AND SOUND. "E.T.A." - THE PROGRAM THAT COMBINES ADVENTURE GAMING WITH ARCADE ACTION - WITH A NEW CHALLENGE EVERY TIME YOU PLAY. FROM THE CREATORS OF "PIMANIA".

16k 48k Sinclair Spectrum; £5 (incl.)



AUTOMATA Ltd. (P)  
65a Osborne Road,  
Portsmouth, PO5 3LR





# Inside the black box

**Stephen Adams looks at Qsave and the LMX programmer for the ZX81.**

Qsave is a hard and software package designed to speed up the *Loading* and *Saving* of tapes with the ZX81. It can save 16K in 30 seconds giving a speed in excess of 4000 bits per second, as against Sinclair's tape speed of 250-300 bits per second.

The hardware is contained in a small black box with four 3.5mm sockets, two per side. This is a filter which fits into the ear lead between the tape recorder and the ZX81. A lead from the power pack also plugs into the unit to power the amplifier inside. The ear and power leads are provided with the unit.

The filter can also be used on its own to solve some tape *Loading* problems. It contains a high and low filter, to cut out noise generated by the tape recorder head and the rumble from the mains/tape recorder motor. It also increases the level which is put out to the ZX81, so some adjustment of the tape recorder volume control may be necessary when using the unit.

One snag with the present model is that it must be disconnected when *Saving* a program, ie the lead from the ear socket of the tape recorder must be unplugged. Apart from this, the unit worked very well and considerably improved the *Loading* of Basic tapes.

## Software side

The software side of the package comes in the form of a tape which auto-runs when *Loaded* to put three machine code routines into the top of memory. The tape I received had only been set up for using a 16K Ram pack, but there are tapes available for 64K and other memory sizes. The machine code is not large (300 odd bytes) and is protected against a Basic program accidentally overwriting it. Only *New*, or pulling out the power plug, will erase it. The three routines, *Load*, *Save* and *Verify*, are called by *Print Usr X*, where X is the number of the routine.

The *Qsave* routine is *Loaded* first and then the program required. If this program has been *Qsaved* previously, then it will load in 30 seconds by calling the appropriate routine. If not, it may be loaded by the normal *Load* command and, provided it can be stopped, it can then be *Qsaved*. If, however, it jumps straight into a machine code routine, you will not be able to *Qsave* it. *Qsave* commands can be written into programs, but it is essential that the program is in *Fast* mode before using *Qsave*.

After *Saving*, the *Verify* command can

be used to check that the program on tape is the same as in memory. If it is not, there is no break facility to get back to the main program, so you would have to run it through another *Qsaved* program to get back control.

The advantages of using this system are fairly obvious, but here are a few examples. A data base program using a full 16K takes approximately 11 minutes to load — using *Qsave* it takes 30 seconds. But a 16K games program also take 30 seconds to load. At present, *Qsave* takes 30 seconds whatever the length of the program.

It also does not use a program name, so it will *Load* the first *Qsaved* program it comes across. However, *Qsave* manufacturer PSS says all these problems have been considered and by the time you read this new software will have eliminated the problems.

I have tried the system with a standard tape recorder and it works very well, if



*Qsave can save 16K in 30 seconds.*

good tapes are used (PSS recommend the AD or D series from TDK). The volume control had to be adjusted to near enough the bottom level, well below the level I use for the ZX Spectrum or BBC micro. The *Verify* is essential, as is a tape counter to keep track of where the programs are. *Qsave* leaves the screen blank with flashing white lines across the screen, however, it is not possible to tell whether a program will *Load* or not by looking at the lines.

PSS does sell a version which has a switch on it to eliminate the disconnection of the *Qsave* box when recording. This I feel is an essential requirement.

The documentation that comes with the system is in the form of a four-page booklet containing simple instructions and diagrams and an emergency telephone number.

I think *Qsave* will promote a greater use of the ZX81, as it allows you to have near enough the speed of discs on an ordinary tape recorder. The only thing that is missing is the ability to store just the variables or code on to tape using *Qsave*.

*Qsave* is manufactured by Personal Software Services, 112 Oliver Street, Coventry CV6 5FE (Tel: 0203 667556) and costs £15.95 for 16K and £17.95 for 64K.

## LMX programmer

The LMX PROM programmer was designed to work on the minimum 1K ZX81 and so has a few limitations. One of these is that it can only cope with one type of Eprom (a Rom that can be reprogrammed), the 2716. However, this is available from various manufacturers and it can hold up to 2K of machine code.

The board is easy to build if you have a little soldering experience. The instructions are easy to follow and the technical details are fully explained. If, however, you want to use it with a 16K Ram pack, extra wire must be provided to connect up the pcb edge on the far side of the programmer. Also, the program to control the programmer, which is supplied on tape, is written in machine code for 1K and produces a peculiar display with the 16K pack.

The programmer is roughly decoded so that it occupies the whole of the 8K-16K space on the memory map and also appears on the 40K-48K section. This means it is not suitable for use with Ram packs of 32K or above. The Eprom is programmed by writing to the memory location required in the Eprom with a 30-36 volt battery applied to the board. This battery can be made of four PP3s, as shown in the notes.

In the program supplied you can change the address to anywhere in a 2K range and alter the memory location. All addresses and data are in hex, so conversions must be done with the aid of the ZX81 manual if you are working in decimal. The instructions to increment/decrement and burn are all single key from the keyboard, using the overlay provided. An led on the board lights normally and goes out when burning data into a location. The program has an error check to stop you programming a location that has already been done.

With a 1K ZX81 this is a very cheap way to program Eproms to store machine code programs (Basic cannot be stored in it), but if you have expanded your machine in any way it is a bit limiting. The programming could have been done just as easily with Basic using *Poke* to program the Rom and *Peek* to check it. Then a large array of data could have been dumped into the Eprom by the ZX81, rather than having to enter it all from the keyboard.

The LMX Prom programmer is available from Lander Microsystems, 32 Clockhouse Lane, Colliers Row, Romford, Essex RM5 3QJ (Tel: 0708 26325) for £17.50 as a kit, excluding batteries and Eprom.



# Sinclair ZX Spectrum

**16K or 48K RAM...  
full-size moving-  
key keyboard...  
colour and sound...  
high-resolution  
graphics...**

**From only  
£125!**

First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

## Professional power— personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

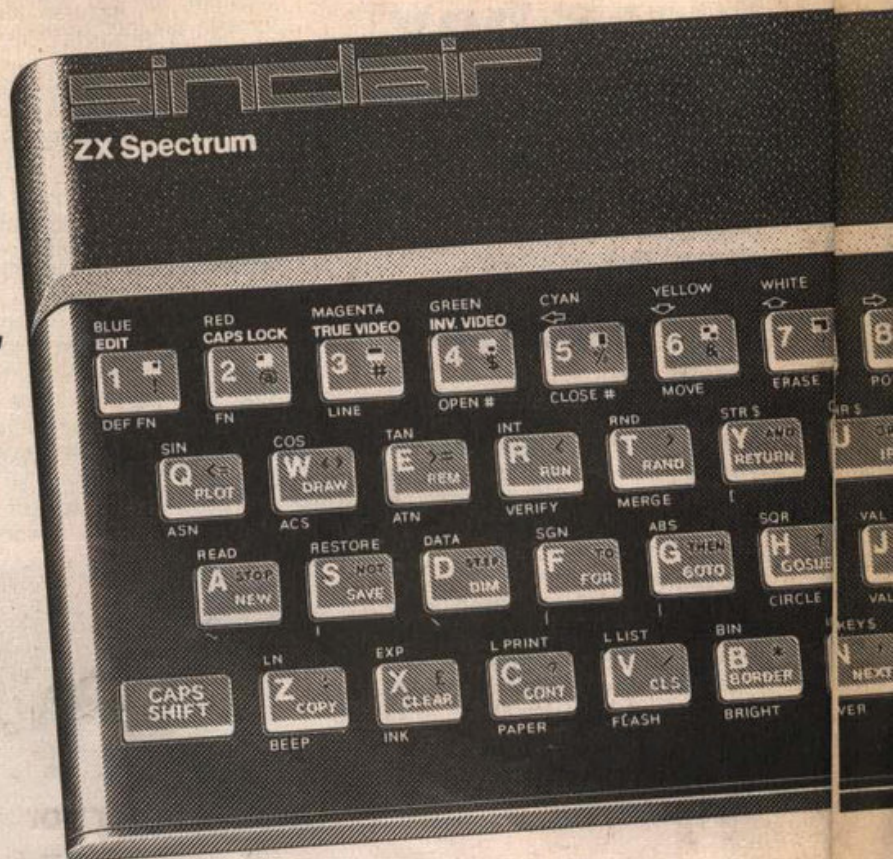
You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can upgrade later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.



## Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer—available now—is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.

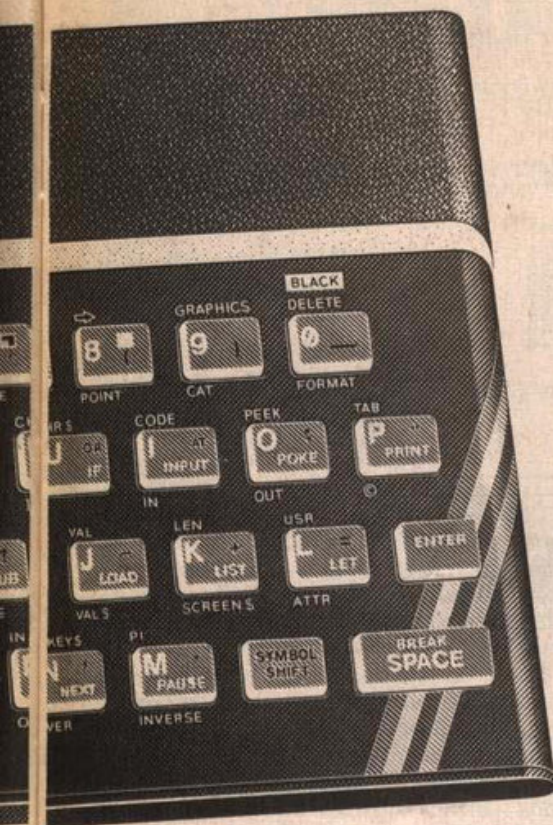


## Key features of the Sinclair ZX Spectrum

- Full colour—8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound—BEEP command with variable pitch and duration.
- Massive RAM—16K or 48K.
- Full-size moving-key keyboard—all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution—256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set—with upper- and lower-case characters.
- Teletext-compatible—user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE—16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC—incorporating unique 'one-touch' keyword entry, syntax check, and report codes.



# um



## ZX Spectrum software on cassettes – available now

The first 21 software cassettes are now available directly from Sinclair. Produced by ICL and Psion, subjects include games, education, and business/household management. Galactic Invasion... Flight Simulation... Chess... History... Inventions... VU-CALC... VU-3D... 47 programs in all. There's something for everyone, and they all make full use of the Spectrum's colour, sound and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

## RS232/network interface board

This interface, available later this year, will enable you to connect your ZX Spectrum to a whole host of printers, terminals and other computers.

The potential is enormous. And the astonishingly low price of only £20 is possible only because the operating systems are already designed into the ROM.

# sinclair

Sinclair Research Ltd, Stanhope Road,  
Camberley, Surrey GU15 3PS.  
Tel: Camberley (0276) 685311.

## The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.



## The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

Each Microdrive is capable of holding up to 100K bytes using a single interchangeable microfloppy.

The transfer rate is 16K bytes per second, with average access time of 3.5 seconds. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum.

All the BASIC commands required for the Microdrives are included on the Spectrum.

A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.



## How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Access,

Barclaycard or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR.				Order
Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

Please tick if you require a VAT receipt ☐

\*I enclose a cheque/postal order payable to Sinclair Research Ltd for £

\*Please charge to my Access/Barclaycard/Trustcard account no.

\*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

Address

POC812

FREEPOST – no stamp needed. Prices apply to UK only. Export prices on application.





*Open Forum* is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £6 for each program published.

## Scrambled Border

on Spectrum

An interesting effect which will enhance some games programs is the scrambling of the screen border, with or without a warning buzz.

The effect relies upon the output of values to port 254 (which controls the speaker and the border colour) of certain values, using the *Out* Basic instruction. It is not necessary to have any external ports

connected.

The accompanying program will serve to illustrate that the screen border may be made to stripe in various colours without disturbing the screen display area. A buzz may be added, if required, by subtracting 24 from the values given in the table. The two *Out* instructions simply change the border colour from white to the chosen colour repeatedly.

If the speaker bit is set then a buzz is produced by the repeated setting/unsetting of the speaker which gives a click.

```
1 REM Scrambled border by P N
20000
30000 PRINT "hello"
40000 FOR J=1 TO 100
50000   OUT 254,255
60000   OUT 254,N2
70000   NEXT J
80000 PRINT "ok"
90000 STOP
```

Data values for port 254  
(This drives speaker & border)

Value of N2	Effect
255	White
254	Yellow
253	Blue
252	Green
251	Magenta
250	Red
249	Blue
248	Black

Subtract 24 from N2 to add buzz

**Scrambled Border**  
by Paul Newman

## Poster

on BBC Micro

This simple routine utilises the BBC's *Point* (X,Y) statement to reproduce characters displayed on the screen, greatly enlarged, on a print-out.

The *Rem* statements explain the restrictions on the size of the poster characters and on the length and depth of the whole poster. The X and Y loops take the *Point* (X,Y) statement from the bottom of the first screen line to the top of the screen and from the left of the screen to the right.

Lines 240 and 250 serve to find what character is printed and use that character form to print the enlarged version of that character on the print-out. Unfortunately the printing character is at right angles to the poster character. If this is unacceptable X can be printed instead by replacing line 290 with

```
290 LET B = ASC("X")
```

The W loop sets the maximum character width and the H loop the maximum character height. The alterations for *Mode 4* operation are to take account of the fact that the *Mode 4* screen width is half that of the *Mode 0* screen width.

The routine will print the whole of the contents of the first line regardless of how large the poster string is. To save time once the poster string has been printed *Escape* can be pressed to terminate the program.

The program does not use graphics characters so any printer should be suitable. To convert the program for use on other computers with a *Point* (X,Y) statement the lines using the screen dimensions (Lines 230, 240 and 270) may have to be altered and the equivalent of the *Vdu* statements used. Note that *Vdu* 1,10 sends a line feed to the printer only.

```
10 REM POSTER
20 REM **A PROGRAM TO PRINT BIG CHARACTERS**
30 CLS
40 PRINT
50 REM Maximum width and maximum height
60 REM must both be multiples of 8.
70 PRINT "Max. width of each character ";
80 INPUT WID
90 PRINT
100 PRINT "Max. height of each character ";
110 INPUT HEIGHT
120 PRINT
130 REM Poster string must be less
140 REM than 80 characters long.
150 PRINT "Poster string ";
160 INPUT A$
170 CLS
180 MODE 0
190 PRINT A$
200 VDU 2 : REM Printer on.
210 W1=WID/8
220 H1=HEIGHT/8
230 FOR X=0 TO 1279 STEP 2
240 LET A=(X DIV 16)+1
250 LET B=MID$(A$,A,1)
260 FOR W=1 TO W1
270 FOR Y=991 TO 1023 STEP 4
280 LET PO=POINT(X,Y)
290 LET B=ASC(B$)
300 LET C=ASC(" ")
310 FOR H=1 TO H1
320 IF PO=0 THEN 350
330 VDU 1,B
340 GOTO 360
350 VDU 1,C
360 NEXT H
370 NEXT Y
380 VDU 1,10
390 NEXT W
400 NEXT X
410 VDU 3 : REM Printer off.
420 END
430 REM Changes for MODE4 operation.
440 REM 130 REM Poster string must be less
450 REM 140 REM than 40 characters long.
460 REM 180 MODE 4
470 REM 230 FOR X=0 TO 1279 STEP 4
480 REM 240 LET A=(X DIV 32)+1
490 NEXT X
500 NEXT Y
510 NEXT W
520 NEXT H
530 NEXT Y
540 NEXT W
550 NEXT H
560 NEXT Y
570 NEXT W
580 NEXT H
590 NEXT Y
600 NEXT W
610 NEXT H
620 NEXT Y
630 NEXT W
640 NEXT H
650 NEXT Y
660 NEXT W
670 NEXT H
680 NEXT Y
690 NEXT W
700 NEXT H
710 NEXT Y
720 NEXT W
730 NEXT H
740 NEXT Y
750 NEXT W
760 NEXT H
770 NEXT Y
780 NEXT W
790 NEXT H
800 NEXT Y
810 NEXT W
820 NEXT H
830 NEXT Y
840 NEXT W
850 NEXT H
860 NEXT Y
870 NEXT W
880 NEXT H
890 NEXT Y
900 NEXT W
910 NEXT H
920 NEXT Y
930 NEXT W
940 NEXT H
950 NEXT Y
960 NEXT W
970 NEXT H
980 NEXT Y
990 NEXT W
1000 NEXT H
1010 NEXT Y
1020 NEXT W
1030 NEXT H
1040 NEXT Y
1050 NEXT W
1060 NEXT H
1070 NEXT Y
1080 NEXT W
1090 NEXT H
1100 NEXT Y
1110 NEXT W
1120 NEXT H
1130 NEXT Y
1140 NEXT W
1150 NEXT H
1160 NEXT Y
1170 NEXT W
1180 NEXT H
1190 NEXT Y
1200 NEXT W
1210 NEXT H
1220 NEXT Y
1230 NEXT W
1240 NEXT H
1250 NEXT Y
1260 NEXT W
1270 NEXT H
1280 NEXT Y
1290 NEXT W
1300 NEXT H
1310 NEXT Y
1320 NEXT W
1330 NEXT H
1340 NEXT Y
1350 NEXT W
1360 NEXT H
1370 NEXT Y
1380 NEXT W
1390 NEXT H
1400 NEXT Y
1410 NEXT W
1420 NEXT H
1430 NEXT Y
1440 NEXT W
1450 NEXT H
1460 NEXT Y
1470 NEXT W
1480 NEXT H
1490 NEXT Y
1500 NEXT W
1510 NEXT H
1520 NEXT Y
1530 NEXT W
1540 NEXT H
1550 NEXT Y
1560 NEXT W
1570 NEXT H
1580 NEXT Y
1590 NEXT W
1600 NEXT H
1610 NEXT Y
1620 NEXT W
1630 NEXT H
1640 NEXT Y
1650 NEXT W
1660 NEXT H
1670 NEXT Y
1680 NEXT W
1690 NEXT H
1700 NEXT Y
1710 NEXT W
1720 NEXT H
1730 NEXT Y
1740 NEXT W
1750 NEXT H
1760 NEXT Y
1770 NEXT W
1780 NEXT H
1790 NEXT Y
1800 NEXT W
1810 NEXT H
1820 NEXT Y
1830 NEXT W
1840 NEXT H
1850 NEXT Y
1860 NEXT W
1870 NEXT H
1880 NEXT Y
1890 NEXT W
1900 NEXT H
1910 NEXT Y
1920 NEXT W
1930 NEXT H
1940 NEXT Y
1950 NEXT W
1960 NEXT H
1970 NEXT Y
1980 NEXT W
1990 NEXT H
2000 NEXT Y
2010 NEXT W
2020 NEXT H
2030 NEXT Y
2040 NEXT W
2050 NEXT H
2060 NEXT Y
2070 NEXT W
2080 NEXT H
2090 NEXT Y
2100 NEXT W
2110 NEXT H
2120 NEXT Y
2130 NEXT W
2140 NEXT H
2150 NEXT Y
2160 NEXT W
2170 NEXT H
2180 NEXT Y
2190 NEXT W
2200 NEXT H
2210 NEXT Y
2220 NEXT W
2230 NEXT H
2240 NEXT Y
2250 NEXT W
2260 NEXT H
2270 NEXT Y
2280 NEXT W
2290 NEXT H
2300 NEXT Y
2310 NEXT W
2320 NEXT H
2330 NEXT Y
2340 NEXT W
2350 NEXT H
2360 NEXT Y
2370 NEXT W
2380 NEXT H
2390 NEXT Y
2400 NEXT W
2410 NEXT H
2420 NEXT Y
2430 NEXT W
2440 NEXT H
2450 NEXT Y
2460 NEXT W
2470 NEXT H
2480 NEXT Y
2490 NEXT W
2500 NEXT H
2510 NEXT Y
2520 NEXT W
2530 NEXT H
2540 NEXT Y
2550 NEXT W
2560 NEXT H
2570 NEXT Y
2580 NEXT W
2590 NEXT H
2600 NEXT Y
2610 NEXT W
2620 NEXT H
2630 NEXT Y
2640 NEXT W
2650 NEXT H
2660 NEXT Y
2670 NEXT W
2680 NEXT H
2690 NEXT Y
2700 NEXT W
2710 NEXT H
2720 NEXT Y
2730 NEXT W
2740 NEXT H
2750 NEXT Y
2760 NEXT W
2770 NEXT H
2780 NEXT Y
2790 NEXT W
2800 NEXT H
2810 NEXT Y
2820 NEXT W
2830 NEXT H
2840 NEXT Y
2850 NEXT W
2860 NEXT H
2870 NEXT Y
2880 NEXT W
2890 NEXT H
2900 NEXT Y
2910 NEXT W
2920 NEXT H
2930 NEXT Y
2940 NEXT W
2950 NEXT H
2960 NEXT Y
2970 NEXT W
2980 NEXT H
2990 NEXT Y
3000 NEXT W
3010 NEXT H
3020 NEXT Y
3030 NEXT W
3040 NEXT H
3050 NEXT Y
3060 NEXT W
3070 NEXT H
3080 NEXT Y
3090 NEXT W
3100 NEXT H
3110 NEXT Y
3120 NEXT W
3130 NEXT H
3140 NEXT Y
3150 NEXT W
3160 NEXT H
3170 NEXT Y
3180 NEXT W
3190 NEXT H
3200 NEXT Y
3210 NEXT W
3220 NEXT H
3230 NEXT Y
3240 NEXT W
3250 NEXT H
3260 NEXT Y
3270 NEXT W
3280 NEXT H
3290 NEXT Y
3300 NEXT W
3310 NEXT H
3320 NEXT Y
3330 NEXT W
3340 NEXT H
3350 NEXT Y
3360 NEXT W
3370 NEXT H
3380 NEXT Y
3390 NEXT W
3400 NEXT H
3410 NEXT Y
3420 NEXT W
3430 NEXT H
3440 NEXT Y
3450 NEXT W
3460 NEXT H
3470 NEXT Y
3480 NEXT W
3490 NEXT H
3500 NEXT Y
3510 NEXT W
3520 NEXT H
3530 NEXT Y
3540 NEXT W
3550 NEXT H
3560 NEXT Y
3570 NEXT W
3580 NEXT H
3590 NEXT Y
3600 NEXT W
3610 NEXT H
3620 NEXT Y
3630 NEXT W
3640 NEXT H
3650 NEXT Y
3660 NEXT W
3670 NEXT H
3680 NEXT Y
3690 NEXT W
3700 NEXT H
3710 NEXT Y
3720 NEXT W
3730 NEXT H
3740 NEXT Y
3750 NEXT W
3760 NEXT H
3770 NEXT Y
3780 NEXT W
3790 NEXT H
3800 NEXT Y
3810 NEXT W
3820 NEXT H
3830 NEXT Y
3840 NEXT W
3850 NEXT H
3860 NEXT Y
3870 NEXT W
3880 NEXT H
3890 NEXT Y
3900 NEXT W
3910 NEXT H
3920 NEXT Y
3930 NEXT W
3940 NEXT H
3950 NEXT Y
3960 NEXT W
3970 NEXT H
3980 NEXT Y
3990 NEXT W
4000 NEXT H
4010 NEXT Y
4020 NEXT W
4030 NEXT H
4040 NEXT Y
4050 NEXT W
4060 NEXT H
4070 NEXT Y
4080 NEXT W
4090 NEXT H
4100 NEXT Y
4110 NEXT W
4120 NEXT H
4130 NEXT Y
4140 NEXT W
4150 NEXT H
4160 NEXT Y
4170 NEXT W
4180 NEXT H
4190 NEXT Y
4200 NEXT W
4210 NEXT H
4220 NEXT Y
4230 NEXT W
4240 NEXT H
4250 NEXT Y
4260 NEXT W
4270 NEXT H
4280 NEXT Y
4290 NEXT W
4300 NEXT H
4310 NEXT Y
4320 NEXT W
4330 NEXT H
4340 NEXT Y
4350 NEXT W
4360 NEXT H
4370 NEXT Y
4380 NEXT W
4390 NEXT H
4400 NEXT Y
4410 NEXT W
4420 NEXT H
4430 NEXT Y
4440 NEXT W
4450 NEXT H
4460 NEXT Y
4470 NEXT W
4480 NEXT H
4490 NEXT Y
4500 NEXT W
4510 NEXT H
4520 NEXT Y
4530 NEXT W
4540 NEXT H
4550 NEXT Y
4560 NEXT W
4570 NEXT H
4580 NEXT Y
4590 NEXT W
4600 NEXT H
4610 NEXT Y
4620 NEXT W
4630 NEXT H
4640 NEXT Y
4650 NEXT W
4660 NEXT H
4670 NEXT Y
4680 NEXT W
4690 NEXT H
4700 NEXT Y
4710 NEXT W
4720 NEXT H
4730 NEXT Y
4740 NEXT W
4750 NEXT H
4760 NEXT Y
4770 NEXT W
4780 NEXT H
4790 NEXT Y
4800 NEXT W
4810 NEXT H
4820 NEXT Y
4830 NEXT W
4840 NEXT H
4850 NEXT Y
4860 NEXT W
4870 NEXT H
4880 NEXT Y
4890 NEXT W
4900 NEXT H
4910 NEXT Y
4920 NEXT W
4930 NEXT H
4940 NEXT Y
4950 NEXT W
4960 NEXT H
4970 NEXT Y
4980 NEXT W
4990 NEXT H
5000 NEXT Y
5010 NEXT W
5020 NEXT H
5030 NEXT Y
5040 NEXT W
5050 NEXT H
5060 NEXT Y
5070 NEXT W
5080 NEXT H
5090 NEXT Y
5100 NEXT W
5110 NEXT H
5120 NEXT Y
5130 NEXT W
5140 NEXT H
5150 NEXT Y
5160 NEXT W
5170 NEXT H
5180 NEXT Y
5190 NEXT W
5200 NEXT H
5210 NEXT Y
5220 NEXT W
5230 NEXT H
5240 NEXT Y
5250 NEXT W
5260 NEXT H
5270 NEXT Y
5280 NEXT W
5290 NEXT H
5300 NEXT Y
5310 NEXT W
5320 NEXT H
5330 NEXT Y
5340 NEXT W
5350 NEXT H
5360 NEXT Y
5370 NEXT W
5380 NEXT H
5390 NEXT Y
5400 NEXT W
5410 NEXT H
5420 NEXT Y
5430 NEXT W
5440 NEXT H
5450 NEXT Y
5460 NEXT W
5470 NEXT H
5480 NEXT Y
5490 NEXT W
5500 NEXT H
5510 NEXT Y
5520 NEXT W
5530 NEXT H
5540 NEXT Y
5550 NEXT W
5560 NEXT H
5570 NEXT Y
5580 NEXT W
5590 NEXT H
5600 NEXT Y
5610 NEXT W
5620 NEXT H
5630 NEXT Y
5640 NEXT W
5650 NEXT H
5660 NEXT Y
5670 NEXT W
5680 NEXT H
5690 NEXT Y
5700 NEXT W
5710 NEXT H
5720 NEXT Y
5730 NEXT W
5740 NEXT H
5750 NEXT Y
5760 NEXT W
5770 NEXT H
5780 NEXT Y
5790 NEXT W
5800 NEXT H
5810 NEXT Y
5820 NEXT W
5830 NEXT H
5840 NEXT Y
5850 NEXT W
5860 NEXT H
5870 NEXT Y
5880 NEXT W
5890 NEXT H
5900 NEXT Y
5910 NEXT W
5920 NEXT H
5930 NEXT Y
5940 NEXT W
5950 NEXT H
5960 NEXT Y
5970 NEXT W
5980 NEXT H
5990 NEXT Y
6000 NEXT W
6010 NEXT H
6020 NEXT Y
6030 NEXT W
6040 NEXT H
6050 NEXT Y
6060 NEXT W
6070 NEXT H
6080 NEXT Y
6090 NEXT W
6100 NEXT H
6110 NEXT Y
6120 NEXT W
6130 NEXT H
6140 NEXT Y
6150 NEXT W
6160 NEXT H
6170 NEXT Y
6180 NEXT W
6190 NEXT H
6200 NEXT Y
6210 NEXT W
6220 NEXT H
6230 NEXT Y
6240 NEXT W
6250 NEXT H
6260 NEXT Y
6270 NEXT W
6280 NEXT H
6290 NEXT Y
6300 NEXT W
6310 NEXT H
6320 NEXT Y
6330 NEXT W
6340 NEXT H
6350 NEXT Y
6360 NEXT W
6370 NEXT H
6380 NEXT Y
6390 NEXT W
6400 NEXT H
6410 NEXT Y
6420 NEXT W
6430 NEXT H
6440 NEXT Y
6450 NEXT W
6460 NEXT H
6470 NEXT Y
6480 NEXT W
6490 NEXT H
6500 NEXT Y
6510 NEXT W
6520 NEXT H
6530 NEXT Y
6540 NEXT W
6550 NEXT H
6560 NEXT Y
6570 NEXT W
6580 NEXT H
6590 NEXT Y
6600 NEXT W
6610 NEXT H
6620 NEXT Y
6630 NEXT W
6640 NEXT H
6650 NEXT Y
6660 NEXT W
6670 NEXT H
6680 NEXT Y
6690 NEXT W
6700 NEXT H
6710 NEXT Y
6720 NEXT W
6730 NEXT H
6740 NEXT Y
6750 NEXT W
6760 NEXT H
6770 NEXT Y
6780 NEXT W
6790 NEXT H
6800 NEXT Y
6810 NEXT W
6820 NEXT H
6830 NEXT Y
6840 NEXT W
6850 NEXT H
6860 NEXT Y
6870 NEXT W
6880 NEXT H
6890 NEXT Y
6900 NEXT W
6910 NEXT H
6920 NEXT Y
6930 NEXT W
6940 NEXT H
6950 NEXT Y
6960 NEXT W
6970 NEXT H
6980 NEXT Y
6990 NEXT W
7000 NEXT H
7010 NEXT Y
7020 NEXT W
7030 NEXT H
7040 NEXT Y
7050 NEXT W
7060 NEXT H
7070 NEXT Y
7080 NEXT W
7090 NEXT H
7100 NEXT Y
7110 NEXT W
7120 NEXT H
7130 NEXT Y
7140 NEXT W
7150 NEXT H
7160 NEXT Y
7170 NEXT W
7180 NEXT H
7190 NEXT Y
7200 NEXT W
7210 NEXT H
7220 NEXT Y
7230 NEXT W
7240 NEXT H
7250 NEXT Y
7260 NEXT W
7270 NEXT H
7280 NEXT Y
7290 NEXT W
7300 NEXT H
7310 NEXT Y
7320 NEXT W
7330 NEXT H
7340 NEXT Y
7350 NEXT W
7360 NEXT H
7370 NEXT Y
7380 NEXT W
7390 NEXT H
7400 NEXT Y
7410 NEXT W
7420 NEXT H
7430 NEXT Y
7440 NEXT W
7450 NEXT H
7460 NEXT Y
7470 NEXT W
7480 NEXT H
7490 NEXT Y
7500 NEXT W
7510 NEXT H
7520 NEXT Y
7530 NEXT W
7540 NEXT H
7550 NEXT Y
7560 NEXT W
7570 NEXT H
7580 NEXT Y
7590 NEXT W
7600 NEXT H
7610 NEXT Y
7620 NEXT W
7630 NEXT H
7640 NEXT Y
7650 NEXT W
7660 NEXT H
7670 NEXT Y
7680 NEXT W
7690 NEXT H
7700 NEXT Y
7710 NEXT W
7720 NEXT H
7730 NEXT Y
7740 NEXT W
7750 NEXT H
7760 NEXT Y
7770 NEXT W
7780 NEXT H
7790 NEXT Y
7800 NEXT W
7810 NEXT H
7820 NEXT Y
7830 NEXT W
7840 NEXT H
7850 NEXT Y
7860 NEXT W
7870 NEXT H
7880 NEXT Y
7890 NEXT W
7900 NEXT H
7910 NEXT Y
7920 NEXT W
7930 NEXT H
7940 NEXT Y
7950 NEXT W
7960 NEXT H
7970 NEXT Y
7980 NEXT W
7990 NEXT H
8000 NEXT Y
8010 NEXT W
8020 NEXT H
8030 NEXT Y
8040 NEXT W
8050 NEXT H
8060 NEXT Y
8070 NEXT W
8080 NEXT H
8090 NEXT Y
8100 NEXT W
8110 NEXT H
8120 NEXT Y
8130 NEXT W
8140 NEXT H
8150 NEXT Y
8160 NEXT W
8170 NEXT H
8180 NEXT Y
8190 NEXT W
8200 NEXT H
8210 NEXT Y
8220 NEXT W
8230 NEXT H
8240 NEXT Y
8250 NEXT W
8260 NEXT H
8270 NEXT Y
8280 NEXT W
8290 NEXT H
8300 NEXT Y
8310 NEXT W
8320 NEXT H
8330 NEXT Y
8340 NEXT W
8350 NEXT H
8360 NEXT Y
8370 NEXT W
8380 NEXT H
8390 NEXT Y
8400 NEXT W
8410 NEXT H
8420 NEXT Y
8430 NEXT W
8440 NEXT H
8450 NEXT Y
8460 NEXT W
8470 NEXT H
8480 NEXT Y
8490 NEXT W
8500 NEXT H
8510 NEXT Y
8520 NEXT W
8530 NEXT H
8540 NEXT Y
8550 NEXT W
8560 NEXT H
8570 NEXT Y
8580 NEXT W
8590 NEXT H
8600 NEXT Y
8610 NEXT W
8620 NEXT H
8630 NEXT Y
8640 NEXT W
8650 NEXT H
8660 NEXT Y
8670 NEXT W
8680 NEXT H
8690 NEXT Y
8700 NEXT W
8710 NEXT H
8720 NEXT Y
8730 NEXT W
8740 NEXT H
8750 NEXT Y
8760 NEXT W
8770 NEXT H
8780 NEXT Y
8790 NEXT W
8800 NEXT H
8810 NEXT Y
8820 NEXT W
8830 NEXT H
8840 NEXT Y
8850 NEXT W
8860 NEXT H
8870 NEXT Y
8880 NEXT W
8890 NEXT H
8900 NEXT Y
8910 NEXT W
8920 NEXT H
8930 NEXT Y
8940 NEXT W
8950 NEXT H
8960 NEXT Y
8970 NEXT W
8980 NEXT H
8990 NEXT Y
9000 NEXT W
9010 NEXT H
9020 NEXT Y
9030 NEXT W
9040 NEXT H
9050 NEXT Y
9060 NEXT W
9070 NEXT H
9080 NEXT Y
9090 NEXT W
9100 NEXT H
9110 NEXT Y
9120 NEXT W
9130 NEXT H
9140 NEXT Y
9150 NEXT W
9160 NEXT H
9170 NEXT Y
9180 NEXT W
9190 NEXT H
9200 NEXT Y
9210 NEXT W
9220 NEXT H
9230 NEXT Y
9240 NEXT W
9250 NEXT H
9260 NEXT Y
9270 NEXT W
9280 NEXT H
9290 NEXT Y
9300 NEXT W
9310 NEXT H
9320 NEXT Y
9330 NEXT W
9340 NEXT H
9350 NEXT Y
9360 NEXT W
9370 NEXT H
9380 NEXT Y
9390 NEXT W
9400 NEXT H
9410 NEXT Y
9420 NEXT W
9430 NEXT H
9440 NEXT Y
9450 NEXT W
9460 NEXT H
9470 NEXT Y
9480 NEXT W
9490 NEXT H
9500 NEXT Y
9510 NEXT W
9520 NEXT H
9530 NEXT Y
9540 NEXT W
9550 NEXT H
9560 NEXT Y
9570 NEXT W
9580 NEXT H
9590 NEXT Y
9600 NEXT W
9610 NEXT H
9620 NEXT Y
9630 NEXT W
9640 NEXT H
9650 NEXT Y
9660 NEXT W
9670 NEXT H
9680 NEXT Y
9690 NEXT W
9700 NEXT H
9710 NEXT Y
9720 NEXT W
9730 NEXT H
9740 NEXT Y
9750 NEXT W
9760 NEXT H
9770 NEXT Y
9780 NEXT W
9790 NEXT H
9800 NEXT Y
9810 NEXT W
9820 NEXT H
9830 NEXT Y
9840 NEXT W
9850 NEXT H
9860 NEXT Y
9870 NEXT W
9880 NEXT H
9890 NEXT Y
9900 NEXT W
9910 NEXT H
9920 NEXT Y
9930 NEXT W
9940 NEXT H
9950 NEXT Y
9960 NEXT W
9970 NEXT H
9980 NEXT Y
9990 NEXT W
10000 NEXT H
10010 NEXT Y
10020 NEXT W
10030 NEXT H
10040 NEXT Y
10050 NEXT W
10060 NEXT H
10070 NEXT Y
10080 NEXT W
10090 NEXT H
10100 NEXT Y
10110 NEXT W
10120 NEXT H
10130 NEXT Y
10140 NEXT W
10150 NEXT H
10160 NEXT Y
10170 NEXT W
10180 NEXT H
10190 NEXT Y
10200 NEXT W
10210 NEXT H
10220 NEXT Y
10230 NEXT W
10240 NEXT H
10250 NEXT Y
10260 NEXT W
10270 NEXT H
10280 NEXT Y
10290 NEXT W
10300 NEXT H
10310 NEXT Y
10320 NEXT W
10330 NEXT H
10340 NEXT Y
10350 NEXT W
10360 NEXT H
10370 NEXT Y
10380 NEXT W
10390 NEXT H
10400 NEXT Y
10410 NEXT W
10420 NEXT H
10430 NEXT Y
10440 NEXT W
10450 NEXT H
10460 NEXT Y
10470 NEXT W
10480 NEXT H
10490 NEXT Y
10500 NEXT W
10510 NEXT H
10520 NEXT Y
10530 NEXT W
10540 NEXT H
10550 NEXT Y
10560 NEXT W
10570 NEXT H
10580 NEXT Y
10590 NEXT W
10600 NEXT H
10610 NEXT Y
10620 NEXT W
10630 NEXT H
10640 NEXT Y
10650 NEXT W
10660 NEXT H
10670 NEXT Y
10680 NEXT W
10690 NEXT H
10700 NEXT Y
10710 NEXT W
10720 NEXT H
10730 NEXT Y
10740 NEXT W
10750 NEXT H
10760 NEXT Y
10770 NEXT W
10780 NEXT H
10790 NEXT Y
10800 NEXT W
10810 NEXT H
10820 NEXT Y
10830 NEXT W
10840 NEXT H
10850 NEXT Y
10860 NEXT W
10870 NEXT H
10880 NEXT Y
10890 NEXT W
10900 NEXT H
10910 NEXT Y
10920 NEXT W
10930 NEXT H
10940 NEXT Y
10950 NEXT W
10960 NEXT H
10970 NEXT Y
10980 NEXT W
10990 NEXT H
11000 NEXT Y
11010 NEXT W
11020 NEXT H
11030 NEXT Y
11040 NEXT W
11050 NEXT H
11060 NEXT Y
11070 NEXT W
11080 NEXT H
11090 NEXT Y
11100 NEXT W
11110 NEXT H
11120 NEXT Y
11130 NEXT W
11140 NEXT H
11150 NEXT Y
11160 NEXT W
11170 NEXT H
11180 NEXT Y
11190 NEXT W
11200 NEXT H
11210 NEXT Y
11220 NEXT W
11230 NEXT H
11240 NEXT Y
11250 NEXT W
11260 NEXT H
11270 NEXT Y
11280 NEXT W
11290 NEXT H
11300 NEXT Y
11310 NEXT W
11320 NEXT H
11330 NEXT Y
11340 NEXT W
11350 NEXT H
11360 NEXT Y
11370 NEXT W
11380 NEXT H
11390 NEXT Y
11400 NEXT W
11410 NEXT H
11420 NEXT Y
11430 NEXT W
11440 NEXT H
11450 NEXT Y
11460 NEXT W
11470 NEXT H
11480 NEXT Y
11490 NEXT W
11500 NEXT H
11510 NEXT Y
11520 NEXT W
11530 NEXT H
11540 NEXT Y
11550 NEXT W
11560 NEXT H
11570 NEXT Y
11580 NEXT W
11590 NEXT H
11600 NEXT Y
11610 NEXT W
11620 NEXT H
11630 NEXT Y
11640 NEXT W
11650 NEXT H
11660 NEXT Y
11670 NEXT W
11680 NEXT H
11690 NEXT Y
11700 NEXT W
11710 NEXT H
11720 NEXT Y
11730 NEXT W
11740 NEXT H
11750 NEXT Y
11760 NEXT W
11770 NEXT H
11780 NEXT Y
11790 NEXT W
11800 NEXT H
11810 NEXT Y
11820 NEXT W
11830 NEXT H
11840 NEXT Y
11850 NEXT W
11860 NEXT H
11870 NEXT Y
11880 NEXT W
11890 NEXT H
11900 NEXT Y
11910 NEXT W
11920 NEXT H
11930 NEXT Y
11940 NEXT W
11950 NEXT H
11960 NEXT Y
11970 NEXT W
11980 NEXT H
11990 NEXT Y
12000 NEXT W
12010 NEXT H
12020 NEXT Y
12030 NEXT W
12040 NEXT H
12050 NEXT Y
12060 NEXT W
12070 NEXT H
12080 NEXT Y
12090 NEXT W
12100 NEXT H
12110 NEXT Y
12120 NEXT W
12130 NEXT H
12140 NEXT Y
12150 NEXT W
12160 NEXT H
12170 NEXT Y
12180 NEXT W
12190 NEXT H
12200 NEXT Y
12210 NEXT W
12220 NEXT H
12230 NEXT Y
12240 NEXT W
12250 NEXT H
12260 NEXT Y
12270 NEXT W
12280 NEXT H
12290 NEXT Y
12300 NEXT W
12310 NEXT H
12320 NEXT Y
12330 NEXT W
12340 NEXT H
12350 NEXT Y
12360 NEXT W
12370 NEXT H
12380 NEXT Y
12390 NEXT W
12400 NEXT H
12410 NEXT Y
12420 NEXT W
12430 NEXT H
12440 NEXT Y
12450 NEXT W
12460 NEXT H
12470 NEXT Y
12480 NEXT W
12490 NEXT H
12500 NEXT Y
12510 NEXT W
12520 NEXT H
12530 NEXT Y
12540 NEXT W
12550 NEXT H
12560 NEXT Y
12570 NEXT W
12580 NEXT H
12590 NEXT Y
12600 NEXT W
12610 NEXT H
12620 NEXT Y
12630 NEXT W
12640 NEXT H
12650 NEXT Y
12660 NEXT W
12670 NEXT H
12680 NEXT Y
12690 NEXT W
12700 NEXT H
12710 NEXT Y
12720 NEXT W
12730 NEXT H
12740 NEXT Y
12750 NEXT W
12760 NEXT H
12770 NEXT Y
12780 NEXT W
12790 NEXT H
12800 NEXT Y
12810 NEXT W
12820 NEXT H
12830 NEXT Y
12840 NEXT W
12850 NEXT H
12860 NEXT Y
12870 NEXT W
12880 NEXT H
12890 NEXT Y
12900 NEXT W
12910 NEXT H
12920 NEXT Y
12930 NEXT W
12940 NEXT H
12950 NEXT Y
12960 NEXT W
12970 NEXT H
12980 NEXT Y
12990 NEXT W
13000 NEXT H
13010 NEXT Y
13020 NEXT W
13030 NEXT H
13040 NEXT Y
13050 NEXT W
13060 NEXT H
13070 NEXT Y
13080 NEXT W
13090 NEXT H
13100 NEXT Y
13110 NEXT W
13120 NEXT H
13130 NEXT Y
13140 NEXT W
13150 NEXT H
13160 NEXT Y
13170 NEXT W
13180 NEXT H
13190 NEXT Y
13200 NEXT W
13210 NEXT H
13220 NEXT Y
13230 NEXT W
13240 NEXT H
13250 NEXT Y
13260 NEXT W
13270 NEXT H
13280 NEXT Y
13290 NEXT W
13300 NEXT H
13310 NEXT Y
13320 NEXT W
13330 NEXT H
13340 NEXT Y
13350 NEXT W
13360 NEXT H
13370 NEXT Y
13380 NEXT W
13390 NEXT H
13400 NEXT Y
13410 NEXT W
13420 NEXT H
13430 NEXT Y
13440 NEXT W
13450 NEXT H
13460 NEXT Y
13470 NEXT W
13480 NEXT H
13490 NEXT Y
13500 NEXT W
13510 NEXT H
13520 NEXT Y
13530 NEXT W
13540 NEXT H
13550 NEXT Y
13560 NEXT W
13570 NEXT H
13580 NEXT Y
13590 NEXT W
13600 NEXT H
13610 NEXT Y
13620 NEXT W
13630 NEXT H
13640 NEXT Y
13650 NEXT W
13660 NEXT H
13670 NEXT Y
13680 NEXT W
13690 NEXT H
13700 NEXT Y
13710 NEXT W
13720 NEXT H
13730 NEXT Y
13740 NEXT W
13750 NEXT H
13760 NEXT Y
13770 NEXT W
13780 NEXT H
13790 NEXT Y
13800 NEXT W
13810 NEXT H
13820 NEXT Y
13830 NEXT W
13840 NEXT H
13850 NEXT Y
13860 NEXT W
13870 NEXT H
13880 NEXT Y
13890 NEXT W
13900 NEXT H
13910 NEXT Y
13920 NEXT W
13930 NEXT H
13940 NEXT Y
13950 NEXT W
13960 NEXT H
13970 NEXT Y
13980 NEXT W
13990 NEXT H
14000 NEXT Y
14010 NEXT W
14020 NEXT H
14030 NEXT Y
14040 NEXT W
14050 NEXT H
14060 NEXT Y
14070 NEXT W
14080 NEXT H
14090 NEXT Y
14100 NEXT W
14110 NEXT H
14120 NEXT Y
14130 NEXT W
14140 NEXT H
14150 NEXT Y
14160 NEXT W
14170 NEXT H
14180 NEXT Y
14190 NEXT W
14200 NEXT H
14210 NEXT Y
14220 NEXT W

```



# **DRAGON 32** NEW FROM **TROJAN** "SPACE TREK"

Space Trek is an absorbing space wars game in real time which can be played in any of four levels. Special features include:

- Onboard battle computer.
- A galaxy containing 100 quadrants.
- Impulse and warp drive speeds.
- Long range galaxy scanning.
- Shield control and status reports.

THIS GAME IS A MUST FOR DRAGON USERS. APPROVED BY DRAGON DATA LIMITED.

ZX81 16K games available, SAE for list.

Send to:

**TROJAN PRODUCTS**  
 Dept. PCK  
 166 DERLWYN, DUNVANT  
 SWANSEA, WEST GLAM SA2 7PF

Please send me "SPACE TREK" for my DRAGON 32. I enclose cheque/P.O. for £7.50 which includes P&P.

MR/MRS.....

ADDRESS.....

# **ZX 81 & SPECTRUM**

## **THE ZETEC** **KEYBOARD/JOYSTICK** **INTERFACES**

- Fully Cased — no open boards.
- Plugs into the expansion port when required.
- Keeps all the original keyboard operational.
- Does not interfere with other add-ons.
- Operates under Basic's command or Machine Codes.
- Requires Atari type joysticks.

FULL INSTRUCTIONS SUPPLIED.

	TO SUIT ZX-81	TO SUIT SPECTRUM
INTERFACE FOR KEYBOARD	£12.95	£14.95
INTERFACE FOR 1-2 JOYSTICKS	£14.95	£20.95
INTERFACE FOR 1-4 JOYSTICKS	£18.95	£15.95
JOYSTICKS — P.O.A.		(VAT AND P&P INC.)

# **ZETEC**

Prompt delivery. Checks/P.O. to  
 16 Walsingham Place, Truro, Cornwall, England.

TELEPHONE: 71135

# **PRINT OUT**



## **AMBER 2400** **MATRIX PRINTER**

LOW RUNNING COST USING  
 PLAIN PAPER  
 USED WITH MANY COMPUTERS  
 INCLUDING BBC, UK101, ATOM,  
 DRAGON, NEWBRAIN, ATARI,  
 TRS-80, VIC-20 AND MZ-80K

**£ 78**

+VAT & £2.95 P&P  
 Or for details send a  
 large SAE to:

**AMBER CONTROLS LIMITED**  
 Central Way  
 Walworth Industrial Est.  
 Andover  
 Hampshire SP10 5AL



Linsac's ZX Companion series has received excellent press reviews:

"Far and away the best" — *Your Computer*

Thoughtfully written, detailed and illustrated with meaningful programs ... outstandingly useful" — *EZUG*

'The Spectrum Games Companion' is the latest addition to the series and is aimed at the games player and programmer alike. Twenty-one games designed specifically for the ZX Spectrum are included, with clear instructions on entry and play. Each program is explained fully with complete details on how it is designed and written. Introductory chapters show how to set up and use the Spectrum and how to create your own games. Later sections cover number games, word games, board games, simulation

games, dice games, card games and grid games. If you want to enjoy your ZX Spectrum and learn its secrets at the same time then this is the book for you!

Bob Maunder is co-author of 'The ZX80 Companion' and author of 'The ZX81 Companion'. He is a Senior Lecturer in Computer Science at Teesside Polytechnic, holds an MSc degree in Computer Science, and is a Member of the British Computer Society.

The Spectrum Games Companion is available from good book shops, or send £5.95 to:

**LINSAC, (PC) 68 Barker Road,  
Middlesbrough, Cleveland TS5 5ES**

Postage is free within the U.K. —

add £1 for Europe or £2.50 outside Europe.

ISBN 0 907211 02 X

**Spectre ZX 81  
16K**

**SPECTRUM  
48K**

## SERIOUS APPLICATION PROGRAMMES

### ELECTRONICS

**£ 5.95**

Ever built a digital electronic circuit that didn't work? Now this highly comprehensive design programme enables you to draw a circuit diagram on the screen, using standard components, including transistors, logic gates, diodes, triacs, thyristors etc etc. (57 defined symbols are used). These may be rotated on screen if required. Once complete the computer will activate the circuit to display the voltage levels throughout. Your circuit may be de-activated, modified and re-activated, saved on tape for future use and copied to the printer. An invaluable aid to the designer of digital electronic circuits, either hobbyist or professional, this programme can cope with components from the simplest to a screenful of densely packed interconnected components.

### NUMERIC

**£ 5.95**

A multi-function maths toolkit programme.  
It will  
a. Solve any equation for a single unknown.  
b. Plot the graph of any function - you may expand or contract the axes and alter the increments in order to obtain the best representation of your function.  
c. Solve simultaneous and quadratic equations.  
d. Solve right angle triangles.  
e. Find arithmetic mean and standard deviation for a list of numbers.  
It will do the same for two lists plus finding the coefficient of correlation between them. Graphs can be produced for your data against the three Standard Deviation curves.  
All displays can be copied to the printer if required.

ELECTRONICS requires the ZX81 board to run on a ZX81 but operates on a normal Spectrum. These superb programmes are extremely user friendly, come with comprehensive instructions and offer facilities too numerous to cover in this advertisement. Exceptional value for money.

Please state computer type:  
Cheques payable to:

**Spectre**

**2 MULL CLOSE  
OAKLEY  
BASINGSTOKE  
HANTS**

# SILVERSOFT

**NEW!**

## STARSHIP ENTERPRISE

Soar through the stars as a starship commander in this exciting new space ship simulation. This new, advanced version of Startrek uses the full colour graphics and sound facilities of modern micros. Full 3D — Klingon attacks, graphic hyper-warp, plus all the normal 'Startrek' features and a whole lot more, add up to one of the best games in the galaxy!

48K Spectrum £5.95.

## ORBITER

Fast and furious action is what you get in this amazing Defender-style program for the ZX-Spectrum.

ORBITER is written entirely in m/c code and has full arcade features, including scanners, reverse, hyper-space, continuous scoring and sound effects, plus humanoids, landers, mutants and all the other alien nasties.

16K or 48K Spectrum £5.95.

## GROUND ATTACK

Survival is the name of the game in this exciting Scramble-type arcade game for the ZX-Spectrum.

Your mission is to pilot your spaceship through torturous caverns while destroying the enemy missile launchers and fuel dumps.

GROUND ATTACK is written completely in machine code. And has full arcade features including lasers, bombs, explosions, continuous scoring and sound effects, plus rockets, fuel dumps and airborne aliens.

16K or 48K Spectrum £5.95.

Any hiring, lending or copying (except backup) of Silversoft software is strictly forbidden without written permission from Silversoft.

**GENEROUS DEALER DISCOUNTS AVAILABLE**  
Silversoft Ltd, 20 Orange Street, LONDON WC2H 7ED.

## NEW! ZX81-COMPILER

Yes! Now you can write machine code on your ZX81. No more messing about with assemblers and disassemblers simply type in the BASIC program and the machine does the rest.  
ONLY £5.95.

## ZX81 ARCADE ACTION (New low prices)

<b>MUNCHER</b> Exciting pacman game for the ZX81	<b>£4.95</b>
<b>ASTEROIDS</b> "Just the thing for asteroid addicts"	<b>£4.95</b>
<b>INVADERS</b> "Probably the best version of INVADERS"	<b>£3.95</b>
<b>ALIEN-DROPOUT</b> Exciting ORIGINAL arcade game	<b>£3.95</b>
<b>STARTREK</b> YES! you can be a starship commander	<b>£3.95</b>
<b>GRAPHIC GOLF</b> 18 graphically displayed holes	<b>£3.95</b>
<b>SUPERWUMPUS</b> An underground adventure	<b>£3.95</b>
<b>GAMES PACK 1</b> Fantastic value for money, nearly 50K of programs on one cassette! Only	<b>£3.95</b>

Please send me \_\_\_\_\_

I enclose a cheque/PO for £ \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

Silversoft Ltd, 20 Orange Street, LONDON WC2H 7ED.





**\*SPECTRUM MONITOR**  
**\*SPECTRUM EDITOR/ASSEMBLER**  
**\*ZX81 SCREEN KIT 1**  
**\*ZX81 ZX-MC \*ZX81 REMLOAD**

**FAST MAIL ORDER-SEND TODAY!**

**SPECTRUM MONITOR.** Machine code programs. • Compatible with Basic • Breakpoints and Registers Display • Disassembly to screen and/or ZX Printer • 16K and 48K versions on one cassette + 30 page manual. **£7.50**

**SPECTRUM EDITOR/ASSEMBLER.** A powerful and essential machine code programming aid. 16K & 48K on same cassette with full documentation. Major features include:  
 • Editor with Auto Line Numbering. 40 Column screen display, tabulated into fields for easy reading. 5 character Label Names: simple Line Editing and Cursor Control:  
 • SAVE/LOAD Text Buffer to cassette: output to ZX PRINTER.  
 • TWO-PASS ASSEMBLER accepts all Z80 mnemonics (plus many unpublished mnemonics): Decimal or Hex numbers: simple arithmetic on operands: Assembler Directives — ORG, END, DEFB, DEFW, DEFL, EQU, DEFM  
 • WE CANNOT FULLY DESCRIBE THIS IMPORTANT UTILITY HERE, AND ASK YOU TO SEND A S.A.E. FOR COMPLETE DETAILS OF THIS AND ALL OUR PROGRAMS. **£8.50**

**ZX81 SCREEN KIT 1.** More power to your screen in all your Basic programs  
 • BORDERS any size, anywhere on screen. SCROLL in all 4 directions. CLEAR and REVERSE PART OF SCREEN. FLASHING CURSOR anywhere on screen — simulates INPUT. DATA FILES SAVE AND LOAD Basic variables: Double Speed, 880 bytes machine code for INSTANT RESPONSE. Becomes part of Basic Program. **£5.70** 4K to 64K

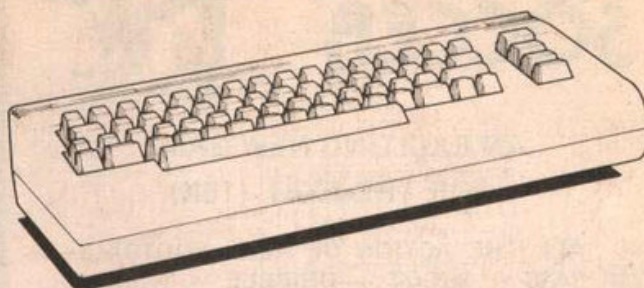
**ZX81 ZX-MC.** Machine Code Debug/Monitor  
 • ENTER, RUN, DEBUG machine code programs • SAVE, LOAD, VERIFY at double speed • BREAKPOINTS and REGISTERS DISPLAY • Self contained — cannot be used with Basic • Cassette plus 36 page manual. **£7.50** 4K to 64K

**ZX81 REMLOAD.** Machine Code Debug/Monitor  
 • A version of ZX-MC without the Save/Load/Verify facility • Compatible with Basic • CREATE A REM LINE of any length • BREAKPOINTS and REGISTERS DISPLAY • Cassette plus 30 page manual **£6.95** 16K to 64K

**SEND S.A.E. NOW FOR DETAILS**  
**6 Corkscrew Hill, West Wickham,**  
**Kent BR4 9BB.**  
 Prices include VAT & P&P

**PICTURESQUE  
PICTURESQUE  
PICTURESQUE**

## SPECIAL OFFER



## Vic-20 Computer £144.95 (incl. VAT)

The Vic Centre has London's most comprehensive range of Vic-20 and Commodore 64 hardware and software. Telephone or call at The Vic Centre, 154 Victoria Road, North Acton, London W3 (opposite North Acton tube station) just off the A40.

Telephone: 01-992 9904

Monday–Saturday 10.00am–5.00pm

VISA, ACCESS, AMEX

## AMAZING NEW PRODUCT TELESOUND 84 BBC/SPECTRUM SOUND BOOSTER

Telesound 84 outputs the computer sound direct through your unmodified TV set. Sound effects then can be controlled from a whisper to a roar. Three easy snap-on connections eliminate soldering.

Telesound 84 measures 2½ x 2 x 1½ cm. and requires no separate power supply. This unique device (patent pending) uses some of the very latest ultra miniature components and costs only **£9.95** inclusive of post, packing, etc.

Full instructions with connection diagrams are supplied so that the unit can be fitted in minutes without any previous experience.

Cheques/PO to

**COMPUSOUND**

**32 Langley Close**

**Redditch, Worcs. B98 0ET**

Please state your computer when ordering

## C.P.S. GAMES

LYNTONTIA HOUSE  
 7/9 PRAED STREET, LONDON W2  
 Tel: 01-402 7964

We have now completed our move. We wish to apologise for the delay this may have caused. The last of the delayed orders should be with you now. If you are still expecting something from us, please give us a ring now.

### ADVENTURE GAMES

#### TOWER OF BRASHT:

Role playing adventure for up to seven players. 4 cassettes. **£9.50**

#### GHOST OF RADUN:

Adventure for one player. 3 cassettes. **£9.50**

#### WIZZARD OF SHAM:

Adventure for one player. 3 cassettes. **£9.50**

#### SEVEN CITIES OF CIBOLA:

Adventure for one player. 3 cassettes. **£9.50**

### WAR GAMES:

#### KING ARTHUR:

Battle in 6th Century England. 3 cassettes. **£9.50**

### CHILDREN'S GAMES:

Peter Rabbit Series and Tummy Digs Series. See previous ads in this magazine. 1 cassette. **£4.50**

Please add 50p P&P for order



# STAR SOCCER



AN EXCITING NEW GAME  
FOR THE ZX81 (16K)

- ★ ALL THE ACTION OF REAL FOOTBALL  
PASS — SHOOT — DRIBBLE — TACKLE  
CORNERS — FREE KICKS — THROW-INS
- ★ YOU PLAN THE MOVES — SEE THE PLAY  
IN HIGH SPEED GRAPHICS
- ★ MATCHES BETWEEN 12 TOP CLUB SIDES  
AND 12 \*STAR\* WORLD CUP SQUADS
- ★ MORE THAN AN ARCADE GAME  
MORE THAN A SIMULATION

'A truly original and absorbing game'

ONLY £5.95

Please make cheques and postal orders payable to:

Watson Software Services Ltd.

1, Ivy Cottages, Long Road West, Dedham, Essex CO7 6EL

Allow 14 days for delivery

## EXCELLENT SOFTWARE FOR APPLE II (disk) SPECTRUM and ZX81 — SOLUTIONS and ACCESSORIES

Our first software was produced on a valve computer (about as powerful as modern pocket computers, but occupying an enormous room). We established Hilderbay Ltd in 1979 and have since produced software for machines ranging from the Casio FX502P programmable calculator to the IBM 3033N mainframe. We have written software to calculate atomic absorption coefficients, mortgage payments, amplifier distortion coefficients, payroll data, ... At present we are offering the following software: PAYROLL (£69) and BOOKKEEPER (£35) on APPLE II; PAYROLL (£25), STOCK CONTROL (£25), CRITICAL PATH ANALYSIS (£15), MORTGAGE & LOAN (£8, 2 programs on one tape), and our fiendish text adventure game GOLD (£8) on the 48K SPECTRUM; OPTIMAX (linear optimisation, 75 variables, 75 >=< constraints, £40), BEAMSCAN (beam analysis for architects, £25), BUDGET (£15), TIME LEDGER (£15), and all the 48K Spectrum programs on the ZX81 with 16-48K (ZX81 GOLD is £6), TAPE saving and loading can be a problem. We have all the answers: (1) a tape recorder, aligned, tested and guaranteed by us which is OK for most computers (including Spectrum & ZX81) (£24); (2) our Microcomputer User's Book of Tape Recorders (mainly for the typical computer user, with a few notes for the electronics buff at the end, £3.10); (3) our Loading Aid (you get the volume right first time with no messing around, £5.95 for standard model, £7.95 for DeLuxe model with large meter); (4) our Alignment Tape which enables you to set up your tape recorder correctly (no instruments needed, £4.90). We have some VERY interesting items under wraps, but we don't want to announce them until they're ready. Come and see us at the Microfair on 18 December! (All prices include VAT & postage where applicable).

**HILDERBAY LTD Professional Software since 1979**  
8/10 Parkway, Regents Park, London NW1 7AA  
Telephone 01-485 1059 Telex 22870  
We have 20 years' experience in computing

## NEED MORE ZX81 MEMORY?

**WHY WAIT** ANY LONGER, WHEN YOU CAN HAVE THE BEST 16K RAM PACK AVAILABLE **NOW** FROM GROUND CONTROL? Built to high-quality standards using a unique design of **custom moulded plastic case** and **gold-plated edge connector**, the RAM PACK clips on to the ZX81 tightly, ensuring no "wobble" or disconnection problems. A switchable **keyboard sounder** is available inside the case as an extra, enabling faster entry of programs from the keyboard and less eyestrain, due to the decreased amount of time necessary referring to the screen to verify data entry. The sounder operates in fast mode and gives a beep every time a key is pressed. The RAM PACK is memory mapped from 16384 to 32767, the same as the Sinclair 16K RAM.



Please send SAE or IRCs with any enquiries for the above or details of our 16K RAM and I.O. BOARD still available at £32 for kit version.

**PRICES.** All inclusive for UK.

**16K RAMPACK (S) ..... £24.95**

**16K RAMPACK ..... £19.95**

European postage add £2. Others add £5. Mail order only. Please make cheques, etc, payable to GROUND CONTROL and send with orders to: Dept POC

**Ground Control**

**Ground Control**  
Alfreda Avenue  
Hullbridge  
Essex SS5 6LT  
ENGLAND

Telephone No: 0702 230324. 10 am to 6 pm





## Spirals

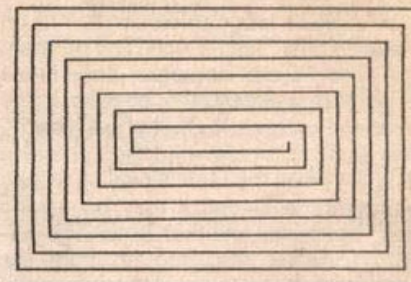
on ZX81

Here are two programs for drawing spirals. The circular routine is done by drawing half circles one at a time.



Spirals  
© Andrew Astrand  
Aged 12

```
5 INPUT "Enter the scale of the spiral ";y: INPUT "Enter the ink colour ";i: INPUT "Enter the border colour ";b: INPUT "Enter the paper colour ";p
10 INK i: BORDER b: PAPER p: CLS
15 LET x=0: PLOT 125,65
20 DRAW x,x,PI: LET x=x+y: GO
SUB 37: DRAW -x,-x,PI: LET x=x+y
GO SUB 37: GO TO 40
37 IF x>=120 THEN GO TO 5
35 RETURN
40 GO TO 20
```



Spirals 2  
© Andrew Astrand

```
5 INPUT "Enter the scale of the spiral ";y: INPUT "Enter the ink colour ";i: INPUT "Enter the border colour ";b: INPUT "Enter the paper colour ";p
20 PLOT 0,0: LET x=170: BORDER b: PAPER p: INK i: CLS
30 DRAW x+85,0: LET x=x-y: GO
SUB 40: DRAW 0,x: LET x=x-y: GO
SUB 40: DRAW -x-85,0: LET x=x-y: GO
SUB 40: DRAW 0,-x: LET x=x-y: GO
40 IF x<=0 THEN GO TO 5
50 RETURN
60 GO TO 30
```

## Spirals

by Andrew Astrand

## Morse code tutor

on ZX81

Several morse tutor programs for the ZX81 have been published but they all suffer the same disadvantage; namely — that the morse is not taught as it should be — by sound. It is absolutely no use whatever learning that 'dot dot dot' is 'S', it takes too long to interpret. Morse reading must be instinctive and this can only be achieved to any degree by learning the sound pattern.

This program, designed for the ZX81 1K, generates morse code at a preset speed, ranging from around five words per minute (very slow), to about 25 words per minute (about twice the Radio amateurs exam standard). Chosen groups of characters may be learned by simple changes to the program.

### Construction of the program

First enter a line 1 REM followed by 39 dots and *Poke* the contents of the table into this storage area. The last three bytes of the table are a simple machine code program to make the 'buzz'. Next, edit line 1 to add, in the order shown, the series of letters and numbers — 36 in all. The first 36 bytes entered in the Rem are a look-up table of the morse characters in coded form.

They are actually the morse sequence in binary, 'dot' = 0 and 'dash' = 1. Simple division by two will yield each successive character in turn — see lines 90 and 140. The sequence in lines 110 to 120 creates a buzz for each character. The construction in line 110 gives a long buzz for a dash and short for dot, the ratio of 3:1 being preserved no matter what the speed chosen.

Enter the rest of the program as listed, omitting all other Rems if you only have 1K. The letter-table in the last 36 bytes of line 1 shows the 'natural' sequencing of

morse when graded by ease of learning: viz E I S H / T M O / A U V / N D B / W J C K / P G R L / Q Z F X Y / and 1 2 3 4 5 / 6 7 8 9 0 / . Line 40 sets this and is for the whole code as given.

To alter this to say /E I S H/ place the Code for '4' instead of '8' i.e. generate a number between 1 and 4. Other pointers may be set in a similar manner. The printer buffer is used as 'free' storage space and does not affect the printer, if plugged in.

Speed is set by line 5 and is variable between the practical limits of 5 and 25 wpm. Morse is heard by either monitoring the 'mic' line with a small amplifier, or

turning up the TV sound and perhaps slightly de-tuning the video. The screen display collapses while morse is being sent. (It cannot be sent in *Slow*). When the display is restored, you simply enter the characters you received (use Newline as 'don't know') one at a time. If you were correct the character is printed. If wrong then the correct one is printed in reversed video.

With more memory it is desirable to make the program easier to use by adding menu selection of speed and letter groups as well as better screen display of checking. This is left to you!

```
1 REM "MORSE CODE TUTOR"
2 ;1YUSK457BUZPEEK TO TAN EISHTHO
3 AUNDBUJCKPGRLOZFXFY1234567890
4 3 REM LINE 5 GOVERNS SPEED.TH
5 IS SET=12 (CODE F=12).
6 LET S=CODE "F"
7 LET C=CODE "C"
8 LET M=VAL "16443"
9 FOR J=0 TO CODE "M"
10 REM POKE INTO THE PRINTER B
11 UFFER A RANDOM BETWEEN 1 AND 25
12 40 POKE M+J,INT (RAND*CODE "S")
13 +0
14 REM LOOK UP THE MORSE DATA
15 USING POINTERS STORED IN PRINTER
16 BUFFER.
17 LET L=PEEK (M+J)
18 LET E=PEEK (16513+L)
19 REM START BINARY DIVISION
20 LET E2=E-INT (E/C)*C
21 FOR Z=0 TO (VAL "100"+CODE
22 "C05" E2)/S
23 LET M=USR 16550
24 NEXT Z
25 REM BINARY DIVISION AGAIN
26 LET E=INT (E/C)*C
27 LET M=0+CODE "M"*(E/C)
28 FOR Z=0 TO INT ((VAL "100"+
29 M)/S)
30 NEXT Z
31 REM GO BACK FOR MORE.
32 IF E>0 THEN GOTO VAL "90"
33 NEXT J
34 SLOW
35 REM CHECK ANSWERS.INPUT COP
36 Y 313 CHARACTER AT A TIME.
37 FOR J=0 TO CODE "M"
38 INPUT B$
39 LET A$=CHR$ PEEK (PEEK (M+J)
40 +16550)
41 REM PRINT CHECK IN REVERSED
42 VIDEO IF WRONG.
43 PRINT CHR$ (CODE A$+128*(A$
44 <B$))
45 240 NEXT J
```

### LINE 1 REM VALUES

16514	2	16515	4
16516	8	16517	16
16518	3	16519	7
16520	15	16521	6
16522	12	16523	24
16524	5	16525	9
16526	17	16527	14
16528	30	16529	21
16530	13	16531	22
16532	11	16533	10
16534	18	16535	27
16536	19	16537	20
16538	26	16539	29
16540	62	16541	60
16542	56	16543	48
16544	32	16545	33
16546	35	16547	39
16548	47	16549	63
16550	211	16551	223
16552	201		

## Morse Code Tutor

by Paul Newman





## Sailors' Hornpipe

on Jupiter Ace

This is a Forth program written to run on the unexpanded Jupiter Ace. The program plays "The Sailors' Hornpipe" three times with increasing speed on each repetition.

Load the program from the cassette by typing "load hornpipe" and then pressing "ENTER" whilst the tape is playing. When the program is loaded it may be run by typing "hornpipe" and then pressing "ENTER". To enter the program from the listing simply type in the listing pressing "ENTER" after each definition. The spaces in a Forth program are very critical especially after the colon at the beginning of a definition and before the semi-colon at the end of a definition. (This will all be obvious to a Forth user).

Chapter 11 in the Jupiter Ace handbook is very helpful about how to use the BEEP command when playing tunes. I have modified the suggested method of playing tunes in the following ways:

1. Instead of giving the numerical value for the pitch of the note each time it is played I have defined the pitch of each note I use as the letter name of that note at the beginning of the program.

The tune is in E major so C, D, G and F should all be sharps, however, I omitted the sharp signs to make the typing simpler. The note A does become A sharp a couple of times so I had to define an A# note.

2. There are only two lengths of notes in the tune (semi-quavers and quavers) so I defined a standard note length DURATION and included this in two definitions, S (for short note) and L (for long note).

With this set-up the tune can be written very easily in a definition by typing the letter name of the note followed by its duration, either long or short. This general method could be used for any tune. I don't think it is worth defining a three octave set of named notes in semi-tone intervals which could be a universal tune-making set because this takes up too much memory in the unexpanded Ace.

The tune may be played at any speed the user likes by typing a number for the duration of the note and following this by DURATION! WHOLE eg: 20 DURATION! WHOLE will play the tune so quickly that the individual notes are not discernable.

```
253 CONSTANT B
225 CONSTANT C
201 CONSTANT D
```

```
190 CONSTANT E
169 CONSTANT F
150 CONSTANT G
142 CONSTANT A
134 CONSTANT A#
127 CONSTANT BB
113 CONSTANT CC
100 CONSTANT DD
95 CONSTANT EE
84 CONSTANT FF
75 CONSTANT GG
100 VARIABLE DURATION
```

```
: L DURATION @ 2 * BEEP ;
: S DURATION @ 1 * BEEP ;
```

```
: PART1 EESDDSEEELELELBBASGSSBBS
EESDDSEESGGFFSEESFFLFLF
LFSEDSFSBBSA#SBBL;
```

```
: PART2 CCSDDEESDDSCCSBBSCCSBB
ASGSASGSFSESESDSCSBSCS
ESDSFSESGSFSASGLELEL;
```

```
: PART3 BBSASGSSBBSSEESBBSGSSBBS
SBBSCCLALALCCSBBSA#SCCS
FFSCCSA#SCCSFFSCCSDDLBB
BBL;
```

```
: WHOLE PART1 PART2 PART1 PART2 PART3
PART2 PART3 PART2;
```

```
: HORNPIPE CLS 10 5 AT ." The Sailors' Hornpipe"
120 DURATION! WHOLE 90
DURATION! WHOLE 60 DURATION!
WHOLE;
```

by Simon Cross

## Carols

on Vic 20

As it is getting near to Christmas I wrote a program to play some carols.

This program is for use with a super

expander and it uses the music capabilities of the super expander. The program gives you the choice of seven carols.

At the beginning of the music lines, e.g., line 220, you have to put a Ctrl ← because the printer misses them.

## Carols

by Alan Blackham

```
3 REM *****
4 REM * ALAN BLACKHAM'S *
5 REM * CHRISTMAS CAROLS*
6 REM * (22/10/82) *
7 REM *****
10 COLOR 0,0,1,1
20 SCNCLR
30 PRINT"***** MENU OF OPTIONS."
35 PRINT"*****"
40 PRINT"001 THE FIRST NOEL,"
45 PRINT"002 HARK THE HERALD
ANGELS SING,"
50 PRINT"003 GOOD KING
WENCESLAS"
55 PRINT"004 SILENT NIGHT,"
60 PRINT"005 JINGLE BELLS,"
62 PRINT"006 WHILE SHEPHERDS
WATCH,"
64 PRINT"007 AWAY IN A MANGER,"
85 PRINT"008 EXIT PROGRAM."
90 PRINT"TYPE THE NUMBER NEXT TO THE
TUNE."
100 REM ** GOTO LINE REQUIRED **
110 GETA$: IFA$="" THEN 110
120 IFA$="1" THEN 200
125 IFA$="2" THEN 300
```

```
130 IFA$="3" THEN 400
135 IFA$="4" THEN 500
140 IFA$="5" THEN 600
142 IFA$="6" THEN 650
144 IFA$="7" THEN 700
185 IFA$="9" THEN PRINT"FINISHED":END
190 GOTO 110
200 REM ** THE FIRST NOEL **
210 PRINT"***** THE FIRST NOEL."
215 PRINT"*****"
220 PRINT"02T5EDT6CT5DEFT6GT4AB
T503C02BAT6GT4AB"
230 PRINT"03T5EDT6CT5DEFT6GT4AB"
240 PRINT"04T5EDT6CT5DEFT6GT4AB"
245 PRINT"05T5EDT6CT5DEFT6GT4AB"
250 PRINT"06T5EDT6CT5DEFT6GT4AB"
270 RUN
300 REM ** HARK THE HERALD ANGELS SING
**
310 PRINT"***** HARK THE HERALD ANGELS
SING"
315 PRINT"*****"
320 PRINT"02T5DGGT4#FT5GBBA03DDDT4C02T5
BAT6BT5"
```

To next page



```

325 PRINT"DGGT4#FT5GBBA03D02AAT4GT5#FET
6DT5"
330 PRINT"03DDD02T4GT503C02BBA03DDD02
T4GT503C02BBA"
332 FORI=1TO2
335 PRINT"03EEET4DT5C02BT603C02T5AT4
B03CT5D02GGAT6BT5"
340 PRINT"03EEET4DT5C02BT603C02T5AT4
B03CT5D02GGAT7G"
350 RUN
400 REM ** GOOD KING WENCESLAS **
410 PRINT"GOOD GOOD KING WENCESLAS"
415 PRINT" "
420 PRINT"02T5GGAGGT6DT5EDE#FT6GGT5"
430 PRINT"GGGAGGT6DT5EDE#FT6GGT5"
435 PRINT"03DC02BABAT6GT5EDE#FT6GGT5"
440 PRINT"DDE#FGGT6AT503DC02BAT7G03
C02T8G"
450 RUN
500 REM ** SILENT NIGHT **
510 PRINT"GOOD SILENT NIGHT."
515 PRINT" "
520 PRINT"02T6GT5AT6GT7ET6GT5AT6GT7E03D
T6DT7Q2B03CT6CT7Q2GAT6A03"
530 PRINT"C02T5BT6AGTT5AT6GT7EAT6A03C02
T5BT6AGT5AT6GT7E03DT6DFT5D02T6B03T7C"
540 PRINT"ET6C02GEGT5FT6DT8C"
550 RUN
600 REM ** JINGLE BELLS **
610 PRINT"GOOD JINGLE BELLS."
615 PRINT" "
620 PRINT"02T5BTT6BT5BTT6BT5B03D02GT4AT
6B03T5CCCT4C"
625 PRINT"T4C02BT5BT4BAAT5AT4B
BT5BT4BTT5BT4B03D02GT3AT5"
630 PRINT"B03T4CCCT3CT4C02BTT3BT403DDCO
2AT5GT4R"
635 PRINT"DBAGT5DT4DBAGT5ET4E03C02BA"
640 PRINT"03DDDT3DT4ED02A#AT5BT4DBAGT5D
T4DBAGT5ET4E03C02BA03DDDT3D
T4EDC02AT5GT4"
645 PRINT"02T4BTT5BT4BTT5BT4B03D02GT3A
T5B03T4CCCT3C"
647 PRINT"T403C02BTT3BT403DDCO2AT6G"
649 RUN
650 REM ** WHILE SHEPHERDS WATCH **
655 PRINT"GOOD WHILE SHEPHERDS WATCH";
660 PRINT" "
670 PRINT"02T5GBT4BT5AG03CCO
2BAB03DD#C02T603D02T5B"
675 PRINT"03ET4DT5C02BAG#FBAGG#FT7G"
680 RUN
700 REM ** AWAY IN A MANGER **
710 PRINT"GOOD AWAY IN A MANGER"
715 PRINT" "
720 PRINT"02T5CFFT4GAT5FFT4AB03T5CCD02
T6$BT5GA$B$B03C02AAT4FAT5GDFT6ET5C"
725 PRINT"FFT5GAFFA$BT403T5CCD02T6$BT4
GAT5$B$B03C02AAT4FAT6GDET7F"
730 RUN

```

READY.

## Blockshift

### on BBC Micro

Functions, procedures and calls on a micro are extremely useful. They allow you to expand the instruction set of your computer without the complication of re-directing the error handling routines or other such nasties.

A good example of the use of calls is on the RML 380Z, for when the high res graphics board is installed, the standard Basic has no instructions to cope with line drawing or plotting, so instead of redesigning a major part of the interpreter, machine code routines are added. When the Basic is loaded in, so are the routines. To use these you must then access them through the Basic command CALL, e.g., BBC Basic's MOVE X,Y becomes CALL "PLOT",X,Y,Z.

Because the Basic is in Ram, it is possible to alter the instruction set, or to add more commands and then save the modified version for a later date. Most home computers have their languages in

Rom so although it is very difficult to alter the standard instruction set you can easily add your own routines and load them in off tape/disk into a spare bit of memory.

What follows is for the BBC micro, but the general ideas might be of some interest to users of other computers.

BBC Basic is extremely fast and is adequate for most purposes. There is one area where I continually find a need for a fast simple alternative and that is when dealing with the graphics. Any Basic is going to be pushed to shift around 20K of memory in under a second.

If you look in your back copies of PCW, Vol 1, No. 16, page 15, you will find a routine to scroll the screen. We will use that and the program in this article to demonstrate how to add more commands via CALL and PROC.

To execute the scrolls, the only thing needed is to say 'CALL RSCROLL' and the whole screen shifts sideways, however the 'BLOCK' program copies a specified section of the screen to another specified position. Therefore, we need a way of passing these parameters to the machine

code. It is possible to use CALL but with the parameters included after the name, however, this would involve a lot of nasty calculating (working out the start addresses and the number of times the loop must be executed) and since this only has to be done once, it is much easier for Basic to deal with the maths and let the m/c deal with the donkey work of shifting the memory about.

To use the 'BLOCK' you must use PROC\_BLOCK (bottom left X,Y, top right X,Y, final top left X,Y). This sets up the hex locations 70,71 with the start address of the portion of screen to be copied, 72,73 with the start of the destination, 76,77 with the number of bytes in one horizontal line of the specified block of screen. The X register is also set to the number of lines to be copied.

When this is done, the procedure calls the m/c which uses the values previously calculated to shift the required memory.

The way to save the m/c of both programs is as follows. First, type in lines 290 to 430 of 'BLOCK' then add on to the end

Turn to page 24





of that the lines of any other routines you have (e.g. 50-250 of Scroll). Remember that the last thing must be the instructions in line 440. You must now find out how long the code is. One way of doing this is to add a label FINISH after the last m/c instruction.

The length is now found simply by subtracting the first label from FINISH. A good place to put the code is just before the graphics memory. To find out where the code starts use (&2FFF-(length of code)). Set P% to this instead of DIM P% and call setup again. Now save the section of memory required using \*SAVE "ROUTINES" (start of code in hex) 2FFF.

Lastly, make a note of the addresses stored in the variables used to call the routines (in the 'block shift' only the variable BLOCK would be needed).

Now you can write your graphics program which use the routines, remembering of course that you must \*LOAD "ROUTINES" before running the program and that the first lines should set the variables such as BLOCK and RSCROLL with the start addresses of the routines.

BLOCK SHIFT works in modes 0,1,2 and regards the screen as a 80 x 32 grid (mode 0 text). The first four parameters define the rectangle to be copied, the last two the position where the copy will be placed. As it stands, the program works well.

If you intend to use it I would advise you to provide some data validation at line 195, since if by some mistake the bottom left Y coordinate is made less than the top right Y, it is possible that the m/c will make

mincemeat of the program which you spent hours perfecting and forgot to save before running.

In line 340 there are two 'no operation' codes. Normally when the code is executed the block of screen is copied exactly. However, if the Basic program places some new instructions instead of the NOP's different effects can be produced.

If EOR #255 was used, everything copied would be inverted (lines 30 and 70 do this). If you do not require this delete lines 320 and 330. If the Basic program is quite long, it would be better to say \*SAVE "PROG" E00 2FFF, LOAD "PROG".

This would then load in the m/c as well as the Basic, but be careful that your program is not too long or it will overwrite the m/c.

```

5 REM**BLOCK SHIFT*GLJ OCT82**
10 PROC_SETUP
20 MODE0
25 REM*****MODE0 DEMO*****
29 REM**change NOP:NOP to EOR #0 **
30 ?FUNCTION=&49:FUNCTION?1=0
40 FOR L%=0T0359STEP2:A=RND(L%):B=60*SIN(A*2)
50 PLOT69,B*SIN(A)+50,B*COS(A)+60:NEXT
60 FOR V%=0T031STEP4:FOR W%=0T075STEP6
70 FUNCTION?1=FUNCTION?1 EOR 255
80 PROC_BLOCK(0,31,5,28,W%,V%):NEXT:NEXT
90 TIME=0:REPEAT UNTIL TIME>200:MODE2
95 REM*****MODE2 DEMO*****
100 FOR L=1T0100:GCOLOR,RND(7):DRAW RND(1280),RND(512):NEXT
110 PROC_BLOCK(0,31,79,16,0,0)
120 TIME=0:REPEAT UNTIL TIME>200:MODE1
125 REM*****MODE1 DEMO*****
129 REM**change NOP:NOP to ORA(&72),Y **
130 ?FUNCTION=&11:FUNCTION?1=&72
140 VDU19,1,2,0,0,0:FOR W%=1T03:GCOLOR,W%:FOR L%=1T0100STEP2
150 V%=(SQR(10001-L%*L%))-W%*15:PLOT69,L%/3,V%:PLOT69,70-L%/3,V%
160 NEXT:NEXT:FOR L%=1T0150
170 V%=RND(75):W%=RND(28):IF V%<5 AND W%>24 GOTO 170
180 PROC_BLOCK(0,31,4,29,V%,W%):NEXT:END
182
185 *****
190 DEF PROC_BLOCK(BX,BY,TX,TY,FX,FY)
200 TLCO=&3000+640*TY+8*BX
210 FTCD=&3000+640*FY+8*FX
220 ?&70=TLCO AND &FF:??&71=(TLCO AND &FF00)/255
230 ?&72=FTCD AND &FF:??&73=(FTCD AND &FF00)/255
240 DIFF=(TX-BX)*8+8:ADD=640-DIFF
250 ?&76=DIFF AND &FF:??&77=(DIFF AND &FF00)/255
260 ?&88=ADD AND &FF:??&89=(ADD AND &FF00)/255
270 X%=BY-TY+1:CALL BLOCK:ENDPROC
275 *****
290 DEF PROC_SETUP:FOR Q=0T01:DIM P%500:EOPT 0*3
300 .BLOCK:LDA #0:STA &78:STA &79:LDY #0
310 .LOOP:LDA(&70),Y
320 .FUNCTION
330 NOP:NOP

```

To next page



from previous page

```

340 STA(&72),Y
350 CLC:LDA#1:ADC &70:STA &70:LDA #0:ADC &71:STA &71
360 CLC:LDA#1:ADC &72:STA &72:LDA #0:ADC &73:STA &73
370 CLC:LDA#1:ADC &78:STA &78:LDA #0:ADC &79:STA &79
380 CMP &77:BNE LOOP
390 LDA &78:CMP &76:BNE LOOP
400 CLC:LDA &88:ADC &70:STA &70:LDA &89:ADC &71:STA &71
410 CLC:LDA &88:ADC &72:STA &72:LDA &89:ADC &73:STA &73
430 DEX:BNE BLOCK:RTS
440 J: NEXT:ENDPROC

```

**Blocksheet**  
by Gareth Jones

## Ghost Chase

on Spectrum

The user-definable characters, for Ghost Chase, are set up from line 600. To save readers' aching fingers I have used decimal numbers in the *Data* statements rather than *Bin* numbers, which are then poked into the characters. To help with the speed of the game I have only included *Beeps*

when destruction of either your player or the ghost occurs.

While writing the program I discovered an annoying problem regarding the function *Screen\$(x,y)*, which gives the character at row *x* and column *y* of the screen. The problem is that if the character has a code greater than 127, *Screen\$(x,y)* does not work. For instance, if you use *Screen\$* on any character which you have defined it will return a null string as the answer, and

the code of *Screen\$(x,y)* will be 0. The character in lines 120 and 130 is a normal capital X and not a graphics character.

Other than this the program is based on a fairly simple idea. In fact the actual routine which appears to make the ghost chase you is at lines 70 and 80. Line 70 adjusts the row in which the ghost is, until it is the same as your player, and line 80 does the same for the column.

```

1 GO SUB 600
2 GO SUB 800
3 LET q=0: LET s=0: LET p=5:
LET hs=0
5 BORDER 0: PAPER 0: INK 7: CLS
LS
10 LET a=INT (RND*10)+2
15 PLOT 40,0: DRAW 215,0: DRAW
0,160: DRAW -215,0: DRAW 0,-160
20 LET b=INT (RND*12)+12
30 LET x=2*(INT (RND*8)+2)
40 LET y=2*(INT (RND*10))+10
45 LET e=2*(INT (RND*6))+6: LET
T f=2*(INT (RND*8))+10
46 IF e=x OR e=a OR f=y OR f=b
THEN GO TO 45
47 PRINT AT e,f: PAPER 2: "X"
48 IF q=p THEN GO TO 50
49 LET q=p: FOR z=0 TO 7-p: GO
TO 45: NEXT z
50 PRINT AT x,y: INK 5: "X": LE
T v=x: LET w=y
60 PRINT AT a,b: INK 6: "X": LE
T c=a: LET d=b
70 LET a=a-(x(a)+(x>2))
80 LET b=b-(y(b)+(y>2))
90 LET x=x+2*(INKEY$="6")-2*(I
NKEY$="7")
95 LET x=x+2*(x<1)-2*(x>20)
100 LET y=y+2*(INKEY$="8")-2*(I
NKEY$="5")
105 LET y=y+2*(y<6)-2*(y>33)
110 PRINT AT v,w: "X": AT c,d: "
115 IF a=x AND b=y THEN GO TO 4
00
120 IF SCREEN$(a,b)="X" THEN G
O TO 200
130 IF SCREEN$(x,y)="X" THEN G
O TO 300
140 GO TO 50
200 PRINT AT a,b: FLASH 1: "X"
210 FOR d=2 TO 42 STEP 4
211 BEEP d/800,-15
212 NEXT d
215 PRINT AT a,b: " "
216 LET s=s+10
217 PRINT AT 10,0: PAPER 4: FLA
SH 1: "SCORE"
218 PRINT AT 12,0: FLASH 1: PAP
ER 0: s
220 GO TO 10
300 PRINT AT x,y: FLASH 1: "X"
310 FOR d=20 TO 1 STEP -1
311 BEEP d/800,25
312 NEXT d
315 PRINT AT x,y: " "
316 LET p=p-1: IF p=0 THEN GO T
O 500
320 GO TO 10
400 PRINT AT x,y: FLASH 1: "X"
410 FOR d=1 TO 10
411 BEEP .01,INT (RND*60)-25
412 NEXT d

```

```

415 PRINT AT x,y: " ": PRINT AT
e,f: " "
416 LET p=p-1: IF p=0 THEN GO T
O 500
420 GO TO 10
500 PAPER 1: FLASH 1: CLS
510 PRINT AT 10,12: "O U T O F"
;AT 12,13: "M E N"
515 FOR n=40 TO -20 STEP -1
516 BEEP .01,n
517 NEXT n
520 FOR d=1 TO 200: NEXT d
530 FLASH 0: CLS
535 PAPER 0: CLS
540 IF hs<5 THEN LET hs=s
550 PRINT AT 5,10: PAPER 3: "HIG
H SCORE "hs;AT 10,0: PAPER 5: J
NK 0: "PRESS ANY KEY FOR ANOTHER
GO"
560 LET a$=INKEY$: IF a$="" THE
N GO TO 560
565 LET p=6: LET s=0
570 GO TO 5
600 FOR n=0 TO 7
610 READ d: POKE USR "a"+n,d
620 NEXT n
630 DATA 26,62,42,107,127,127,3
09,73
640 FOR n=0 TO 7
650 READ d: POKE USR "b"+n,d
660 NEXT n
670 DATA 145,82,0,195,0,74,137,
0
680 FOR n=0 TO 7
690 READ d: POKE USR "m"+n,d
700 NEXT n
710 DATA 8,28,8,62,8,8,20,34
720 RETURN
800 BORDER 0: PAPER 0: INK 7: CLS
LS
805 PRINT TAB 5: INK 6: FLASH 1
: "G H O S T C H A S E"
810 PRINT "You have to save y
our man (: INK 5: "X": INK 7: "
around the screen to entice th
e ghost (: INK 6: "X": INK 7: "
which is chasing you, to run int
o the bombs!"; PAPER 2: "X": PAPE
R 0: "): But be careful you don't
run into the bomb or let the gh
ost catch you. You have 5 lives.
Good luck."
820 PRINT "Press keys "5" -
"6" to move in direction shown
on key"
830 PRINT: FLASH 1: "Press any
key to continue"
840 LET a$=INKEY$: IF INKEY$=""
THEN GO TO 840
850 RETURN

```

**Ghost Chase**  
by Jeremy Hall





7 LEVELS, RAPID FIRING, LASER SHIELD, MOTHER SHIP, RE-FUELLING, SMART BOMBS, 3 WAVES, HIGH SCORE SPECTRUM VERSION HAS SOUND AND GRAPHICS. ONLY £4.50. FOR SPECTRUM OR 16K ZX81. P.C.W. "ONE OF THE BEST SINCLAIR GAMES YET". Y.C. "THE ACTION IS FAST."

#### AND NOW SPECTRUM SCRAMBLE

"CONDITION RED", M/CODE ACTION, 8 DIRECTIONAL KEYS, MISSILES, FUEL DUMPS, METEORS, USER GRAPHICS, SOUND. MOVE, FIRE AND BOMB AT THE SAME TIME. HIGH SCORE, FAST ACTION AND DELIVERY. £4.95

"ZX81 CONDITION RED", ZX81 VERSION. MOVE UP/DOWN, FIRE LASERS. FAST M/CODE. HIGH SCORE TABLE. BY ARCADE GAMES FOR ZX81 USERS. £3.95.

**DRAGON, ZX81, SPECTRUM PROGRAMS WANTED**  
**WORK FORCE. 140, WILSDEN AVENUE, LUTON, BEDS.**

## Salamander Software

Software from the south

### ● FOR THE DRAGON 32

**STAR TREK.** A full version of this classic game in realtime. Features Faerie Queen, hyperprobe, tractor beams, time travel and more! Includes 16-page flight manual and requires only one joystick. ....£6.95\*

**WIZARD WAR.** The mighty mages of the Tri-Suns strive for supremacy in a fearsome battle of skill and strategy! Joystick required .....£6.95

**VULCAN NOUGHTS AND CROSSES.** Pit your wits against the Dragon or your friends in this three-dimensional game of logic! Also features zero player option. ....£6.95

**GAMES COMPENDIUM D1.** A selection of games for all the family, including Blackjack, Donkey-Derby, Kingdom, Lunar-Lander and Hunt the Wumpus! £6.95

### ● FOR THE BBC MODEL B

**DRAGON RIDER.** Can you destroy the enemies from the sky before your fiery steed runs out of puff! ....£6.95

**TANKS!** Variable wind and terrain make this exciting two-player game a challenge for everyone! ....£6.95

Cheques or postal orders payable to  
Salamander Software  
27 Ditchling Rise  
Brighton, East Sussex BN1 4QL

Tel: 0273 686454

Discount for bulk orders and retail:  
send SAE for catalogue

PLEASE ADD 50p P&P TO ALL ORDERS.

\* SPECIAL INTRODUCTION OFFER

Programmers wanted:  
good royalties paid!



## THE WORKING SPECTRUM

A LIBRARY OF PRACTICAL  
SUBROUTINES AND PROGRAMS



DAVID LAWRENCE

The Working Spectrum is the first well-documented collection of serious programs for the ZX Spectrum.

The programs include a Basic Renumber which can handle Gotos and Gosubs. You will read in other books that this can't be done. We prove it can.

With some of the other programs you can define your own characters, store them in a dictionary, design geometric shapes without using maths, draw pictures for use in other programs and recall them at will, draw different graphs from the same subroutines, create a file-handling program for up to 28,000 characters, create a data-base handling program, learn how to sort your data, learn how to touch-type, handle your accounts and play sophisticated games such as Missile and Tracker.

Each program is explained in detail, line by line. And each of the programs is built up out of general purpose subroutines which, once understood, can form the basis of any other programs you need to write.

Advanced programming techniques spring out of the discussions explaining each subroutine. The result is not only to advance your programming skills but also to leave you with a wide range of practical application programs which might otherwise only be available to those prepared to buy cassettes or those capable of writing substantial programs for themselves.

Expert or novice — whatever your experience, you will find this the most useful and valuable book for the Spectrum.

228 pages. Over 150 separate subroutines and programs.

Also available through your local computer bookshop

Please send me a copy of The Working Spectrum.  
I enclose a cheque/postal order for £5.95.

Name.....

Address.....

Signed.....

Please make your cheques payable to Sunshine Books Ltd.

Please send your order to The Working Spectrum, Sunshine Books Ltd, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

We can normally deliver within four to five days.





## Heart of the matter

**Asghar Ahmed rolls the bones in an educational game for the unexpanded Vic20.**

This program runs on an unexpanded Vic20 and tests your skills on naming various bones in Latin. It starts by drawing a skeleton with arrows pointing to various bones, which you have to name. The score is shown throughout the program. There are five questions which show the graphic make-up of a skeleton.

The next section of the program is named "Bone Test". In this part the computer will give you three questions about bones. When the three questions are up, it plays a tune and displays your final score. This program takes full advantage of the Vic's sound and graphics capabilities.

### Program notes

Lines  
2 clears the screen and sets the score variable at nought.  
4 to 25 graphics for the skeleton.  
100 reads a screen location from the data.  
110 pokes screen location and colour.  
120 waits for you to input an answer.  
130 reads the answer from the data.  
140 sees if the input is same as the data.  
150 displays score.  
160 blanks out the arrow then goes to T, which clears the screen again, but this time printing the arrow at a different bone.  
703 clears the screen.  
704 set / at 6.  
705 to 707 draws the head line.  
708 reads a question from the data.  
709 reads the answer from the data.  
710 prints the question.  
720 waits for you to input the answer.  
730 sees if the input is the same as the data.  
740 displays the score.  
750 goes to / which clears the screen and prints the headline again and issues the next question.  
800 to 809 are music.  
810 to 820 wait for your to press Y or N.  
830 if Y is pressed then run.  
840 if not print chicken.  
2000 onwards are data for colour, arrows, questions, answers and music.

## Eliminating long delays

**A Collyer explains how to save and load programs with non-standard Basic.**

If you own a Vic20 with more than 8K of memory, you probably know you can only have a user definable character set if you move the start of Basic. The problem comes once the program is Saved, because you need to remember to move Basic before Loading.

The following method solves this and allows the character set to be Saved along with the program, eliminating those long

delays at the start of a program while new characters are defined.

First, starting with a fresh system, enter the basic line:

```
10 POKE 44,30:RUN
```

then type:

```
POKE 45,3:POKE 46,30:POKE 7680,0:  
POKE 43,1:POKE 44,30:NEW (return)
```

This moves Basic to 7680. You can now enter your routine to define a character

set. Once run, it can be deleted. The character generator should start at 5120 (end 7679).

Next, type the program which uses the character set, (Poke 36869,205 will switch to the defined characters). To Save the program and the new characters type:

```
POKE 44,18:SAVE "(programe)" (return)
```

When loaded, the program should run as normal using the new character set. ■

READY.

```
1 REM THE SKELETON,BY
  ASGHAR AHMED , 1982
2 PRINT "J":A=0:FORT=1T05
4 PRINT "      "
5 PRINT "      "
6 PRINT "      "
7 PRINT "      "
8 PRINT "      "
9 PRINT "      "
10 PRINT "      "
13 PRINT "      "
14 PRINT "      "
15 PRINT "      "
16 PRINT "      "
18 PRINT "      "
19 PRINT "      "
20 PRINT "      "
21 PRINT "      "
22 PRINT "      "
23 PRINT "      "
24 PRINT "      "
25 PRINT "      "
26 PRINT "*****"
100 READ SL,CL
110 POKESL,31:POKECL,0
120 INPUT "*****":A$
130 READR$
140 IF A$=R$ THEN A=A+1
150 PRINT "A" OUT OF "T
160 POKESL,32:NEXTT
702 FORO=1T01598:NEXT
703 PRINT:PRINT "J"
704 FORI=6T08
705 PRINT "      "
706 PRINT "      BONE TEST      "
707 PRINT "      "
708 READI$
709 READN$
710 PRINTI$
720 INPUTA$
730 IF A$=N$ THEN A=A+1
740 PRINT "A" OUT OF "I
750 NEXTI
800 READ N,S
801 POKE36878,15
802 IF N<0 THEN 809
803 POKE36876,N
804 FORD=1T020*S
805 POKE36879,N-25
806 NEXTD
807 POKE 36876,0
808 GOTO800
809 POKE36878,0
810 POKE36879,27:PRINT:
  PRINT "IF YOU WANT AN
  OTHER GO PRESS (Y/N)"
820 INPUTB$
830 IF LEFT$(B$,1)="Y" THEN RUN
840 PRINT "J":PRINT "*****"
  *:PRINT "CHICKEN":PRINT "
  *****":END
2000 DATA 712,38432,CRANIUM,
  7754,38474,ORBIT
2001 DATA 7956,38676,HUMERUS,
  7977,38719,RIBS,7868,
  38588,CLAVICLE
2002 DATA "WHAT DOES THE BONE
  NEED IN VAST AMOUNTS",
  "CALCIUM"
2003 DATA "WHAT IS THE
  LUBRICATION FLUID
  CALLED","SYNOVIAL"
2004 DATA "HOW MANY PAIRS OF
  RIBS ARE THERE","
  TWELVE"
2005 DATA 172,2,181,2,189,2,
  172,2
2006 DATA 172,2,181,2,189,2
2007 DATA 189,2,193,2,200,4
2008 DATA 189,2,193,2,200,4
2009 DATA 200,1,206,1,200,1,
  193,1,189,2,172,2
2010 DATA 200,1,206,1,200,1,
  193,1,189,2,172,2
2011 DATA 172,2,145,2,172,4
2012 DATA 172,2,145,2,172,4
2013 DATA -1,-1
```

READY.





# Displayed entries

In part five of our extract from *The Working Spectrum* we continue adding modules/sub-routines to the Unifile program, designed to enable a single program to cover a variety of filing tasks without the need for constant re-writing every time a new use comes along.

## Commentary on Module 5

Lines 1680-1720. These lines check that there is room in the file for the new entry.

Lines 1730-1830. The binary search is applied to the entries in B\$. The search is conducted on the basis of the alphabetical order of the first item in each entry. For an explanation of how the Spectrum understands alphabetical order, see page 95 of the Spectrum manual.

Line 1730 finds the highest power of 2 which is still less than or equal to the number of entries in the file. It uses the logarithm function. The search position is set equal to this.

Line 1750. T\$ is created equal to the first item of the entry in the search position.

Lines 1760-1830. This loop adds or subtracts powers of 2 according to the principles set out in the discussion of binary sorting.

Line 1770. FN A was defined in line 1370. It extracts from two characters in Y\$ a numerical value which is a pointer to the first character of an entry in the main file.

Line 1780. FN A\$ was defined in line 1380. It extracts from the main files the item whose indicator is found at position C in B\$.

Line 1790. This line needs more explanation. A condition such as T\$>U\$ is either true or false but in everyday usage it cannot be said to have a value in the same way that a number or a variable has value. For the Spectrum, however, T\$>U\$ has a real value which is either 1, if the condition is true, or 0, if the condition is false. The value of the condition can be used in a program in the same way that a number or a variable can. In this particular line if T\$<U\$ the condition will have a value of 1 and S will have (2↑K)\*1 added to it. On the other hand T\$>U\$ will equal 1 and S will have (2↑K)\*0 subtracted. If T\$ had been less than U\$ then the roles would have been reversed, while if T\$ had been equal to U\$ both conditions would have been false and S would not have altered at all.

Lines 1810-1820. If S, the search position, points to one of the dummy entries, these two lines shunt it back into the main body of the data.

Lines 1840-1850. Having completed the binary search, the item at the selected position is extracted for examination. If the item at this position and the new item are equal, the new item is numbered after the existing item. If they are not equal then the new item is numbered before the existing item.

Line 1870. The new entry is added to the end of the file. The correct order of the entries in the file is kept only in Y\$. Provided that Y\$ knows where the 378th entry is, for instance, it is not important that it is actually stored in the 378th place.

## Testing Module 5

It is difficult to test this module until the search and display function has been added to the program, allowing entries to be displayed with ease. You may care to input a few entries and then stop the program to test whether they have been inserted into B\$. Remember that they have been inserted in the order in which they were input. You can also examine Y\$ with this loop if you wish.

```
9000 FOR S = 1 TO LEN Y$ STEP 2: PRINT FN
A():NEXT S
```

This will print out the pointer values, which you should be able to match up with the beginnings of the entries in the main file.

## MODULE 6

The purpose of this module is to display entries from the file, either one at a time from the beginning or starting from the first entry which satisfies certain search conditions. Having displayed an entry the module gives the user the choice of continuing the search, examining the next entry, changing the entry or deleting it from the file. Note the continuous use of FN A and FN A\$ to provide the address of an entry and to extract it from the file.

## Commentary

Line 2200. S is the number of the entry currently being examined. It is initially set to 2 because the first entry in the file is actually a dummy.

\* Lines 2290-2380. If the user inputs a search instruction beginning with III, the

program scans the first item of each entry until it finds one which begins with the character following III. If no such item is found the program returns to the main menu.

Lines 2390-2420. The special search which searches for any combination of characters specified, regardless of whether it is a whole item or not, is carried out by a separate subroutine which is called up by these lines if the search instruction begins with SSS.

Lines 2430-2500. Whole items in the file are examined to see whether they correspond to the item the program has been requested to search for. This is much faster than the special search, which moves along the file character by character. A fast binary search cannot be used since only the first items of each entry are in alphabetical order. For this search to be successful the item input must be exactly the same as the item in the memory. Searching for Smith,J in the file would not find Smith,John, whereas using special search, SSSSmith,J would find Smith,J or Smith,John but would be much slower.

Lines 2510-2570. This section prints out an entry using the subroutine at 2850 which we have already examined.

Lines 2580-2740. Having discovered an entry which satisfies the search criteria, the module now offers the user the choice of paging through the file entry by entry, searching for the next entry which satisfies the original search criteria or calling up the routine which allows the entry to be altered or deleted.

## Testing Module 6

You can test the correct functioning of all the search functions with the exception of the special search. The amend function has not yet been entered.

```

2170 REM *****
2180 REM SEARCH
2190 REM *****
2200 LET S=2
2210 PRINT "PAPER 2:"
2220 REM SEARCH
2230 PRINT "COMMANDS AVAILABLE
2240 PRINT ">INPUT ITEM FOR NORM
2250 PRINT ">PRECEDE WITH 'SSS'
2260 PRINT ">SPECIAL SEARCH"
2270 PRINT ">PRECEDE WITH 'III' TO SEARCH"
2280 PRINT ">FOR FIRST CHARACTER OF ENTRY"
2290 PRINT ">FOR FIRST ITEM ON FILE"
2300 PRINT "*****"
2310 PRINT "INPUT SEARCH ITEM:"
2320
2330 GO SUB 2750
2340 PRINT "S(2 TO )
2350 LET S=0
2360 IF LEN S$=1 THEN GO TO 2510
2370 LET C=FN A()
2380 IF LEN S$<5 THEN GO TO 2430
2390 IF S(2 TO 4) <> "III" THEN G
2400 TO 2390
2410 FOR I=5 TO N
2420 LET S=I
2430 LET C=FN A()
2440 IF E$(C+1)=S$(5) THEN GO TO
2450
2460 NEXT I
2470 RETURN
2480 IF S$(2 TO 4) <> "SSS" THEN G
2490 TO 2430
2500 GO SUB 2920
2510 IF C$=1 THEN GO TO 2510
2520 RETURN
2530 FOR I=1 TO X
2540 IF FN A$(I)=S$ THEN GO TO 25
2550
2560 IF FN A$(I)=CHR$ 2+CHR$ 255
2570 THEN RETURN
2580 NEXT I
2590 LET S=S+1
2600
2610 LET C=FN A()
2620 GO TO 2430
2630 LET C=FN A()
2640 IF P$="CCC" THEN GO TO 2300
2650 IF P$="" THEN GO TO 2510
2660 IF P$="AAA" THEN GO TO 271
2670
2680 LET C=FN A()
2690 CLS
2700 GO SUB 1930
2710 IF P$="ZZZ" THEN RETURN
2720 IF P$="AAA" THEN RETURN
2730 CLS
2740 GO TO 2260

SEARCH

COMMANDS AVAILABLE:
>INPUT ITEM FOR NORMAL SEARCH
>PRECEDE WITH 'SSS' FOR
SPECIAL SEARCH
>PRECEDE WITH 'III' TO SEARCH
FOR FIRST CHARACTER OF ENTRY
>'ENTER' FOR FIRST ITEM ON FILE
*****

INPUT SEARCH ITEM:

```





# Twinkle, Twinkle

**Keith and Steven Brain  
present a Singalong  
Dragon program.**

As sales of the Dragon 32 soar at Christmas, thousands of bemused mothers will once again be asking the eternal question "It's very nice dear, but what does it do?" As it is Information Technology year, we have applied ourselves to this communication problem and devised a couple of programs which illustrate the string handling, sound and high-resolution graphic facilities and show how to train your Dragon to help with the Christmas chores.

Too much singing of carols can be bad for your voice, so what about a program which not only plays the tunes but also displays the words in time to the music? Program 1 (*Singalong*) uses some sneaky string slicing techniques to ease this task.

The words, or rather the individual syllables which are sung on separate notes, are contained within *Data* statements on lines 10 and 20 (not more than 255 characters can be put on a single program line). Spaces between words are included in the data, and the end of a line is indicated by (/).

The tune is contained with *As* in line 30. The format is the usual Dragon *Play* format, except that all natural (ie not sharp or flat) notes are preceded by a space. It is necessary to convert all *Play* instructions into two characters in this way, as the *Play* commands (like 02, L2 and T5) are two characters and the slicing technique must treat all information in the same way. Sharps and flats are entered without a leading space as usual (eg B-, F+).

*Xs* in line 40 contains all of the characters which indicate that a note (rather than a change in octave, note length etc) is to be *Played*.

Line 50 steps through *As* two characters at a time by means of *For N = 1 To Len(As) Step 2* and puts these two characters into *Bs* by means of *Bs=Mids(As,N,2)*. *Bbs=Lefts(Bs,1)* selects the first character of *Bs* and tests by *X=Instr(1,Xs,Bds)* if this is an actual note rather than another *Play* command. It is not necessary to define all the possible sharp, natural and flat notes, as naturals are characterised by a leading space and sharps and flats by a letter from A-G.

If *Bs* is not a note, then line 60 *Plays* the command, without printing anything and then returns to take the next two characters. If *Bs* is a note, then line 70 *Reads* the appropriate syllable from the *Data* and checks by *If Rights(Cs,1)* whether it is a (/). If it is not, then *Bs* is printed with a trailing semicolon.

If the last character of *Bs* is a (/) then all of *Bs* except the last character (/) is printed

by *C=Len(Cs)-1:Print Lefts(Cs,C)*, followed by a semicolon, and then the print position is moved to the next line by an extra print which is not followed by a semicolon.

So, now we have trained the Dragon to sing carols for us, what about some Christmas decorations? Program 2 (*Xmas 82*) can provide the answer with an interesting demonstration of high-resolution graphics which should certainly impress your relations.

Rather than spoil the surprise, we will leave you to enter the program to find out exactly what is in store, but the following notes explain some of the more devious points in the program.

Line 20 partially superimposes a series of similar objects. Line 40 draws a line in an unused colour to link together these items which are to be *Painted* the same colour.

Line 60 selects random points in an area of the screen around the picture and checks by *Ppoint* if these are set to colour 1. If they are, then it draws a randomised *Circle* at that point in random colour, and makes a sound which depends on the co-ordinates. In line 70 there are two sequential *Paint* commands, as the required colour cannot be painted directly.

A drawback of the Rom is that the *Draw* command does not allow you to enter variables in a blank move (*BM*) statement ie *Bmx,Y* for example. This can be circumvented by first plotting a line of zero length at the variable co-ordinates required (line 100 *Line(X,Y)-(X,Y),Pset*). This sets the next *Draw* position to those co-ordinates.

If you have nothing to do on Boxing Day, you might like to try linking programs 1 and 2, especially if you are dreaming of a white Christmas.

```
1REM XMAS 82 COPYRIGHT K&S BRAIN
151182
```

```
10 PMODE 3,1:PCLS4:SCREEN1,0
```

```
20 DRAW"BM50,1":FORN=1TO20STEP2:
DRAW"S"+STR$(N):DRAW"C1G8R16H8D5
":NEXTN
```

```
30 DRAW"BM50,130C1L2D10R4U10L2C3
D5"
```

```
40 DRAW"BM50,2C3D25":PAINT(50,14
5),1,1
```

```
50 DRAW"BM50,160C2L4D4F2R4E2U4L4
":PAINT(50,176),2,2
```

```
60 FORN=1TO500:A=RND(80):B=RND(1
40):C=RND(3)+1:IF PPOINT(A,B)= 1
THEN CIRCLE(A,B),RND(4),C,RND(0)
+0.4:SOUNDA,1
```

```
70 NEXTN:DRAW"BM140,140C2S4F5R60
E5L70":PAINT(145,142),2,2:PAINT(
145,142),3,4
```

```
80 DRAW"BM150,145":CIRCLE(175,12
5),3,2,1,.43,.09:DRAW"BM139,141C
2R70":PAINT(175,125),2,2
```

```
90 DRAW"BM172,90C1S8G2L4D2L2D2L2
D4R4U2R2U2R2U4E4":PAINT(165,95),
1,1:DRAW"BM172,90F2R4D2R2D2R2D4L
4U2L2U2L2U4H4":PAINT(178,95),1,1
:CIRCLE(170,95),4,4:CIRCLE(174,9
7),4,4:PAINT(170,95),4,4:PAINT(1
74,97),4,4
```

```
100 FORN=1TO10000:X=RND(256):Y=R
ND(192):LINE(X,Y)-(X,Y),PSET:DRA
W"S"+STR$(INT(N/30)):DRAW"NUNDNL
NRNENFNGNH":NEXT N
```

```
1REM SINGALONG COPYRIGHT K&S BRA
IN 151182
```

```
10 DATA0,COME,ALL,YE,FAITH,
FULL/,JOY,FULL,AND,TRI,UM,PHAN
T/,0,COME,YE,0,CO,ME,YE,TO
,BE,TH,LE,HEM,COME,AND,BE,HOL
D,HIM/,BORN,THE,KING,OF,A,N
,GELS/,0,COME,LET,US,AD,ORE
,HIM/
```

```
20 DATACOME,LET,US,AD,ORE,HI
M/,0,COME,LET,US,AD,ORE,H,I
M/,CHRI,ST,THE,LORD
```

```
30 A$="02T5 FL2 FL4 C FL2 G CL
4 A G AB-L2 AL4 G FL2 FL4 E D E
F G AL2 EL4 DL8 CL2 CP4L203 C02L
4 B AL2 B AL4 G A F GL4 EL8 DL4
C F F E F GL2 FL4 C A G AB-L2 AL
4 G AB- A G FL2 EL4 FB-L2 AL4 GL
8 FL2 F"
```

```
40 CLS:X$+" ABCDEFG"
```

```
50 FOR N=1 TO LEN(A$) STEP 2:B$
=MID$(A$,N,2):BB$=LEFT$(B$,1):X=
INSTR(1,X$,BB$):IF X<>0 THEN 70
```

```
60 PLAY B$:NEXT N:RUN
```

```
70 READ C$:IF RIGHT$(C$,1)<>"/"
THEN PRINT C$;:GOTO60
```

```
80 C=LEN(C$)-1:PRINT LEFT$(C$,C)
:GOTO60
```





## Crashed out op art

Last week we looked at *Push and Pop* and how they can be used to access the machine stack, thus avoiding the use of a subroutine call. We also saw how the bytes are transferred from register to memory — the junior byte being loaded first.

Conversely:

LD HL (4105)

would have exactly the reverse effect (NB, it codes as 2A 05 41, following the standard convention). Similarly:

LD HL 1000

(an attempt to load *HL* with the value 1000 hex) encodes as:

21 00 10

so that, even though 1000 is data, not an address, its bytes get transposed as usual.

When a Basic program crashes, little harm is done — you can always break out, one way or another, without losing the program. But machine code crashes are more spectacular, and infuriating. Spectacular, because they often signal their presence by drawing op-art patterns all over the screen, and infuriating because (on the ZX81) the only way to break out of them is to pull the power plug out and lose the contents of Ram. You want to see a crash, to check this? OK, try this little program:

1 REM X

2 POKE 16514, 118

3 RAND USR 16514

The screen blanks, and the machine no longer responds to the keyboard. This is because it uses a Rom routine to scan the keyboard, but the Basic operating system is not in use during a *Usr* call of a machine code program. Once a crash occurs, you are stuck with it. Pull the plug and start again (however, there's no way to alter the Rom contents, so don't worry about doing any lasting harm. It is you, not the ZX81, that will suffer). But there are some simple precautions worth taking.

1. Check all machine code listings scrupulously and make sure you have input them correctly.
2. Never use *Halt* (hex code 76).
3. Make sure that *Calls* and *Rets* match, as do *Pushes* and *Pops*.
4. Make sure you call the correct starting address.
5. Unless there's not much to lose, *Save* what you can on tape before calling *Usr*.

Do you remember we said that there is no Z80 multiply instruction? Let's write a subroutine to do the job.

First, examine the nature of the problem. There is no better way of doing that than looking at an example. To keep things as simple as possible, we will work in 8-bit registers. So, if we want to multiply 9 by 13 it will look like:

```

      0 0 0 0 1 0 0 1
x     0 0 0 0 1 1 0 1
-----

```

Now we can treat this as conventional long multiplication, but because it is in binary, it's actually easier than usual. If the current digit we're multiplying by is 1, copy the top line — if it's zero, do nothing:

```

      0 0 0 0 1 0 0 1      P
x     0 0 0 0 1 1 0 1      Q
-----
      0 0 0 0 1 0 0 1
      0 0 1 0 0 1 0 0
      0 1 0 0 1 0 0 0
      0 1 1 0 1 0 1 0
-----

```

Of course we have had to add in zeros on the right at each stage, just as we would in a decimal long multiplication. In machine code terms, that is equivalent to a shift left. We have called the two numbers *P* and *Q*, for reference.

While *P* is shifted left, it's also going to be convenient to shift *Q* right, because that way we only need to keep examining the junior bit of *Q* to determine whether to add *P* into the sum or not.

Assume that *P* and *Q* are in the *D* and *E* registers. The procedure is:

1. Set the A-register to zero.
2. If the junior bit of *E* is 1 then add *D* into *A*.
3. Shift *D* left.
4. Shift *E* right.

repeat these steps 8 times

Here's a first stab at the code:

LD A,00

LD B,08

The first step is obvious. The second sets *B* to act as a loop counter in conjunction with a *Djnz* to come at the end. Now we want to test the junior bit of *E*. The only way we currently have of doing that is to use a mask pattern (00000001) with an *And* operation, so let's set up the *C* register to that pattern:

LD C,01 [see table for hex coding]

We can only *And* with the *A*-register, which will destroy its current contents, so we'll save it in *L* first:

LOOP: LD L, A

then extract the junior bit of *E*, and restore the *A*-register:

LD A, C

AND A, E

LD A, L

If the result of the *And* was zero, we need to jump round the "add *D* into *A*" part of step 2 so:

JRZ SHIFT

Note that since *Ld* does not affect the flags, the *Jrz* still refers to the *And*. Otherwise perform the *Add*:

ADD A, D

Now do the shifts:

SHIFT: SLA D

SRA E

and see if we've done the loop enough times yet:

DJNZ LOOP

RET

Below is the whole thing.

If you want to try this program out, you will have to arrange for the *D* and *E* registers to hold the values to be multiplied. So you could precede the program by something like:

LD HL, 4300 21 00 43

LDD, (HL) 56

INC HL 23

LD E, (HL) 5E

and then *Poke* 4300 (hex) and 4301 (hex) with the values to be multiplied, before calling the program. These two bytes will, of course, be the two zero bytes at the beginning of the routine, so the *Ld*, *HL*, 4300 will start in 4302.

Address	Instruction	Hex code
0000	LD A, 00	3E 00
0002	LDB, 08	06 08
0004	LDC, 01	0E 01
0006	LOOP: LD L, A	6F
0007	LD A, C	79
0008	AND A, E	A3
0009	LD A, L	7D
000A	JRZ SHIFT	28 01
000C	ADD A, D	82
000D	SHIFT: SLA D	CB 22
000F	SRA E	CB 2B
0011	DJNZ LOOP	10 F3
0013	RET	C9

If you have any machine code sub-routines/tips/games, please send them to: Machine Code, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Reproduced from *Machine Code and better Basic*, by Ian Stewart and Robin Jones (price £7.50), by kind permission of Shiva Publishing Ltd, 4 Church Lane, Nantwich, Cheshire CW5 5RQ.





Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke*, PCW, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

## NO KNOWN LIST OF POKES AROUND

J Jarret of 4 Honeycroft, Welwyn Garden City, Herts, writes:

**Q** I wonder if you could help me with a couple of queries. Firstly, can the *Cap Lock* on the Spectrum be set from software, and if so, how? Is there a complete list of useful *Pokes* anywhere which would help me in programming? Also, if you publish this letter, I am very interested in graphics and so would like to contact anyone in my area who has a micro with user defined graphics.

**A** *Caps Lock* can be set by *Poke* 23658,8. This will give an inverted capital C cursor. When you have finished, use *Poke* 23658,0 to reset your computer to normal.

As far as I know, there is no actual list of useful *Pokes* on the Spectrum available, though I am sure that one would, as you say, be very useful. Certainly we at *Popular Computing Weekly* are very interested to hear such things.

## GET IN TOUCH WITH ATARI GROUPS

Steve Bates of *Leopard Rise*, Worcester, writes:

**Q** I recently bought an Atari 400 micro-computer. I know very little about its language. Please could you tell me where I can find information on the Atari 400, and on software for it.

**A** There is quite a lot of support for the Atari computers, and it seems to be growing. There are two user groups. One can be contacted by writing to 'Atari Computer Owners Club' care of Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex. Another user club is based around the Silica shops and can be contacted at Silica Atari 400/800 users club, 1 The Mews, Hatherly Road, Sidcup, Kent DA14 4DX.

Both clubs have newsletters or magazines. They would probably be the best way for you to make contact with other Atari owners in your area.

One of the advantages of the Atari set up is the large amount of software available on cartridge, cassette and disk. Either of the shops mentioned could supply you with a wide range to choose from.

The only Atari book I have had a chance to look at is *De Re Atari*, which is recommended by Atari and appears to be very good. It is available from both shops and costs around £17.

Atari computers and software are now being carried by the Spectrum group of shops and there is one actually in Worcester — David Waring Ltd, 1 Marmion House, High Street, Worcester. This might be the best place for you to start looking.

SD Lang of *Bothlin Drive*, Stepps, Glasgow, writes:

**Q** Recently, after replacing a roll of paper, my ZX printer has taken to printing in double height characters. Can you explain what has happened? Is there a way to select the size of the character you want printed (either in a program or by a switch on the printer)? Or is there something wrong with my printer? I have enclosed an example of the print out before and after.

**A** As you say the characters are double height, not double width. If you look closely, you will see that the extra height does in fact come from the blank line that is in between every printed line.

Inside your printer there are two heads that actually spark on to the paper. These are mounted on what can only be described as a sort of caterpillar track. So, in every half turn of the track, one or other of the heads will scan along the line of the paper. Clearly what

## ENCOUNTERED PROBLEMS

Alex Ames of *High Lorton*, *Cockermouth*, *Cumbria*, writes:

**Q** It has been stated that it is possible to write a program for the ZX81 directly onto the Spectrum. How? I cannot seem to be able to do it. Can you help?

**A** You are not the only person to ask this, but it is quite possible to do. ZX81 Basic is a sub-set of Spectrum Basic in almost all respects. You do not say where you have encountered problems. The only areas to look at are *Peek* and *Poke* because there are some differences in the two memory maps. There is no scroll on the ZX Spectrum, and no *Unplot*. The command *Print At* on the ZX81 only needs the single command *At* on the Spectrum.

If it is not one of these, then the only thing that I can think of is that you do not have enough room. That would only be true if you have a 16K Ram pack on your ZX81, and an unexpanded Spectrum. If this was the case then you might be trying to get, say, a 12K program from your ZX81

on to your Spectrum. Unfortunately, the Spectrum only has 9K of user Ram, the rest being taken up by the variables, screen map and so on.

## ONBOARD 6502 WITH THE TUBE

Anne Cheney of *Canvey Island*, writes:

**Q** When looking at details on various computers, and trying to decide which to buy, I have seen the word 'Tube' twice used about the BBC micro. It seems important, but I have not seen it on another computer. Could you tell me what it does?

**A** The Tube is essentially a way of using a second processor at the same time as using the onboard 6502. If a second processor was connected up then the onboard 6502 would handle the mechanics of the system, such as the keyboard control of peripherals, and the video output, while the second processor would deal with the actual program.

The second processor does not have to be another 6502. At the moment a Z80 board is being developed by Acorn, which among other things would enable CP/M to be used on the BBC micro.

## TRANSFORMING CHARACTERS ON THE ZX PRINTER

has happened is that one of these heads has fallen off, so instead of getting two print lines every turn, you are now getting only one. Unfortunately, the paper is moved relative to the head every half a turn. This is how you get the alternate printing.

Because the head must be almost entirely disconnected from the belt it will have to be put back. Inside, the printer is very compact and I would not

suggest that you have a go at this yourself, unless you have a lot of confidence in your ability to take such things apart.

You have the choice of either sending it back for repair or else keeping it as it is. Although the print is much lighter, I know some people who find the larger size of the characters more than compensates for this. However, it does have the disadvantage of using twice the amount of paper.

Before:

```
10 LET tim=0
20 LET score=0
100 REM @ @ Bomb Alley @ @
110 REM Prog. 28/10/82
1000 REM
```

After:

```
10 LET tim=0
20 LET score=0
100 REM @ @ Bomb Alley @ @
110 REM Prog. 28/10/82
1000 REM
```





# CLASSIFIED

Semi-display — £5 per single cc  
Trade lineage — 20p per word  
Private lineage — 10p per word

## WORTHWHILE PROGRAMS

**16K ZX81 and 48K Spectrum**  
**FIRST AID** — teaches the principles of first aid. Fully scoring. Ages 13+  
**COMMUNICATOR** — Morse code, semaphore, verbal reporting, use of telephone.

Ideal for cubs and scouts.  
£4.99 each. State machine.

Cheques/POs to  
**Network Computer Systems Ltd.**  
39 Bampton Road, Luton, Beds.

## ZX81 High Res Graphics Unit

£32 (excl. VAT)

Tel: William Haynes 01-969 0819

Tools for Living

**Notting Dale Technology Centre**  
191 Freston Road, London W10 6TH  
cheque/PO (add 15% VAT)  
plus 75p p+p

## MORSE TUTOR PROGRAM

For Spectrum 16 or 48K more than just a random morse generator this program will teach you from absolute beginner to amateur radio morse test. A flexible user friendly program on cassette for only £3.95 post paid. Jim Grice G4JNO 116 Churchfields Lane, Glasshoughton, Castleford, West Yorks WF10 4DB.

**MORSE TUTOR BBC A/B.** For the beginner or just for practice. Teaches you the code. Tests with random letters. Generates and sends grammatical random messages. Becomes a Morse key. Professionally recorded tape. £4.95 including p & p. Carlton Computing, Carlton Cottage, Little Glemham, Woodbridge, Suffolk.

## SPECTRUM

**SHEEPDOG TRIAL** (16K). Pen up to six very obstinate sheep. Good graphics. £2.95 including P&P.

**GOLF** (48K). 18-hole course, holes not randomly generated. Bag of clubs. 0-24 handicap. Includes course design notes. £3.45 including P&P.

### GM Software

1 Rhwisaeson, Cross Inn  
Pontyclun, Mid Glamorgan

## ZX81 VIDSWITCH

The Original Inverse Video Module  
(April 82)

Sharp white characters on completely black screen (no borders). Switchable between modes. Size only 27mm x 15mm including switch. Easybuild, easyfit kit only £3.95. Built only £4.95. All prices inclusive. Overseas 50p extra. Any excess refunded. S.A.E. with enquiries. B. A. Reader, Dept. W. 45 Alford Street, King's Heath, Birmingham B14 7HG.

## NEW FROM MR MICRO

MR Micro are pleased to announce the following new releases in their popular Vic Value Series.

### VIC VALUE No. 2

Alpha Square, Switchback, Rayfection  
Micromind — £6.95 inc. VAT.

### VIC VALUE No. 3

2 Player Chess and Chess Clock  
Jyogen, Alien, Scanner

Martian Defence — £6.95 inc. VAT.

Send SAE for our latest catalogue.

For 24-hour telephone ordering service with Access or Vise, ring 061-728 2282 or send cheque/PO to:

### MR MICRO LTD

69 PARTINGTON LANE, SWINTON  
MANCHESTER M27 3AL

We are now a member of the Spectrum Computer Group. Our retail shop is now open. We look forward to seeing you there.

## MINDSEYE

AGAIN PRESENTS ANOTHER  
AMAZING CASSETTE

The 'Second' brings you 3 fast moving machine code games for the 16K ZX81.

**Space Rescue** — for the first time on the ZX81 — fly through a meteor storm to land safely on an alien planet, to pick up one of the stranded astronauts, then fly back through enemy spaceships to dock with the mother ship — more like 4 games in one!

**UFO** — battle against a virtually indestructible alien space cruiser.

**Dodgem** — race throughout the concentric tracks avoiding the suicidal oncoming car.

Amazing value. Only £2.95 for 3 games.

Also the 'First' — again 3 fast m/c games for the 16K ZX81. Byte-man, Star Fighter and Bomber, and still only £2.95.

'MINDSEYE', 12 NORTH GROVE DRIVE,  
LEEDS LS8 2NJ

WHY PAY MORE FOR LESS?

## VIC20 LIBRARY

Hire a Commodore Cartridge (Adventures/Games) for £1.50 per week, including P&P. Joining Fee £25.00. Stamped S.A.E. for details to:

Warren Software Library, 24 Southville  
Close, West Ewell, Epsom, Surrey KT19 9RB.

## BBC (32K)

Guaranteed programs for home and school. 'ANGLES' — full BBC graphics demonstrate angle as turning, and introduce degrees. Suite of four programmes on one tape for £6.95. SAE for details and complete list. CHALKSOFT, Lowmoor Cottage, Tonedale, WELLINGTON, Somerset TA21 0AL.

## A.C.E. ZX81 GAMES VOLUME II

Seven 16K games for one or two players. Includes Battleships, Dracula, Hangman, Minigolf. All for just £3.50 (£3.00 if ordered before January 1983). Amberwood Computer Enterprises, Market Place, Penkridge Staff, ST19 5DH.

Hangman was never like this!

## LYNCHMOB

for the ZX81 (16K)  
and ZX Spectrum (16K)

A competitive game of skill and strategy for 2 to 6 players. To make things fair, the program picks turns. If you're the lucky one, you type in a word or phrase. Then it's the other players' turn to show their word skill. But look out if they guess wrong for then the lynching begins! Great fun! And don't forget to tell Mum and Dad it's educational too! Ideal for the family Christmas get-together round the TV. Superb animated graphics — The Spectrum version has brilliant hi-res colour AND sound effects!

LYNCHMOB for the ZX81 (16K Ram) £4.95  
LYNCHMOB for the ZX Spectrum (16K/48K) £6.50

All inclusive price. Sent first class by return. Full money-back guarantee

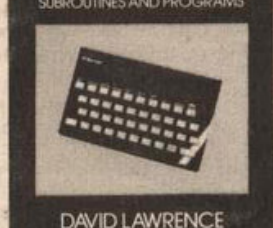
Dept Pop, BRIDGE SOFTWARE,  
36 Fernwood, Marple Bridge,  
Stockport, Cheshire SK6 5BE



## New book for Spectrum

### The Working Spectrum

THE WORKING SPECTRUM  
A LIBRARY OF PRACTICAL  
SUBROUTINES AND PROGRAMS



DAVID LAWRENCE

Published in association with  
Popular Computing Weekly.

Send cheques/postal orders, for £5.95, to The Working Spectrum, Sunshine Books, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF. We can normally deliver in four to five days.

## DRAGON GAMES

Five super games for your DRAGON, supplied on ONE top quality cassette. AWARI, BURGERS, BREAKOUT, MOONLANDER, OTHELLO. Fascinating entertainment at unbelievable low cost. £5.75 per cassette (incl P&P etc.) J. Morrison (Micros), 2 Glensdale Street, Leeds LS9 9JJ

## SPECTRUM

**SHEEPDOG TRIAL** (16K). Pen up to six very obstinate sheep. Good graphics. £2.95 including P&P.

**GOLF** (48K). 18-hole course, holes not randomly generated. Bag of clubs. 0-24 handicap. Includes course design notes. £3.45 including P&P.

GM Software, 1 Rhwisaeson, Cross Inn  
Pontyclun, Mid Glamorgan

Got a DRAGON 32 or TANDY colour computer? Then you need your own monthly magazine 'RAINBOW' for colour computer users. Send £1.50 and large sae for sample issue to: ELKAN ELECTRONICS (Dept. POP), FREEPOST, 28 Bury New Road, Prestwich, Manchester M25 6LZ. Telephone 061-798 7613 (24-hour service).

## SPECTRUM ASSEMBLER

Enter the world of the Z80! Full 2-pass assembler with labels all opcodes — 11 powerful directives easy program editing — 16/48K — manual written and tested by professionals £5.95 Cheque/PO to C. Newport, 57 Camlet Way, Hadley Wood, Herts.

## WHAT IS AXON USERS GROUP?

Axon Group has been formed to give school, private clubs and private house users of Microcomputers a complete range of consumables at a discounted price. We are a group of companies already supplying to large trade and business users and because of our buying power we can pass on the bulk costs to yourselves. Our aim is to reduce your cost of consumables by at least 10 per cent. Axon User Group, 31 Corsica Street, London N5 1JT. For further details please telephone 01-226 8809.

## DRAGON 32 SOFTWARE

**FAMILY PROGRAMS:** Eight full-length original games, utility and educational programs.

**FUN AND GAMES:** Ten exciting games for young and old. Ideal for Christmas parties etc. £5 for each cassette, £9 for the pair.

Send cheque/PO to Shards Software, 10 Park Vale Court, Vine Way, Brentwood, Essex CM14 4UR.

## ZX SPECTRUM

### Vaults of the Vampyre Supa Maze

Two great games, testing the memory and logical abilities of the player. Both use full sound and graphic facilities and are available together for 16K or 48K at £5.95 including VAT from

I Q SERVICES  
Canal House  
Ardishaig, Argyll

## VIC20 Programmers required

System Company looking for competent programmers in basic or machine code to write games and business programs for the Vic20. enormous earning potential for the right people. Send details or sample programs to:

Software Department,  
42 Deacons Hill Road  
Elstree, Herts

## ZX81 BOOK SALE

Peek, Poke, Byte and Rom £4... Not only 30 Progs £5... Understanding your ZX81 Rom £7... Disassembly part A £5... Disassembly part B £6... Machine Lang. Made Simple £7... The Complete BASIC Course £2

Occam Software, 13 Hawthorn Grove  
Wilmslow, Cheshire SK9 5DE

## HIRE ZX cassettes

FOR JUST £1 EACH!

Get the most from your ZX81 or Spectrum by hiring program cassettes for just £1 each (plus 25p p&p) per fortnight!

We offer a terrific selection of over 150 tapes — all the latest advertised games including 3-D adventures, tests of skill and wits, plus utility and toolkit for the expert.

Just send £5 annual membership and we will pots your Library List, Newsletter and order forms by return — on full money-back approval!

Sinclair Owners' SOFTWARE LIBRARY  
Heather Cottage, Warren Road,  
LISS, Hants GU33 7DD

## ZX81 ★ TRS-80 ★ GENIE ★ SPECTRUM

**LMX EPROM PROGRAMMER FOR ZX81** (SEE REVIEW IN THIS ISSUE). Kit £17.50. Assembled £21

**LMX-PORT BOARD FOR ZX81 AND SPECTRUM**

Plugs directly into expansion slot on computer. 8 latched TTL out bits, 8 buffered TTL in bits (tristate). Instructions. LMX-P. Assembled £12.50

**TAPE CONTROLLER FOR ZX81 AND SPECTRUM**

Internal microphone and loudspeaker. Reset, Power-on indicator. 4-position switch for LOAD, SAVE, CUE, TALK. Specify model: LMX-TC81 or LMX-TCS. Assembled £13.50

**BEEP AMPLIFIER FOR SPECTRUM**

Amplifies and enhances the audible tones and beeps from your computer. Volume control, LOAD/SAVE switch to eliminate feedback. Plugs in-line with cassette player. LMX-A. Assembled £11.50

**EPROM PROGRAMMER FOR TRS-80 AND GENIE**

Professional units for model I level II. Programs 1K, 2K and 4K + 5V Eproms. 12 Commands; graphic display, integral p.s.u.; machine code software on tape; comprehensive manual. LM124T and LM124G. Assembled £79.50. Manual available separately £2.50.

ALL PRICES INCLUSIVE OF POSTAGE AND PACKING.

SEND SAE FOR FURTHER DETAILS

## LANDER MICROSYSTEMS

32 Clockhouse Lane, Collier Row, Romford, Essex RM5 3QJ  
Tel: Romford 26325



#### INVADERS for the VIC20

"A neat version of the popular favourite - machine code, good colour and sound. Four rows of nine invaders each, five levels of difficulty." (VIC Computing, October 1982)

**BRIDGEMAN** for the BBC micro (model B)  
£6.90  
£7.90

The popular gobbler game - full sound and colour

Still available (see our last two adverts)

**4K INVADERS** for the ZX81 (at least 4K RAM)

£4.00

**SUPER INVADERS** for the ZX81 (16K)

£4.95

**LYNCHMOB** for the ZX81 (16K)

£4.95

**LYNCHMOB** for the ZX Spectrum (16K)

£6.50

All-inclusive prices. Sent First-Class by return

Full money-back guarantee

Dept. Pop, **BRIDGE SOFTWARE**  
36 Fernwood, Marple Bridge  
STOCKPORT, Cheshire, SK6 5BE



#### SPECTRUM SOFTWARE: "ZXtext"

Teletext simulation for 48K (60 pages), 32K (34 pages) or 16K (8 pages) Spectrum. Full simulation including colour, flashing, 24-hour clock, alarm, tape/microdrive storage, save/verify/load with auto-run, freely mixed text and graphics (including user-defined graphics), etc. Set up your own personal databank. Cassette with full instructions and 12-months guarantee, £5; "Defender" - can you save the Federation base from an all-out Romulan attack? Dramatic sound effects, deep-space background, fantastic user-defined graphics. Defend the base using high-powered phasor banks. Cassette with full instructions and 12 months guarantee, £4.20. All products available on 10-day delivery. Details (SAE): Iain Stewart, 17 Torry Drive, Alva, Scotland, FK12 5NQ.

**PET 4000 SERIES** 16K for sale, manuals, 84 programs free, £450 ono or will swap for BBC model B. Tel: 0665 830466, evenings.

**TANGERINE MICROTAN 65** Tanex Tanram system, rack keyboard, p/supply, graphics board, sound board, £300. Tel: 01-954 8162, after 6.30 pm.

**ZX81** m/c cassettes, Spaceventure, 5 1K games: Shoot Asteroids, Land Your Spaceship, Attack Rebels, Explore Tunnels, £2.50; Pacman-81 (6K); Powerpills, Sidedoors, Fruit, £3.95; Spaceventure + Pacman-81, £4.95. (SAE details): A. Laird, 9 Franklin Road, Saltcoats, Ayrshire.

**DRAGON** wishes to exchange data with other Dragons. Adrian, 226 Epping Walk, Hulme M15 6FP (enclose SAE).

**M/CODE LOADER** Spectrum Hex-Dec, Dec-Hex, monitor, eraser, mover, JR dis calc, 16K/48K, £3 tape, Jeff, 1 Dan-y-Lan, Aberkenfig, Bridgend.

**TREAT YOURSELF** for Christmas! Buy "21 Programs for Micros". Moving graphic games for all micros. Full program listing, variables list and program explanation, two lines define all screen memory locations and characters used in the program. A few changes and these programs run on the Vic, Spectrum, Pet, Dragon, MZ80K, TRS80, BBC, etc. Keep moving or you'll be entombed in Trap... can you hit the men with your tank in Man Hunt... avoid the poison arrows as you seek gold in Grave Robber... Send cheque/PO for £3.95 to Wynford James, 103 Norcot Road, Reading, Berkshire.

**VIC20 WORMFEED.** 3.5 K, full sound, colour and redefined characters, gives additive game at just £1.80!! H. Gifford, Sexton's Cott, Tipton, Sidmouth, Devon, EX10 0AG.

#### WANT A JOB IN MICRO-COMPUTERS?

We need a micro enthusiast to assist in our tape programme duplicating plant. Lots of front-end responsibility with customers etc and good pay.

Please contact **Nigel Boyle**  
**BIBI MAGNETICS LTD**  
101/105 PLOUGH ROAD  
LONDON SW11 2DJ  
Tel: 01-223 5955

**ZX81** 16K with the ZX81 companion and machine code book and Sinclair games software cassette, £65.00 Tel: 921 8958.

**SPECTRUM AND JUPITER ACE SOFTWARE** wanted. Top royalties paid. Cassettes to N. A. Barnett, 7 Oakwood Drive, Aspley, Nottingham NG8 3LZ.

**ZX81 SPECTRUM PROGRAMS** wanted. 20 per cent royalties paid. Send lists and/or cassettes: Ram Scan Design, 33 Gardner Road, Prestwich, Manchester.

**SPECTRUM GRAPHICS.** Demonstration of Plot Draw Sin/Cos UDG Colour Animation. Instructive and entertaining. Cassette for 16K £4. Willden, Maybank, Yew Tree Lane, Rotherfield, Sussex.

**WANTED: PERSONAL COMPUTERS,** all models bought for cash. Morgan Camera Co., 160 Tottenham Court Road, London W1.

**SPECTRUM 16K FIREFIGHTER GOLF INDEXER** and Buzzman all on one cassette, £3.50. R. G. Martin, 56 Qualitas, Bracknell, Berks.

**VIC20 OWNERS.** At last! All-action arcade games for the unexpanded Vic at low prices. Written entirely in m/c for exciting colour graphics, animation and sound. Super games cassette - three games on one cassette, Super Break-out, Galaxions and Scrambler. Full feature games with defined graphics, hi-score, free ships and bonus points. Only £4.95. Fast delivery. J. P. Shay, 51 Meadowcroft, Radcliffe, Manchester.

**DRAGON SOFTWARE.** 10-Pin Bowling, Addictive, Rivals Space Invaders, automatic scoring on hi-res screen, £7 (tape). G. M. Newman, 12 Malden Park, New Malden, Surrey KT3 6AS.

**ATTENTION MICRO USERS!** The Nottingham Computer Club are now expanding nationwide. For details of membership: 21 Chaceley Way, Silverdale, Nottingham.

**ZX81 POOLS PROGRAM.** Listing £1.30. Special offer for Christmas. D. J. Wyatt, 77 Redgrave Gardens, Luton, Beds.

**VIC20 + CASSETTE,** memory upgrade, joystick, adventure cartridge + games cassettes and magazines, mint condition, guarantee + original packaging. Worth £350+, genuine bargain £200 ono. Tel: 01-942 3090 (evenings).

**ZX81 16K FAMILY HISTORY PROGRAM,** menu driven, 11 functions, updates enquiries, four browsing routines, search for a relative, tree display. Cassette, manual, £5. D. Bradburn, Shielling Wayside Road, Basingstoke, Hants. RG23 8BH.

**VIC FUNCTIONS:** make programming easier, customise the function keys to your own requirements, suitable for any Vic, expanded or not. M/c program only occupies 170 bytes. £3.95. G. Collard, 14 Wroughtington Street, Wigan WN1 2BX.

#### COMMODORE 64 £264 (excl. VAT)

Tel: Chris Gurney, Dave Walsh or Floyd Paterson.  
Tel: 01-969 4658 or send SAE  
**Image Science Micro Computers Ltd**  
189 Freston Road, London W10 6TH  
or cheques PO (add 15% VAT)  
and £5 for p+p

#### Dragon Software!

**BARNSOFT**  
**32K STARTREK**

Save the Universe from the Invading Klingons, £6.50.

**Barnsoft, 48 Waverley Road, Portsmouth**

**16K ZX81** + printer and £35 of programs 3D defender etc + mags, cost £196, only one month old, hardly used. Sell for £130 ono.

**ZX81 VIDEO LEADS,** 3m long. Compute in comfort for only £2.99 inc P&P. Johns Computer Models, 6 Southern Street, Manchester, M3 4NN.

**ZX81 16K** educational cassette, Graphic Geography and Maths tests, £2.50. S. P. Weekes, 38 Anthony Drive, Norwich, Norfolk.

**SPECTRUM SOFTWARE LIBRARY.** Why buy those expensive progs when you can hire them from 50p weekly. Send stamp for free catalogue to: T. McQueen, 25 Blenheim Gardens, Brixton Hill, London, SW2.

**ZX MICROFAIR:** Lift wanted from North-East England, costs shared. Phone Jan Cumpson (0632) 464366 (home) or 472321 ext 9 (work).

**VIC20 VOODOO CASTLE CARTRIDGE,** swap for The Count or Mission Impossible. Tel: 952 4397 (Edware).

**ZX81 16K,** simultaneous and quadratic equations tester and solver, £5, correction coefficient, means, standard deviation, variance and Madam tutor and solver, £6.25. S. P. Moore, 39 Pottery Street, Llanelli, Dyfed, South Wales.

**12 MACHINE CODE ROUTINES FOR THE ZX81.** Features nine graphic and three general routines. Send £4.45 (includes demo and instructions) to S. Hibbert (toolkit), 23 Jolliffe Road, West Wittering, West Sussex PO20 8ET.

**VIC20 UNEXPANDED GAMES,** seven on cassette (e.g. Pacman, Snakes), £5.50. Tel: 928 36277 for details, after 4 pm.

**UNEXPANDED VIC20 SOFTWARE,** Pacman, Missile Defence, Space Defence, Space Shootout. Send £5.50 to: Barnes, 3 The Beeches, New Way, Whitworth, Rochdale OL12 8AP.

**VIC20 UNEXPANDED.** Gobbler, Bomber, Sprogger, Hangman, Xenon and Addictive. Excellent colour, sound and defined characters. Keyboard or joystick. Amazing value. Extremely entertaining. All for £4.50. Peter Robinson, 24 Butterfield Road, Bolton BL5 1DU.

#### LOVE —

#### a 16K ZX81 women's adventure game

set in the riotously funny Poke Hall. Meet the voluptuous Griselda, the rude Sinclair, Indian mystic Mr Ram Pac, and more. Interactive, machine coded and fast. Cassette £3.95 inc instructions. **REMISOFT, 18 George Street, Brighton BN2 1RH** (tel: 0273 602354).

#### JUPITER ACE USERS GROUP

Newsletter, software, advice on add-ons. S.A.E. for details.

**Remsoft, 18 George Street, Brighton BN2 1RH**

**ZX81, 16K,** with Klick keyboard and lots of software, £65 ono. Tel: Middleton-on-Sea 4207.

**CHRISTMAS CAROL PROGRAM,** BBC, 3-channel sound, verses on screen. Send £3 including P&P. P. Dignan, 2 Kingswood Close, Surbiton, Surrey KT6 6DZ.

**DRAGON 32 24K WORLD FOOTBALL,** £3.50; Adventure, £2.50; both £5. On cassette. From Mark Gorick, Myrtle Grove, Nooklands, Fulwood, Preston, Lancs. PR2 4XN. Tel: (0772) 717767.

**T199/4A SOFTWARE ON TAPE,** from £1.95. Send s.a.e. for list. ATL, 115 Crescent Drive South, Brighton BN2 6SB.

**WANTED:** any ZX81 or Spectrum genuine cassettes. Get some money back from your software investments. Send list and quotation to: C. Holm, Konvaljvägen 8 S-53171, Lidköping, Sweden.

**ZX81 VIDEO INVERTER.** Saves your eyes, increases safe level, displays sharp white characters on solid black background screen. Kit £4, built £5 (includes VAT, P&P and instructions). Reviewed in *Popular Computing Weekly*, August 26. Send cheque/postal order to D. Fritsch, 6 Stanton Road, Thelwell, Warrington, Cheshire WA4 2HS.

**DRAGON 32 SOFTWARE ON TAPE,** from £1.95. Send s.a.e. for list. ATL(D), 115 Crescent Drive South, Brighton BN2 6SB.

**FEASIBILITY STUDY.** Anyone interested in joining a software exchange club. Send details of your computer and software owned to 15 Tunwell Greave, Sheffield S5 9GB.

**SHARP M2.** 80K, 42K hi-res board, nine basics including Xtal, Pascal, Fortran, machine code, Forth, 2CN, Assembler/Disassembler. Over £700 software of all types in all languages. Realistic offers to N. Ingram (05438) 5265.

## Computer Swap

### 01-930 3266

Free readers entries to buy or sell a computer.  
Ring 01-930 3266 and give us the details.

#### Spectrums for sale

**SPECTRUM 48K** plus Sinclair printer with paper. Also amplifier, books, cassettes and mags. £230 ono. Tel: 0636 813751 evenings.

**ZX SPECTRUM, 48K.** Tel: 01-302 1808, Mr Gausden.

**SPECTRUM 48K or ZX81 + 16K RAM,** + Kayde professional keyboard. Tel: 01-680 5860.

**ZX SPECTRUM, 16K,** hardly used, and book of the Spectrum, £120. Please write to: Mr. Peatheyjohns, 20 Long Leasow, Sallyoak, Birmingham B29 4LT.



**SPECTRUM 48K**, new, unused, still in makers case, £175. Tel: 0293 015493 (any time).

**16K SPECTRUM**, Abacus controller, Sharp cassette recorder, s-ware, books, £110. Tel: 061-428 7477 (Manchester).

**16K SPECTRUM**, one month old, best offer secures. Mr. M. Winch, 42 Cherwell Close, Tonbridge, Kent.

## ZX81s for sale

**16K ZX81**, Sinclair built, PSU leads plus manual. Boxed and guaranteed. Magazines and software. (including chess) plus machine code book, £70.00 ono. Tel: 0252 549104.

**16K ZX81** with leads and manual, 6 tapes including Gulp and Monster Maze plus 5 books, £65.00. Tel: 07456 89857.

**16K ZX81**, with Books plus software. £70.00. Tel: Morecambe 418004.

**ZX81 16K** plus software, £55. Tel: Lingwood, Herne Bay 66543.

**ZX80**, with 8K ROM, ZX81 manual, book of 30 progs, 4K original ROM, £30 ono, sold as seen. R. P. Bold, Tel: 0272 839365 (Bristol).

**ZX81 16K**, plus software and magazines, extended tv, lead and books, £60 ono. Tel: Egham 33502 (after 5 pm).

**16K ZX81**, + fuller K/Brd + games software + books + cassette recorder + magazines, only £100. Tel: Graham England, 01-405 7137 (office hours).

**ZX81 + 16K RAMPAC**, Sinclair built, complete with manual + software, £50. Tel: 01-935 9887, Mr Moser.

**ZX81 56K**, all usual extras, including Chess, three months old. £100. Tel: Richard, 01-551 2549; 01-989 4484.

**ZX81 16K**, Fuller keyboard, 3 books, 5 games cassettes (Scramble etc), £75. Tel: Darren on Milton Keynes 318376 (after 4 pm).

**ZX81, 16K**, QS motherboard, QS soundboard, telesound 82 unit, works with soundboard, home-made joystick, cassette inc QS Defender, Scamble etc, worth £160, will accept £80. Tel: 982 2832 Dorford.

**ZX81**, with leads, power pack and manual, 16K Ram, compatible tape recorder and £40 worth of software, £95. Telephone 0344 883172 (evenings/weekends).

**ZX81 + Diconics keyboard**, + 16K RAM, leads + manual + power supply, approx 11 games and tapes included + many copies of Sinclair user. £95.00. Tel: Wallingford (0491) 35849.

**ZX81 plus 16K**, plus cassette, plus cassettes and magazines, all guaranteed, £80.00 ono. Weybridge 55751 eves.

**ZX81, 16K**, 4 travel k-board, £50 of s/ware + 2 books, only £80 ono. Tel: 01-542 6177 (after 5 pm).

**ZX81, + 16K**, Ram pack, as new, Sinclair built, all leads, £25 of s/ware, all worth £110, will accept £90 ono. Tel: 01-870 2081.

**ZX81**, Sinclair-built, all leads + manual, 2 books and mags, £35. Tel: 041-945 0025 (after 6 pm).

**ZX81 16K**, with cased Maplin keyboard, eight months old, four books, magazines, software, £80. Tel: Bolton (0204) 386280.

**ZX81 16K RAM** pack, work station, plus software including chess, bank account and many games, £75.00 ono. Tel: 01-600 2300 ext 3476. Mr Lampl, 9 am-6.30 pm.

## Commodores for sale

**VIC20** plus cassette with manual, one year old, dust covers, plus software book and VIC computing magazines. £160.00. Tel: 0444 413591.

**VIC20 8K**, plus Datacassette, joystick, VIC revealed, dust cover, some games, still under guarantee, £165 ono. Tel: 0784 34133 (after 6 pm).

**CBM PET 3032**, toolkit + superchip, cassette deck, 3022 printer, paper, leads, programs, £575 ono. Bryer: 01-891 0855 (evenings).

**VIC20 — 6K RAM**, cassette deck, super-expander, 30 software programs, £180 ono. Stephen, Tel: 01-980 8675 (after 5 pm).

**VIC20**, still guaranteed, plus cassette unit, programmers aid, super expander, voodoo castle, light pen, reference manual, software including Frogger, Blitz, Amok, Index, £375. Tel: Robert 01-455 1132 (after 6 pm).

**VIC20** Data set, books, 16K super expander, cartridge cassette, worth £550.00, sell for £300.00. Tel: Wrexham (0978) 822505.

**VIC20 COMPUTER** plus £35.00 of software and cassette unit, £125.00. Tel: 051-228 1356.

**VIC FORTH CARTRIDGE**, + starting Forth manual, £40. Tel: Preston 864599.

**VIC20 + 16K**. Data set, recorder, much software, introduction to basic, Vic revealed. Worth £400.00, bargain £275.00. Tel: 0708 47993.

**VIC20**, + cassette deck + joystick + programmers reference guide + Blitz + Vic arcade game book + over 40 games, £170. Great Dunmow (0371) 810720 (after 5 pm weekdays).

**COMMODORE VIC20** + cassette also a Stack 16K + 3K expansion. Prog aid cartridge, Commodore 3K Ram. Vic Revealed. Complete set of Vic computing, £230. Tel: Sunbury upon Thames 85763.

**VIC20** with cassette unit and Space Battle cartridge, £25 of bought software, £175.00. Tel: Henley 5588.

**VIC20**, extra 3K Rom super expander cartridge, including Jelly Monster cassette unit, joystick, introduction to basic manual plus cassette, plus other software tapes. £200.00. Tel: 01-380 1131.

**VIC20**. Cassette deck, stack store board with 8K, Vic kit 2 with high-res, introduction to Basic 1 and 2, innovating computing book, under guarantee, £280.00. Tel: 01-328 6048 (after 6 pm).

**VIC20**. Cassette deck, Arlon expansion unit plus 8K Ram/Pac and cartridge games Alien and Super Lander, joystick plus programs, reference guide and tapes, £275.00. Tel: Rotherham (0709) 544781 (9-6 pm).

## Ataris for sale

**ATARI VCS** + 5 cartridges including Space Invaders, as new in original box, £110 ono. Tel: 061-678 9910, evenings or weekends.

**ATARI VCS**, in mint condition, including paddles, joysticks + two cartridges, combat and missile command. Wanted: £70. Tel: Leyland 21744.

**ATARI VCS** with Invaders and Breakout, two joysticks and paddles, as new, £90.00 ono. Tel: 061-998 3320.

**ATARI VCS**. Hardly used, + 6 cartridges inc, Asteroids and Invaders, all in good condition, £130 ono. Tel: 021-523 8666 (after 4 pm).

**ATARI VCS**, with cartridge holder, 9 cartridges: Pac-Man, Defender, Asteroids, etc. Worth £350 new, asking £270 ono. Tel: Mike on 01-670 3485 after 6 pm.

**ATARI VCS** with 5 cartridges, Combat, Space Invaders, Asteroids, Breakout and Basketball, cost over £200, accept £100 ono. Tel: Ipswich 70487.

**ATARI 400**. 16K basic, Star Raiders, Asteroids and Basket Ball Roms, amusing graphics, 2 months old, full guarantee, £280.00. Tel: 051-427 4927 (Dave).

**ATARI VCS** with 11 cartridges including Asteroids, Missile Commands Indi 500, £200 or very near offer. Tel: Waltham Cross 21260 after 6 pm.

## Tandys for sale

**TRS 80**. Model 1, level 2, 48K with disk drive and printer, vgc. £1,000 ono. 197 Oak Road, West Bromwich, West Midlands. Tel: 021-553 3005.

**VIDEO GENIE EG 3003**, 16K RAM, 12K ROM with lower case, built-in sound unit, plus driver program, also books, plus over £200 of software, £275 ono. Tel: Leicester 0533-704193 (after 12 am) A. Marshall.

**VIDEO GENIE 16K**, plus manuals, demo tape and centronics interface card, £180. Tel: 01-947 9649 (9 am-5 pm).

**VIDEO GENIE I**, 16K RAM, sound, re-number, machine code monitor, lower case, software, includes Asteroids, £200 ono. Tel: Worksop 771222.

**VIDEO GENIE EG003**. 16K memory, built-in cassette, games and adventure cassettes plus books on graphic games and service manual, £200.00. Tel: Stevenage 720521.

**GENIE I**. 16K Ram, 13K Rom, vu meter, extra keys, internal cassette, two books, 32 software tapes, £230 ono. P. Stallard. 01-689 0022 (6 pm).

**TRS80 MODEL 1**, 16K with model seven printer with over £500 worth of software, £700. Also Atari VCS plus Combat and Basic programming plus keyboards, £70. Colin Maxted, 52 Bowyer House, Vermont Road, Wandsworth, London SW18.

**TRS 80**. 16K, level ii, T Bug, Editasm, £190.00. Light pen, loudspeaker, £15.00. Complete years "80-Microcomputing," "Microsoft Basic D'Codet," and other books, software, £50.00 ono. Tel: 01-337 4403, ext 42. ext 42. 8-4 pm.

## Acorns for sale

**ACORN ATOM 12+12K**. Floating point Rom, toolbox, power supply +cassette player + 20 cassettes of S/W, S. Atom. Books. The lot £180 ono. Tel: 01 992 8249 after 4 pm.

**BBC MICRO MODEL B** + lots of software including Machine Code Scroll, Invaders and Pacman, still in box and can be mailed to you. £390. Tel: Newcastle (0632) 737654.

**BBC COMPUTER MODEL B**, as new, £375. Tel: Totnes (Devon) 863454.

**ACORN ATOM 12+12K**, fitted with all accessories including floating point ROM, VIA, tool box, 20 cassettes + cassette player and 5 books, the lot £200. Tel: 01-992 8249 (after 4 pm).

**ACORN ATOM**. 12K Rom + 12K Ram including link floating point, £180.00 ono. Tel: 01-501 1629 (evenings).

**ACORN ATOM**. 5k Ram, PSU, little used, £100.00. Tel: 061-339 4991.

**ACORN ATOM**, 12K+12K, + utilikit, PSU, leads etc, manual + books, games, cassettes, less than 6 months old, £180. Tel: 01-245 3470 (daytime), Mr Armstrong.

**ATOM 12K + 12K**. Five bolt PSU books, manuals etc. £150.00. Tel: Padgate 817281.

## For sale

**NINE ROLLS** of ZX paper, £10.00. Tel: Sheffield 363273.

**DRAGON 32, 32K**, original packing, £150 ono. Sanderson: 01-834 8269 (evenings) 01-213 6310 (daytime). Pickup in Central London).

**TV GAME**. Interton 4000 plus 19 cartridges, £150.00 ono. Tel: Wickford (03744) 62892.

**DRAGON 32**. Almost brand new with one games cartridge and cassette lead, some software on cassette, still in original box, £170.00 ono. 01-330 2380.

**MICRO-WRITER**, as new, £450. Tel: 0306 79432. Ask for Ian.

**FX602P CALCULATOR**, £45 ono. Peter, Tel: 01 723 9947 after 6 pm, not Tuesdays.

**UK101 8K**, cased, mono 2, toolkit, joysticks, mini eeprom board, psg assembler and more software, £190. Tel: Bradford (0274) 727635 after 6 pm.

**TANGERINE MICROTAN 65** + Tanex, keyboard, keypad, all manuals + software, £150 or swap for Spectrum. Tel: Milton Keynes (0908) 641722, Mr Green.

**CASE FOR SINCLAIR SPECTRUM**, £30.00. Tel: 01-223 9171, Mr Fisher. (As advertised in Computer Magazine).

**FOR SALE**, 13 Mattel Intellivision cartridges, £10 each. Tel: Bath 834595.

**FOR SALE**: Sinclair printer paper, two boxes, £8 per box. Tel: 01-898 0792, evenings (Richard Page).

## Wanted

**WANTED**. 16K SPECTRUM with new board, in exchange for 16K Spectrum with old board. Apply to M. Pursell, Sherwood Hall, Nottingham University, Nottingham.

**ZX81 16K**, £50 or any other computer for under £100. Tel: Chesham, Bucks 772544 after 5 pm.

**WANTED** Super Expander 3K/8K/16K Ram expansions. Joystick for Vic20. Tel: Bill, 051-645 8371 evenings and weekend.

**WANTED**, VIC20 plus cassette deck, manuals and software. Tel: Tonbridge 352232.

**WANTED**: Any ZX81 or Spectrum genuine cassettes. Get some money back from your software investments. Send list and quotation to: C. Holm, Konvaljaven 8 S-53171 Lidköping, Sweden.

**WANTED 8K OR 16K** Ram pack for Vic20. Contact Frank McDowell, 0946 (Whitehaven) 3051 or 5112.

**SPECTRUM 16K or 48K** wanted. Tel: Alan on 061-973 9728 after 4.30 pm.

**VDU FOR VIC20**, will collect. Tel: Weston-Super-Mare 417199 evenings.

**ZX81 16K WANTED**. Newcomen Primary School, Redcar. Tel: 484318. Mr Flindall.

**WANTED SINCLAIR ZX81** with 16K Ram Pack in excellent condition. Alan Lamont, 6 Herbert Road, Hornchurch, Essex. Tel: 45922 weekday evenings.

**ZX81 16K**, anything considered within 60 miles. Tel: Oxford 750296, Mr Page.



## Ziggurat



### Babel's Tower

G. H. Hardy thought that a mathematician, like a painter or poet, was a maker of patterns — if the mathematician's patterns were more permanent than those of the painter or poet, then that was because the mathematical patterns were made with ideas. "The mathematician's patterns, like the painter's or the poet's, must be *beautiful*; the ideas, like the colours or the words, must fit together in a harmonious way. Beauty is the first test: there is no permanent place in the world for ugly mathematics." (*Mathematician's Apology*, revised edition, 1967).

I do not think that computing, or computer programming in particular, is a branch of mathematics, but I do believe that programming is essentially a human construction — an exemplification of a human's set of ideas. I also believe that there is no permanent place in the world for ugly programs, or ugly programming languages. But, as they say, beauty is in the eye of the beholder.

Start with Basic — a beautiful language (particularly in its original Dartmouth version). The quality of the ideas in that original version have scarce been bettered. Basic was a Beginners All-purpose Symbolic Instruction Code, and how well it succeeded. Forget all these people who tell you that Basic is not the best language (for there is no best language in any case) but wonder if any of the languages that have been suggested as replacements are as novel now, as Basic was then.

Present Basics are not as beautiful, because the original integrity of the Dartmouth formula-

tion has been eroded, and for many purposes there are languages which are better than Basic — but will they ever be developed as far? And will anybody want to develop them? The beauty of Basic, and the quality of its ideas, are the reasons why it has been so successful.

Another beautiful language is Algol 68, and the beauty of Algol 68 (a language mainly reserved for large main-frames) is partly a result of its mathematical structure. Algol 68 has been the only language to make me feel excited when I read its description. It is not easy to explain, but what is so impressive about Algol 68 is the utter simplicity and power of the language (termed 'orthogonality') — even though to produce this simplicity requires a complex system of language analysis by the computer. Simplifying tremendously, the central building block of Algol 68 is called a clause, and every clause produces a result. As long as the result is of the correct mode it is possible to do anything to anything — within the rules.

To be beautiful does not always bring success. Though Algol 68 has its devotees it has not been as successful as that rather ugly language Cobol.

I find Cobol tedious and ugly because it lacks style, and has a strange verbosity I find alien. As a working language, however, Cobol has no competitors — most of the world's programs are written in Cobol, and it is estimated that more time is spent running Cobol programs than all other languages put together.

A language which seems to have taken on a new importance is Forth, and when I look at Forth I see a few flashes of beauty in an otherwise rather dull prospect. The beauty of Forth lies in its simplicity and inherent extensibility. Forth has been promoted as an easy language to use with advantages in speed and compactness, and indeed its simplicity in use interactively is beguiling.

But as an improvement on Basic it has too many inherent drawbacks — some of which have been removed with the new Jupiter Ace. One recent Forth version in a non-trivial benchmark was only twice as fast as Basic.

Boris Allan ■

## Puzzle

### The long and the short of it

#### Puzzle No 35

Concealed in the following jumble of letters is a message which might be thought applicable to this time of year. Although it's not 'leap' year why not try it out after the roast turkey and plum pudding? Now there's a clue if ever I heard one!

NPKNNEOAHG/TPA/R/SASRLO/SITC/PEED/GR/PREYAE/OUAEEN/PR/IUMMLVOWFS//E/TONGWAYAEYY

Can you decipher it? Once you have found the method to use, a short program might make your task easier.

#### Solution to Puzzle No 31

In addition to the set given — 192/384/576 — there are four other sets: 219/438/657, 267/534/801, 273/546/819 and 327/654/981 (if 078 is counted as a three-figure number then 078/156/234 may also be included).

The following program first generates the top number, checks for duplication, multiplies it by 2 and 3 and again checks for duplication:

```
10 FOR H = 1 TO 3 20 FOR T = 0 TO 9 30 IF H = T
THEN GOTO 260 40 FOR U = 0 TO 9 50 IF U = T OR
U = H THEN GOTO 250 60 LET N = H * 100 + T * 10
+ U 70 LET A = N * 2 80 LET B = N * 3 90 LET AS =
STR$ A 100 LET BS = STR$ B 110 IF LEN AS <> 3
OR LEN BS <> 3 THEN GOTO 250 120 LET CS = AS
+ BS 130 FOR M = 1 TO 5 140 FOR L = M * 1 TO 6
150 IF CS (M) = CS (L) THEN GOTO 250 160 NEXT L
170 NEXT M 180 LET NS = STR$ N 190 FOR M = 1
TO 3 200 FOR L = 1 TO 6 210 IF NS (M) = CS (L)
THEN GOTO 250 220 NEXT L 230 NEXT M 240
PRINT NS: " "; AS: " "; BS 250 NEXT U 260 NEXT T
270 NEXT H
```

#### Winner of Puzzle No 31

The winner is: Railton Frith, Narcot Lane, Chalfont St Giles, Bucks, who provided a solution in Pascal on an Apple III. He receives £10.

## Top 10

### Atari

- 1(2) Jumbo Jet Pilot (Thorn EMI)\*
- 2(1) Submarine Commander (Thorn EMI)\*
- 3(4) Preppie (Adventure International)
- 4(3) Soccer (Thorn EMI)\*
- 5(-) Pac-Man (Atari)\*
- 6(-) Star Raiders (Atari)\*
- 7(-) Air Strike (English Software)
- 8(-) Temple of Apshai (Epyx)
- 9(9) Shamus (Synapse)
- 10(-) Alien Swarm (Inhome Software)

\*Cartridge  
(Figures compiled by Calisto Computers, Birmingham 021-632 6458)

### ZX Spectrum

- 1(4) Escape (New Generation)
- 2(1) Mazeman (Abbersoft)
- 3(2) Spectral Invaders (Bug-Byte)
- 4(-) Meteor Storm (Quicksilver)
- 5(-) Night Flite (Hewson)
- 6(6) Star Trek (Chromasoft)\*
- 7(5) Arcade Pack (C-Tech)
- 8(10) Gulpman (Campbell Systems)
- 9(9) Spectrum Chess (Artic)\*
- 10(-) Espionage Island (Artic)\*

\*Requires 48K  
(Figures compiled by Buffer Micro Shop, London 01-769 2887)

### Books

- 1(1) ZX Spectrum Explored, Hartnell
- 2(3) Easy Programming for the ZX Spectrum, Stewart and Jones
- 3(5) Z80 Assembly Language Programming, Leventhal
- 4(8) Machine Code and Better Basic, Stewart and Jones
- 5(6) Programming the 6502, Zaks
- 6(-) The Working Spectrum, Lawrence
- 7(2) BBC Micro Revealed, Ruston
- 8(-) Vic Innovative Computing, Ramshaw
- 9(7) Starting Forth, Brodie
- 10(4) Over the Spectrum, various authors

(Figures compiled by Watford Technical Books, Watford 0923 23324)  
(Last week's position in brackets)

### ZX81\*

- 1(2) Mazeman (Abbersoft)
- 2(1) 3D Defender (JK Greye)
- 3(5) Mazogs (Bug-Byte)
- 4(7) Frogger (DJL Software)
- 5(-) 3D Monster Maze (JK Greye)
- 6(4) Adventure 1 (Abbersoft)
- 7(10) Gulp II (Campbell Systems)
- 8(3) Gauntlet (Colourmatic)
- 9(-) Flight Simulation (Psion)
- 10(6) Chess (Artic)

\*All require 16K.  
(Figures compiled by Buffer Micro Shop, London 01-769 2887)

### Vic20

- 1(5) Adventureland (Commodore)\*
- 2(-) Omega Race (Commodore)\*
- 3(-) Rat Race (Commodore)\*
- 4(1) Grid Runner (Llamasoft)
- 5(2) Defenda (Llamasoft)\*
- 6(-) Night Crawler (Rabbit)\*
- 7(9) Blitz (Commodore)
- 8(10) Star Battle (Commodore)\*
- 9(-) Avengers (Commodore)\*
- 10(-) Voodoo Castle (Commodore)\*

\*Cartridge. †Requires 8K or 16K. ‡3K.  
(Figures compiled by the Vic Centre, London 01-992 9904)

## LOSERS

unbeatable programmes.





THE FLEXIBLE COMPUTER SYSTEM FOR THE FUTURE

# ORIC-1

## CREATED BY

# TANGERINE

How can Tangerine promise you a professional computer for only £99.95? Because, unlike most computer builders, we have designed the U.L.A. ourselves.

This makes the ORIC-1 substantially more reliable and versatile to work with and what's more, at £99.95, you get a professional system well below the price of

all leading manufacturers.

We can give you prompt service, quality, reliability and full technical backup: The ORIC Computer System will guarantee you that and more:

- 8 colour graphic display (8 foreground + 8 background)
- 40 character by 28 line colour text display
- High resolution graphics (240/200 pixels) 240 across screen, 200 down
- 96 User defined graphics symbols
- Microsoft BASIC software
- 6 octaves of music with Hi-Fi output and 4 preset sound effects - Shoot, Explode, Ping, Zap
- Centronics printer interface (compatible with a whole range of standard printers)
- Optional Communications Modem (allowing access to 200,000 pages of Prestel and direct link with other computers)
- Typewriter style keyboard
- Professionally written user manual by well-known computer authors
- Oric Owner Magazine included with each ORIC 1 purchased
- Tan-Forth supplied free with every mail order 48K Model
- Extended Basic (BBC etc) available soon
- Full range of business and leisure software coming shortly.



(Please allow 28 days for delivery) Subject to availability

### Order your ORIC-1 direct from the designers

BY POST: You can pay by cheque, postal order, ACCESS - BARCLAYCARD-VISA

BY PHONE: Just ring our telesales number ELY (0353) 2271/2/3/4

Please delete/complete as applicable.  
\*I enclose a cheque/p.o. payable to TANGERINE  
COMPUTER SYSTEMS LTD. For £  
Please charge my Access, Barclaycard, Visa No.

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

If you require a VAT receipt please tick ☐

Please send me a full colour brochure ☐

TANGERINE COMPUTER SYSTEMS LTD. 3 Club Mews, Ely Cambs CB7 4NW

Item	Qty	Price Inc. VAT	Total
ORIC-1 16K RAM		£99.95	
ORIC-1 48K RAM		£169.95	
ORIC Communications Modem		£79.00	
ORIC Owner Magazine (Bi-monthly)		£10.00	
Postage and packing		£5.95	
TOTAL £			

POPULAR COMPUTING WEEKLY