60p

YOUR COMPUTER

OCTOBER 1982

BRITAIN'S BIGGEST – SELLING HOME COMPUTER MAGAZINE

Vol.2 No.10

Trooping the colours: we review the new Sanyos, MPF-II, Vic-64 and Colour Genie

ZX word processing

BBC software survey

Vic catacombs

Spectrum assembler

Hitch-hiker's guide interview

Win the new Sanyo

DRAGON 32

ONLY

£199.50

PLUS £3 P/P

Once upon a time . .

. . . . in medieval days, there were dark, mysterious Forests, and within these Forests there lived mythical monsters called DRAGONS.

Now in 1982 when buying a computer you enter a technological Jungle; here within this jungle you will also find Dragons. But these Dragons are no myth.

The heart of the system is a 6809E micro-processor, a great advance on the still popular 6502, with a 32K Memory as standard, expandable to 64K. Uses **Extended Microsoft Colour Basic,** 9 colours available, 5 resolutions of graphics up to 256 x 192, displayed on TV set or composite colour monitor. Generates a full five octave sound range through the TV Speaker.

Unlike other systems in this price range it uses a conventional QWERTY Keyboard.

Standard connections include:—

ROM Cartridge
2 Joystick controllers
Remote cassette unit
Centronics Parallel printer

160 page "BASIC" Manual included with every system.

All this for the unbelievably low price of only **£199.50 including V.A.T, plus £3.00 post and packing.**

Computers for All

72 NORTH STREET, ROMFORD, ESSEX. TEL. 0708 752862

See us at the

The 5th Personal Computer World Show

On Stand 205/207

Television not included in price.

Please send me — *Total*

..... Dragon 32 @ £199.50 ea. .....
..... Dragon Joysticks @ £19.95 pr. .....

Cartridges

..... Ghost Attack @ £24.95 ea. .....
..... Berserk @ £19.95 ea. .....
..... Meteoroids @ £19.95 ea. .....
..... Cosmic Invaders @ £19.95 ea. .....
..... Cave Hunter @ £19.95 ea. .....
..... Tube Frenzy @ £19.95 ea. .....
..... Starship Chameleon @ £19.95 .....
..... Personal Finance @ £19.95 ea. .....

Cassettes

..... Compendium of Games @ £7.95ea. .....
..... Comp. of Applications @ £7.95ea. .....
..... Quest @ £7.95 ea. .....
..... Madness & the Minotaur @ £7.95 ea. .....
..... Computavoice @ £7.95 ea. .....
..... Graphic Animator @ £7.95 ea. .....
..... Mazerace @ £7.95 ea. .....

Name .....

Address .....

.....

I enclose Cheque/P.O. for £ .....
or, please debit my Access/Barclaycard No.

YOUR COMPUTER

Cover photograph by Stephen Oliver.

Editor
TOBY WOLPE
Assistant Editor
MEIRION JONES
Staff Writer
SIMON BEESLEY
Sub-editor
PAUL BOND
Editorial Secretary
LYNN COWLING
Editorial: 01-661 3144
Advertisement Manager
PHILIP KIRBY 01-661 3127
Advertisement Executives
BILL ARDLEY 01-661 8484
PETER RICE 01-661 8441
Midlands Office
KEITH SALT 021-356 4838
Northern Office
RON SOUTHALL 061-872 8861
Advertisement Secretary
JEANETTE MACKRELL
Publishing Director
CHRIS HIPWELL

Your Computer, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.
Subscriptions: U.K. £8 for 12 issues.

©IPC Business Press Ltd 1982

Typesetting by In-Step Ltd, London EC1.
Printed by Riverside Press Ltd, Whitstable, Kent.
Published by IPC Electrical-Electronic Press Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500 Telex/grams: 892084 BIPRESG. ISSN 0263-0885

EDITORIAL

IF THE WRITING is on the wall for British micro manufacturers, most of them have been too busy composing delayed-delivery letters to notice it. Even if they had, they might not have understood the inscription — which would probably be in some oriental tongue. U.K. micro-makers should take heed of the machines which are beginning to flow in from overseas — and from the Far East in particular — if they want to avoid the complacency which has cost other areas of British industry dominance of their home market.

The new wave of micros reviewed in this issue — Sanyo's PHC range, the MPF-II from Taiwan, the Commodore-64, and the Colour Genie from Hong Kong — may not topple the British manufacturers' sandcastle, but then they are only the first ripples of a rising tide. Given the innovations by British firms in low-cost home computing, it would be a shame if production problems and poor reliability lost them the lead. These are exactly the areas where foreign manufacturers, particularly the Japanese, make sure they never put a foot wrong.

In the early 1970s, Clive Sinclair produced the world's first wristwatch with all its electronics on a single chip. His Black Watch failed in the face of Japanese competition because of poor reliability and late deliveries. He and other British innovators are unlikely to meet the same fate, saved this time by the volume of software available for their machines. The fact is that the cost of a micro is a relatively small part of the price one must pay to start computing — the software accounts for the rest of it. If the overseas manufacturers produce the right software they will begin to dominate.

If you have waited 12 or 14 weeks for a ZX Spectrum or a BBC model B — or worse, you are facing more delays because your first, long-awaited micro proved faulty and had to be returned — you have little choice but to go on waiting. With an influx of foreign machines anyone confronted with a situation like that would simply go to the nearest High Street electronics store and buy something reliable off the shelf. It would be a sad irony if one were able to buy a machine from Japan, Hong Kong or Taiwan more easily than from Camberley or Kettering. ■

BEFORE YOU BUY YOUR MICRO!

COMPUTER, PRINTER, DISC DRIVES & ACCESSORIES

ALMOST EVERY MAKE OF POPULAR COMPUTER STOCKED
AT PRICES WELL BELOW RECOMMENDED RETAIL

GIVE US A RING ON 01-441 2922

AND SAVE £££'s WITH THE LOWEST PRICE GUARANTEE

All products carry a 1 year guarantee (parts & labour)
Pay and extra 10% for a 2 year guarantee

Shelves of Computer Books

Spares & repairs on all products, even if you didn't buy from Comp Shop

EXPRESS MAIL ORDER SERVICE

Many items over stocked on Sale Offer

New products arriving daily

'Phone your order to reserve

INSTANT CREDIT
just pay the deposit by Credit Card and take it away

SATISFYING PRICE CONCIOUS CUSTOMERS FOR NEARLY 5 YEARS

P.S. Hopeless on Software

COMP SHOP LTD

"Europes Largest Discount Personal Computer Stores"

TELEPHONE SALES
OPEN 24 hrs. 7 days a week
01-449 6596

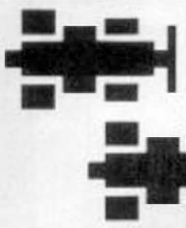
BARCLAYCARD VISA

MAIL ORDER SHOP
14 Station Road, New Barnet,
Hertfordshire, EN5 1QW
(Close to New Barnet BR Station - Moorgate Line)
Telephone: 01-441 2922 (Sales) 01-449 6596
Telex: 298755 TELCOM G
OPEN (BARNET) - 10am - 7pm - Monday to Saturday

Software for all

72 NORTH STREET, ROMFORD, ESSEX. TEL 0708 60725

Announce the launch of their range of BBC programs



For Model B only. **Grand Prix**

Time Trials around our race track. Includes computer controlled car to hinder your progress. 9 levels of difficulty.

£5.95

GHOST MAZE

For Model B only.

Our own version of this popular Arcade game. With colour & sound. 9 levels of difficulty.

£6.95

BEEBTREK

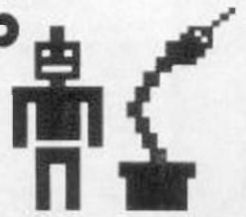
For Model A or B, real time advanced Startrek Game. Extra facilities include "probe satellites", "damage reports" & "on-board computer".

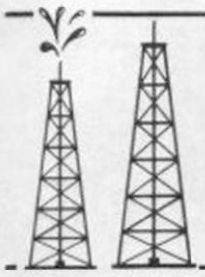
£7.95

Cobra/Robo-Swamp

For Model A or B (please state version required). Two addictive graphic games — insomniacs delight!

£6.95

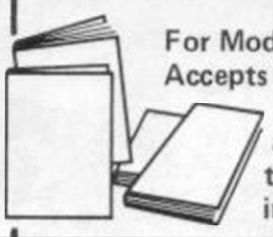




J.R.

For Model B only. Two player game, features include exploration, drilling, employment and Price Wars.

£6.95



For Model A or B **DATABASE**

Accepts up up to ten definable fields. Facilities include Quick Search, Sort and Hard copy — capable of storing up to 300 complete records in memory (Model B).

£9.95

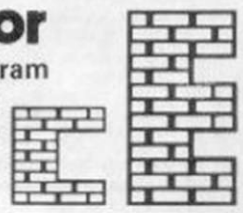
INVADERS

For Model A or B. Classic Arcade game. With colour and sound.

£6.95

Character Generator

For Model B only. Useful utility program enables user to re-define character set using Mode 4. Displays new character in graph form.



£4.95

Programmers

We are looking for good quality programs covering games, utilities and education. We pay excellent royalty rates. Please write or phone us on (0708) 60725

Dealer enquiries also welcome.

We're only a few minutes from your Post Box. So why not try our mail order service.

Paralander VIC-20

For unexpanded model, graphics and sound are incorporated into this absorbing battle between you-(the dare-devil)-and the elements.

£4.50

ZX Spectrum Disassembler

£4.00 Useful Utility Programme. Fits in 16K.

Attention

Dragon Owners!

Software Coming Soon!

Please send me:- Add £1 p&p per order.

..... £.....

..... £.....

..... £.....

I enclose Cheque/P.O. for - £

Please debit my Access/Barclaycard No. | | | | | | | | | | | | | | | |

Name .....

Address .....

.....

.....

Make cheques/P.O. payable to: SOFTWARE FOR ALL
72 North Street, Romford, Essex.
Tel: Romford (0708) 60725

ATOM & BBC

"ZODIAC"

Following the success of our 1st Adventure Competition (winner to be published next month). We are launching our second Adventure Competition (we have doubled the prize money as well). "Zodiac" is your greatest challenge yet from A&F. Solve the problem of this Astrological Adventure and you could win £100.
Full machine code program requires 12K RAM.

Price £6.00

Closing date 30/11/82 the winner will have £100 in his hand in time for Christmas.

NEW ATOM

TORPEDO RUN
Another fantastic high resolution (clear 4) real time game for the "Atom". Can you complete your mission and destroy the enemy convoy? Will you return to a heroes welcome or is Davy Jones Locker your final resting place!!!
5K Text 6K Graphics **Price £4.95**

ESCAPE
The invader P.O.W.s are out for exercise. You, a guard have to catch them, enthral and frustrate your family all at the same time.
5K Text 3K Graphics **Price £4.95**

NEW

CYLON ATTACK
A FAST MOVING 3D SPACE BATTLE
As you sit in your starfighter looking out into the void of space remember the CYLON race only want Mankind for food!! You glance up at your long range scanner, the CYLON fleet is in range. Quickly you select a target and turn to meet it ready to defend Earth to the end!!
5K Text 6K Graphics **Price £4.95**

MISSLE COMMAND
A fast moving version of the popular arcade game. You have three bases from which to fire your defence missiles, protecting your cities and bases from the missles and aircraft attacking you!!
SCORE/HI SCORE/MULTIPLE LEVELS/SOUND
5K Text 6K Graphics **Price £4.95**

POLARIS
Your submarine is ordered to sink an enemy convoy. By using skill, cunning and strategy can your avoid the escorting warships and dangerous shallows to succeed with your mission?
5K Test 6K Graphics **Price £3.95**

*SPECIAL OFFER, DEDUCT £1 PER ADDITIONAL CASSETTE ORDERED

ATOM ☆ UTILIKIT EPROM

FOR JUST £16.00 ADD 22 BASIC COMMANDS AND FIVE FEATURES!! TO YOUR ATOM
(SUPPLIED FULLY DOCUMENTED ON 4K EPROM)
COMMANDS Read; Restore; Data; Tone; Key X; Clr; Disassemble; On Error; On Escape; Var; Hex; At; List (controlled list with up & down scroll facility); Renumber; Find; Search & Replace; Auto; Delete; Block Move; Cold; Warm; Fast; Slow.
***1200 BAUD CASSETTE OPERATING SYSTEM FEATURES**
Visible Load/Save; Audio indication of successful Load/Save; Extended Lines (ie up to 208 characters per line); Auto Repeat on all keys (except Break & Lock); Auto list of line when an error occures.
THE BEST VALUE FOR MONEY TOOLKIT AVAILABLE! WHAT! ALREADY GOT A TOOLKIT FITTED? Why not buy our Add-an-Eprom Board — add up to 4 Eproms for only £18.00 (free program when ordering both items)

The Best Software The Best Prices

BBC

ROADRUNNER MOD. B
The opposition will stop at nothing to get you. In this arcade style car chase: dodge through the Sunday traffic, weave to avoid their fire as the black cars try to shoot you off the road! Beware the hells angels who assist them!
Can you survive! **£6.00**

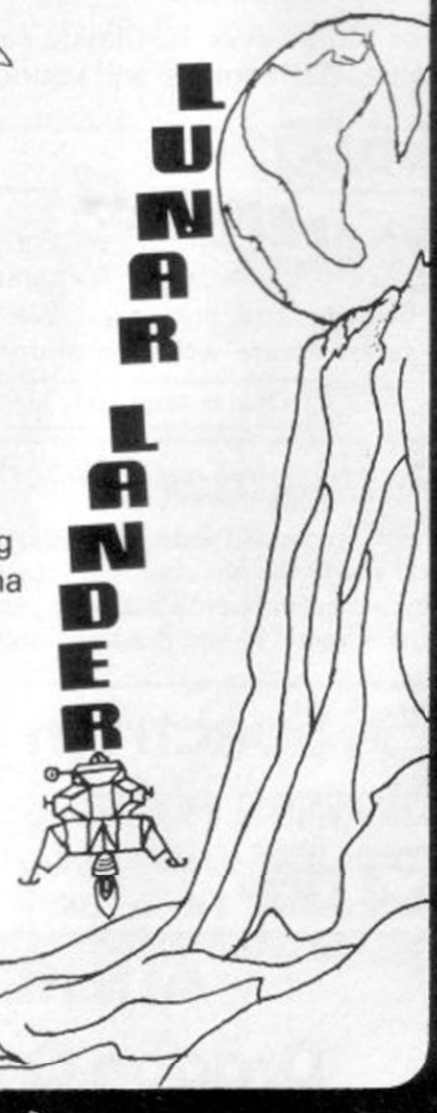
EARLY WARNING MOD. B
Destroy the attacking waves of ICBMs using a radar tracking system and intercept missles. 48 Levels — Each one harder than the last. **£6.00**

NEW "TOWER OR ALOS" MOD. A &B
A fully interactive adventure program for the BBC. Clear "ALOS" of its monster and demons. Fight your way to fame and fortune. **£6.00**

SPECIAL OFFER
DEDUCT £1 PER ADDITIONAL CASSETTE ORDERED.

BBC MOD B ONLY
A superb reproduction of the popular arcade game: Four skill levels, realistic sound and fantastic graphics. Long range and close up Luna Landscape Displays. A safe soft landing is your target. But can you do it?

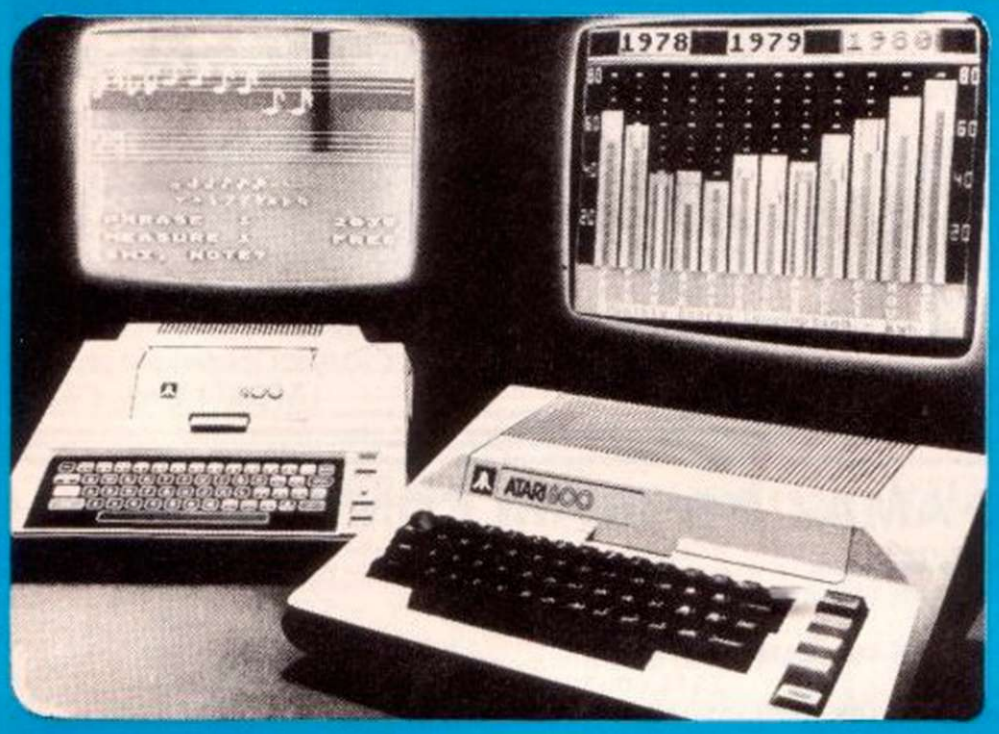
PRICE ONLY £6.00



Orders to A&F Software, 830, Hyde Road, Gorton, Manchester M18 75D.
Orders by mail or phone (061) 223 6206
All prices fully inclusive no hidden extras
Micro-Link * A&F's Showroom now open Address as above.
We pay 25% royalties on ATOM/ BBC programs

A&F

100 FREE PROGRAMS
FROM SILICA SHOP — WITH EVERY PURCHASE OF AN
ATARI 400 800



ATARI PRICES REDUCED

We at Silica Shop are pleased to announce some fantastic reductions in the prices of the Atari 400/800 personal computers. We believe that the Atari at its new price will become the U.K.'s most popular personal computer and have therefore set up the Silica Atari Users Club. This club already has a library of over 500 programs and with your purchase of a 400 or 800 computer we will give you the first 100 free of charge. There are also over 350 professionally written games and utility programs, some are listed below. Complete the reply coupon and we'll send you full details. Alternatively give us a ring on 01-301 1111 or 01-309 1111.

ATARI 400 with 16K	**£199**
ATARI 400 with 32K	**£248**
ATARI 800 with 16K	**£449**

400/800 SOFTWARE & PERIPHERALS

Don't buy a T.V. game! Buy an Atari 400 personal computer and a game cartridge and that's all you'll need. Later on you can buy the Basic Programming cartridge (£35) and try your hand at programming using the easy to learn BASIC language. Or if you are interested in business applications, you can buy the Atari 800 + Disk Drive + Printer together with a selection of business packages.

Silica Shop have put together a full catalogue and price list giving details of all the peripherals as well as the extensive range of software that is now available for the Atari 400/800. The Atari is now one of the best supported personal computers. Send NOW for Silica Shop's catalogue and price list as well as details on our users club.

THE FOLLOWING IS JUST A SMALL SELECTION FROM THE RANGE OF ITEMS AVAILABLE:

ACCESSORIES
Cables
Cassettes
Diskettes
Joysticks
Le Stick - Joystick
Misc Supplies
Paddles

ADVENTURE INT
Scott Adams Adv
No 1 Adventureland
No 2 Pirate Adv
No 3 Mission Imp
No 4 Voodoo Cast
No 5 The Count
No 6 Strange Ody
No 7 Mystery Fun
No 8 Pyramid of D
No 9 Ghost Town
No 10 Sav Island 1
No 11 Sav Island 2
No 12 Golden Voy
Angle Worms
Deflections
Galactic Empire
Galactic Trader
Lunar Lander
Mountain Shoot
Rearguard
Star Flite
Sunday Golf

AUTOMATED SIMULATIONS
Crush Crumble Cmp
Datestones of Ryn
Dragons Eye
Invasion Orion
Rescue at Rigel
Ricochet
Star Warrior
Temple of Apshai
Upper Reaches Aps

BOOKS
Basic Ref Manual
Compute Atari DOS
Compute Bk Atari
Compute Magazine
De Re Atari
DOS Utilities List
DOS2 Manual
Misc Atari Books
Op System Listing
Wiley Manual

BUSINESS
Calculator
Database Managemt
Decision Maker
Graph-It
Invoicing
Librarian
Mort & Loan Anal
Nominal Ledger
Payroll
Personal Fint Mgmt
Purchase Ledger
Sales Ledger
Statistics 1
Stock Control
Telelink 1
Visicalc
Weekly Planner
Word Processor

CRYSTALWARE
Beneath The Pyram
Fantasyland 2041
Galactic Quest
House Of Usher
Sands Of Mars
Waterloo
World War III

DYNACOMP
Alpha Fighter
Chompelo
Crystals
Forest Fire
Intruder Alert
Monarch
Moonprobe
Moving Maze
Nominoes Jigsaw
Rings of The Emp
Space Tilt
Space Trap
Stud Poker
Triple Blockade

EDUCATION from APX
Algicalc
Atlas of Canada
Cubbyholes
Elementary Biology
Frogmaster
Hickory Dickory
Inst Comptg Dem
Lemonade
Letterman
Mapware

Maths-Tac-Toe
Metric & Prob Solvg
Mugwump
Music Terms/Notatn
Musical Computer
My First Alphabet
Number Blast
Polycalc
Presidents Of U.S.
Quiz Master
Starware
Stereo 3D Graphics
Three R Math Sys
Video Math Flash
Wordmaker

EDUCATION from ATARI
Conv French
Conv German
Conv Italian
Conv Spanish
Energy Czar
European C & Caps
Hangman
Invit To Prog 1/2/3
Kingdom
Music Composer

Scram
States & Capitals
Touch Typing

EMI SOFTWARE
British Heritage
Cribbage/Dominoes
Darts
European Scene Jig
Hickory Dickory
Humpty Dumpty
Jumbo Jet Lander
Snooker & Billiards
Submarine Commdr
Super Cubes & Tilt
Tournament Pool

ENTERTAINMENT from APX
Alien Egg
Anthill
Attank
Avalanche
Babel
Blackjack Casino
Block Buster
Block 'Em
Bumper Pool

Castle
Centurion
Checker King
Chinese Puzzle
Codecracker
Comedy Diskette
Dice Poker
Dog Daze
Domination
Downhill
Eastern Front
Galahad & Holy Grl
Graphics/Sound
Jax-O
Jukebox
Lookahead
Memory Match
Midas Touch
Minotaur
Outlaw/Howitzer
Preschool Games
Pro Bowling
Pushover
Rabbotz
Reversi II
Salmon Run
747 Landing Simul
Seven Card Stud

Sleazy Adventure
Solitaire
Space Chase
Space Trek
Sultans Palace
Tact Trek
Terry
Wizards Gold
Wizards Revenge

ENTERTAINMENT from ATARI
Asteroids
Basketball
Blackjack
Centipede
Chess
Entertainment Kit
Missile Command
Pac Man
Space Invaders
Star Raiders
Super Breakout
Video Easel

ON LINE SYSTEMS
Crossfire
Frogger

Jawbreaker
Mission Asteroid
Mouskattack
Threshold
Ulysses/Golden Fl
Wizard & Princess

PERIPHERALS
Centronics Printers
Disk Drive
Epson Printers
Program Recorder
RS232 Interface
Thermal Printer
16K Memory RAM
32K Memory RAM

PERSONAL INT from APX
Adv Music System
Banner Generator
Blackjack Tutor
Going To The Dogs
Keyboard Organ
Morse Code Tutor
Personal Fitness Prg
Player Piano
Sketchpad

PROGRAMMING AIDS from Atari
Assembler Editor
Disembler (APX)
Microsoft Basic
Pascal (APX)
Pilot (Consumer)
Pilot (Educator)
Programming Kit

SANTA CRUZ
Basics of Animation
Bobs Business
Display Lists
Graphics Machine
Kids 1 & 2
Horizontal Scrolling
Master Memory Map
Mini Word Processor
Page Flipping
Player Missile Gr
Player Piano
Sounds
Vertical Scrolling

SILICA CLUB
Over 500 programs write for details

FOR FREE BROCHURES – TEL: 01-301 1111

For free brochures and reviews on our range of electronic products, please telephone 01 301 1111. To order by telephone, just quote your name, address, credit card number, and order requirements and leave the rest to us. Post and packing is FREE OF CHARGE in the UK. Express 24 hour delivery available at an additional charge.

- SHOP DEMONSTRATION FACILITIES — we provide full facilities at our shop in Sidcup. Monday to Saturday 9am to 5.30pm (closing Thursday 1pm, Friday 8pm).
- MAIL ORDER — we are a specialist mail order company and are able to supply goods direct to your door.
- MONEY BACK UNDERTAKING — if you are totally unsatisfied with your purchase, you may return it to us within 15 days. On receipt of the goods in satisfactory condition we will give you a full refund.
- PART EXCHANGE SECOND HAND MACHINES — we offer a part exchange scheme to trade in many makes of T.V. game for personal computers.
- COMPETITIVE PRICES — our prices, offers and service are very competitive. We are never knowingly undersold, and will normally match any lower price quoted by our competitors.
- HELPFUL ADVICE — available on the suitability of various computers.
- AFTER SALES SERVICE — available on all computers out of guarantee.
- VAT — all prices quotes above include VAT at 15%.
- CREDIT FACILITIES — we offer credit over 12, 24 or 36 months, please ask for details.

SILICA SHOP LIMITED
Dept YC1082 1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 4DX.
Telephone: 01-301 1111 or 01-309 1111.

SILICA shop

FREE LITERATURE

I am interested in purchasing an Atari 400/800 computer and would like to receive copies of your brochures and test reports as well as your price list covering all of the available Hardware and Software:

Name .....

Address .....

.....

.....

Postcode .....

YC1082 — Your Computer — October 1982

INTEREST FREE

On Atari, VIC 20, Commodore 64 and

If your order contains over £120 worth of computer hardware apply now for interest free credit by telephoning: Mail-order: (0702) 552911. London Shop: 01-748 0926. Birmingham Shop: 021-356 7292. Southend Shop: 0702 554000 or write to P.O. Box 3, Rayleigh, Essex SS6 8LR.

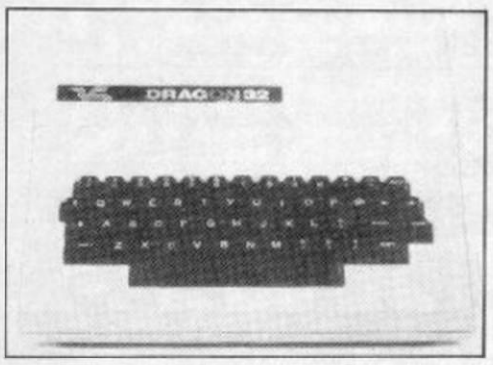
You pay 10% down, then 10% per month for a further nine months (to nearest penny). Example: VIC20 Colour Computer. Cash Price £169.99. Credit terms: £16.99 down then £17 per month for nine months: Total £169.99. Credit quotations on request.

THE NEW COMMODORE 64

The incredible new computer from Commodore comes with 64K RAM fitted! Plus 16 colours, hi-res graphics, 320 x 200 pixels, 40 columns by 25 lines, Z80 micro processor can be added — that means you can run CP/M software, 8 independently movable Sprites with collision detection, and a sound generator with 3 voices, 4 wave-forms, envelope and filter to rival some dedicated music synthesisers. And all this at the most incredible price ever.

(AF56L) Only £339.00

DRAGON 32



The amazing new British computer with a full-travel standard keyboard, a 16-bit microprocessor, 32K RAM fitted (expandable to 64K and later to 256K!!), 9 colours, hi-res graphics and Microsoft extended colour BASIC (the very best BASIC to learn with). It can be used with virtually any ordinary cassette recorder, it has a printer interface (Centronics-type), joysticks are available and it's incredible value for money. **(AF57M) Only £199.50**

THE AMAZING ATARI COMPUTERS

4 Consoles Available:

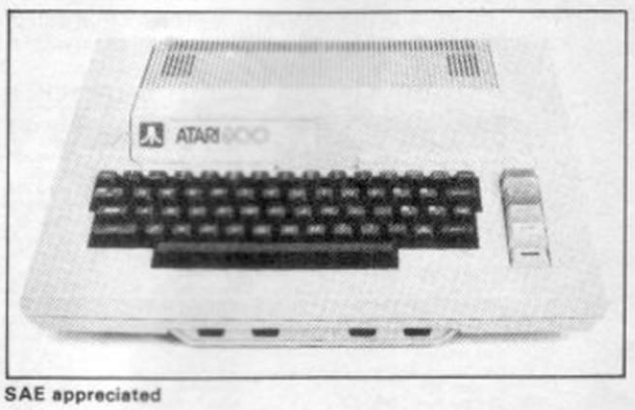
Atari 400 with 16K RAM (AF36P) £249.95

Atari 400 with 48K RAM (AF37S) £319.00

Atari 800 with 16K RAM (AF02C) £499.00

Atari 800 with 48K RAM (AF55K) £590.00

★All above with BASIC & handbooks



Other hardware:		
Cassette Recorder	(AF28F)	£50.00
Disk Drive	(AF06G)	£299.95
Thermal Printer	(AF04E)	£265.00
Epson MX80T Mk III	(AF38R)	£399.95
Epson MX80F/T Mk III	(AF40T)	£447.35
Printer Interface for 400	(AF41U)	£59.95
Printer Interface for 800	(AF42V)	£59.95
Interface Module	(AF29G)	£135.00
Versawriter	(AF43W)	£199.95
16K RAM Module	(AF08J)	£55.00
48K RAM Module for 400	(AF44X)	£125.35
48K Upgrade for 400	(AF45Y)	£75.00
Floppy Disk	(YX87U)	£2.50
Le Stick	(AC45Y)	£24.95
Joystick Controllers (Pair)	(AC37S)	£13.95
Paddle Controllers (Pair)	(AC30H)	£13.95

For full details ask for our hardware leaflet (XH54J) SAE appreciated

JOIN THE U.K. ATARI COMPUTER OWNERS' CLUB

An independent users' group. Four issues of the club magazine for only £3.00! Address your subscription to Ron. Issue 1 of the club magazine featured a tutorial on character set redefinition and contained a collection of demonstration and games programs and lots more. Issue 2 featured a tutorial on player/missile graphics, an article about graphics on computers, a selection of members' contributions to the program library and much more.

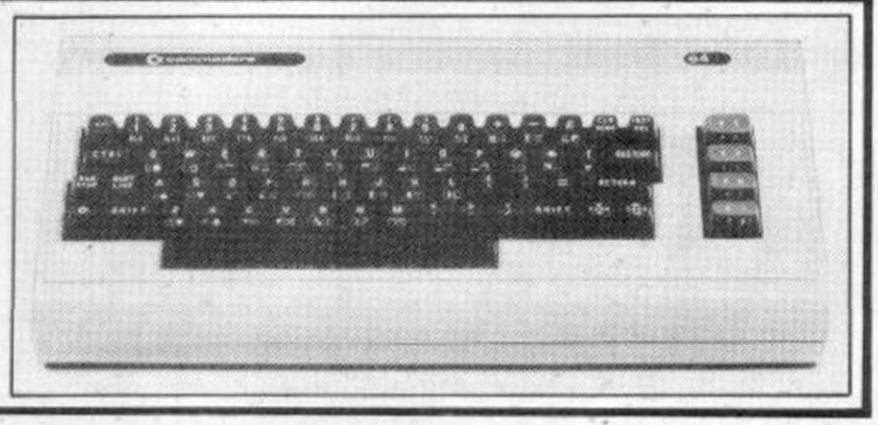
THE FINEST SELECTION OF ATARI SOFTWARE

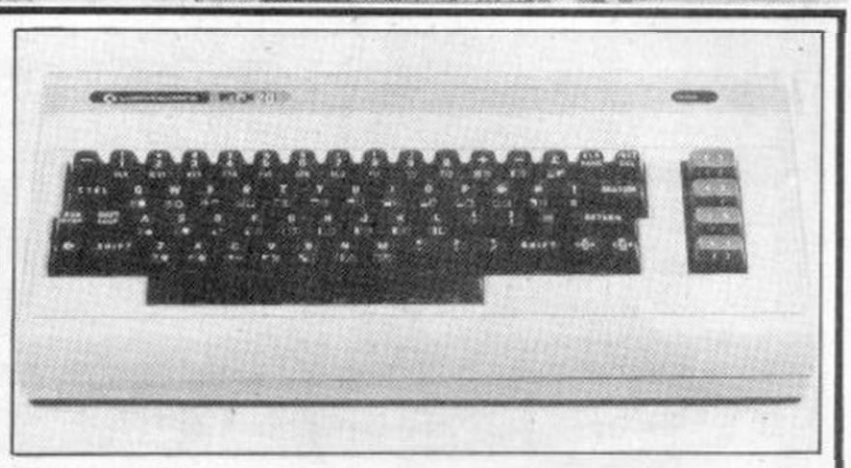
Teach-Yourself Programs		
Conversational French	-5C-16K-YG44X	£39.95
Conversational German	-5C-16K-YG45Y	£39.95
Conversational Spanish	-5C-16K-YG46A	£39.95
Conversational Italian	-5C-16K-YG47B	£39.95
Touch Typing	-2C-16K-YG49D	£15.95
States & Capitals	-1C-16K-YG56L	£9.95
Euro Countries & Capitals	-1C-16K-YG57M	£9.95
Kids 1 (3 Programs)	-1C-16K-BG00A	£9.95
Kids 1 (3 Programs)	-1D-24K-BG01B	£9.95
Kids 2 (3 Programs)	-1C-16K-BG02C	£9.95
Kids 2 (3 Programs)	-1D-24K-BG03D	£9.95
Learn Programming		
Invitation To Programming 1	-1C-8K-YG43W	£15.95
Invitation To Programming 2	-2C-8K-BQ67X	£22.95
Invitation To Programming 3	-2C-8K-BQ68Y	£22.95
Basics Of Animation	-1C-16K-BQ57M	£11.95
Basics Of Animation	-1D-24K-BQ58N	£11.95
Player Missile Graphics	-1C-32K-BQ59P	£18.95
Player Missile Graphics	-1D-32K-BQ60Q	£18.95
Display Lists	-1C-16K-BQ51F	£11.95
Display Lists	-1D-24K-BQ52G	£11.95
Horiz./Vert. Scrolling	-1C-16K-BQ53H	£11.95
Horiz./Vert. Scrolling	-1D-24K-BQ54J	£11.95
Page Flipping	-1C-16K-BQ55K	£11.95
Page Flipping	-1D-24K-BQ56L	£11.95
Sounds & Music	-1C-16K-BG04E	£11.95
Sounds & Music	-1D-24K-BG05F	£11.95
Tricky Tutorials	-3C-32K-BG06G	£59.95
Tricky Tutorials	-3D-32K-BG07H	£59.95
Business Programs		
Visicalc	-1D-32K-YL39N	£119.95
Atari Word Processor	-1C&3D-48K-YG42V	£99.95
Text Wizard	-1D-32K-BQ99H	£69.95
Mini Word Processor	-1C-32K-BG08J	£11.95
Mini Word Processor	-1D-32K-BG09K	£11.95
Calculator	-1D-24K-YG50E	£16.95
Graph-It	-2C-16K-YG51F	£13.95
Statistics	-1C-16K-YG52G	£13.95
Personal Financial Management	-3D-32K-BQ65V	£49.00
Mortgage & Loan Analysis	-1C-16K-BQ66W	£13.95
Bob's Business	-1C-32K-BG11M	£9.95
Bob's Business	-1D-32K-BG12N	£9.95
Adventure Games		
Galactic Empire	-1C-32K-BQ14Q	£14.95
Rescue At Rigel	-1C-32K-BQ21X	£22.45
Rescue At Rigel	-1D-32K-BQ80B	£22.45
Datestones Of Ryn	-1C-32K-BQ22Y	£14.95
Datestones Of Ryn	-1D-32K-BQ82D	£14.95
Star Warrior	-1C-32K-BQ24B	£28.95
Star Warrior	-1D-32K-BQ79L	£28.95
Invasion Orion	-1C-24K-BQ23A	£18.95
Invasion Orion	-1D-32K-BQ81C	£18.95
Star Trek 3.5	-1C-32K-BQ15R	£14.95
Star Trek 3.5	-1D-40K-BG26D	£18.95
Crush, Crumble & Chomp	-1C-32K-BQ83E	£22.45
Crush, Crumble & Chomp	-1D-32K-BQ84F	£22.45
Mission: Asteroid	-1D-40K-BQ91Y	£17.19
Wizard & The Princess	-1D-40K-BQ25C	£21.79
Ulysses & The Golden Fleece	-2D-40K-BQ92A	£20.64
Zork I	-1D-32K-BQ94C	£29.95
Zork II	-1D-32K-BQ95D	£29.95
Ali Baba & The 40 Thieves	-1D-32K-BQ78K	£27.95
Temple Of Apshai (Part 1)	-1C-32K-BQ85G	£28.95
Temple Of Apshai (Part 1)	-1D-32K-BQ86T	£28.95
Upper Reaches Of Apshai (Part 2)	-1C-32K-BQ87U	£14.95
Upper Reaches Of Apshai (Part 2)	-1D-32K-BQ88V	£14.95
Curse Of Ra (Part 3)	-1C-32K-BQ89W	£14.95
Curse Of Ra (Part 3)	-1D-32K-BQ90X	£14.95
Analog Adventure	-1D-32K-BQ33L	£16.95
Adventure Land	-1C-24K-BQ00A	£14.95
Pirates Adventure	-1C-24K-BQ01B	£14.95
Mission Impossible	-1C-24K-BC02C	£14.95
Voodoo Castle	-1C-24K-BQ03D	£14.95
The Count	-1C-24K-BQ04E	£14.95
Strange Odyssey	-1C-24K-BQ05F	£14.95
Mystery Fun House	-1C-24K-BQ06G	£14.95
Pyramid Of Doom	-1C-24K-BQ07H	£14.95
Ghost Town	-1C-24K-BQ08J	£14.95
Savage Island I	-1C-24K-BQ09K	£14.95
Savage Island II	-1C-24K-BQ10L	£14.95
Golden Voyage	-1C-24K-BQ11M	£14.95
Softporn Adventure	-1D-40K-BQ93B	£20.64
Deadline	-2D-32K-BQ96E	£34.95
The Shattered Alliance	-1D-48K-BQ98G	£29.95
The Battle Of Shiloh	-1C-40K-BQ63T	£29.95
The Battle Of Shiloh	-1D-40K-BQ97F	£29.95
Energy Czar	-1C-16K-YG53H	£9.95
Kingdom	-1C-8K-YG55K	£9.95
Space Shuttle Module 1	-1D-32K-BG65V	£19.95
Arcade Games		
Star Raiders	-1E-8K-YG66W	£29.95

CREDIT

(Subject to approval which can take up to 48 hours) (APR = 0%)

Dragon 32 computer hardware





ATARI SOFTWARE continued

Asteroids	-1E-8K-YG60Q	£29.95
Space Invaders	-1E-8K-YG70M	£29.95
Missile Command	-1E-8K-YG64U	£29.95
Caverns of Mars	-1D-16K-BQ69A	£24.50
K-Razy Shoot Out	-1E-8K-BQ63T	£29.95
K-Razy Kritters	-1E-8K-BG51F	£29.95
K-Star Patrol	-1E-8K-BG52G	£29.95
Pathfinder	-1D-32K-BG33L	£27.95
Crossfire	-1C-16K-BG22Y	£20.64
Crossfire	-1D-32K-BG23A	£20.64
Protector	-1C-32K-BG24B	£21.80
Protector	-1D-32K-BG25C	£21.80
Threshold	-1D-40K-BG18U	£27.54
Deluxe Invaders	-1D-16K-BG34M	£29.95
Galactic Chase	-1C-16K-BQ62S	£16.95
Galactic Chase	-1D-16K-BQ61R	£19.95
Race In Space	-1C-16K-BQ35Q	£14.95
Race In Space	-1D-16K-BG20W	£16.95
Space Chase	-1C-16K-BG42V	£10.95
Space Chase	-1D-24K-BG43W	£12.95
Centipede	-1E-16K-BQ70M	£29.95
Angle Worms	-1C-8K-BG50E	£10.95
Lunar Lander	-1C-24K-BQ16S	£10.95
Lunar Lander	-1D-24K-BG49D	£14.95
Jumbo Jet Lander	Available November	
Submarine Commander	Available November	
Rasterblaster	-1D-32K-BQ35Q	£22.95
Shooting Gallery	-1C-16K-BQ36P	£14.95
Shooting Gallery	-1D-16K-BG19V	£16.95
Shooting Arcade	-1C-16K-BG15R	£24.95
Shooting Arcade	-1D-16K-BG16S	£24.95
Super Breakout	-1E-8K-YG67X	£24.50
Dodge Racer	-1C-16K-BG29G	£19.95
Dodge Racer	-1D-24K-BG30H	£19.95
Matchracer	-1C-16K-BG31J	£23.95
Matchracer	-1D-16K-BG32K	£23.95
Mouskattack	-1D-32K-BQ77J	£22.95
Jawbreaker	-1C-16K-BG17T	£20.64
Jawbreaker	-1D-32K-BQ26D	£20.64
Ghost Hunter	-1C-16K-BQ64U	£19.95
Pac-Man	-1E-8K-BQ71N	£29.95
Pacific Coast Highway	-1C-16K-BG13P	£24.95
Pacific Coast Highway	-1D-16K-BG14Q	£24.95
Chicken	-1C-16K-BG27E	£21.80
Chicken	-1D-16K-BG28F	£21.80
Tumble Bugs	-1D-24K-BG46A	£24.95
Bug Attack	-1C-24K-BG36P	£23.95
Bug Attack	-1D-40K-BG37S	£23.95
Canyon Climber	-1C-16K-BG44X	£24.95
Canyon Climber	-1D-16K-BG45Y	£24.95
Mountain Shoot	-1C-16K-BQ12N	£10.95
Haunted Hill	-1C-16K-BG38R	£16.95
Haunted Hill	-1D-16K-BG39N	£19.95
Time Bomb	-1C-16K-BG40T	£10.95
Time Bomb	-1D-24K-BG41U	£12.95
Tank Trap	-1C-16K-YL34M	£9.95
Tank Trap	-1D-32K-YL35Q	£12.95
Thunder Island	-1C-16K-BQ37S	£10.95

Home Game Programs

Scram	-1C-16/24K-YG58N	£17.50
Basketball	-1E-8K-YG61R	£24.50
Cypher Bowl	-1C-16K-BQ20W	£29.50
Sunday Golf	-1C-16K-BQ13P	£10.95
Darts	-1C-16K-BQ42V	£19.95
Tournament 8-Ball Pool	-1C-16K-BQ45Y	£19.95
Snooker & Billiards	-1C-16K-BQ44X	£19.95
Ricochet	-1C-16K-BG47B	£14.95
Ricochet	-1D-32K-BG48C	£14.95
Computer Chess	-1E-8K-YG63T	£24.50
Fast Gammon	-1C-8K-YL33L	£16.95
Gomoku	-1C-16K-BQ18U	£14.95
Gomoku	-1D-16K-BG55K	£19.95
Reversi	-1C-16K-BQ19V	£14.95
Reversi	-1D-16K-BG54J	£19.95
Cribbage & Dominoes	-1C-16K-BQ43W	£14.95
Poker Solitaire	-1C-16K-BQ17T	£10.95
Poker Solitaire	-1D-16K-BG53H	£14.95
Blackjack	-1C-8K-YG62S	£9.95
Hangman	-1C-8K-YG54J	£9.95
Super Cubes & Tilt	-1C-16K-BQ48C	£14.95
Humpty Dumpty & Jack & Jill	-1C-16K-BQ38R	£19.95
Hickory Dickory Dock & Baa Baa Black Sheep	-1C-16K-BQ39N	£19.95
British Heritage Jigsaw Puzzles	-2C-16K-BQ40T	£19.95
European Scene Jigsaw Puzzles	-2C-16K-BQ41U	£19.95
Video Easel	-1E-8K-BQ72P	£24.50
Micro Painter	-1D-48K-BG56L	£29.95

Music Programs

Music Composer	-1E-8K-YG48C	£35.95
Movie Themes	-1C-8K-BQ34M	£9.95

Computer Languages

Assembler	-1C-16K-YL32K	£19.95
Assembler Editor	-1E-8K-YG68Y	£39.95
Macro Assembler	-1D-32K-BQ73Q	£59.95
Basic A+	-1D-48K-BQ31J	£49.95
Basic A+ & Operating System A+	-1D-48K-BQ32K	£99.50
Microsoft Basic	-1D-32K-BQ74R	£59.95
Pilot (Educator)	-1E & 2C-16K-BQ75S	£79.95
Pilot (Consumer)	-1E-8K-YG69A	£54.00
QS Forth	-1D-24K-YL29G	£49.95
Tiny-C	-1D-48K-BG62S	£64.95
Inter-Lisp/65	-1D-48K-BG61R	£87.00

Utilities

Programming Aids Package 1	-1C-16K-BG60Q	£ 9.95
6502 Disassembler	-1C-8K-YL30H	£9.95
6502 Disassembler	-1D-8K-YL31J	£12.95
Atari World	-1D-40K-BQ27E	£43.95
3D Supergraphics	-1C-40K-BQ29G	£29.95
3D Supergraphics	-1D-40K-BQ28F	£29.95
File-It 2	-1D-48K-BG10L	£34.95
Filemanager 800	-1D-40K-BG59P	£72.80
K-DOS	-1D-32K-BQ76H	£49.95
Disk Manager	-1D-32K-BG58N	£21.80
Disk Detective	-1D-16K-BG57M	£24.95
Operating System A+	-1D-32K-BQ30H	£49.95
Telelink	-1E-8K-YG59P	£21.50
The Next Step	-1D-32K-BG64U	£27.54

Books

Master Memory Map	-XH57M	£4.00
De Re Atari	-WG56L	£16.95
Operating System User's Manual & Hardware Manual	-WA46A	£16.95
Atari Basic-Learning By Using	-WG55K	£5.24
Games For The Atari	-WA47B	£4.45
Atari Basic	-WG05F	£6.80
Atari Sound & Graphics	-WA39N	£8.25
Your Atari Computer	-WA40T	£13.45
6502 Assembly Language Subroutines	-WA05F	£12.45
Advanced 6502 Interfacing	-WA41U	£11.45
Beyond Games (6502)	-WA45Y	£13.00
Computers For People	-WA00A	£8.25
Analog: The Magazine For Atari (6 issues) Annual Subscription	-GG24B	£9.00

Send sae now for our new software leaflet with details of all the above programs.

Order As XH52G — Issue 3.

Key: C = Cassette. D = Disk. E = Cartridge. 2C = 2 Cassettes etc. 8K, 16K shows minimum memory requirement.

Note: Order codes shown in brackets. Prices correct at time of going to press. (Errors excluded).

VIC20 COLOUR COMPUTER

Hardware

VIC20 Console	(AF47B)	£169.99
C2N Cassette Unit	(AF48C)	£44.95
VIC Printer	(AF49D)	£230.00
VIC Disk Drive	(AF50E)	£396.00
3K RAM Cartridge	(AF51F)	£29.95
8K RAM Cartridge	(AF52G)	£44.95
16k RAM Cartridge	(AF53H)	£74.95

Joysticks and Paddles

Single Joystick	(AC53H)	£7.50
Pair of Joysticks	(AC37S)	£13.95
Le Stick	(AC45Y)	£24.95
Pair of Paddles	(AC30H)	£13.95

Programming Aid Cartridges

Super Expander: 3K RAM and Hi-res graphics	(AC54J)	£34.95
Programming Aid: Additional commands, function Key programming etc.	(AC55K)	£34.95
Machine Code Monitor	(AC56L)	£34.95

Software (all 3K unless stated)

Introduction to BASIC Cassettes

Part 1	(AC57M)	£14.95
Part 2	(AC58N)	£14.95

Game Programs

Avenger Cartridge	(AC59P)	£19.95
Star Battle Cartridge	(AC60Q)	£19.95
Super Slot Cartridge	(AC61R)	£19.95
Jelly Monsters Cartridge	(AC62S)	£19.95
Alien Cartridge	(AC63T)	£19.95
Super Lander Cartridge	(AC64U)	£19.95
Road Race Cartridge	(AC65V)	£19.95
Rat Race Cartridge	(AC66W)	£19.95
Blitz Cassette	(AC67X)	£4.99
Mole Attack Cartridge	(AC85G)	£24.95
Adventureland Cartridge	(AC86T)	£24.95
Pirate Cove Cartridge	(AC84F)	£24.95
Mission Impossible Cartridge	(AC87U)	£24.95
Voodoo-Castle Cartridge	(AC88V)	£24.95
The Count Cartridge	(AC89W)	£24.95
Sargon 2 Chess Cartridge	(AC77J)	£24.95
Gorf Cartridge	(AC90X)	£24.95
Omega Race Cartridge	(AC91Y)	£24.95
Another VIC in The Wall Cassette	(AC78K)	£7.00
VIC Panic Cassette	(AC79L)	£7.00
Cosmiads Cassette	(AC80B)	£7.00
Backgammon Cassette (+3K)	(AC81C)	£7.00
VIC-Men Cassette	(AC82D)	£7.00
VIC Asteroids Cassette	(AC83E)	£7.00

Business Programs

Simplicalc Disk (+16K)	(AC92A)	£24.95
Simplicalc Cassette (+16K)	(AC93B)	£19.95
VIC Stock Control Cassette (+8K)	(AC94C)	£19.95
VIC File Disk (+16K)	(AC95D)	£24.95
VIC Writer Disk (+8K)	(AC96E)	£24.95
VIC Writer Cassette (+8K)	(AC97F)	£19.95

Education (CSE & GCE 'O' Level Revision) All cassette based and require at least 8K expansion memory.

English Language	(AC98G)	£9.99
Mathematics 1	(AC99H)	£9.99
Mathematics 2	(BC00A)	£9.99
Biology	(BC01B)	£9.99
Chemistry	(BC02C)	£9.99
Physics	(BC03D)	£9.99
Computer Studies	(BC04E)	£9.99
Geography	(BC05F)	£9.99
History	(BC06G)	£9.99
Arithmetic for 9 to 11 year olds	(BC07H)	£9.99
Reading for 9 to 11 year olds	(BC08J)	£9.99
General Knowledge for 9 to 11 year olds	(BC09K)	£9.99
Spelling for 9 to 11 year olds	(BC10L)	£9.99

Home Programs

All cassette based and require at least 8K expansion memory.

Quizmaster	(BC11M)	£9.99
Know Your Own IQ	(BC12N)	£9.99
Junior IQ	(BC13P)	£9.99
Know Your Own Personality	(BC14Q)	£9.99
The Robert Carrier Family Menu Planner	(BC15R)	£9.99
VIC Money Manager	(BC16S)	£9.99
VIC Road User & Highway Code	(BC17T)	£9.99
Garden Planner	(BC18U)	£9.99
Interior Designer	(BC19V)	£9.99
BBC "Ask The Family"	(BC20W)	£9.99
BBC "Mastermind"	(BC21X)	£9.99
"Mastermind" additional General Knowledge Data 1	(BC22Y)	£2.50
Data 2	(BC23A)	£2.50
Data 3	(BC24B)	£2.50
Data 4	(BC25C)	£2.50
"Mastermind" additional Specialist Knowledge Wine & Food	(BC26D)	£2.50
Music	(BC27E)	£2.50
Sport & Games	(BC28F)	£2.50
Films & TV	(BC29G)	£2.50

Books About VIC

Learn Programming on the VIC	(WA31J)	£2.50
VIC Revealed	(WA32K)	£10.00
VIC Programmers Reference Guide	(WA33L)	£9.95
VIC Graphics	(WA48C)	£10.00

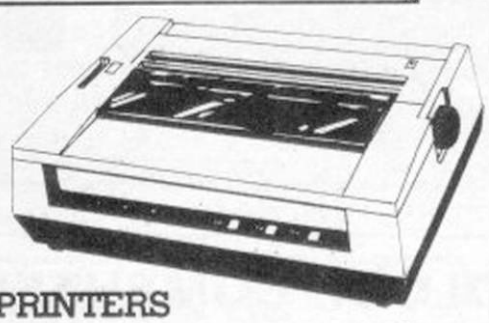
MAPLIN

Maplin Electronic Supplies Ltd., P.O. Box 3, Rayleigh, Essex. Tel: Southend (0702) 552911/554155.

Demonstrations at our shops NOW. See the computers in action at 159-161 King St., Hammersmith W6. Tel: 01-748 0926
284 London Road, Westcliff-on-Sea, Essex. Tel: (0702) 554000
Lynton Square, Perry Barr, Birmingham: Tel: (021) 356 7292.

ingenious!

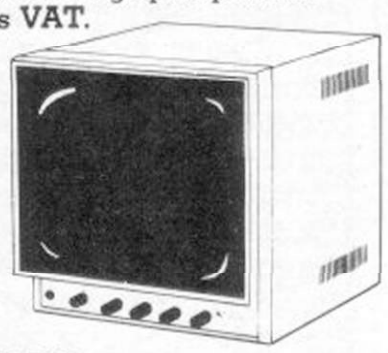
Genie I and II accessories



PRINTERS

The EG 3085 is quiet, fast and efficient. Printspeed is 100 characters per second and printing is bi-directional at 80 or 136 characters per line. Suitable for use with other systems, it has three typestyles, adjustable pin or friction feed and single sheet or roll paper facilities. **£425 plus VAT.**

If you don't want to pay that much for a printer, consider the EG 603. It doesn't match the EG 3085 in certain areas, but you will still get 100 c.p.s. bi-directional, a range of character styles, forward and reverse feed and pin/friction feed, with 96 characters and 64 graphic patterns. **£235 plus VAT.**



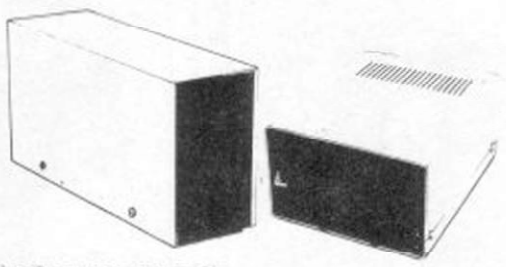
MONITORS

Available in 9" and 12" sizes, with white, green or amber display, Lowe A.V.T. monitors are sturdy, attractive, easy to operate and feature an easy view screen with smoked anti-glare display filter. Compatible with most popular micros on the market. **From £75 plus VAT.**

EQUIPMENT COVERS

Beat the dirt, coffee spills and sticky fingers when your computer and monitor are not in use with these top quality black leather covers.

Genie CV1 **£5 plus VAT.**
12" monitors CV6 **£6.20 plus VAT.**
9" monitors CV3 **£4.20 plus VAT.**



DISK DRIVES

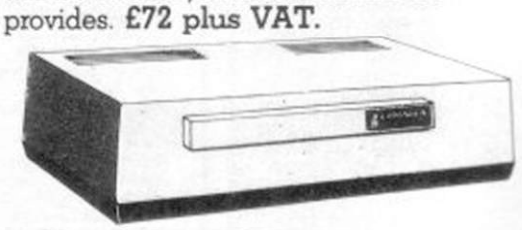
If you want fast, reliable program storage, true random access file handling and access to many computer languages, we can meet your needs. The EG 400T provides storage of up to 184320 bytes per floppy disk and comes complete and tested, in a stylish colour matched cabinet. **£220 plus VAT.**

The EG 401 AT offers dual disk drive with 368640 bytes of useable storage and comes complete with a power supply ready to connect to an expander box. **£365 plus VAT.**

DOUBLE DENSITY ADAPTOR

Allows the use of standard minidisk drives in double density, with virtually double the storage capacity. The EG 3021 is equally at home in the Genie or TRS-80 expander boxes.

A double density disk operating system will be needed, such as smalLDOS provides. **£72 plus VAT.**



EXPANDER BOX

The updated EG 3014 expander box allows for up to four disk drives with optional double density. It connects to a printer, or RS 232 interface, or S100 cards. Not bad value at **£190 plus VAT (16K version) or £200 plus VAT (32K version)**

*The EG 3014 will work with TRS 80 by using the EG 3023 Tandy Adaptor.

TECHNICAL MANUALS

Full technical details of Genie Hardware (all you ever wanted to know about Genie).

Genie I/II Technical Manual
£10 - No VAT.
Expander and accessories (EG3014)
£10 - No VAT.

smalLDOS

Powerful, yet reasonably priced, the Genie smalLDOS contains 21 library commands, 7 utilities, LBASIC, disk basic and bags of information, including a reference manual and 40 page beginners guide to disk usage. **£35 plus VAT.**

HIGH RESOLUTION GRAPHICS

Increase graphic resolution capabilities on your Genie seventy-three fold with the LE18 HI-RES unit. It offers bit image graphics of 73,728 points, a resolution of 384 x 192, and uses a separate 16K of video memory to achieve its resolution. Graphics are intermixable with text or existing pixtel graphics, and animation, reverse video displays and use of programmable graphic characters are possible. **£86 plus VAT.**

GENIE MONITORS

Two good performance, low priced 12" monitors, either to match your Genie or compatible with a wide range of other systems. Good resolution and band width and, of course, they free your television set for the other type of programmes you like to watch!

The EG 100 12" in black & white costs **£69 plus VAT.**
The EG 101 12" with green phospher is **£79 plus VAT.**

BUSINESS SOFTWARE

Specifically written for the Genie II computer, with disks and a suite of packages from the renowned house TRIDATA. The suite includes SALES LEDGER, PURCHASE LEDGER, PAYROLL and STOCK CONTROL. Each package is a very reasonable **£175 plus VAT.** Full details are available on request.

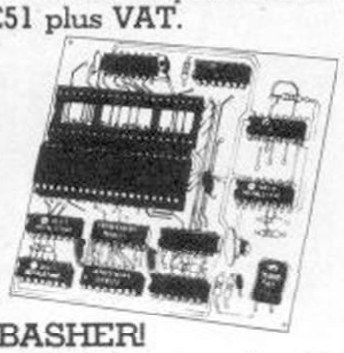
SYSTEMS DESK

Even a compact modular computer system like the Genie benefits from being used on a custom designed system desk. The SD-1 system desk is designed to accommodate a complete Genie System and has a special upper shelf to support the display monitor at the best level. The desk is flat packed for easy delivery and finished in attractive teak and charcoal colours. **£81.40 plus VAT.**

FRED MUSIC SYNTHESISER

Beethoven might well roll over at this stereo music synthesiser: it can produce six simultaneous notes over the whole audio range and provide sound effects. FRED comes complete with a software compiler, full instructions and a demo tune.

It is simply plugged onto the Genie 50 way bus and has two outputs for an audio amplifier. **£51 plus VAT.**



EG 3203 TANDY-BASHER!

If you are a TANDY user, read on! The EG 3203 is bus converted to allow Genie peripherals to be used with Tandy Model I computers. **£18.40 plus VAT.**

(Just in case there might be a few strange souls who want to convert in the opposite direction, there is the 50/40 converter which generates a Tandy compatible 40 way bus from a Genie.) **£34 plus VAT.**

EG 3016 PARALLEL PRINTER INTERFACE

The EG 3016 is a simpler interface allowing a Centronics parallel compatible printer (EG 603, EG 3085) to be connected directly to the Genie keyboard without the need for an expander box. **£38 plus VAT.**

BUS EXTENDER

A most useful accessory, allows two bus using devices to be connected simultaneously to the Genie - when using the Hi Res and expander for instance. **£21 plus VAT.**

EP1, EP2, EP3

Genie I and Genie II have ROMS offering 13.5K Microsoft BASIC, of which the final 1.5K BASIC are custom written extensions contained in EPROMs.

You can change these as follows:

EP1
Adds all Genie 1 software facilities to other Genies, lower case driver, machine language monitor, renumber facility, keyboard repeat and screen print.

EP2
Has improved M.L. monitor, can load and save programs. Defined function keys (list, load, save etc.) for Genie II and lower case driver.

EP3
Has HI-RES driver software with 10 extra HI-RES commands which prevent need to load HI-RES software from tape.

All at £12 plus VAT.

For Video Genie Systems, the LE-19 connects direct to the Genie bus and allows one of these EPROMs to be fitted externally. **£26.50 plus VAT.**

NEW! A 64K CP/M computer for less than £1,000!

CP/Genie with single disk drive has 64K RAM, 13.5K ROM, comes complete with a 12" monitor, 64 x 16 screen format and operates under CP/M 2.2 supplied with machine. **£999 plus VAT.**

The dual disk version will cost **£1,175 plus VAT.**

Both are compatible with existing Genie I software and are supplied with the Genie SmalLDOS. A breakthrough for Lowe Electronics customers that should not be missed.

SPECIAL TECHNICAL GENIE HOT – LINE ON 0629 4995

for all your technical advice and service back-up on any aspect of the Genie system direct from the experts!

LOWE electronics

Chesterfield Road, Matlock,
Derbyshire DE4 5LE.
Tel: 0629 4995.
Telex: 377482 Lowlec G.

Available now from your local GENIE dealer

AVON Microstyle, Bath, 0225 334659/319705. **BEDFORD** Comserve, Bedford, 0234 216749. **BERKSHIRE** P.C.P., Reading, 0743 589249. Castle Computers (Windsor), 07535 58118. **BIRMINGHAM** Ward Electronics, Birmingham, 021-554 0708. Consultant Electronics, Birmingham, 021-382 7247. A. E. Chapman and Co., Cradeley Heath, 0384 66497/8. **BUCKINGHAMSHIRE** Photo Acoustics, Newport Pagnell, 0908 610625. **CAMBRIDGESHIRE** Cambridge Micro Computers, Cambridge, 0223 314666. **CHESHIRE** Hewart Electronics Macclesfield, 0625 22030. Mid Shires Computer Centre, Crewe, 0270 211086. **CORNWALL** A B & C Computers, 11 Brockstone Road, St. Austell, Cornwall, St. Austell 64463. **CUMBRIA** Kendal Computer Centre, Kendal, 0539 22559. **DORSET** Blandford Computers, Blandford Forum, 0258 53737. Parkstone Electrics, Poole, 0202 746555. **ESSEX** Emprise, Colchester, 0206 865926. **GLOUCESTERSHIRE HAMPSHIRE** Fareham Computer Centre, Fareham, Hampshire, Fareham, 231423. **HERTFORDSHIRE** Photo Acoustics, Watford, 0923 40698. Q Tek Systems, Stevenage, 0438 65385. Chrisalid Systems and Software, Berkhamsted, 04427 74569. **KENT** Swanley Electronics, Swanley, 0322 64851. **LANCASHIRE** Harden Microsystems, Blackpool, 0253 27590. Sound Service, Burnley, 0282 38481. Computercat, Leigh, 0942 605730. BEC Computerworld (Liverpool) 051-708 7100. **LEICESTERSHIRE** Kram Electronics, Leicester, 0533 27556. **LONDON** City Microsystems, EC2, 01-588 7272/4. Wason Microchip, N18, 01-807 1757/2230. Premier Publications, Anerley, SE20, 01-659 7131. **NORTH EAST** Briers Computer Services, Middlesborough, 0642 242017. General Northern Microcomputers, Peterlee, 0783 860314. HCCS Associates, Gateshead, 0632 821924. **NOTTINGHAMSHIRE** Midland Microcomputers, Nottingham, 0602 298281. Mansfield Computers, Mansfield, 0623 31202. East Midland Computer Services, Arnold, 0602 267079. Electronic Servicing Co., Lenton, 0602 783938. **NORFOLK** Anglia Computer Centre, Norwich, 0603 29652. Bennetts, Dereham, 0362 2488/9. **OXFORDHSIRE** Micro Business Systems, Whitney, 0993 73145. Pebbleglow Ltd. (Thame) 084421 5368. **SCOTLAND** Esco Computing, Glasgow, 041-427 5497. Edinburgh, 031-557 3937. Computer and Chips Ltd., St. Andrews, 0334 76206. Scotbyte Computers, Edinburgh, 031-343 1055. Victor Morris and Co., Glasgow, 041-221 8958. **SHROPSHIRE** Tarrant Electronics, Newport 0952 814275. **SOUTH WEST** Diskwise, Plymouth (0752) 267000. West Devon Electronics, Yelverton, 082 285 3434. Bits and Bytes, Barnstaple, 0271 72789. **SUFFOLK** Elgelec Ltd., Ipswich, 0473 711164. **SURREY** Catronics, Wallington, Surrey, 01-669 6700/1. Croydon Computer Centre, Thornton Heath, 01-689 1280. **WALES** Tryfan Computers, Bangor, 0248 52042. **WEST MIDLANDS** Allen TV Services, Stoke on Trent, 0782 616929. **WILTSHIRE** Everyman Computers, Westbury, 0373 823764. B & D Computing (Swindon), 0793 762449. **YORKSHIRE** Media 5 Ltd., Sowerby Bridge, 0422 33580. Advance TV Services, Bradford, 0274 585333. Huddersfield Computer Centre, Huddersfield, 0484 20774. Comprite, Bradford, 0274 668890. Superior Systems Ltd., Sheffield, 0742 755005. Photo Electrics, Sheffield, 0742 53865. Ebor Computer Services (York) 0904 791595. **NORTHERN IRELAND** Business Electronic Equipment, Belfast, 0232 46161. Brittain Laboratories, Belfast 0232 228374.

Please send me further details of the following item(s)

_____

_____

Name _____

Address _____

_____

_____

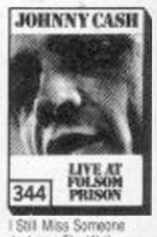
Telephone _____

YC.10.82

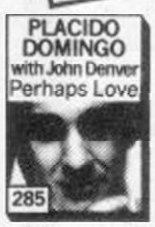
NEW introductory offer to Audio Club

Save more than £11 now– go on and get recordings at half-price and even free.

I Wanna Get Next To You • Wishing On A Star
WHITFIELD RCP£5.60



I Still Miss Someone • Jackson • The Wall
CBS RCP£5.45



Yesterday • Time After Time
CBS RCP£5.55

Beethoven: Symphony No. 5—Solti
DECCA RCP£5.75

Something In The Night • Adam Raised A Cain
CBS RCP£5.65

Annie's Song • Brian Boru's March
RCA RCP£5.49

Working Girl • Detroit City • Poor Folks Town
RCA RCP£5.75

Misunderstanding • Turn It On Again • Duchess
CHARISMA RCP£5.65

Rainy Night In Georgia • You Might Need Somebody
WARNER RCP£5.80

Go Your Own Way • Don't Stop • Dreams
WARNER RCP£5.60

I Shot The Sheriff • Let It Grow
RSO RCP£5.55

If You Don't Want My Love • Hot As Sun
MCA RCP£5.60

These Good Old Dreams • I Believe You
A.M. RCP£5.40

Make It With You • If • Guitar Man • 17 more
ELEKTRA RCP£5.45

You Shook Me • Give The Dog A Bone
ATLANTIC RCP£5.70

Stand By Your Man • DIVORCE • Lonely Street
CBS RCP£4.99

Down In The Tube Station At Midnight • David Watts
POLYDOR RCP£5.55

I'm Not In Love • Wall Street Shuffle
MERCURY RCP£5.50

Scarborough Fair • America • Cecilia
CBS RCP£5.80

Ashes To Ashes • Starman • John I'm Only Dancing
RCA RCP£5.80

Making Your Mind Up • Piece Of The Action
RCA RCP£5.60

Lay All Your Love On Me • The Winner Takes It All
EPIC RCP£5.80

Hundreds of thousands of Audio Club members have already found the better way to buy records simply by returning an £11 saving voucher like the one below. Making your three introductory selections involves you in no risk whatsoever. We don't even want to see your money until you've had time to judge for yourself that all of them are exactly like the ones you normally buy from any renowned record shop. But when you do—and we're sure you will—you'll have taken the first step towards enjoying all the other benefits that membership of Audio club can offer.

Your free monthly magazine.

The club's lively magazine, Music News, arrives through your letterbox every month, each issue packed with current releases. You don't have to take any recording unless you wish to. All that is asked of you is that from the hundreds of exciting titles featured in Music News you take at least three a year at regular club price during your first two years of membership. You probably buy more than three albums a year anyway but the difference is that, as a member of Audio Club every regular price purchase entitles you to a bonus title at half price.

Recordings at HALF PRICE —and even FREE.

Three genuine recordings for the price of £1.49 each is just for a start. As a member, every recording you buy at regular price entitles you to another selection at HALF PRICE. And when you have bought your six regular price recordings you become specially privileged. From then on, every further two regular price purchases you make entitles you to one recording FREE. And this is in addition to your normal half price entitlements.

any 3 for £1.49 (plus p & p) each

ON CASSETTES OR RECORDS

Too Much Heaven • Tragedy
RCP£0.00

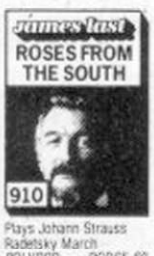
You Drive Me Crazy • Green Door • It's Raining
EPIC RCP£5.85

Sultans Of Swing • Wild West End
VERTIGO RCP£5.40

Tainted Love • Bedsitter • Say Hello, Wave Goodbye • Sonne Bizarre
RCP£5.80

Take It Easy • Lyin' Eyes • Desperado
ASYLUM RCP£5.55

Waiting For A Girl Like You • Juke Box Hero
ATLANTIC RCP£5.80



Plays Johann Strauss • Radetsky March
POLYDOR RCP£5.60

Tchaikovsky: 1812; Romeo & Juliet—Karajan
D Gram RCP£5.75

Whisky In The Jar • Killer On The Loose
VERTIGO RCP£5.80

V-a-c-a-t-i-o-n • Who's Sorry Now • Stupid Cupid
MGM RCP£5.40

Take It On The Run • Keep On Loving You
EPIC RCP£5.80

Cathy's Clown • Bird Dog • Ebony Eyes
WARNER RCP£5.50

If You're Lookin' For A Way Out • Use It Up
RCA RCP£5.60

Heartbreak Hotel • Hound Dog • All Shook Up
RCA RCP£5.15

The Tide Is High • Rapture
CHRYSALIS RCP£5.60

Dirty Ol' Man • When Will I See You Again
EPIC RCP£5.45

Pavarotti—World's Favourite Tenor Arias
DECCA RCP£5.75

What You're Proposing • Lies • Don't Drive
VERTIGO RCP£5.80

Thatcher And Reagan • The 14½ lb. Budgie
POLYDOR RCP£5.65

Attention To Me • Don't Make Waves
EPIC RCP£5.80

Julian Bream & John Williams—Together
RCA RCP£5.49

Only You • Red Sails In The Great Pretender
MERCURY RCP£5.15

Proud Mary • Bad Moon Rising • Green River
FANTASY RCP£5.60

This Is Texas Land • Blue Blue Nights
BIGR RCP£5.40

Dead Ringer For Love • I'm Gonna Love Her
EPIC RCP£5.80

Holst: Planets • Solti
DECCA RCP£5.75

Fall Back On Me • You Beat 'Em All
RCA RCP£5.40

Ant Music • Jolly Roger • Dog Eat Dog
CBS RCP£5.75

Gimme Shelter • Midnight Rambler
DECCA RCP£5.40

In the Mood • Little Brown Jug • Penn. 65000
RCA RCP£5.15

Don't Stand So Close To Me • De Do Do Do, De Da Da Da
A.M. RCP£5.60

I Fall To Pieces • Welcome To My World
RCA RCP£5.15

SEND FOR FREE 10 DAY HOME TRIAL

Guarantee of quality

All recordings are genuine, and are manufactured and supplied by the world's leading record companies such as—POLYDOR, PHILIPS, DEUTSCHE GRAMMOPHON, DECCA, CBS, WEA and RCA.

Any query about your Audio Club membership or service will receive prompt attention if you write to—
Britannia Music Co. Ltd.,
P.O. Box 31, Ilford,
Essex IG1 2AE.

A member of the worldwide polygram group of companies.

Audio Club of Britain observes the Code Of Practice of the British Direct Marketing Association A5

£11 SAVING VOUCHER

To: AUDIO CLUB OF BRITAIN, Britannia Music Co. Ltd., FREEPOST, P.O. Box 31, Ilford, Essex IG1 2AE

Please accept me as a member and send me the three recordings I have specified at just £1.49 each. For these you will bill me only £4.47 plus a total of £1.47 towards postage, packing and insurance.

I can audition them for 10 days and if I decide not to become a member, return them and owe nothing. Otherwise I agree to purchase just 3 regular price recordings per year during my first two years of membership on the understanding that every regular price purchase entitles me to another selection at **half price.** All selections are described well in advance in the club's free monthly magazine, MUSIC NEWS. On the Order Form provided I can accept the Recording Of The Month recommended for me, choose any other title in MUSIC NEWS, or buy none at all in any particular month. Having fulfilled my commitment I can cancel at any time. Or I can remain a member and go on to enjoy the extra entitlement of one recording FREE (paying only p&p) for every further two I buy at regular price—and this is in addition to my normal half price bonus privileges.

Mr/Mrs/Miss/Ms _____ PLEASE PRINT

Address _____

Town _____ County _____ Postcode _____

SIGNATURE X _____

SEND NO MONEY NOW—NO STAMP NEEDED (If under 18 parent must sign) One membership per household only.

Fill in the number of your selections: 5 [ ] 5 | 5 [ ] 5 | 5 [ ] 5

I wish to receive my selections on: Tick one box only.
RECORDS ○ CASSETTES ☐
All three selections will be supplied on LP or Cassette.

I wish to enrol in the musical category I have ticked below; but understand I am free to choose any title reviewed in MUSIC NEWS irrespective of category. Tick one box only.
CLASSICAL 1 ☐
EASY LISTENING 2 ☐
POP 3 ☐ ROCK 4 ☐
COUNTRY ☐

All orders subject to acceptance. Offer applies only in U.K.

AUDIO CLUB OF BRITAIN

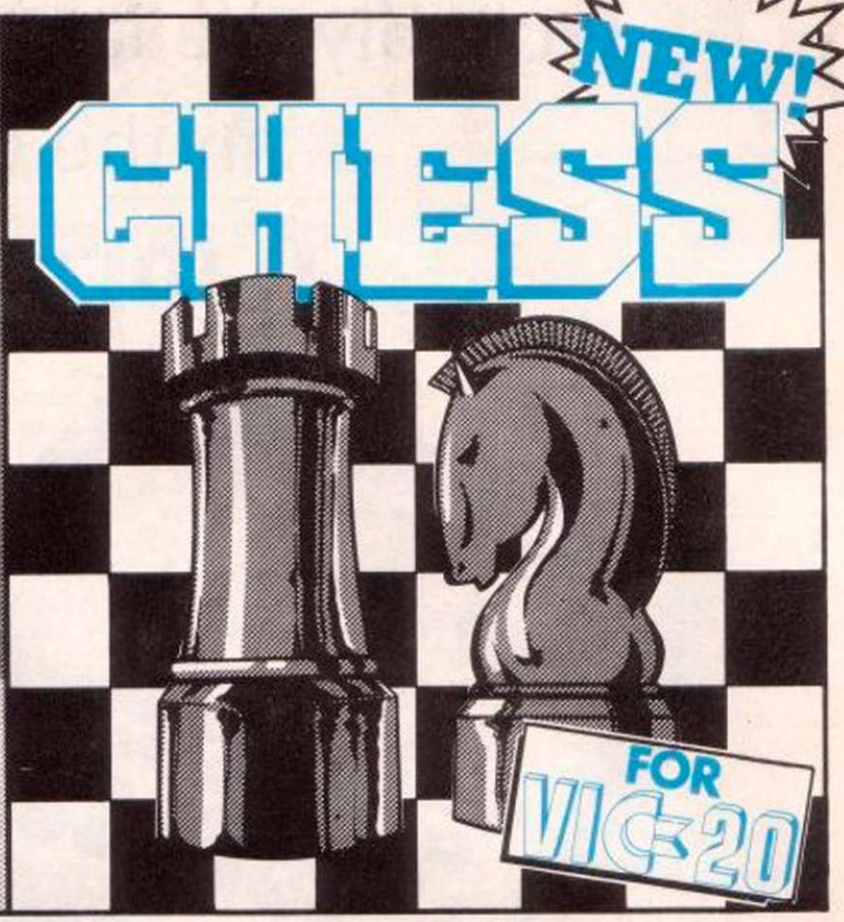
A391

Britannia Music Co. Ltd. 1206311

ZX81..SPECTRUM..B.B.C. MICRO..ATOM..VIC

NOW! unleash the full power of the Z80 microprocessor in your incredible Spectrum, and program for yourself those fast-moving machine code games. Our unique 'Aspect' Assembler has a full screen Editor, and the Assembler can generate code for any address. It has a built-in, foolproof, error-detection system, comes complete with full instruction manual, and will run on 16K and 48K Spectrum.

Just £9 inc. post & packaging



Hot on the heels of our quality chess programs for the BBC and Atom Micros, we introduce, for the first time in the U.K., chess on your VIC! (16K expansion). Once again there are 1000 levels of play, plus many options, chess problems, game storage etc. Deals with castling and en passant.

Just £7 inc. post & packaging

BBC CHESS **£11.50**
ATOM CHESS **£9.00**

Spectral INVADERS

The original and the best!
The very first, arcade-quality machine-code game to appear on the market for the sensational ZX Spectrum.

Just £5 inc. post & packaging

... also for your VIC

Another VIC in the wall
VIC Gammon
VIC Panic
VIC Cosmiads
VIC Asteroids

ALL £7 inc. post & packaging

ALL PRICES INCLUDE POSTAGE

IMMEDIATE DELIVERY

Send stamped addressed envelope for details of ZX81 and Atom Software

BUG-BYTE SOFTWARE

BUG-BYTE SOFTWARE, FREEPOST (No Stamp req.) LIVERPOOL L3 3AB.

Please send me _____
I enclose cheque/P.O. for _____
OR, Please debit my Access 5224 _____
BARCLAYCARD 4929 _____ Expiry date _____
Name _____
Address _____
_____ Code _____
Dealers Discount Available
ACCESS, BARCLAYCARD ORDERS WELCOME ON 24hr ANSAPHONE 051-227 2642, or mail to:
BUG-BYTE SOFTWARE, FREEPOST, (No stamp req.) LIVERPOOL L3 3AB.

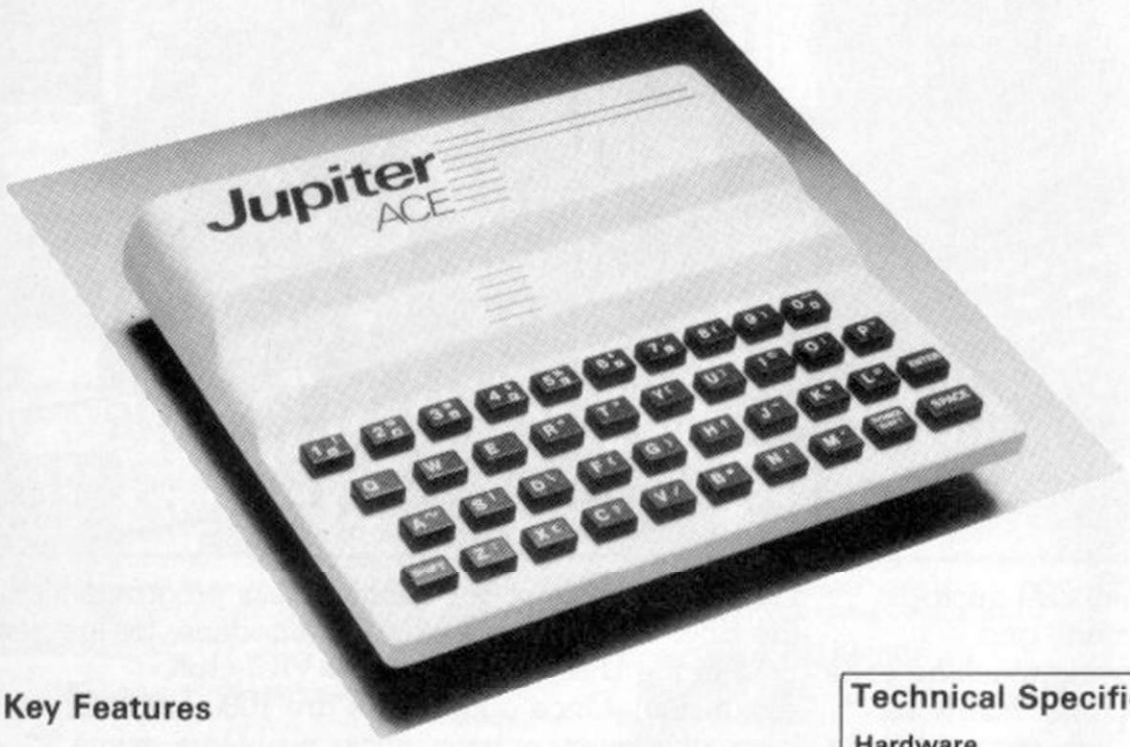
YC.10.82

VISA

ZX81..SPECTRUM..B.B.C. MICRO..ATOM..VIC

Probably the fastest microcomputer in the universe

the **JUPITER ACE** only £89.95.



All inclusive Price

For £89.95 you receive your Jupiter Ace, a mains adaptor, all the leads needed to connect to most cassette recorders and T.V.s (colour or black and white), a software catalogue and a manual.

The manual is a complete introduction to the world of personal computing and a course in FORTH programming on the Ace.

Even if you are a complete newcomer to computers, the manual will guide you step by step from first principles to confident programming.

The price includes postage packing and V.A.T.

Key Features

- Revolutionary microcomputer language FORTH.
- Full-size moving-key keyboard.
- User-defined high-resolution graphics.
- Programmable sound generator.
- Floating point arithmetic.
- Fast cassette interface.
- Upper and lower case ascii character set.
- 24 x 32 character flicker-free display.

The Jupiter Ace uses FORTH

The Ace is set apart from all other personal computers on the market by its use of a revolutionary language called 'FORTH'. Some computer languages are easy for humans to understand, others are easy for computers; FORTH is most unusual in being both. Its underlying principles are so simple that it takes even a newcomer to computers only a few minutes to learn how to do calculations on the Ace, yet the very same principles are powerful enough to allow you to invent your own extensions to the language itself.

At the same time, the memory-saving coded form used to store your programs inside the Ace allows it to obey them very fast — typically in less than a tenth of the time it would take to do the same thing using a different language. Amongst other things, this makes the Ace ideal for games.

FORTH's unique combination of speed, versatility and ease of programming has already made it a prime choice for professional applications as diverse as pub games and radio telescopes, and gained it an enthusiastic national user group. Now the Jupiter Ace can bring this addictive language into your own home.

Designed by Jupiter Cantab

Leading computer Designers Richard Altwasser and Steven Vickers have a reputation for pushing technology forwards. After playing the major role in creating the ZX Spectrum they formed Jupiter Cantab to develop their latest brainchild the Jupiter Ace.

Technical Specification

Hardware

Processor/Memory
Z80A running at 3.25 MHz. 8K bytes ROM 3K bytes RAM.

Input
40 moving-key keyboard with auto-repeat on every key.

Output
Memory-mapped 32 x 24 character display with high resolution user graphics. Output to drive normal UHF TV set on channel 36.

Sound
Provided by internal. loudspeaker.

Cassette
Load Save & Verify at 1500 baud, separate data storage.

Software, FORTH

Data Structures
Integer, Floating point and String data may be held as constants, variables or arrays with multiple dimensions and mixed data types.

Control Stuctures
IF-THEN-ELSE, DO-LOOP, BEGIN-WHILE-REPEAT, BEGIN-UNTIL, all may be mixed and nested to any depth.

Operators
Mathematical +, —, X, ÷.
Logical AND, OR, NOT, XOR.
Comparison <, >, =.

Program Editing
FORTH words may be listed, edited and redefined. Comments are preserved when words are compiled.

Order Form

The **Jupiter Ace** is available only by mail order. Please allow up to 28 days for delivery.

Send cheque or postal order with the form to:—

JUPITER CANTAB, 22 FOXHOLLOW, BAR HILL, CAMBRIDGE CB3 8EP

Please send me:—

☐ JUPITER ACE MICROCOMPUTER(S) @ £89.95.

Name. Mr/Mrs/Miss

Address

F

YOUR LETTERS

DUNGEONS POKE

There was yet another high-quality ZX-81 machine-code program in the August issue of *Your Computer* — J Chalmers' Dungeons — but after painstakingly entering the hexadecimal, I found that, on Running, an error code 5/0 appeared at the bottom of the screen.

I set about unravelling the Print Room routine and discovered the mistake; the final two bytes of 16 should read

06 09 1D B, 9

The simple remedy to my problem was to enter: Poke 16937, 9 as a direct command.

I hope that more ZX machine-code programs will be seen in the future issues, including ZX Spectrum programs, but has anyone found an easy way to manipulate the display file of the Spectrum? The peculiar three-sections layout has me puzzled. Is there some hidden advantage, possibly for the Prestel interface?

J Ratcliffe,
Leicester,
Leicestershire.

SPEED BALL

When I entered Speed Ball on my machine, it did not run properly and crashed when I came too close to the left hand corner. I finally found the error was not in the machine code proper but in the bytes before. The answer is to run the program in Slow, and Poke 16534 to 16537, 16540, 16541 and 16544 to 16548 with 8. 16548 is not a minus sign but 8 again.

How do you obtain random positions in a machine-code program? Most of the balls originate in the left-hand corners.

R Vanhove,
Merelbeke,
Belgium.

ALARM SOUNDS

There were a few mistakes in the listing for Sounds of Alarm in the August edition, page 85. Here are the corrections.

```
 4 POKE36879,8 : GOSUB 40
25 PRINT "SQQQTIME"
33 PRINT"0)))))))"; leftf(AL$,2);
   ":";MID$(AL$,3,2)":";RIGHT$
   (AL$,2)
37 GOTO 25
```

S will clear home, Q brings the cursor down, O brings the cursor up and) moves the cursor right.

David Harmes,
Walton,
Derbyshire.

BEEBOX PET

With regard to the article on Vic memory expansion in the August edition, I would like to draw your attention to the following points: the Beebox has the facility to operate as a 40 column Pet (minus Pet graphics), but in colour. No mention of this was made in the article. It is true that the unit has been designed to accept a Prestel adaptor unit, Acoustic Mode, for communicating with British Telecom computers, and the standard ASCII codes have been used. No claim has been made that this unit runs as Prestel.

The author states the unit worked with the Beelines monitor, but not with his TV. The Beebox monitor is RGB and the Beebox gives out RGB at TTL level and composite video at 1V P.P on 75Ω.

You must either modulate the video up to RF to enable reception on a domestic TV, or encode the RGB to PAL and then modulate or display on a video monitor.

Roy Briant,
East Sheen,
London.

SELLING POINTS

I have been looking into buying a new home computer. I have a ZX-81 at present, and have been reading reviews of the other more popular micros. I find the choice bewildering. As a result I have formed a comprehensive list of desirable features with a rating of 1 to 10 on each feature.

Features	Rating 1 to 10
Motor control	7
Data files on cassette	8
Reliable loading	9
Verify	6
Merge programs	7
If-Then-Else, on-goto, On-gosub, multi-statement lines	8
25 × 40 screen	6
> 192 × 256 resolution	7
User-defined graphics, Functions, keys	7
Printer, disk, etc, capability	8
> 16K RAM, preferably 32K	8
Line and circle plotting	8
Joysticks, paddles, light-pens	7
Plug-in cartridges	3
Software available	5
Other languages than Basic	8
Screen editing	7
Auto repeat on all keys	7

J Gardner,
Dalebrook,
Burton on Trent.

WRIT LARGE

The following program is written for the standard Vic-20 or the Vic-20 with 3K RAM pack:

```
10 POKE51,255:POKE52,19:POKE
   55,255:POKE56,19:CLR
20 FOR I=0TO1024:POKE5120+I,
   PEEK(32768+I):NEXT
30 FOR X=0TO512:A=PEEK
   (32768+X)
40 POKE6144+2*X,A:POKE
   6145+2*X,A:NEXT
50 POKE36869,253:POKE36866,PEEK
   (36866)OR128
```

The double-height characters take the place of the reverse characters in the character set. The characters may be Poked or Printed on to the screen.

CTRL-RVS$^{B}_{C}$ will create a large letter "A", or CTRL-RV$^{D}_{E}$ will produce a large "B".

The Poke codes for the double-height characters are from 128 to 255. Hence:

POKE7680,128:POKE7702,129

will produce a double-sized @ at the top-left of the screen. Because the program reserves 2K of memory, only just over 1K is available to the user, unless a 3K expander is attached.

A Kavanagh,
Sutton Coldfield,
West Midlands.

THE LONG WAIT

I just had to let you know it is three whole months since I placed a telephone order for a 48K Spectrum. I offer no prizes for guessing how I feel about this situation.

I remain a firm believer in the Spectrum and the thought of the Microdrive keeps my order with Sinclair — for the moment.

However, I would like to offer one warning to Sinclair, if I may be so bold. Japanese industry has shown its abilities in both our motor cycle and motor car markets. It will not be very long before they enter our home computer market, and if the past performance in terms of delivery and back-up service to the consumer are not greatly improved upon by Sinclair Research, I believe they will very quickly become an example of the best-forgotten side of British industry.

P Bloxham,
Loughborough,
Leicestershire.

SPECTRUM BUGS

When my Spectrum finally arrived, I discovered a couple of interesting bugs. Type

CLS:PRINT CHR$ 8;"x";

Two black squares appear on the far right of the screen. If you alter the "x" to other letters for example "b", you get some interesting results.

The other bug is even stranger. Type the following as a direct command:

```
FOR F=1 TO 100 STEP 0:PRINT
"o":NEXT F
```

When the computer asks "scroll" press Caps shift and Symbol shift together. You will get your command back again. You cannot keep it though, for when you press any key, a lot of half-finished keywords, such as Randomiz, are printed on the screen. I wonder how many other bugs there are.

Stephen Dixon,
1 Collaton Road,
Leicester LE8 2GY.

MEMORY SAVER

Tim Hartnell's reply to Nick Flint's enquiry on random movement in August Response Frame prompts me to donate a version of this type of subroutine where plus or minus one is allotted to Print At co-ordinates.

Try:

```
10 LET X = PI * PI
20 LET Y = X
30 PRINT AT X, Y;" "
40 LET X = X + SGN (RND-RND)
50 LET Y = Y + SGN (RND-RND)
60 PRINT AT X, Y; "*"
70 GOTO 30
```

This halves the usual amount of memory needed to achieve the same effect. If —1, 0 and + 1 are needed, then try

LET X = X + INT (RND*2—RND)

Keeping in mind that Plot and Print at round to the nearest integer, byters on a 1K diet may make use of LET A = COS PI (= —1), NOT PI (=0), SGN PI (=1), SQR PI (=2), PI (=3).

For other uses INT PI gives an integer 3. Thanks for the help I have had from your excellent magazine.

Brian P Johnson,
Pimlico,
London.

ATOM FILE

For a long time now I have been working on a file-handling program for my Atom. The Basic search routine is so slow! George Byrns' article on machine-code filing routines in August *Your Computer* was most handy.

However, having typed in the programs I found the data was being deposited throughout my program, overwriting the Basic text. The following attentions are required:

```
1000 ! # 80 = # 00008205
1550 PRINT "5. . . . . DELETE
     RECORD" '
4050 IF ?S = CH ":" THEN GOTO 4090
4070 IF ?T = CH":" THEN GOTO 4090
8020 PRINT & # 8205 + ?# 87*? # 84,'
LL18 Again  LDA (88), Y
            CMP 013
            BEQ LL21
            CMP (85), Y
            BEQ LL19
            CLC
            LDA 88
            ADC 01
            STA 88
```

Note: all assembler addresses are in hexadecimal.

Simon Stroud,
Basingstoke,
Hampshire.

MICRO WIDOW

My husband's computing, I'd best beware
"That's it!" he yells out — I leap up with glee
"You have finished?" I ask, "We can watch some TV?"
"No — the program has gone!" he cries in despair
I wish the micro would likewise, in thin air
He loads the machine at lunch, dinner and tea
Is up late at night to one, two and three
Fixing the box with a permanent stare
As wife number two, I'm resigned to my fate
Till he has conquered this thing I now hate
Maybe I could break it, then blame the cat
Far too dishonest, I couldn't do that
The irony is, I'm sure you'll agree
This monstrous computer was a present from me.

Anon ■

Blake's Seven beware — £99 Oric has 16K and built-in explosions

WITH 16K, high resolution colour, and sound the Oric I appears to offer more than any other computer under £100.

Oric Products International is launching the machine this month and expects to sell at least 50,000 of them.

The £99 Oric offers 16K of RAM, 28 by 40 screen layout, 240 by 200 high resolution and 16 colours. There is also a 48K version for £169. Both run on Microsoft Basic and are priced to undercut rivals such as the Spectrum.

The sound facility improves on the Spectrum by supplying one noise and three voice channels. In addition to two enveloping commands it gives a range of pre-programmed sounds like explosions and laser zaps.

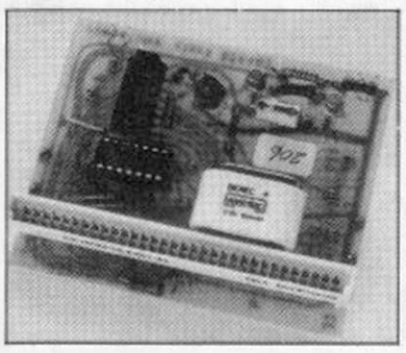
Other features include a Centronics printer interface, teletext screen compatibility and a choice of two character sets. By moving the alternative character set — containing mosaic graphic characters — into RAM up to 255 characters can be defined by the user.

The Oric is manufactured by Tangerine Computer Systems, who produced the Microtan kit and the Tantel adaptor.

Othello note

WE HAVE been asked, by Mine of Information Ltd, to point out that it is the proprietor of the registered Trade Mark "Othello" in respect of printed matter relating to computer programs.

This real-time clock and calendar fits inside the Atom case and can run for six months on a back-up battery. The price is a bit steep at £40 inclusive of postage and packing, but it also provides a separate interrupt output for control applications. The board is available from Varuna Electronics, Hornsell Park, Woking, Surrey.



Fun to learn with Spectrums

SPECTRUM OWNERS will not be short of software support from the manufacturers. Sinclair have released the first set of 21 cassettes for the Spectrum, developed for them by Psion and ICL. The ICL range includes five games cassettes at £4.95 and a Fun to Learn series at £6.95.

Among the Psion range are a 48K chess program for £7.95 and two full-length games, Space Raiders and Planetoids, at £4.95 each. All the new cassettes are now available by mail order from Sinclair Research, Stanhope Road, Camberley, Surrey.

Vicsoft — test your own IQ

COMMODORE has set up the Vicsoft Club to market inhouse programs and accessories as well as products from other companies like Bug-Byte, Adda, ASK and Stack. For £5 members receive an illustrated catalogue and discounts on selected products.

Among Commodore's latest batch of software are some O-level revision programs for English language, mathematics and the sciences; a series of five adventure games or "mind fantasies" as Commodore describes them; and programs to test your IQ and personality. These last two are based on the ideas of Professor Eysenck — not universally accepted in the world of psychology.

Vicsoft is at 818 Leigh Road, Trading Estate, Slough, Berkshire.

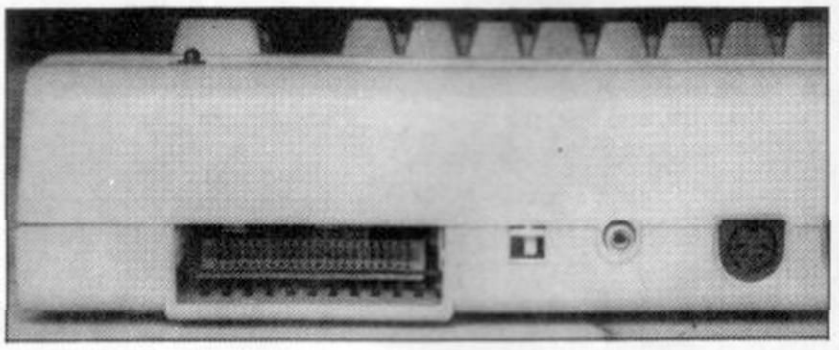
Simons finds it simple to answer Commodore's $64,000 questions

DAVID SIMONS, a 16-year-old schoolboy, writes machine code like other people write Basic. He started computing four years ago on an early Pet. Commodore was impressed by some extensions he made to Pet Basic and lent him a Vic-20 to write a demonstration program.

After taking a look at the extra Basic commands offered on other micros, Simons decided to improve Vic Basic by adding the same features. In a remarkably short time he wrote an 8K machine-code program which extends the resident Basic's list by over 60 new terms.

When the first pre-production models of the Commodore-64 arrived from the US nine months ago, David Simons set about mastering the machine, virtually unaided by documentation. Now he probably knows more about the 64 than anyone else in Britain.

He has completed a 16K version of his Basic extension for the 64, which Commodore will be releasing within the next two months. They had originally intended to produce a Super Expander cartridge for the 64 but shelved the idea when they saw the Simons package.



Simons Basic adds 108 commands to the Commodore-64's vocabulary. It incorporates all the features present in more extensive Basics — like If-Then-Else, Repeat-Until, definable procedures — and many of the facilities, such as Dump and Trace, given by utility programs.

Other features are unique to this package. To mention just a couple, it allows you to set the speed at which a program is listed and even to protect a program by suppressing its listing.

In addition there are a number of commands which handle and enhance horizontal scrolling: high-res graphics, sound, sprite graphics, multi- and extended-colour modes. On the standard 64 these areas can only be accessed through Pokes.

Simons Basic will come in ROM on a plug-in cartridge. Commodore has guaranteed 10,000 sales in the first year and will pay David Simons £1 royalty on each sale. Another company, Honeyfold, hope to release the 8K version for the Vic-20.

Open Forth channel now

INTEREST IN Forth is gathering momentum and supporters of the language will be encouraged that the new Jupiter Ace supplies Forth rather than Basic in ROM. Forth is an unusual programming language which can be tailored to fit specific applications. It runs faster than Basic — 10 times faster, for example, than ZX-81 Basic — and occupies far less program memory. When a new command is defined, it is compiled and added to a dictionary of existing commands.

The language is now available for the ZX-81, Atom, BBC and Vic. Artic Computing, 396 James Reckitt Avenue, Hull, North Humberside, supplies ZX Forth on cassette for £35 or on two 4K EPROMS for £69.95. Acornsoft, 4a Market Hill, Cambridge CB2 3NJ, offers versions for the Atom and BBC on cassette for £11.50 and £7.50. A ROM cartridge version for the Vic-20 costs £38.95 from Adda Computers. 14 Broadway, West Ealing, London.

Sinclair's £15 million for education — 25 percent off next buy is the bait

EVERY PRIMARY SCHOOL that orders a Spectrum under the government's Micros in Primaries project will receive from Sinclair a free ZX printer, free copy of Logo computer language and ten vouchers, each worth £45 off the price of a 48K Spectrum.

Clive Sinclair claims that "we and we alone have a suitable printer for primary education", and also feels that providing each class with one computer is not much use: ideally, each child should have a computer. He is prepared to spend £15 million on the project.

Sinclair will also release a range of educational software through ICL to complement the government's 150-program library and is already working with Possum Controls to produce a version of the Spectrum for physically handicapped children.

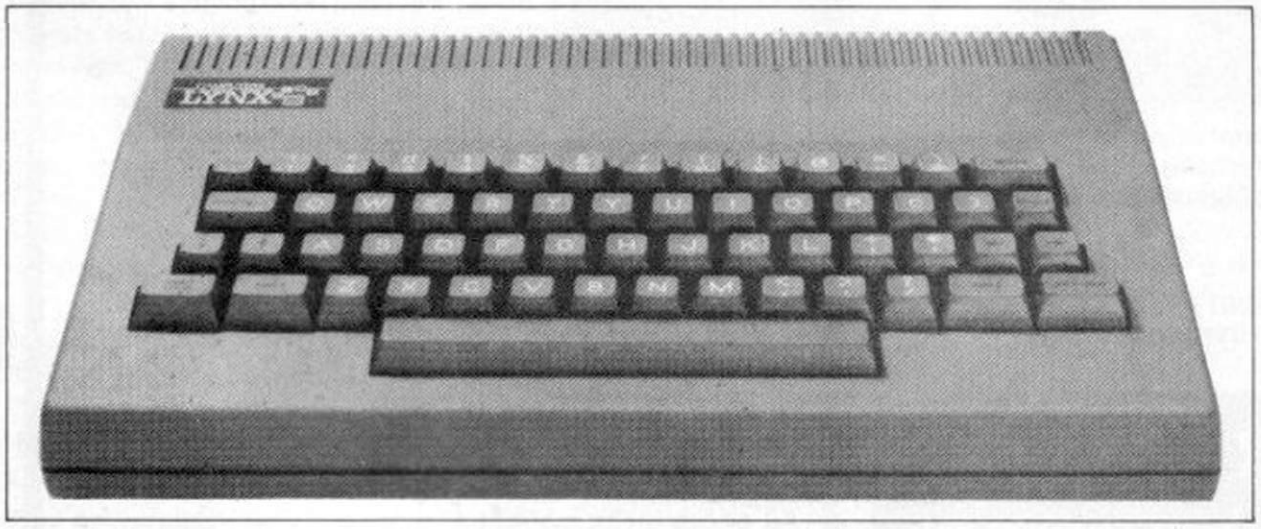
Unabashed by delivery delays of up to three months for Spectrums, Sinclair promised to deliver micros to schools within six weeks and claims general deliveries will also be back on "a 28-day order pattern by early October".

ZX conversion made easy

ZX-81 OWNERS who have graduated to the Spectrum do not need to write off all their ZX programs and add-ons. The Adam Adaptor enables you to double the Spectrum's memory to 32K by connecting your ZX 16K RAM pack. Devices such as sound boards which make use of the memory space above 16K can also be run on the Spectrum through the adaptor. It is available from Stephen Adams, 1 Leswin Road, London N16 7NL, for £7.

The Slowloader program converts ZX-81 programs to Spectrum Basic. Machine code routines outside the Basic program area translate ZX-81 code as it is read in from tape. Inverse characters, for example, are changed to normal characters, while the user is given the option of converting half-tone graphics to full-tone or user-defined characters. The Slowloader comes on cassette for £10 plus 45 pence postage from East London Robotics, Finlandia House, 14 Darwell Close, East Ham, London E6. Telephone: 01-471 3308.

Camputers' 48K colour Lynx will help you work, rest, and play



CAMPUTERS' LYNX calls itself "a serious machine at a remarkably low price". It is certainly the cheapest off-the-shelf 48K computer to have a real keyboard, colour and sound.

By the end of the year Camputers will be offering disc-drives, printers and other add-ons as well as the basic machines.

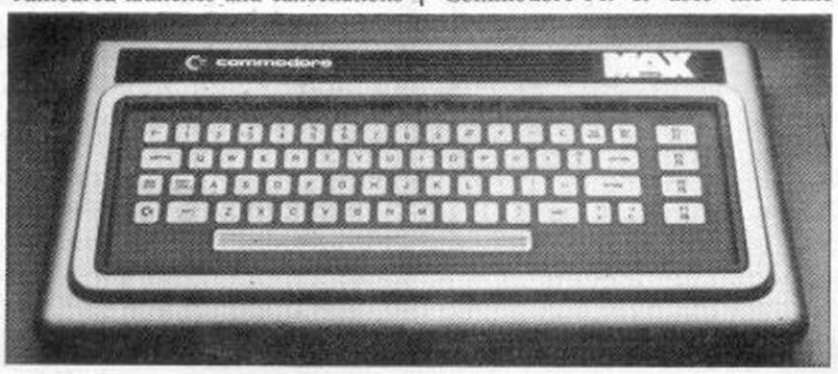
The Lynx carries 48K RAM, expandable inboard to 192K, and costs £225. Built around a Z-80A microprocessor with an RS-232 port as standard, it is compatible with CP/M software and so may be suitable for business applications as well as home use.

Eight colours can be displayed on a screen of 24 lines by 40 characters and also in the 248 by 256 high-resolution mode. Memory expansion will boost the display to 80 characters a line and resolution to 248 by 512.

Camputers which makes the Lynx claim that the Basic is easily expanded or modified and incorporates several commands to allow machine-code routines to be inserted. A machine-code monitor with 26 commands is tagged on the end of Basic. The Lynx also incorporates a digital-to-analogue sound facility.

Multi-role Max Christmas launch

"A RETAIL-ORIENTED, games-playing computer" is how Commodore describes the Max. After months of rumoured launches and cancellations the machine will finally appear in the shops around Christmas for £100. The Max is like a skeleton Commodore-64. It uses the same video and sound chips and has the same sprite and high-resolution graphics and sound generator but it lacks the real keyboard of the 64.



With only 2K RAM and no resident Basic, the Max will need plug-in cartridges to bring out its potential. A mini-Basic is available on cartridge, which increases the memory to 4K, but lacks arrays and trigonometric functions. Commodore claims that Max has three roles: as games machine, music synthesiser and home computer. But probably only beginners will be interested in its programming possibilities.

DRAGONS SIGHTED IN LONDON

DRAGON 32

THE BRITISH MADE 32K HOME COMPUTER

FOR ONLY **£199.50** *INC. VAT*

THE DRAGON'S TEETH
32K RAM expandable to 64K: 9 colours: advanced 6809E Microprocessor: 5 octaves of music: Professional quality keyboard: Plug in sockets for printer, joysticks, cassette, games cartridges: Expanded Microsoft colour Basic: 160 page Basic manual: A growing library of the best games and applications Software.

If you want to meet a Dragon,
Phone us today! **01-633 9611**

S.W. WINTER & Co.Ltd.

101 WESTMINSTER BRIDGE RD, LONDON SE1

Please supply:

_____ DRAGON 32 £199.50 each
_____ JOYSTICKS £19.95 each
CARTRIDGES:
_____ GHOST ATTACK £24.95 each
_____ COSMIC INVADERS £19.95 each
CASSETTES:
_____ DRAGON GAMES SELECTION £7.95 each
_____ QUEST £7.95 each

Phone for the complete list of cassettes & cartridges.
Prices include VAT — Add £3.00 p&p per Dragon.

Payment by Cheque or P.O. please.

Name _____

Address _____

_____

_____

HILDERBAY LTD

Professional Software

48K SPECTRUM SOFTWARE NOW AVAILABLE!

Payroll £25
Stock Control £25

Tape recorder suitable for microcomputer use, aligned and tested on computer signals £22 + £2 p&p Hilderbay Loading Aid. Load your microcomputer from tape first time, every time! £5.95

HILDERBAY SUMMER ZX81 SALE!

Beamscan (beam analysis))
Payroll) £13 each
Stock Control)

Optimax £20 until 21 September

Budget I & II £9 (2 programs)

Time Ledger)
Critical Path) £8 each

Financial Pack 1)
Gold) £5 each

These programs have been described and reviewed previously (and we can provide details).

Comprehensive project planning package (PPP), comparable with software at five times the price! £138 (48K Spectrum or 48K ZX81: specify version).

All prices include VAT, and are post fee. Sale prices are valid until 21 September 1982. Free updates, comprehensive telephone and personal support, and competition prizes are not available for summer sale purchases.

Holdco Ltd are no longer handling our advertising. Enquiries, and orders: please contact us directly.

Hilderbay Ltd
Professional Software
8/ 10 Parkway
Regents Park
London NW1 7AA

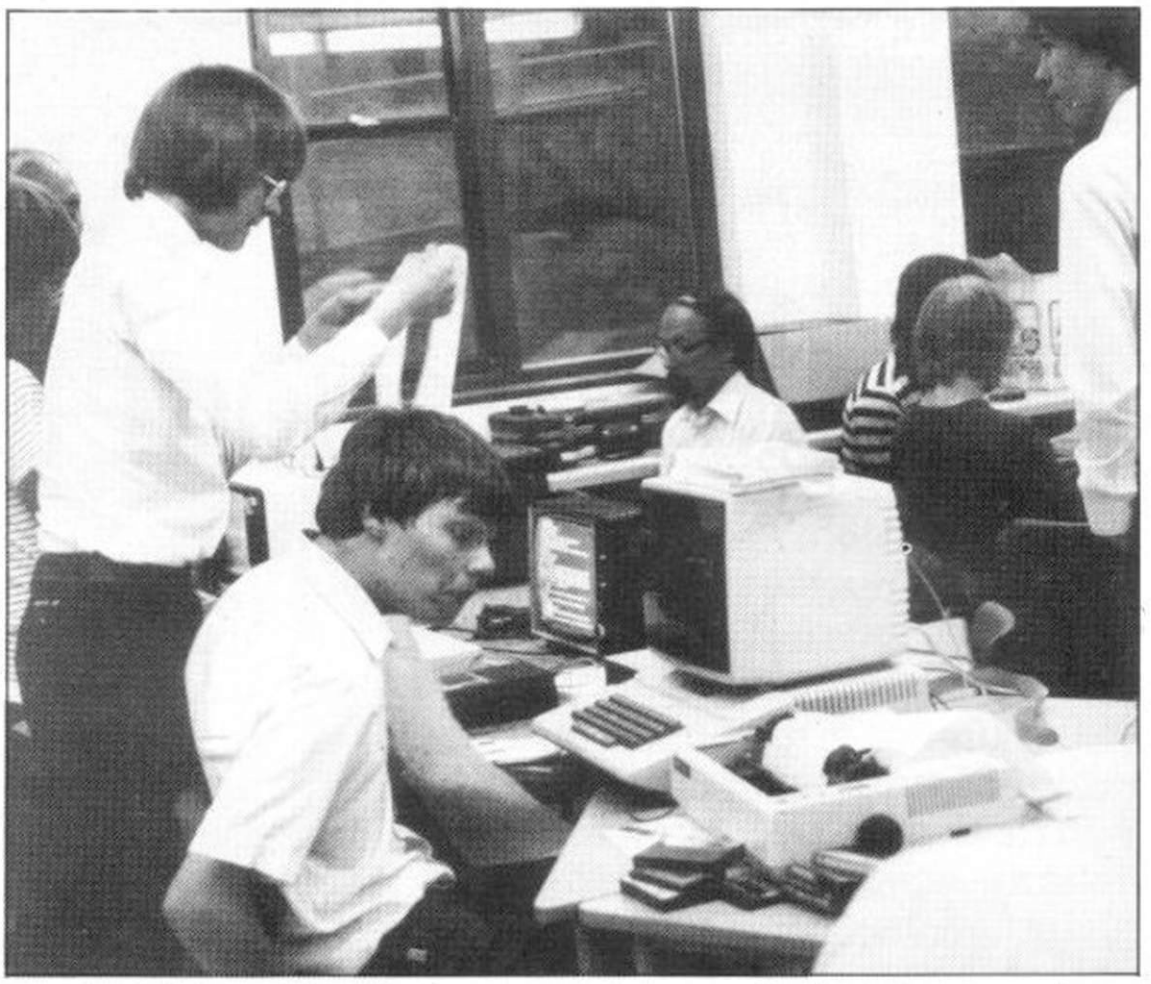
Tel: 01-485 1059 **Telex: 22870**

(Our phone has been out of order for weeks: British Telecom haven't even sent a repairman yet. We apologise).

Computer Club is here to encourage you to start your own local computer club or, if one already exists, to join it and become involved. We would like to hear of anything which has made your club a success, or of any projects or programs you are developing.

Rush-hour in Milton Keynes

From aiding a handicapped child, to building a robot dog, the Milton Keynes Micro-computer Users' Group is involved in a variety of interesting projects. The club is also writing software for educationally subnormal children, to be used on a micro in a local school. Simon Beesley looks at micro-computer developments in one of the U.K.'s youngest towns.



EARLY AUTUMN can be a slack period for computer clubs, but Milton Keynes Micro-computer Users' Group still managed to attract more members to their weekly meeting than most clubs draw in a month. Nearly 40 people turned up for an informal session.

Founded nearly a year ago, the club grew out of a Tandy users' group and now boasts 126 enrolled members. TRS-80 owners are well catered for: Keith Blout, club secretary, has collected a library of programs which members have typed in from magazines and put on tape. Video Genie, Atari, BBC Micro, UK-101 and ZX-81 are some of the other machines owned. A single Spectrum made a fleeting appearance before developing a hardware fault.

John Chewter, founder and club chairman, attributes their success to the way meetings are organised. The formula is to offer three types of session, in separate rooms, at each meeting.

One room has been set aside for courses. A course in Basic for beginners centred on a project to write a program listing and assessing the results of the local Darts League. Future courses will cover advanced Basic and machine code.

K-9, lost to *Dr Who* fans some time ago, may be making a reappearance in the club's hardware section, where members are building a robot dog. In another project the club hopes to be able to help a 10-year-old handicapped girl, who cannot speak and can only move her head. They intend to give her the chance to communicate through an Apple by linking it up with a smaller ZX-type click keyboard. Also in the pipeline is a scheme to write software for an ESN school. Although the school has a micro, there is very little software available for educationally-subnormal children; a state of affairs the club hopes to remedy by building up a bank of graphic routines.

The third room is given over to more informal computing activities. When we visited the club, so many members were plugging in their machines, power points began to be in short supply. A visitor can wander in and gain hands-on experience on a range of machines, talk to members, or else try out a variety of computer games. The club hires out a ZX-81 to beginners for £1 a week.

Meetings take place every Tuesday at 7.30 pm at Sir Frank Markham School, Woughton Campus, Woughton, Milton Keynes. The club is also planning the occasional whole-day session on Saturdays to be tied in with the local Microtechnology Centre. For more details ring Keith Blout on 0604-402460. ■

Local society news

South Yorkshire

THE SOUTH YORKSHIRE Personal Computing Group meet on the second and fourth Wednesday of each month. A formal meeting with a talk or demonstration is held at the General Lecture Theatre, St George's Building, Mappin Street, Sheffield. A more informal session takes place at the second meeting in the University of Sheffield's CTS Club, Favell Road. In the middle of this month, the group will be running their annual competition with prizes for software and hardware applications. For more information ring S Gray on 0742 351440.

Edinburgh

EDINBURGH'S ZX Computer Club is flourishing. They recently organised the first Scottish ZX Computer Fair and their membership now stands at over 70. As well as organising tutorial groups on topics ranging from elementary Basic to advanced machine code, they publish a bi-monthly newsletter. Meetings take place every second and fourth Wednesday in the Claremont Hotel, Claremont Crescent, Edinburgh from 7.30 pm onwards. Ring Keith Mitchell on 031-661 3183 for more details.

Worcestershire

COMPUTER owners in the Worcester area are welcome at the Old Pheasant, New Street, Worcester, where the Worcester and District Computer Club meets on the second Monday of every month. No single make of computer predominates and the club aims to cater to interests in as many different models as possible. D J Stanton will answer any queries on 09025 22704.

Newcastle

IAN KIRTON is interested in starting up a users' group for Dragon owners in the North-East, based in Newcastle. Since the only outlet for Dragons in Newcastle has already sold 87 of them there could be a good response. If enough users telephone him on 0632 814215, he will organise a first meeting shortly.

The new Dragon 32. So well designed, you'll even understand this ad.

If you're already a computer expert, may we refer you to the box of technical specifications displayed opposite.

If you're not, may we refer you to the new Dragon 32 Family Computer. A computer so easy to understand, you won't understand why all the others seem so difficult.

And the new Dragon 32 costs under £200.

32K RAM FOR UNDER £200?*

When you're comparing computers, the first thing you need to know is the size of the memory. In plain English, the Dragon has approximately 32 thousand units of Random Access Memory. (32K RAM for those who prefer to be blinded by science.) This means that the Dragon's memory is at least twice as powerful as its competitors.

With a memory this powerful, the amount of information the Dragon can store is literally vast. But the Dragon doesn't just make it easy to store information. It makes it easy to use, too.

USER-FRIENDLY?

You may have heard of the term 'user-friendly.' Reverting to plain English once more, this means simply that the computer will go out of its way to understand you, rather than vice-versa.

The Dragon 32 is so user-friendly, it practically licks your hand.

You tap (literally) its vast resources through a beautifully-designed keyboard that's as easy to use as a typewriter.

On this keyboard, you type in a language which is surprisingly close to the English you talk every day. The Dragon 32 will receive your order. Understand it. Send it to the appropriate section of its massive brain. And then display the appropriate information on your screen. All before you can say 'gobbledygook.'

*TV not included in price.

SPECIFICATIONS
6809E MICROPROCESSOR. Pet, Apple, Atari 400, BBC Micro, and VIC 20 still have the less powerful 6502.
32K RAM (as standard). At least twice the power of similarly priced machines. Expandable to 64K RAM.
EXTENDED MICROSOFT COLOUR BASIC (as standard). Featuring: ADVANCED GRAPHICS (set, line, circle, paint, print, draw, rotate and print using). ADVANCED SOUND 5 octaves, 255 tones. AUTOMATIC CASSETTE RECORDER CONTROL. FULL EDITING with INSERT and DELETE.
9 COLOUR, 5 RESOLUTION DISPLAY.
USE WITH ANY U.H.F. TV and/or separate P.A.L. monitor.
PROFESSIONAL QUALITY KEYBOARD. Typewriter feel. Guaranteed for 20 million depressions.
PRINTER (Centronics parallel).
JOYSTICK CONTROL PORTS.

FIRE YOUR IMAGINATION.

Learning how to use the Dragon 32 won't cause you to experience any problems. Learning what you can use it for will cause you to experience something entirely different.

Delight. Surprise. Fascination. And challenge.

The Dragon offers a range of some of the most popular computer games in the world. From those celebrated space battles to mind-boggling adventures in seemingly unfathomable dungeons and caves.

As if by magic, a simple typed message will command the Dragon to create your own drawings. Then it will colour and paint them in 9 colours.

And it's clever enough to create virtually any image you want - circles and arcs as well as straight lines.

The Dragon will also play and compose music with you, with a range of 5 octaves. And it works with any UHF TV or PAL monitor.

LEARNING THROUGH PLAYING.

All of this makes the Dragon the ideal machine to build your children's interest in the world of computers as they become increasingly more vital. School-children already enjoy using computers.

The Dragon is the first computer specifically for the family - so by enjoying yourselves at home, you and your children can soon become expert enough to create your own programs.

PRODUCT / FEATURE	DRAGON 32	SINCLAIR SPECTRUM	ACORN ATOM	VIC 20	TI 99/4A	BBC MICRO 'A'
PRICE	£199	£125	£175	£190	£199	£300
STANDARD RAM SIZE	32K	16K	8K	5K	16K	16K
STANDARD AVAILABLE RAM FOR HIGH RESOLUTION GRAPHICS	26K	9K	N/A	N/A	14K	3K
EXTENDED MICROSOFT BASIC AS STANDARD	YES	NO	NO	NO	NO	NO
PROFESSIONAL-TYPE KEYBOARD	YES	NO	YES	YES	YES	YES

BRILLIANTLY SIMPLE GUIDE.

The Dragon is living proof that you don't have to be an expert in computerspeak to be an expert in computers. It comes with the easiest-to-understand instruction manual ever written for a home computer.

Every step, every explanation, is made clear - even if you're a beginner. In minutes, it will show you how to write a simple program. Within hours, you'll be fascinated. And from then on, you'll continue to be astounded by the new world which the Dragon's power and versatility will open up to you.

See the new Dragon 32 in your High Street. At under £200, it's not just the first family computer. It also has all the features an expert could wish for.

Except perhaps the jargon.

DRAGON 32

The first family computer.

To: Jean Webster, Dragon Data Ltd, Queensway, Swansea Industrial Estate, Swansea, Glamorgan SA5 4EH.
Tel: 0792 580651.

Please send me further information about the Dragon 32.

Name _____

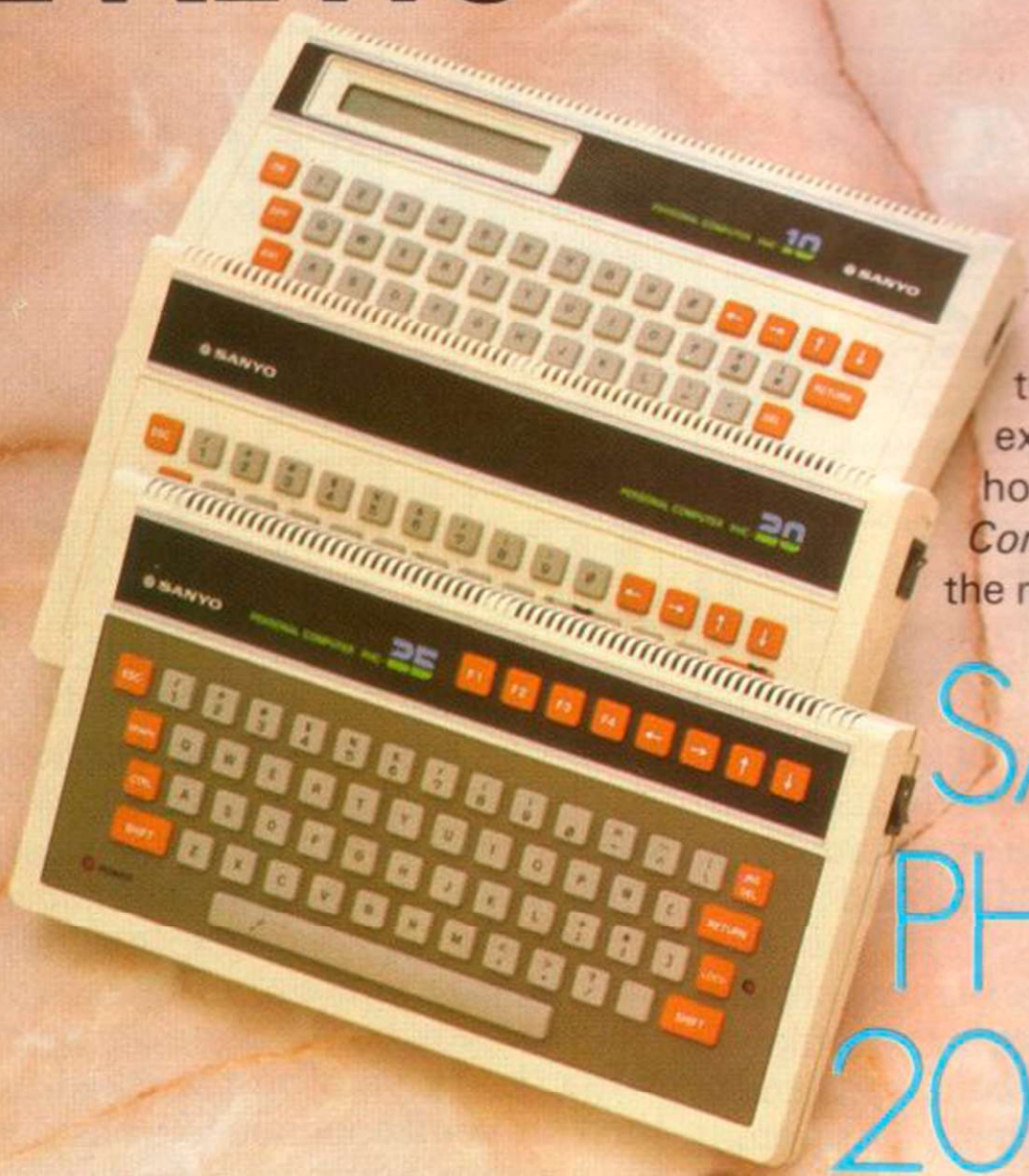
Address _____

_____

_____ YC

A member of the Mettoy Group of Companies.

REVIEWS

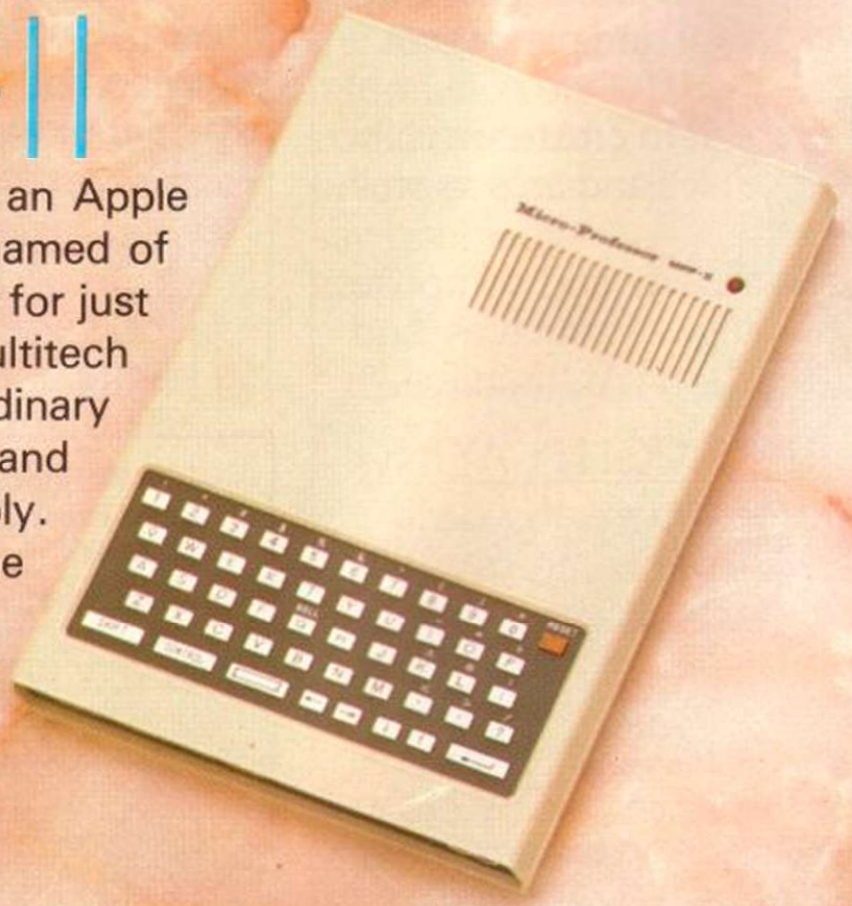


Japan's new micros are here. What impact will the Japanese technological expertise have on Britain's home-computer scene? *Your Computer* takes the wraps off the new Sanyo trio on page 24.

SANYO PHC-10, 20 AND 25

MPF-II

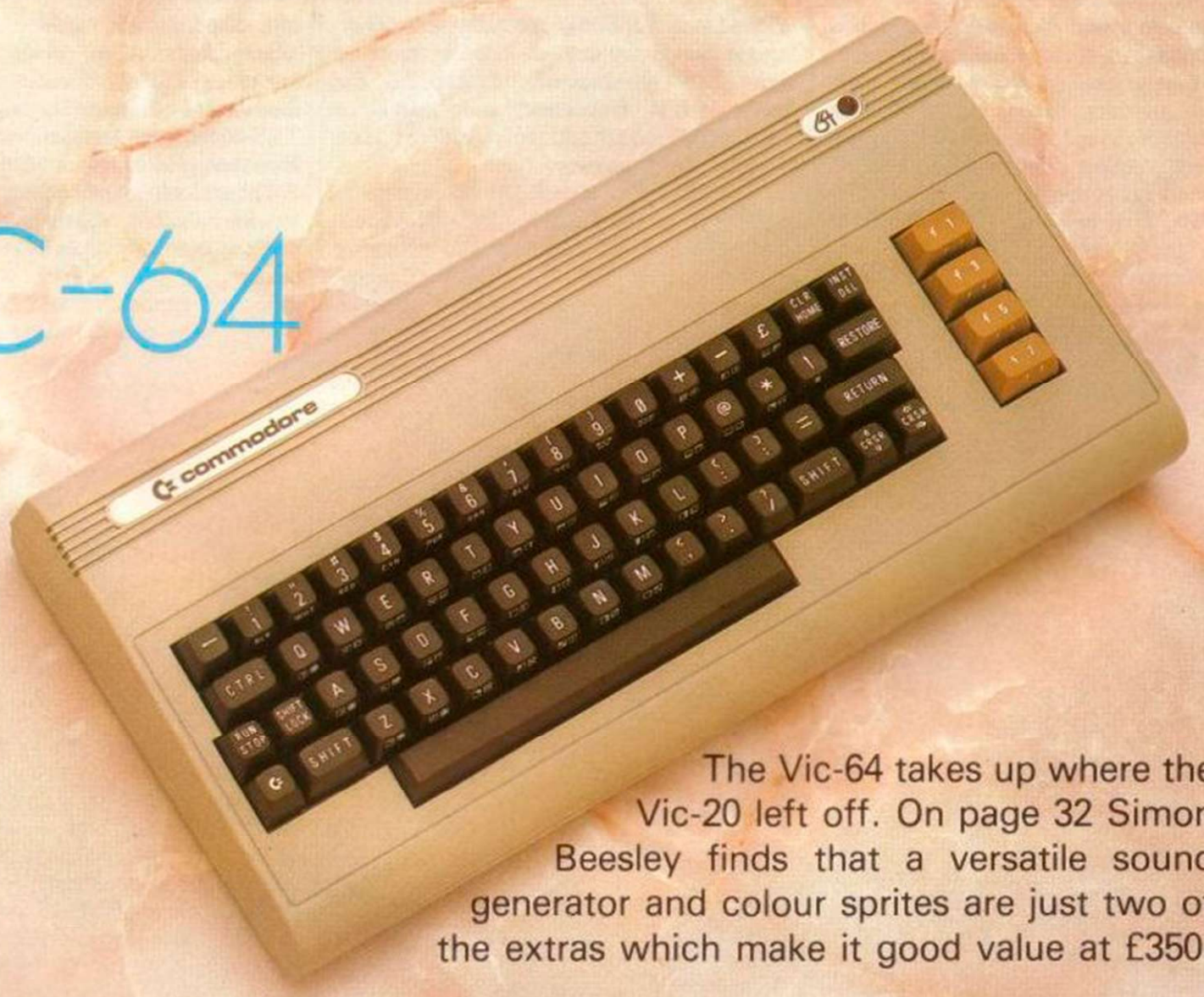
With a display that an Apple could hardly be ashamed of and 64K of memory for just over £200, the Multitech MPF-II is not as ordinary as its plain looks and keyboard might imply. Tim Langdell puts the micro through its paces on page 28.



COLOUR GENIE

From the Far East comes the £199 Colour Genie — we rubbed the lamp and found a willing servant. Turn to page 34.

VIC-64



The Vic-64 takes up where the Vic-20 left off. On page 32 Simon Beesley finds that a versatile sound generator and colour sprites are just two of the extras which make it good value at £350.

REVIEW

Pretty boxes and elegant keyboards — Tim Langdell finds out what is inside Sanyo's shiny new micros.

BY THE END of last year the only personal computers on the market were the ZX-81, the Vic-20, and the Atom. Now, less than a year later you have the choice of a dozen machines from all over the world — many offering high-resolution colour and sound.

The Japanese have been noticeably absent from the under-£200 market until now. Sanyo's launch of three microcomputers is just the spearhead of a new Japanese invasion.

The Sanyos range from a strong Spectrum rival, to a cheap battery-powered pocket computer with an LCD display. All three micros have similar cases and full-size keyboards.

Sanyo's machines are wedge-shaped like typewriters and are 12in. wide by 6in. deep. The keyboards are a lesson in cheap but efficient design. Sanyo uses a similar rubber matting to the Spectrum underneath the keys but capped with hard plastic. A full-size space bar makes touch-typing possible although a keyboard bleep would have been useful.

Top of the range

Sanyo's PHC-10 is a battery-powered £60 training computer with a single-line liquid-crystal display and no provision for television display. Next up the range is the PHC-20, a 4K RAM machine with no colour capability for about £100. But Sanyo's real hopes rest on the top of the range PHC-25 with high-resolution colour, user-defined keys and 16K RAM for about £150.

This nine-colour computer with high-resolution graphics has a full QWERTY keyboard, with keys for editing, Escape, CTRL, and graphics. The two Shift keys are double-width, as is the Return key.

The PHC-25 is based on a Z-80A CPU as used on the Spectrum, ZX-81, and early Tandy machines. The PHC-25 is nominally referred to as a 16K computer, but on requesting the free bytes in user RAM a return of about 14K is obtained. In contrast, the Spectrum 16K version really only has 9K, so the PHC-25 could still be considered good value on RAM, anyway.

The PHC-25's video RAM is separate in memory from user RAM, and the ROM containing the Basic interpreter and operating system resides in 24K. This leaves some 18K of free space in the machine's memory map.

Sanyo Basic is Z-80 colour Microsoft with a few changes for the specific machine. This is thus virtually the same language as used on the TRS-80 colour computer and Dragon 32. However, like the new Colour Genie, the Z-80-based versions of colour Microsoft seem somehow easier to use than the 6809 (Dragon) version, especially when it comes to defining colours.

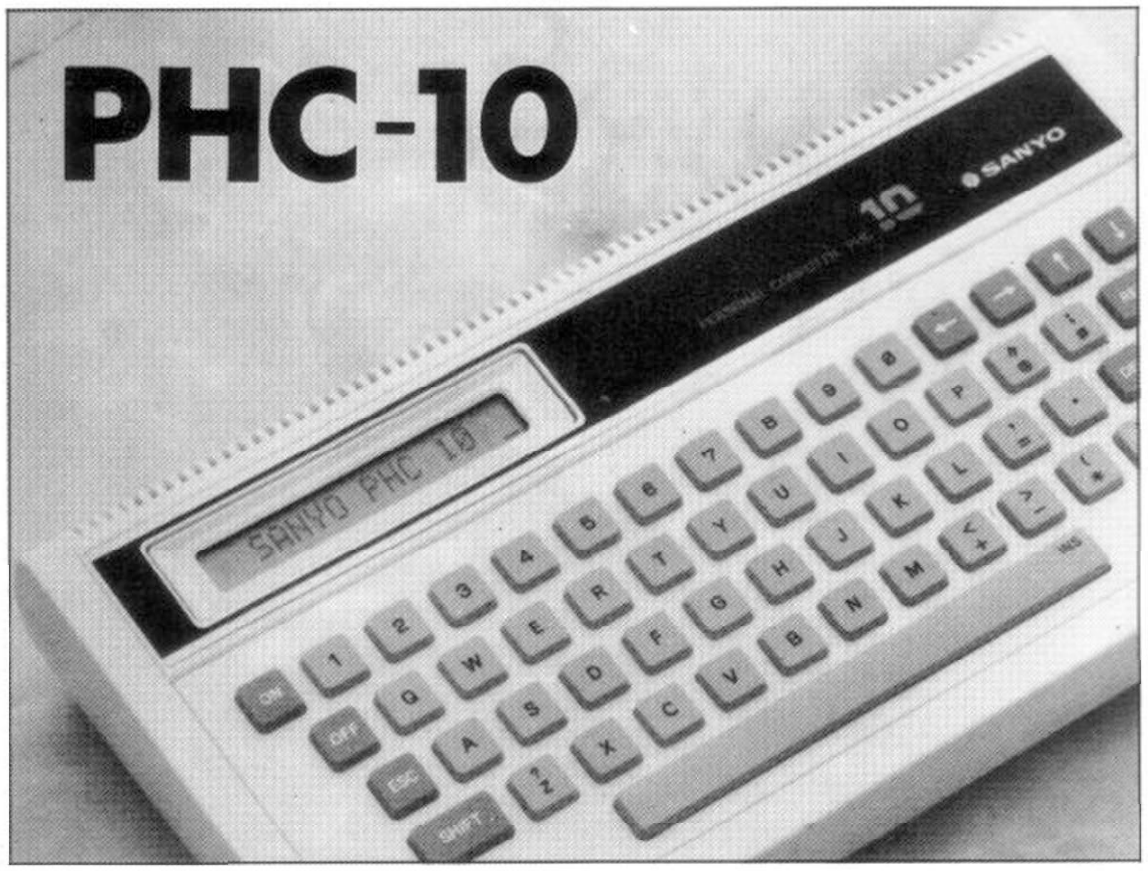
For instance, CTon and CToff enable you to switch the cassette player on and off from within a program. Other commands include If-Then, Else, plus the usual Goto and Gosub. There are other especially interesting commands like On Goto and On Gosub.

The PHC-25 can not only draw lines using Line but, as with the Dragon, it can use an almost identical statement to construct a box from the line co-ordinates. It can even produce a filled-in box by the addition of one other letter in the statement. Its repertoire includes Paint, which means that full graphics capabilities are within the PHC-25's range.

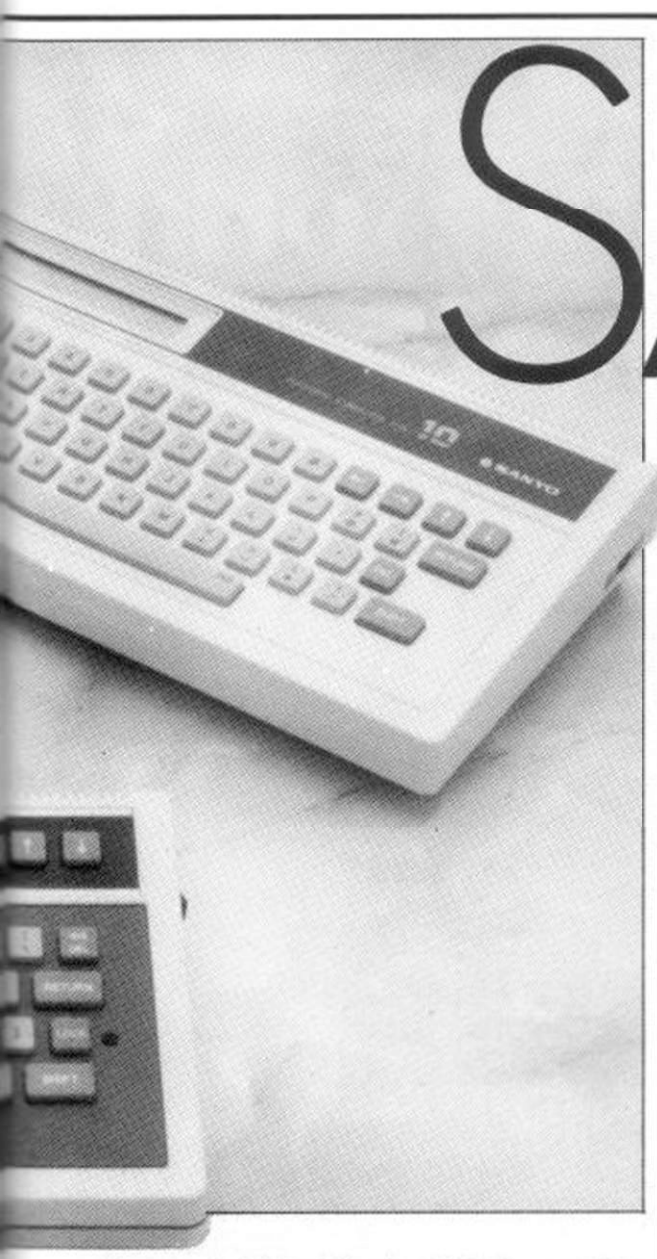
Saving a screen

You can save a screen to cassette, you can directly access the Z-80A's ports with Inp and Out, you can load data files with Input$ and define functions. You can also Scroll just part of the screen using Console which can create text and graphics windows.

Colour on the PHC-25 is a little harder to use than on a Spectrum and the choices of colours vary with the level of resolution. There are four modes. The first is a text-only mode, the second is a nine-colour, low-resolu-



SANYO



tion mode 64 by 64, the third is a medium resolution mode 192 by 128 with nine colours, and the fourth is a 256 by 192 resolution mode. This has, it seems, only two of three possible colours, white, green and black.

Unlike the Dragon the same commands create the colours locally or globally in all modes, and the same commands put dots of colour on the screen. There is none of the fuss of clearing video pages, but then again the PHC-25 only offers up to two pages compared to four on the Dragon and these must be designated at switch-on. The colour from our test model was sharp, without dot-crawl.

The Sanyo PHC-25 has Escape and CTRL keys on the keyboard allowing you to either Pause, or to stop a program totally.

CTRL functions are also available: turning on and off a printer, changing video pages, and so forth. Using the graphics key lets you explore the massive internal character set of the PHC-25 — over 200 characters and graphics in ROM. In our machine there were 100 or so Japanese characters which will apparently be changed for extra graphics in the U.S./U.K. market.

An excellent feature is the four separate cursor keys and four user-defined keys which with Shift allow up to eight single-entry key-words or commands. These are set up upon switching on to produce useful key-words like Run and Return, List, Print, but can be redefined simply using Key.

The PHC-25 is clearly not designed for indefinite expansion. It comes with both a video monitor, a domestic TV outlet, a built-in Centronics port, a cassette socket, and a user port of undefined character. A sound-synthesiser box allows the PHC-25 to use its extensive Sound and Play commands to the full — it will have a three-channel synthesiser with envelope control. This extension box will also have joystick controls.

In conclusion, this machine is a real competitor to the Spectrum, having 5K more user RAM than the 16K Spectrum for about £25 more. It also has a more powerful Basic and its keyboard is certainly far superior.

The two lower-priced Sanyos enter a market already dominated by the ZX-81. The PHC-10 is a battery-operated microcomputer with an LCD display and no potential for expansion. It is purely a training device, somewhat outclassed by such machines as the ZX-81. It has the excellent full-size Sanyo keyboard, but a maximum RAM of only 4K. Its Basic is a version of Tiny Basic resident on the purpose-designed chip used as the processor.

It is easy to type programs into the PHC-10, but you can only see a maximum of 16 characters at a time. However, you can use the four cursor keys to scan through quite easily. Each key has auto-repeat.

The major draw-back is the 4K Tiny Basic. With less than 2K of user RAM, and a very limited range of commands, the PHC-10 would be restrictive even for a beginner.

(continued on page 27)

How to make the best home computer in the world even better.

Peripherals to turn a powerful computer into a super-computer for the professional.

With VIC, you have the finest home computer money can buy. And the more you use it, the more you will ask it to do.

Pretty soon, you'll want to extend VIC's vast potential to the full; and there is a wide range of VIC peripherals to help you do it.

Disk drives, disk-based software, a printer, cassette unit, joysticks, paddles–with these, VIC computing becomes total computing: giving you true professional power and capability.

We describe the major units here:

VIC PRINTER

The VIC Printer, like all VIC peripherals, offers a very high specification at a very competitive price.

It will print programs, letters, business data, graphic displays and so on.

Its main features include: 80 characters per line • Tractor feed dot matrix • 30 characters per second print speed • Full alphanumerics and graphic printing • Double-size character capability • All cables and leads.

VIC FLOPPY DISK UNIT

The VIC single-drive Disk Unit provides a fast, accurate and efficient means of storing and retrieving data and programs.

Together with the Printer, it transforms the VIC 20 into the ideal system for the small businessman or serious computer programmer.

Features include: 174,848 bytes capacity • Uses soft-sectored standard 5¼" single density floppy disks • Direct interface to VIC • Direct compatibility with Printer Intelligent system independent of VIC. (VIC RAM not required to run it).

EXPANSION MEMORY CARTRIDGES

Special plug-in cartridges are available to expand VIC's memory. 3K, 8K and 16K RAM packs plug directly into the computer.

A Memory Expansion Board is also available to develop VIC's capabilities to the maximum.

For full details of VIC 20, its peripherals and software, and a list of your local dealers, contact: The Commodore Information Centre, 675 Ajax Avenue, Slough, Berkshire, SL1 4BG. Tel: Slough 79292.

commodore

VIC 20

The best home computer in the world.

Actual size of Sanyo keyboard, above. Below back shot of PHC-25.

(continued from page 25)

Like the ZX-80, the PHC-10 can only handle integers. Thus dividing 5 by 3 will give an answer of 1. This is not a micro which will double as a home calculator.

Like the Sharp and Tandy handheld computers — which is the market it is aimed at — it will accept a program in the same way as a larger micro, but Running the program results in one-line-at-a-time display, unless the Return key is depressed. To get it to go through a program automatically you use Pause instead of Print in statements, which produces a display of each line at one-second intervals.

The PHC-10 also produces sound of sorts. A Beep command gives a note of a specified pitch for durations of a tenth of a second to 20 seconds.

Good ergonomics

The PHC-20 shares the good ergonomics of its stablemates but may find it difficult to compete in Britain with the features home-grown micros are offering for £100. The PHC-20 is Z-80A based with 8K of ROM and 4K RAM of which 3K is available to the user. Little thought has been devoted to interfacing the PHC-20 to printers and other peripherals. Even connecting the machine to a television is not straightforward.

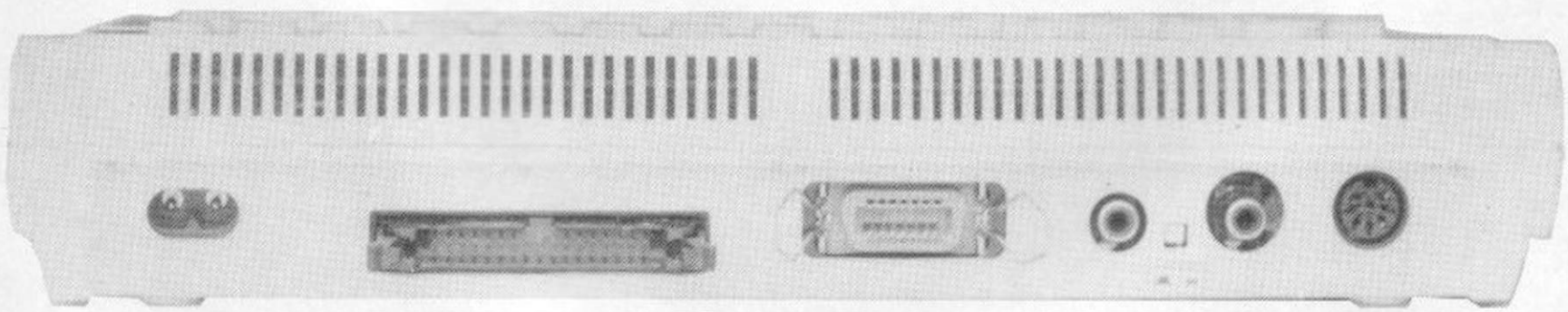
The Basic is early Microsoft, characterised by friendly if obscure syntax reports. Instead of the line numbers quoted by a Sinclair the PHC-20 will answer all errors with:

?? HOW

?? WHAT

?? SORRY

Loading from cassettes is quite easy but not trouble free. Although the PHC-20 is quite fast it is severely limited by an integer-only ROM.



CONCLUSIONS

- All the Sanyo machines are well packaged and have comfortable keyboards.
- At the bottom of the range the PHC-10 is little more than a training machine limited by integer Basic and the lack of a screen-display facility.
- The PHC-20 is again limited. Users can expect new machines to offer more than 3K user RAM, integer Basic, and black and white display for £100.
- Sanyo's PHC-25 offers a good keyboard, 14K of user RAM, high-resolution colour and user-defined keys for about £150.
- If Sanyo make the PHC range available in the High Street the 25 could be a winner. The British micro industry may be forced to do something about reliability and long delivery times. ■

REVIEW

MPF-II

Tim Langdell discovers whether the 64K MPF-II really is an Apple at far less than half the price.

TAIWANESE MULTITECH has pushed a new contender into the £200 colour-computer arena. Its MPF-II is a 64K 6502-based machine with six colours and a Basic which bears far more than just a passing resemblance to Applesoft. In fact the MPF-II is almost identical to a 64K Apple II — but without the expansion potential — and will run most Apple software.

About 32K of RAM is available to the user, and a further 16K or so is required for the video pages. It uses 16K of ROM, which again seems very similar to the Apple II. Indeed the few Calls we made to the ROM produced the same results as on our Apple. For instance, Call -932 cleared the screen, and Poking location 33 enabled us to set the line length to any given value.

Positive keyboard

The MPF-II's unattractive casing is flat and light-grey, about 7in. wide by 10in. deep, by about 1in. high — it is rather like an Apple in a Spectrum case. The keyboard is of the calculator type, although it has a more positive feel than many on the market. Multitech claims an inexpensive add-on typewriter-quality keyboard is also about to be released.

As soon as you begin to work with the MPF-II its similarity to the Apple becomes apparent. There are three modes: text, low- and high-resolution graphics. The text mode is black and white only, but six colours are available in either of the graphics modes. The lower-definition graphics mode has a resolution of 40 by 40, while the higher is 280 by 192. The MA command moves the screen memory to another location, and there is a choice of two high-resolution screens. The first leaves four text lines at the bottom of the screen: the second leaves just one line for, say, error reports.

The MPF-II has a full QWERTY keyboard with larger keys for Return, Space, Control and Shift. There is also a reset button, which is set precariously close to the 0 key, and four cursor keys. The keyboard is uncluttered, but hides many secrets.

Use of templates

The first of the two templates supplied with the machine reveals that the keys provide a full range of graphics functions, accessed by pressing CTRL B followed by any key. There are a total of 49 graphics ranging from a variety of line-drawing aids, through block graphics, to hearts, clubs, diamonds and spades.

The second template presents the surprise; pressing Shift and CTRL at the same time — they are conveniently adjacent — along with another key produces a full key-word on the screen. Thus you can type words in the normal manner, as well as use the Sinclair approach of single-key entry. Offering both is an excellent idea, and using templates instead of cluttering the keyboard is ingenious.

At the back of the MPF-II are sockets to attach either a domestic television or a video monitor. There are also Mic and Line sockets for your cassette recorder, and one for an AC plug. On the left-hand side is a printer interface, a plug-in ROM socket and a socket labelled RCB.

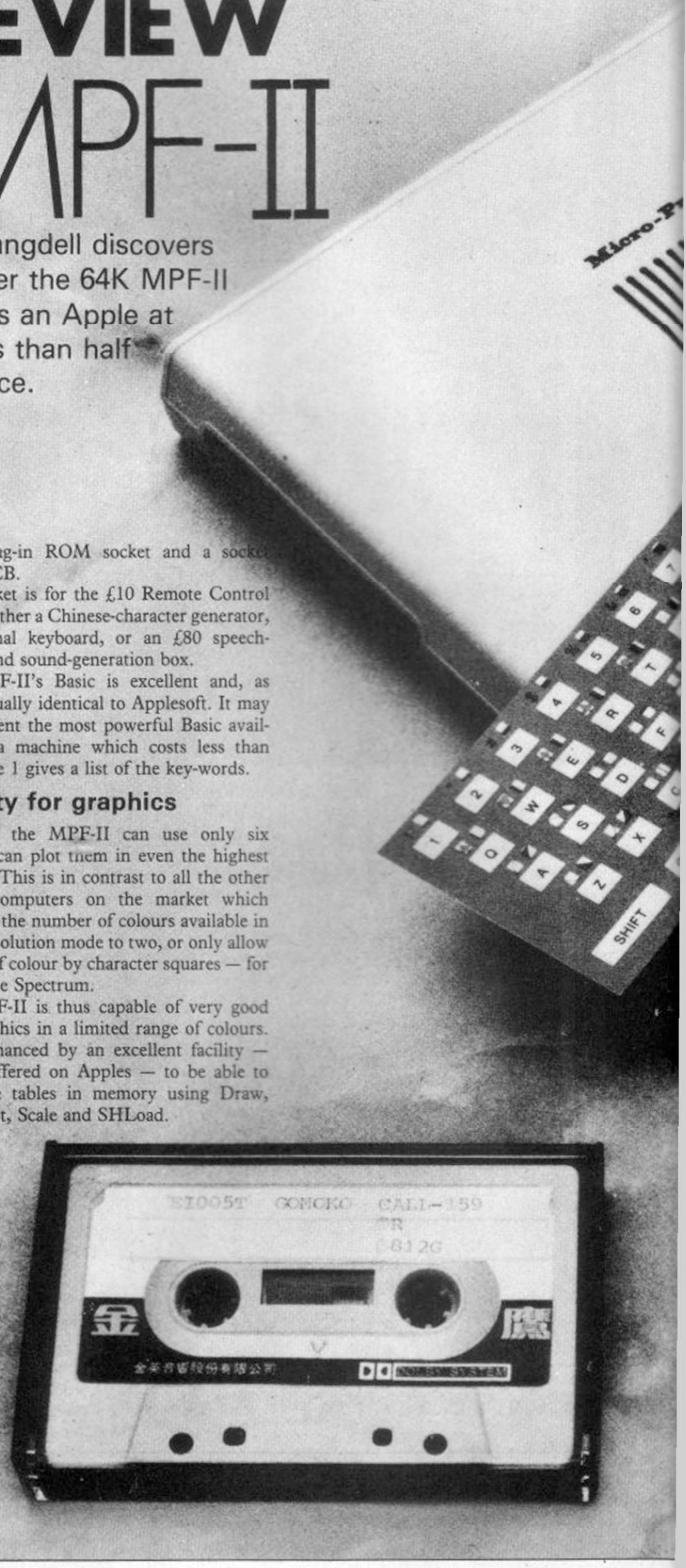
This socket is for the £10 Remote Control Box — or either a Chinese-character generator, an additional keyboard, or an £80 speech-synthesis and sound-generation box.

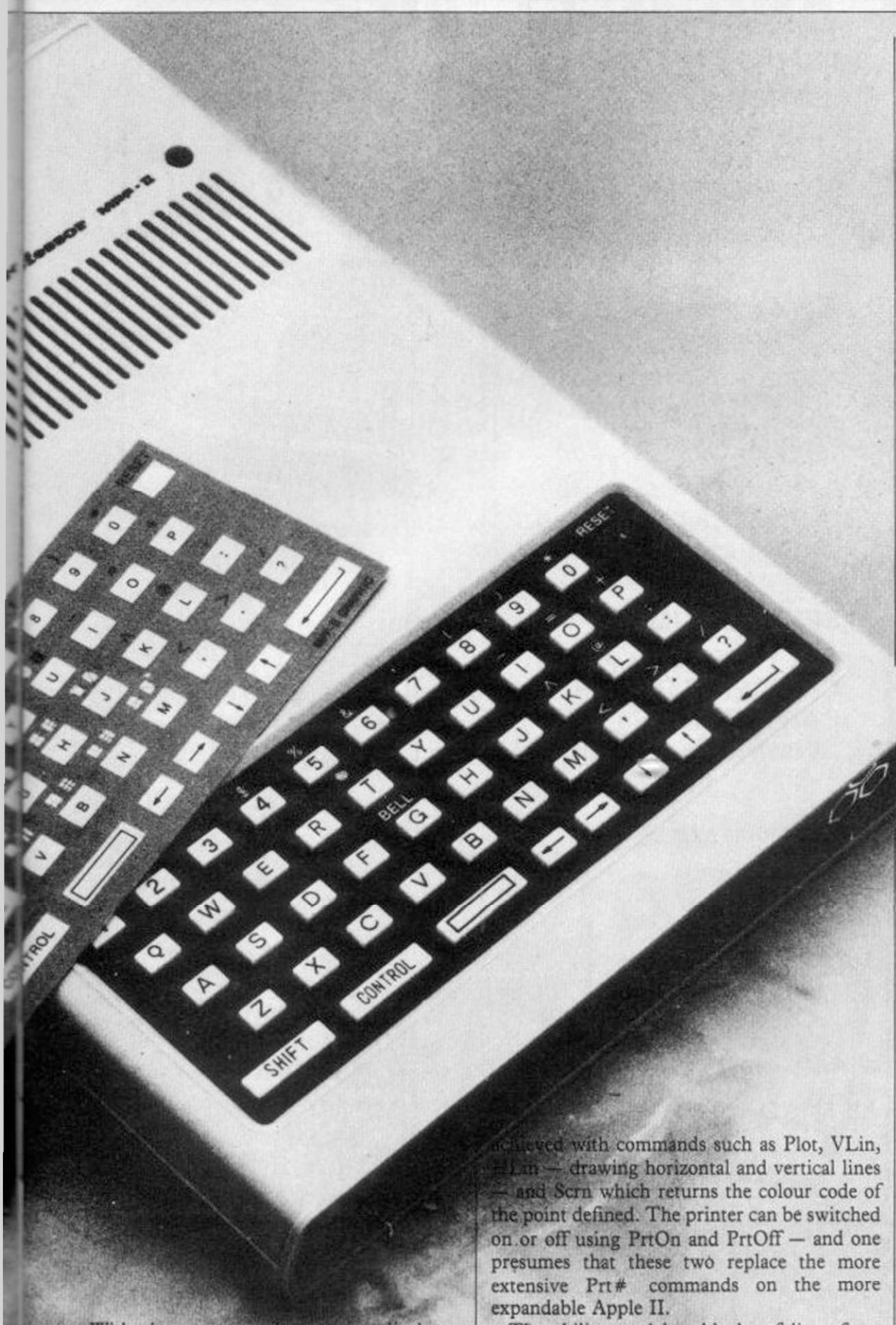
The MPF-II's Basic is excellent and, as stated, virtually identical to Applesoft. It may well represent the most powerful Basic available with a machine which costs less than £200. Table 1 gives a list of the key-words.

Capacity for graphics

Although the MPF-II can use only six colours, it can plot them in even the highest resolution. This is in contrast to all the other sub-£200 computers on the market which either limit the number of colours available in the high-resolution mode to two, or only allow definition of colour by character squares — for example, the Spectrum.

The MPF-II is thus capable of very good colour graphics in a limited range of colours. This is enhanced by an excellent facility — again, as offered on Apples — to be able to draw shape tables in memory using Draw, XDraw, Rot, Scale and SHLoad.





With these commands you can display a defined shape in memory on the screen, either as it was written into memory, or scaled up or down, or rotated through a given number of degrees, or drawn in the complement colour — XDraw. In addition it is possible to load such shapes on to cassette or disc and recall them again — astounding abilities for such an inexpensive computer.

The Basic contains all the standard data and variable handling key-words along with such unusual but very useful commands as OnErr Goto — when an error occurs a Goto is executed — On Goto, and On Gosub. The two graphics resolutions are set by either GR for low resolution or HGR for high.

Drawing lines and plotting points are easily achieved with commands such as Plot, VLin, HLin — drawing horizontal and vertical lines — and Scrn which returns the colour code of the point defined. The printer can be switched on or off using PrtOn and PrtOff — and one presumes that these two replace the more extensive Prt# commands on the more expandable Apple II.

The ability to delete blocks of lines from programs using Del is welcome, but the Basic sadly lacks a renumber routine. Screen editing, Multitech claims, is possible by moving the cursor to the line on screen with an error and retyping it. However this full screen-editing facility did not seem to work on the review version.

A rather interesting plus for those used to other inexpensive microcomputers is the fact that like the Apple the MPF-II has a built-in monitor which can be Called from Basic. Once Called, memory locations and register situations are displayed. With simple one-key commands you can dissasemble any area of the memory map into 6502 mnemonics.

Hex dumps are also possible, and there is also a facility for testing areas of RAM for certain bytes, moving bytes in blocks to other locations, and reading and writing machine code to tape or disc. Multitech has included two such systems, one for its own system, and one compatible with the Apple II.

Although sound is clearly possible with the MPF-II, directions on using it are not given in the manual. The useful Diagnostic Nurse supplied with the MPF-II runs a check on most aspects of the machine, including a display of its sound capabilities, which are essentially duration and pitch variations. Like the Apple, the MPF-II has a Trace facility to aid debugging. Unlike the Apple II the MPF-II is not expandable, but it will soon have a disc drive, the speech-synthesis and sound-generation board mentioned earlier and Pascal and Forth. A Chinese-language unit has already been produced which allows Chinese-speaking users to work in the Dragon symbol system. Excellent plug-in ROM games are available, and the Invaders and Bridge provided with our system were of excellent quality. A £110 printer will also appear soon, producing 150 lines a minute in a 40-character-per-line format.

CHR$, ASC, LEFT$, RIGHT$, MID$, POKE, PEEK, WAIT, CALL, USR, HIMEN, LOMEN, LIST, LISTx,y, DELx,y, REM, INPUT, INPUT" ", GET, DATA, READ, RESTORE, LET, DEF FN, GOTO, GOSUB, IF-THEN, FOR-TO-STEP, RETURN, POP, ON GOTO, ON GOSUB, ONERR GOTO, GR, COLOR, PLOT, HLIN, VLIN, SCRN, HGR, HCOLOR, HPLOT, HPLOT TO, HGR2, SIN, COS, TAN, ATN, INT, RND, SGN, ABS, SQR, EXP, LOG, PRTON, PRTOFF, HC, CONTROL, MA, MP, LOADT, SAVET, LOADA, SAVEA, LOADD, SAVED, DRAW AT, XDRAW AT, ROT, SCALE, SHLOAD, SPEED, TAB, SPC, POS, HOME, NEW, CLEAR, FRE(0), DIM, VAL, STR$, TRACE.

Table 1. Key-words.

CONCLUSIONS

- The MPF-II offers excellent value at around £200.
- The fact that it is compatible with the Apple II means that an enormous amount of software is already available for it.
- It is the only £200 microcomputer with true high-resolution colour graphics, and offers a Basic which until now is to be found only on machines as expensive as the Apple II or a BBC Micro.
- The excellent idea of having the option of either single-key entry or normal entry of key-words should mean that the MPF-II satisfies everyone.
- It would make an excellent training machine, especially with its good, built-in monitor, but also a good home computer for the game player or a low-cost computer for the small businessman.
- Clearly, anyone who has been attracted by the Apple's facilities but not by its price will seriously consider this micro as an inexpensive alternative. ■

COME AND MEET VIC
AT YOUR NORTH LONDON VIC CENTRE

SALE — VIDEO GENIE — SALE

EG3003	£240.00	EG400	£195.00
GENIE I	£269.00	EG3020	£35.00
GENIE II	£269.00	EG3022	£55.00
EG3014	£185.00	EG3015	£85.00

VIC SINGLE FLOPPY DISK

* 174K Byte Storage
* Direct Interface to VIC
* Direct Compatibility with printer

ONLY £335.00

VIC CASSETTE DECK

* Direct Interface to VIC
* Tape Counter

ONLY £34.00

supplied with Free cassette with 6 Programmes

VIC EXPANSION UNIT

★ 7 Slot expansion board, for: extra memory, Programming, Games, etc.

★ Modulator Holder

★ Enclosed Power Supply

EXPANSION UNIT with LID ONLY £85.00

**** SPECIAL SUMMER OFFER ****
EXPANSION UNIT WITH LID AND MACHINE CODE MONITOR CARTRIDGE **ONLY £100.00**

VIC 20 COMPUTER

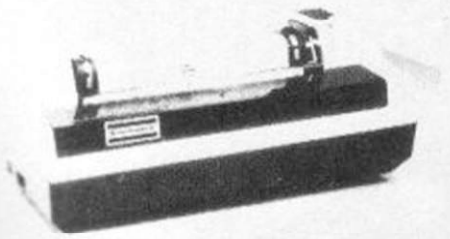
* A Typewriter Keyboard.
* 5K memory-expandable to 29.5K.
* 8 programmable function keys.
* High resolution graphics
* Music in three voices and three octaves, as well as sound effects
* Eight border colours and sixteen screen colours

**** SPECIAL SUMMER OFFER ****
ONLY £165.00 + FREE CHOICE OF GAMES CARTRIDGES (Worth over £17.00)

SALE —UK101 KITS— SALE

P.P.I.	£19.95	Colour
Prog. Sound	£19.95	£59.95
P108 Eprom	£19.95	Memory
JI Expand	£ 9.95	£79.95

VIC PRINTER



* 80 characters per line
* 30 characters per sec
* Dot Matrix printer
* Tractor Feed

ONLY £185.00

CARTRIDGES

8K Memory **£34.00**

16K Memory **£56.00**

Programmers Aid **ONLY £27.50**

Super Expander High Resolution graphics with 3K RAM **ONLY £27.50**

*** SPECIAL SUMMER OFFER ***
MACHINE CODE MONITOR ONLY £25.00

TERMS OF BUSINESS

Please add 15% VAT to all Prices. Deliver charged at Cost. Prices valid for coverdate of this magazine. Phone or Send your Order **TODAY** using

ACCESS OR BARCLAYCARD

Please send me a copy of your '**VIC LIST**' containing Software, Hardware and Books for the VIC 20

NAME _____

ADDRESS _____

_____

YC

CHROMASONIC electronics

48 JUNCTION ROAD, ARCHWAY, LONDON N19 5RD 100 yds FROM ARCHWAY STATION TEL: 01-263 9493/01-263 9495 TELEX: 22568. .

STONECHIP ELECTRONICS

NEW!

PRODUCTS FOR VIC-20, SPECTRUM, ZX81

ZX81 USERS
THE ZX-PANDA

UNIQUELY EXPANDABLE 16K RAM PACK

EXPANDABLE INTERNALLY BY PLUG-IN MODULE TO FULL 32K
ATTRACTIVE CUSTOM MADE CASE CONTOURED TO REAR OF ZX81 FOR MAXIMUM STABILITY
COMPACT SIZE. LED POWER INDICATOR
COMPATIBLE WITH MOST EXPANSION SYSTEMS

ZX-PANDA	16K EXPANDABLE RAM	£25.00
ZX-PANDA	16K EXPANSION MODULE	£19.95

OR FULL 32K EXPANDED

GIANT PANDA £39.95

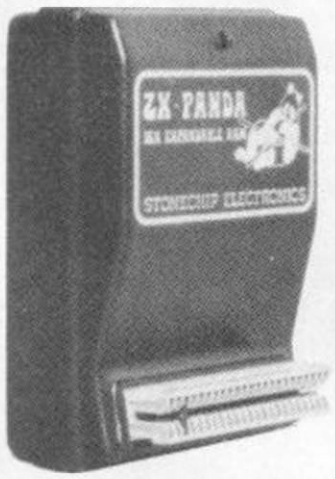
VIC-20 OWNERS

Fully Assembled, Cased and Guaranteed

MASSIVE 16K RAM MEMORY EXPANSION

PLUGS DIRECTLY INTO YOUR VIC-20 OR MOTHERBOARD

£39.95



EXPAND YOUR VIC-20 WITH

Tandem

3+1 EXPANSION UNIT
FOR USE WITH MEMORY AND GAMES CARTRIDGES
MORE THAN 1 UNIT CAN BE USED IN TANDEM TO GIVE EVEN MORE EXPANSION
INCLUDES ROM SOCKET
PLUGS DIRECTLY INTO YOUR VIC-20 EXPANSION PORT
ATTRACTIVELY CASED

£34.95

ZX SPECTRUM OWNERS
SPECTRUM ECHO

MAKE FULL USE OF YOUR SPECTRUM'S SOUND FACILITY BY AMPLIFYING IT! ENABLES LOADING AND SAVING TO TAPE WITHOUT SWITCHING LEADS
NO ADDITIONAL POWER SUPPLY REQUIRED
OTHER FEATURES INCLUDE:

* TONE AND VOLUME CONTROL
* AUDIBLE CUEING FACILITY
* DIN COMPATIBILITY
* ATTRACTIVELY CASED

£23.50

PLEASE SEND ME: .....

.....

.....

I enclose £ .....

NAME .....

ADDRESS .....

.....

.....

YC10

Send now to:

STONECHIP ELECTRONICS,
UNIT 4, HOSKINS PLACE, WATCHETTS RD, CAMBERLEY,
SURREY. TEL: (0276) 681131

MAKE CHEQUES OR P.O.'s PAYABLE TO: STONECHIP LTD

ALL PRODUCTS FULLY ASSEMBLED, TESTED AND GUARANTEED
ALL PRICES FULLY INCLUSIVE
ALLOW 28 DAYS DELIVERY

COMMO 64

The 64's strong selling point is its memory capacity, but — as Simon Beesley discovers — its other features all conspire to make it something of a force to be reckoned with.

THE VIC-20'S STOCK has fallen slightly since it first went on sale last autumn. At the time it was welcomed as the only computer under £200 with colour and sound. Now it seems overshadowed by a number of competitors which offer more features at an equivalent price.

People tend to point to the Vic's limited memory capacity — only 3.5K — or its constricted screen layout of 22 columns by 23 rows, and belittle its strong characteristics as secondary features. But such secondary features as well-spaced and robust keys, or a good screen editor assume great importance for anyone who spends much time programming.

Improved screen size

The Commodore-64 remedies most of the Vic's shortcomings, while maintaining its virtues. The keyboard layout is the same and, apart from its beige colour, the casing has the same size and appearance. An extra games socket supplements the number of ports available on the Vic. These allow attachments to cassette, disc drive, program and games cartridges. A user port which will take a Z-80 cartridge to give the 64 access to CP/M software is also included. The VicModem, RS-232 and IEEE interface cartridges can also be plugged in.

Memory capacity and screen size are two areas in which the Commodore-64 improves on the Vic. 64K RAM is on board, of which 38K is available for Basic programs. The screen format gives 25 rows of 40 characters. Like the Vic, there is a choice of 16 colours and two character sets which include predefined graphic characters.

Commodore micros score highly for the ease with which one can change character sets, select graphic characters and alter the text or graphic colour. All this can be done through a combination of control and colour or graphic keys. Compare this with the laborious business of keying in a VDU command on the BBC Micro to change colour.

Easy to set up displays

Setting the background and border colours is equally convenient and just requires Poking a value into a single memory location. Multicolour mode on the Vic and the 64 enables you to use four colours within a single character space but is really only suitable for user-defined characters. Extended Colour Mode on the 64 is a new and more useful feature, which allows you to choose one of four colours for the background to a single character. The drawback is that only the first 64 characters can be used in this mode.

The 64 runs the same Basic as the Vic, itself more or less the same as Pet Basic. Programs should be transferable from other machines with 40-column displays if Peek and Poke addresses are changed.

The attractive feature of this Basic is the convenient way that cursor and colour control characters can be entered into character strings in a Print statement. They determine the screen position and also the colour of the text or graphics that follow after — making the task of setting up the display in a program considerably easier than it is in other versions of the language.

In these and other respects the Commodore incorporates almost all the specifications of the Vic-20. But it would have to be more than just an expanded Vic to justify a price of nearly £350 including VAT. Sprite graphics and a powerful sound generator are the features which supply the difference and lift it into the BBC Micro class.

The sound facility is at least as extensive as the BBC Micro's and, arguably, easier to use. Rather than being embedded in sound and envelope commands, sound control is obtained by Poking values into specific memory locations. The 22 sound-memory locations allow you to define notes in up to three voices with a range of eight octaves. Each voice can be set to one of four wave-forms — triangle, sawtooth, pulse or noise. The attack and decay and sustain/release parameters affect the way the volume of a note develops and fades.

Like the BBC's generator, the sound facility approaches that of a full sound synthesiser. A fairly close simulation of instruments such as the piano and harpsichord can be achieved as well as a variety of sound effects — the sound of jet engines, gunshots, wind, surf, snare drums, cymbals are some of the possibilities mentioned in the provisional manuals.

Sprites are user-definable shapes which can be moved around a 320 by 200 dot screen. The term was coined by Atari which offers a

DORE

similar feature on its microcomputers. A sprite object is defined on a grid 24 dots wide and 21 dots long; up to eight of them can be controlled at a time.

Fun with sprites

The video-display chip handles the writing and deleting of the shape on the screen. All the user needs to do to move a sprite is Poke new X and Y co-ordinates into the sprite register.

It is also possible to expand sprites, change their colour, and make them pass behind or in front of other objects on the screen. Two locations in the register can be read to detect potential collisions between sprites or other background objects. Clearly sprite graphics will be useful for games applications, particularly since they can be displayed on the ordinary screen with many other text and graphic characters, as well as in the high-resolution mode. It is not difficult, for example, to program a flock of sprites to pass behind the lines of a program listing — a rather bizarre sight.

The ability to read the entire character generator from ROM into RAM is a boon to the Vic user which makes up for some of the machine's deficiencies and provides a limited high-resolution facility. Not only does the 64 share this flexibililty, but it also supplies a separate high-resolution mode. You can open a screen with a resolultion of 320 by 200, which is bit-mapped to an 8K screen and leaves 24K RAM available to the user.

But it is a little misleading of Commodore to claim that the standard 64 offers high-resolution graphics since the Basic does not contain any line or point-plotting commands. Poking to screen memory would indeed light up a pixel; but locating a single dot on the screen is complicated by the fact that the bits in memory correspond to eight by eight blocks rather than successive rows of dots.

Promise for the future

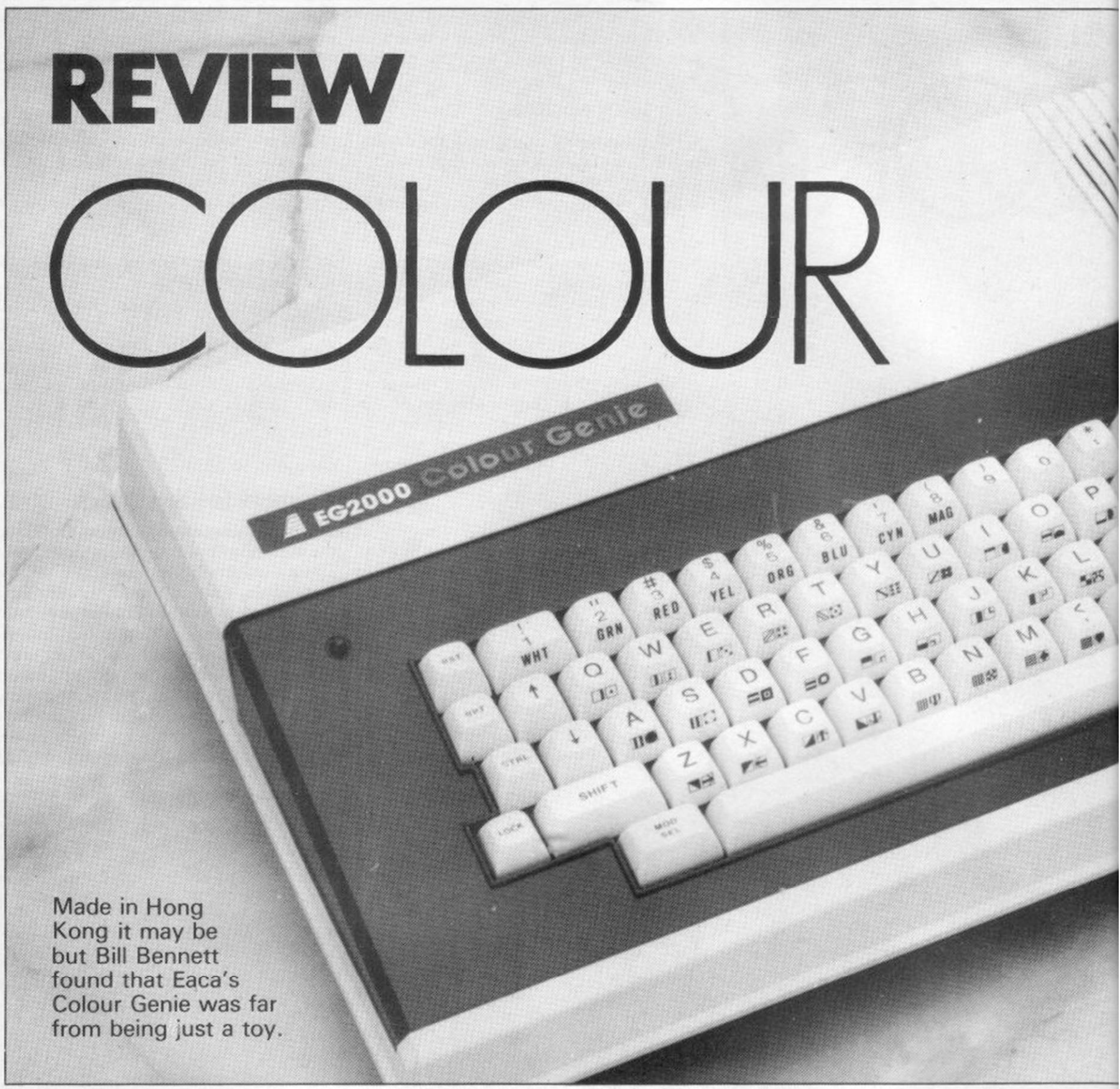
A true high-resolution plotting facility on this machine will have to wait for the arrival of a language, which supplies commands like Plot, Circle, and Paint. Such a language is Simons Basic, which will furnish the resident Basic with refinements such as If-Then-Else, definable procedures and error-trapping found in more advanced Basics. This development will enable full use of the 64's ample memory capacity — 38K user RAM. One of the eight other possible memory configurations releases 52K for machine code or other languages. ■

CONCLUSIONS

- The addition of sprite graphics, high-resolution mode and a very effective sound generator to the Vic's specification make the 64 a very different, far more powerful and versatile machine.
- Like the Vic, the 64 will profit from a large range of cartridge-based software — as much of it for business applications as for games.
- It will be able to take advantage of much of the software and accessories for the Pet and the Vic, while cartridges for the Max — also known as the Vic-10 — are compatible with the 64.
- The 64 is let down by a rather limited Basic. The forthcoming Simons Basic should make good this failing, although it will up the price by at least £50.
- In respect of its other features the 64 is an excellent machine which can be highly recommended.

REVIEW

COLOUR



Made in Hong Kong it may be but Bill Bennett found that Eaca's Colour Genie was far from being just a toy.

THE COLOUR GENIE bears a passing resemblance to the Commodore Vic-20. It is a little larger, and a fair bit heavier. It has a two-tone brown plastic case, moulded in two halves, and a column of function keys down the right-hand side of the keyboard.

The main alphanumeric keyboard is of typewriter quality and is laid out in the time honoured QWERTY fashion, with the numerics in a row above the alphabet keys.

Keyboard features

The alphabet keys have pairs of graphics characters printed on their fronts. These are accessible via the keyboard and include lines, squiggles and crosses, as well as six dice-face characters and the symbols of the four playing-card suits.

The break keys, labelled RST, are at the two extremes of the numeric row and must be operated as a pair. The first eight numeric keys can be used to change the low-resolution colour by hitting Control followed by the desired colour key.

The Control key can access colours and graphic characters. The Mod SEL key on the bottom row can change the display into the high-resolution mode, when used in conjunction with the Control key.

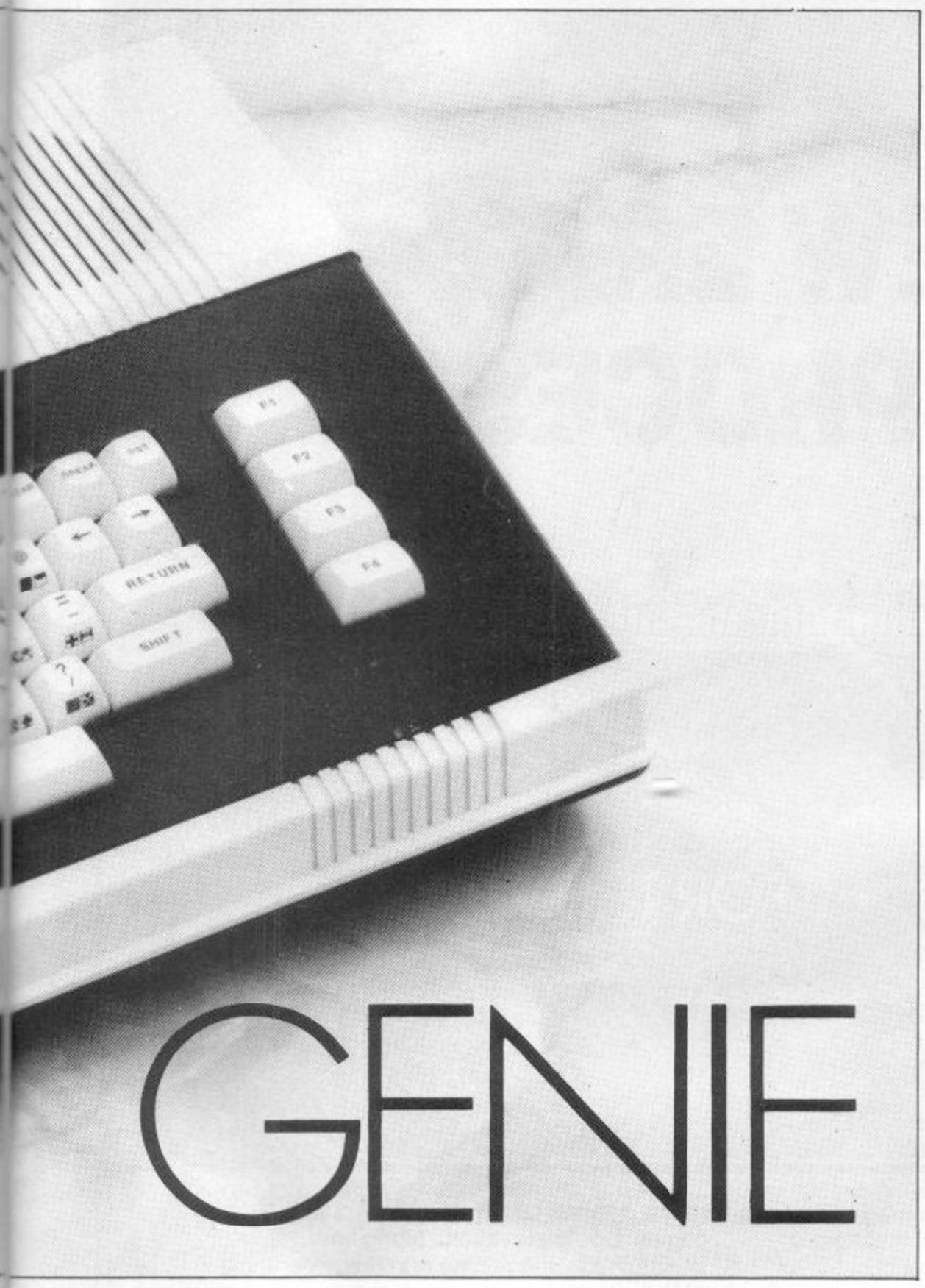
There are several ports around the side and rear of the Genie. The first port on the right-hand side is the parallel port. This is normally used to connect the Genie to a fast printer; however it could be used to interface with a floppy-disc unit. There is a DIN-plug socket for a light-pen, and another DIN-plug socket next to this for the serial port. It could not look much less like an RS-232 socket, and the way in which it works is not revealed by the pre-release manual.

The cassette input/output port is on the rear of the Genie, next to a cartridge port similar to the cartridge ports on the Dragon-32 and Vic-20. Whether or not there are any cartridges to fit it is another matter. Further along the back are two sockets: one audio and one a video-monitor socket.

The Genie costs £199.53 including VAT, thus placing itself in the most competitive sector of the home-computer market. Its real keyboard will attract the kind of user who would never buy a ZX Spectrum, and the machine is undoubtedly more powerful than the Vic-20. There are a number of other machines under £200 including the Dragon-32, the Atari and the Texas 99/4.

A competitive micro

The Atari, with its touch-sensitive keyboard, will appeal to a totally different type of user, and so cannot be considered as a rival. The Texas has only a small memory and so would appeal to yet a different kind of user, which



leaves us ironically with the Dragon. Ironic because the Dragon uses an almost identical version of Basic, and has some similar shortcomings in its colour.

The Dragon, moreover, has more memory and better graphics, but the Genie beats the Dragon hands-down as far as its sound generation facilities are concerned.

If you are a budding artist or animator the Dragon will be for you; however if you think that sounding like Depeche Mode or Kraftwerk is your idea of fun then it has to be the Genie.

The Genie's processor is the ubiquitous Z-80, running at a heady 2.2MHz. This makes it relatively fast, especially when compared to other Z-80-based micros that have colour. It would appear that the colour chips are the same as the Dragon and the Tandy Colour computer, but that is not definite.

The Colour Genie features an extended version of the Basic language. It is a very powerful implementation. Although there is only 16K of ROM, all the usual Basic commands are included as well as a number of extra commands which handle the graphics and sound capabilities of the Genie. There are also a number of extra editing commands — not really part of Basic — which make the programmer's life easier.

Language differences

However, there are inconsistencies contained within the Interpreter. For example; in the low-resolution mode, the command for defining the colour of a character to be printed is Colour, the English spelling. This is interesting because in the high-resolution mode, the command to set the colour at a point is Fcolor. On the whole, the Basic reminded me of Tandy Level II; hardly surprising, since the original Video Genie uses that dialect. The differences between the two languages are mainly in the extra graphics and sound commands. Tandy commands Set, Reset and Point are not included, since their function is made redundant by the high-resolution commands.

Although a user can enter any software written in the Tandy Basic, and run it, it is not possible to load Tandy cassettes. This is because signals are stored differently on the different machines.

The command to load a program from cassette is CLoad, or to load a specific program CLoad "program name". Twin stars then appear in the top right-hand corner of the screen. One of the stars remains constant, the other flashes. These flashes indicate that the computer has read in a particular character — most likely carriage return. If the twin star on the right does not flicker, then the cassette is not being read, and you know you have to start again.

The Edit facility is certainly useful, though difficult to use at first. The real advantage comes when debugging.

The Auto command means that the programmer does not have to keep entering line numbers. Programmers used to more expensive machines with Microsoft Basic will love the Genie.

Special commands

Commands available on the Genie which may be unfamiliar are: Char, which enables a special user-defined character set; Verify, which compares a program on tape with that in memory; System, which takes the user into the monitor program; Tron and Troff, a trace facility which prints out line numbers as lines are executed.

DefDBL defines as double-precision all variables beginning with a certain letter; similar commands define integer variables, single-precision, strings and arrays. Two useful features include Error which simulates an error and On Error Goto, which means the program does not necessarily crash if something is amiss. A number of unfamiliar functions, mainly dealing with double-precision variables, are also available.

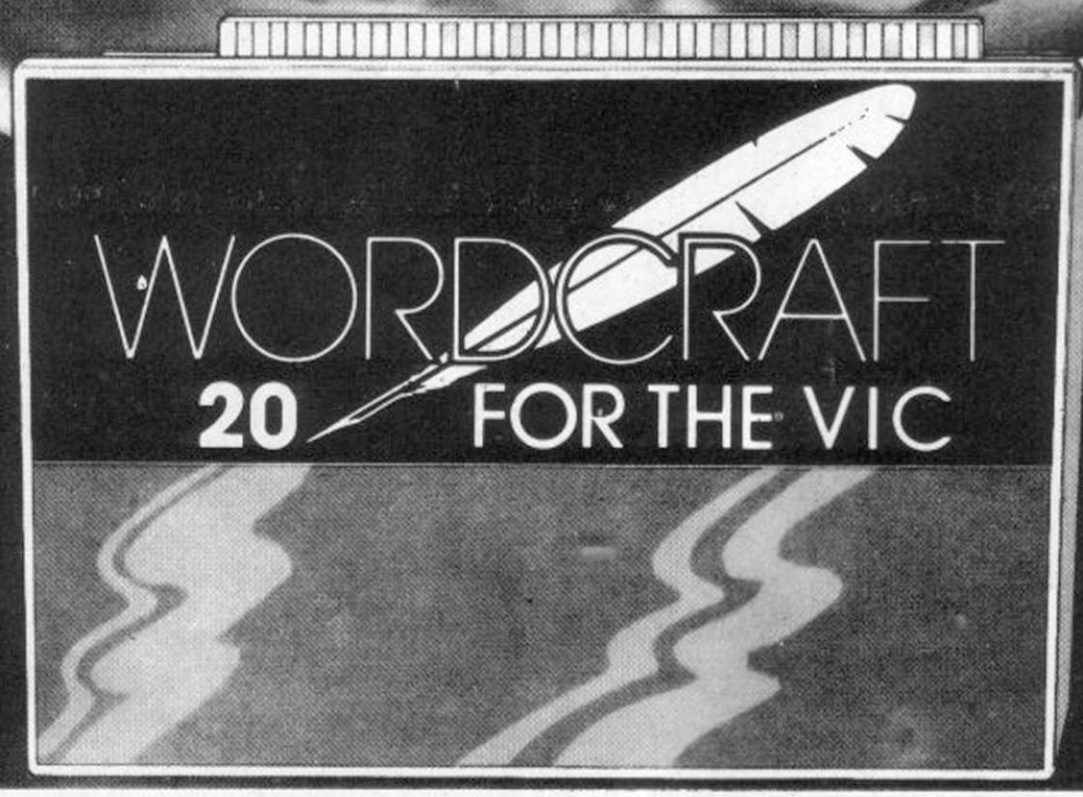
A special command is included to cope with a joystick. It returns a number giving a co-ordinate of its position. Maybe the most interesting command included in the Genie is Sound. I say maybe, because the pre-production documentation only hints that "the Sound command tells the music generator what combination of notes to play".

The music generated by the Genie is reasonably good; more to the point, the software makes it easy to use. The Play command is followed by four parameters, channel, octave, note and amplitude. My only criticism is that the user cannot specify the duration. ■

CONCLUSIONS

- The implementation of Basic and the musical facilities on the Colour Genie are as powerful as any to be found in this price range.
- The colour is a bit of a disappointment, but no worse than many competing machines. The resolution is not as high as it might be.
- A fine, but unremarkable machine.

A NEW ERA OF WORD PROCESSING



The introduction of Wordcraft 20 for the VIC brings the benefits and advantages of full scale word processing directly to the general public.
Until now only the business world could afford word processing systems but this amazing price breakthrough makes it available to everyone.
Wordcraft 20 comes on a cartridge ready to plug into the back of the VIC. Included in the cartridge is an extra 8K of RAM that is also available for use with other programs – so not only do you get a word processor but you also get a memory expansion thrown in. The system also comes with complete documentation catering both for the inexperienced user and for those already familiar with Wordcraft 80.
Just look at these features:

★ Full use of colour and sound.
★ Full compatibility with VIC 1515 printer, parallel printers or RS232C serial printers.
★ Full control over margins, document width, tab stops, decimal tabs, justified output, multiple copies. Complete control of the final output.
★ Automatic underlining and emboldening.
★ Full screen display with automatic paging.
★ Full storage and retrieval facilities from disk and tape.
★ Full compatibility with Wordcraft 80.
★ Name and address capabilities – including labels.
★ Full document merging facilities.

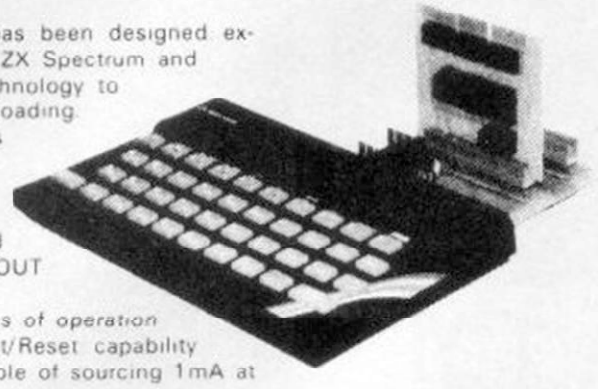
Wordcraft 20. The package that the VIC user has been waiting for. A word processor of proven quality at a low price.
For the first time ever, every home can have one.

audiogenic LTD

Wordcraft 20: £125.00 inc. VAT and p&p. Available from all VIC dealers or direct from Audiogenic Ltd. PO Box 88, Reading, Berks. Tel: 0724 586334.
Wordcraft 20 is copyright P.L. Dowson 1982.

ZX SPECTRUM HARDWARE

24 line programmable Input/Output Port



This new port has been designed exclusively for the ZX Spectrum and utilises MOS technology to minimise bus loading. The main features are:

- 3 x 8 bit ports
- Port mapped using IN and OUT commands
- 3 basic modes of operation
- Direct Bit Set/Reset capability
- Outputs capable of sourcing 1mA at 1.5 volts
- Access via 3 x 16 pin DIL sockets **and** 28 way edge connector

The port is available fully built together with a set of detailed instructions and suggested control applications. The port can either be used with our new Motherboard thus allowing a further card to be used, or with a stackable connector. Either way, it means that Micro-Drives, Printers etc. will run happily with the port.

ZX Spectrum PPI Port **£16.50**
ZX 2 Slot Motherboard **£16.95**
ZX Stackable Connector **£5.50**

The prices are inclusive of VAT but postage must be added at 70 pence for a single item (100 pence for 2 or more items).

Please note that we shall continue to support the ZX81 and that we also offer a 16 bit port for the 81 based on a Z80A PIO at £15.50 inc.

ZX81 Klik-Keyboard

This is a full, forty key, moving keyboard which fits into the recess left after peeling off the existing 'touch-sensitive' keypad. Consider the following advantages:

- Positive feedback from keys
- Fits onto the ZX81
- No trailing wires
- No special case needed
- Elegant design with two colour legends

The fully built keyboard requires *absolutely no soldering* since two flexible connectors plug into the ZX81 sockets. Alternatively, the keyboard is available as an easy to build kit at a considerable saving. Other ZX81 products available include a two-tone keyboard bleeper (fits inside the case) at £8.95 built, and a Repeat key kit at £3.95. Now available with 41 keys, the extra key can be used to give a repeat or reset facility £26.50 (built) £23.00 (kit).

Your Name and Address _____

_____

_____

Date

Quantity	Description	Unit Price	Amount	
	ZX81 Keyboard Kit	£22.50		
	ZX81 Keyboard Assembled	£26.00		
	ZX81 User I/O Port	£15.50		
	ZX Spectrum PPI Port	£16.50		
	ZX 2 Slot Motherboard	£16.95		
	ZX Stackable Connector	£5.50		
		Sub total		
		Carriage		70
		Total due		

Cheques/P.O. made payable to:
KEMPSTON ELECTRONICS
Please allow 21 days for delivery

YC10

KEMPSTON ELECTRONICS

60 Adamson Court, Hillgrounds Road,
Kempston, Beds MK42 8QZ

NEW! from **YOUR COMPUTER**

As a reader of *Your Computer* you'll agree that every issue is an invaluable reference.

To keep your copies in order you'll need a binder, specially designed for *Your Computer*, to ensure every issue remains in good condition for your future use.

To order your binder complete the coupon below and return it to us, with your cheque. Prices, including VAT, postage and packing, are as follows:

UK	£3.45
Europe	£4.00
Rest of the World	£5.00

To: **General Sales Manager, Room 108, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS, England.**

Please send me.....*Your Computer* binders at £.....each.

I enclose my cheque/postal order for £.....made payable to IPC Business Press Ltd.

Name.....

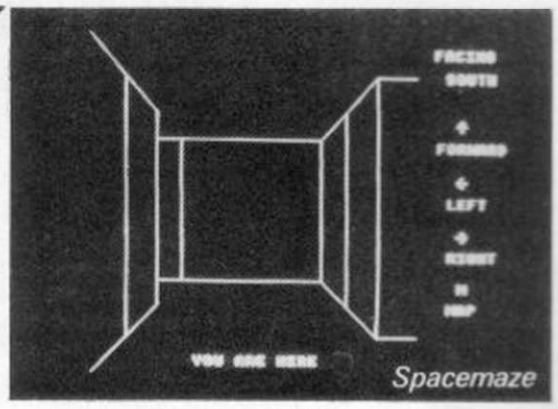
Address.....

.....

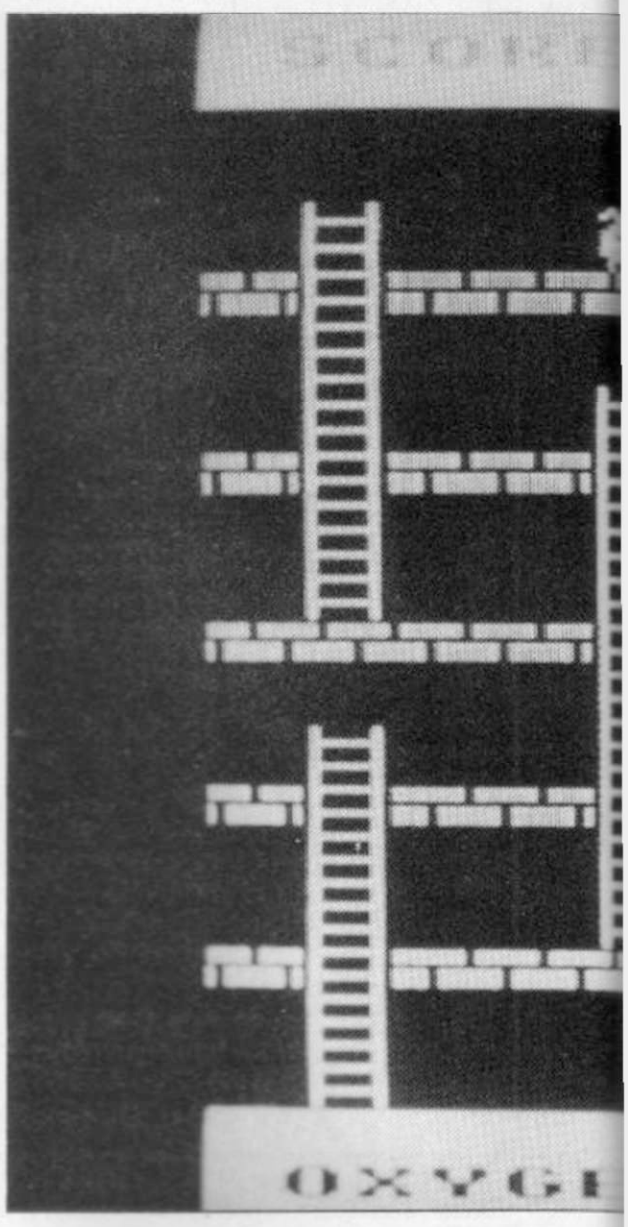
.....

SURVEY

BBC SOFTWARE



Spacemaze



Does the BBC need to do anything about the entertainment quality of its programs? Simon Beesley casts a critical eye over the first batch of would-be VDU stars now emerging from various software stables.

GIVEN THE BBC Microcomputer's extensive graphics and sound facilities it was reasonable to expect from this first batch of programs some high quality software — superior, at least, to what is available for other less well-endowed machines. As it is, only a handful of these programs fully exploit the BBC's potential.

Many of the programs under review were written in Basic and it is a mark of the speed of BBC's Basic interpreter that they are not noticeably slow. However, anyone using high-resolution graphics on the Model A has to fit their program into 6K, which is probably a little cramped if only Basic is used.

There were few problems loading from a cassette recorder specially adapted to the BBC's signal, but loading from a Ferguson recorder sometimes needed precise volume and tone adjustment. Programs are normally recorded at 1,200 baud but Beebug's cassettes contain a back-up copy at 300 baud. A & F will supply a 300 baud copy if problems are encountered.

A class of their own

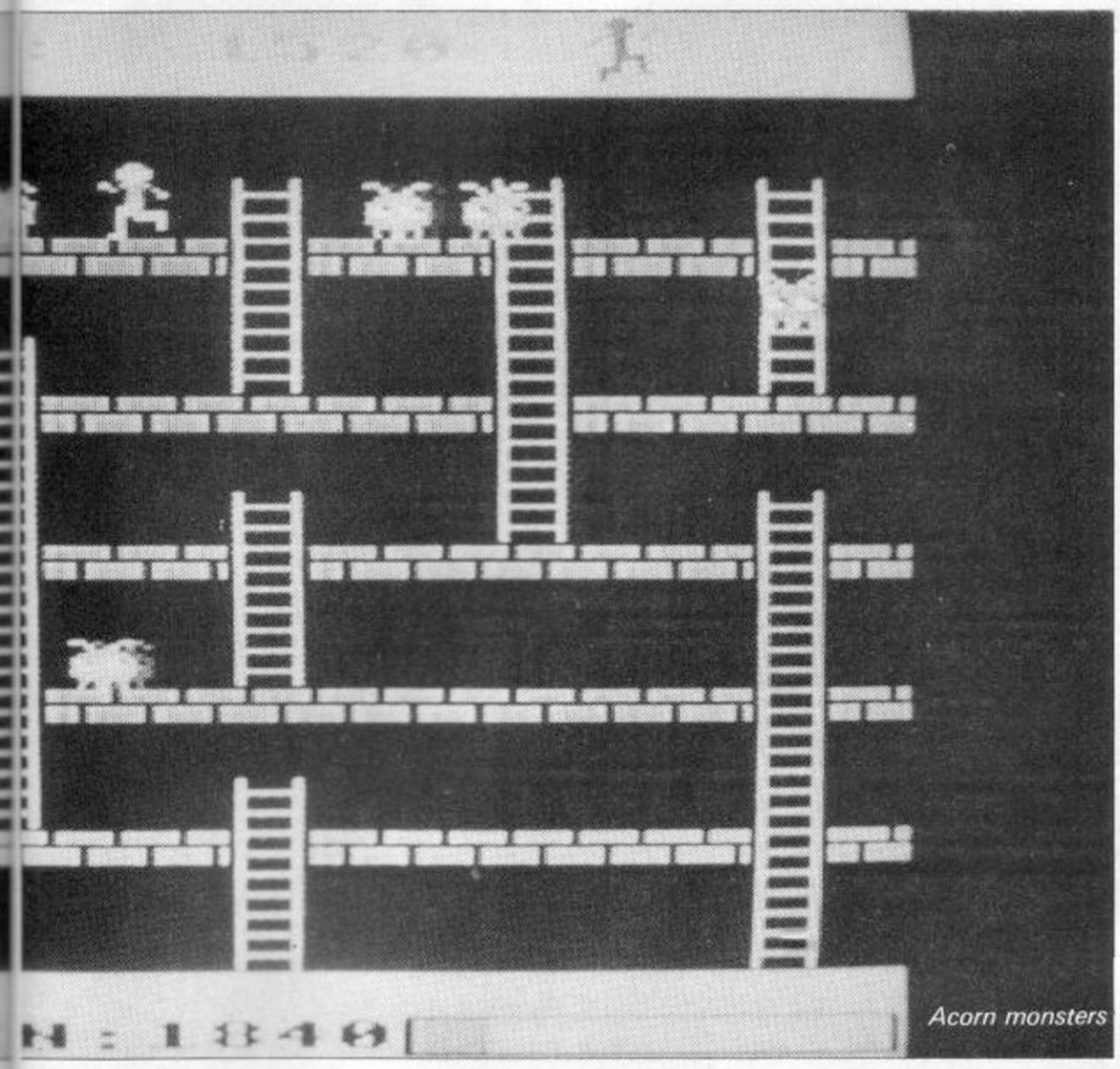
Acornsoft programs are almost in a class of their own. With their three games, Snapper, Defender and Monsters, they have faithfully reproduced every feature of the arcade originals. Unlike most other 32K programs, these need a 6522 VIA chip to be fitted, as well as a 16K memory expansion, before they can be run on a Model A.

Monsters requires the player to move his man up and down ladders and destroy the pursuing monsters — which look rather like mobile tomatoes — by digging holes and burying them. The speed of control response, sound effects and graphic detail are very impressive. Both Snapper, a Pac-Man-type game, and Defender achieve the same high standard of animation.

Defender involves piloting a spacecraft over a mountainous terrain and blasting successive waves of landers, mutants, baiters, pods, bombers and swarmers in an attempt to rescue humanoids. This is a demanding task since the action is very fast and is free from the jerkiness common to some computer games which try to achieve a number of different animated effects simultaneously.

Philosopher's Quest is an absorbing 32K text adventure game. If the reviewer's experience is typical, finding the correct route, avoiding traps, deciphering clues and returning with all the treasure could be a lengthy process. The program allows you to save a housekeeping file, which keeps a record of

Company	Game	Size	Price
Program Power	Tirnetrek	32K	£7.95
8/8A Regent Street	Spacemaze	32K	£3.95
Chapel Allerton	Munchyman	16K	£3.95
Leeds LS7 4PE	Chess	16K	£4.95
	Gomoku	16K	£2.95
	Disassembler	16K	£3.95
Acornsoft	Snapper	32K	£9.95
4A Market Hill	Monsters	32K	£9.95
Cambridge CB2 3NJ	Philosopher's Quest	32K	£9.95
	Defender	32K	£9.95
	Desk Diary	16K	£9.95
	Peeko-Computer	16K	£9.95
Beebug Software	Games 1	32K	£2.50
375 Wandsworth Road	Games 2	16K	£2.50
London SW8 4TE	Utilities 1	32K	£2.50
(only available to members)			
Bugbyte Software	Polaris	32K	£8
Freepost	Beebgammon	16K	£8
Liverpool L3 3AB	Golf	32K	£7
Personal Computers	Golf	32K	£8
20 Wellington Square	Monster Maze	32K	£6
Ayr KA7 1HB			
IJK Software	Cassette 1	16K	£5.95
55 Fitzroy Road	Startrek, Candyfloss		
Bispham	Cassette 2	16K	£3.95
Blackpool	Breakout	16K	£3.95
	Beebmunch	32K	£5.95
	Super Hangman	32K	£3.95
	3D Maze	32K	£3.95
	Mutant Invaders	16K	£5.95
	Invaders	16K	£4.95
A & F Software	Roadrunner	32K	£6
830 Hyde Road	Tower of Alos	32K	£6
Gorton	Lunar Lander	32K	£6
Manchester	Early Warning	32K	£6



Acorn monsters

your position, rather than start afresh each game. As a last resort you can send Acornsoft a post card for specific hints for "those who are totally baffled".

Loading a file of addresses from tape rather than flipping through an address book seems a little pointless. But if you want to maximise your involvement with your computer Acornsoft's Desk Diary might appeal. As well as an address file the cassette contains a day to day planner with a real-time alarm. Keep the program running long enough and it can tell you when it is time to pay your electricity bill. Peeko-Computer simulates the workings of a simplified microprocessor. 80 single-byte memory locations are depicted with their contents. By using the cursor you can enter any one of 20 machine-code instructions drawn from the 6502 set.

Machine-code introduction

A program can then be run step by step while the changing contents of the memory locations and registers are displayed. Accompanied by an instruction booklet, this is a useful and unusual introduction to the principles of machine-code programming.

Two drawbacks attach to Acornsoft's products. At £9.95 they are fairly expensive, and they are not readily available. In the best Acorn tradition, buyers have had to wait more than two months for delivery. Otherwise these programs — all of them nicely packaged and well documented — can be highly recommended.

Program Power's Munchyman only costs £3.95 and runs in 16K but looks crude in comparison with Acornsoft Snapper: the keys do not auto-repeat and the graphics are poor. The same fault flaws their 16K chess program, where the pieces are not clearly distinct.

Eldorado Gold is a 32K adventure game set in cowboy and Indian country. Although the conception is not as grand as in Philosopher's Quest, the text is enlivened at times by a small illustration. If you enjoy adventure games you will find this quite engrossing. The reviewer was driven in frustration to break into the program and look at the list of command words. In common with other adventure games the player is given a few commands at the start but has to discover the rest.

Gomoku is a competent version of the board game in which the winner must place five pieces in a row in any direction. Spacemaze takes too long to display new positions in its 3D maze but includes sliding doors and a colourful monster. However, these and Program Power's other two programs, Disassembler and Timetrek, hardly stretch the BBC's facilities.

Too many companies are serving up the same old fare: Munchyman, Invaders, 3D Maze, Breakout, Golf, this Trek and that Trek — the list could well be expanded. Whatever machine they are implemented on, these games usually have the same format. IJK's versions of these standards are better than most but lack inspiration.

On Cassette Two are six short games — Hangman, Dice, Grand National, Kryptogram, Music and Beetle — for 16K at £3.95. Like a Christmas stocking the interest lies in the variety rather than the quality.

Invaders is a remarkably fast adaptation of Space Invaders, which fits into 16K using teletext graphics and the Y and arrow characters as missiles.

Other cassettes include programs for Breakout, Munchyman, Startrek, 3D Maze and Super Hangman. Although not very sophisticated, they are reasonably satisfying. Super Hangman draws a rather gruesome gallows and victim, while 3D Maze has the merit of rapid scene changes.

Along with Acornsoft, Computer Concepts' programs stand out. Snake is one of the few games that genuinely deserves the adjective "addictive".

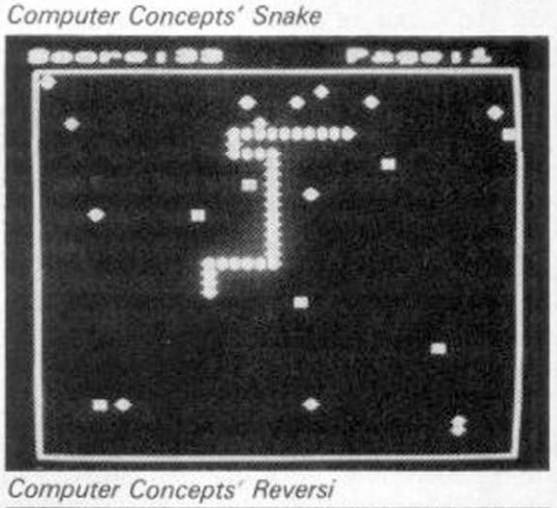
The object is to manoeuvre a snake around the screen, picking up segments which are added to its body. As the snake grows it moves faster and it becomes more difficult to avoid obstacles while the chance of colliding with the rear of the body increases.

Clearing the screen takes you on to a new layout, where the pace is even faster. This version is nicely done with several refinements such as the option of destroying obstacles with a laser, and appropriate sound effects.

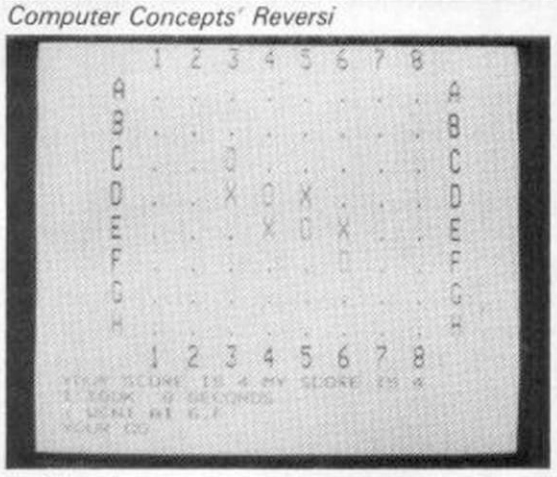
Sound Idea allows you to investigate the 18 parameters of the Sound and Envelope commands. New sounds can be heard by using the cursor keys to alter any parameter. The second part of the program lets the keys be

(continued on next page)

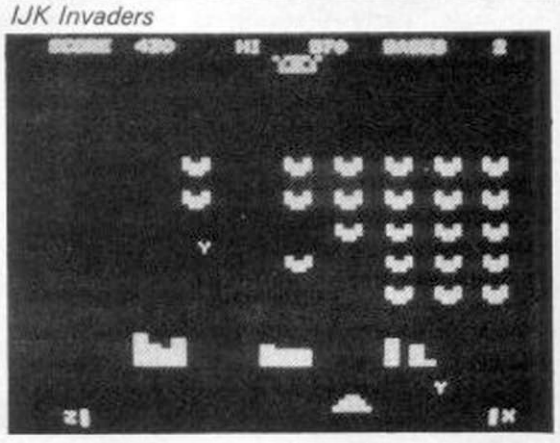
Computer Concepts' Snake

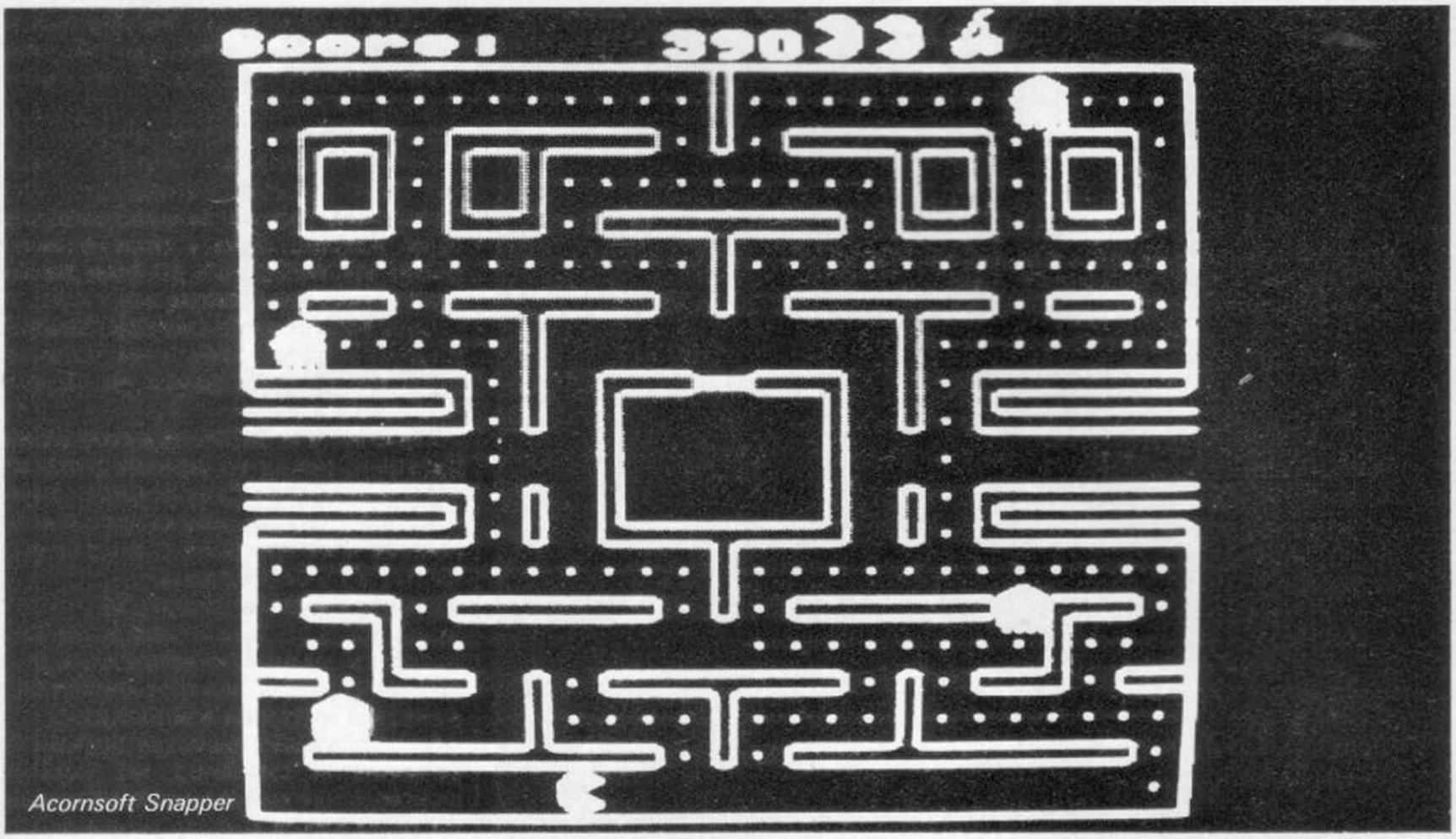


Computer Concepts' Reversi



IJK Invaders





Acornsoft Snapper

(continued from previous page)

played on as a musical keyboard using the pre-defined sound, or one of nine preset effects.

These are well-written programs, as are Reversi (also known as Othello) which plays a clearly set-out and hard-to-beat game, and Dissambler. A simulation of the Rubik Cube gives a 3D view of all sides and does all you might expect from it, but is probably only of interest to cubists. The other simulation of a one-armed bandit, Fruit Machine, could not be loaded from either cassette recorder.

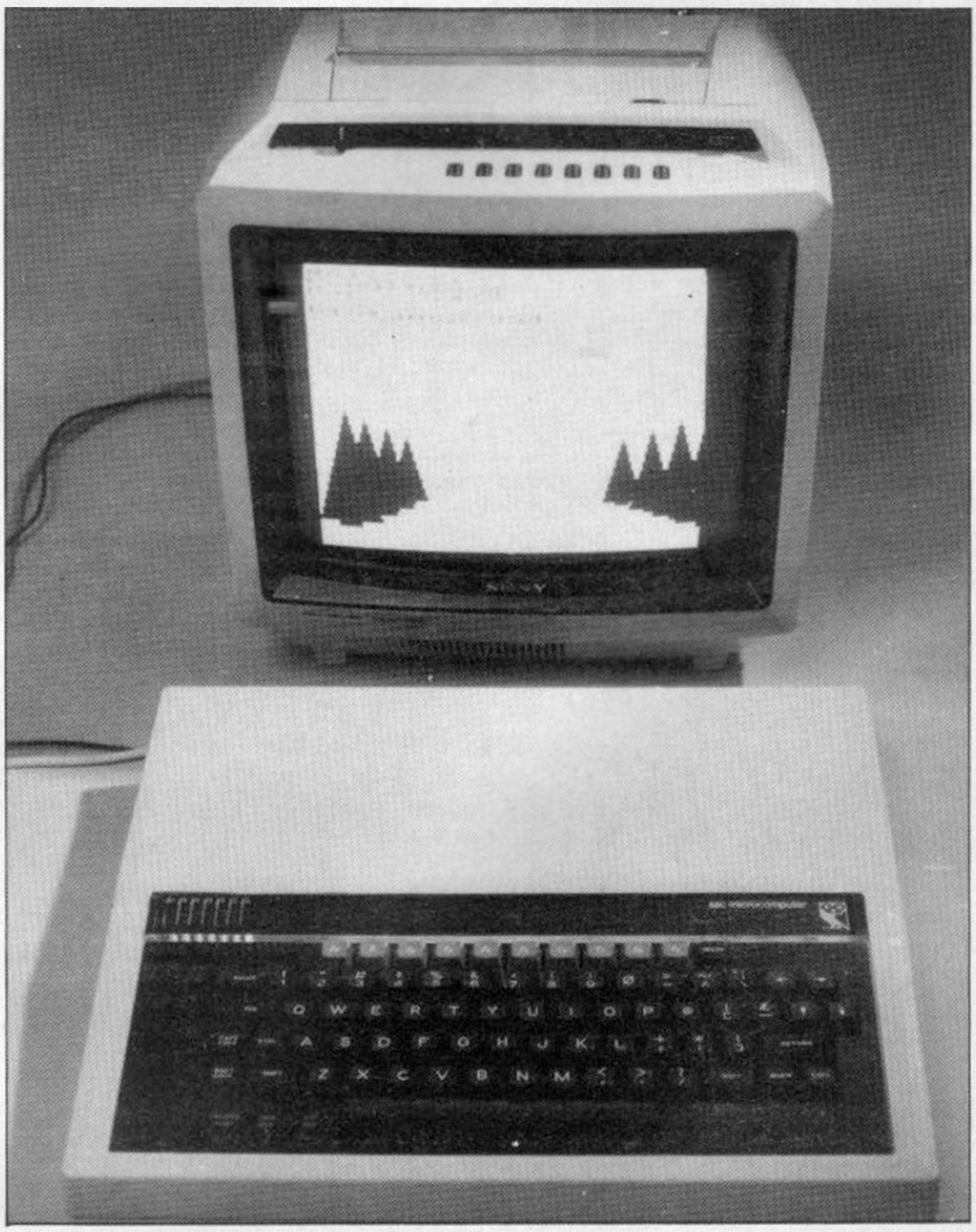
Software library

Beebug, the BBC's users' group, have launched their own software library available to members only. Their first four cassettes are good value at £2.50 each, particularly the utilities package, which contains a good dis-assembler, a character definer and a mini text-editor. The disassembler gives addresses in hex or decimal, 6502 mnemonics, machine code and ASCII characters if recognised.

Games 2 offers a moon lander game, which shows a vapour trail but no lander, and a nicely-displayed version of 3D noughts and crosses. Play on the Starfire program on Games 1 is confined to lining up your sights on enemy craft and firing; use of colour and sound, however, is excellent.

A & F's games are best described as adequate. Early Warning is a slow-moving version of Missile Command; Road Runner is a motorway version of Beebug's Polaris; in contrast, Lunar Lander is a slightly above-average treatment of this old favourite.

Their Tower of Alos makes more ambitious use of BBC's graphics. The player can move the £ character around two maps in a fairly complex game involving such items as dragons, castles, lizardmen and swordfights. Again, the game would have been greatly improved if these features had been shown in high-resolution graphics. ■



ATARI AT WORK

Silicon Chip Ltd. present the only business specialist software for the Atari 800 in the world

CHIPSOFT

Chipsoft Packages

Stock Control.....£149.95
Sales Ledger £149.95
Purchase Ledger. £149.95
Mail Shot £149.95
Payroll £149.95

Does your company have:

less than 100 employees?
less than 1000 stock lines?
less than 2600 sales transactions per month?
less than 2600 purchase transactions per month?

Do you have a need for a first class word processor and a mailing list that will merge?

If the answer is yes, Silicon Chip have the complete word processor package including daisy wheel printer and mailshot software package for under £1950+VAT.

For the Chipsoft Package a *unique* offer:

Silicon Chip have available a video cassette demonstrating our software for you to see at your leisure – for only £19.95*+£2.50 postage and packing.

*Refundable against return of video and purchase of software.

Please find enclosed £22.45 for copy of your video ☐

Please send me.....

Please tick	Software	Specification
	☐ Stock Control	☐
	☐ Sales Ledger	☐
	☐ Purchase Ledger	☐
	☐ Mail Shot	☐
	☐ Payroll	☐

Name .....
Access/Barclaycard No. .....
Address .....
.....
.....
Job Title .....
Company .....

All packages need a 48K Atari 800, two Atari 810 disk drives, 1 Atari 850 interface, printer and Micro Soft Basic.

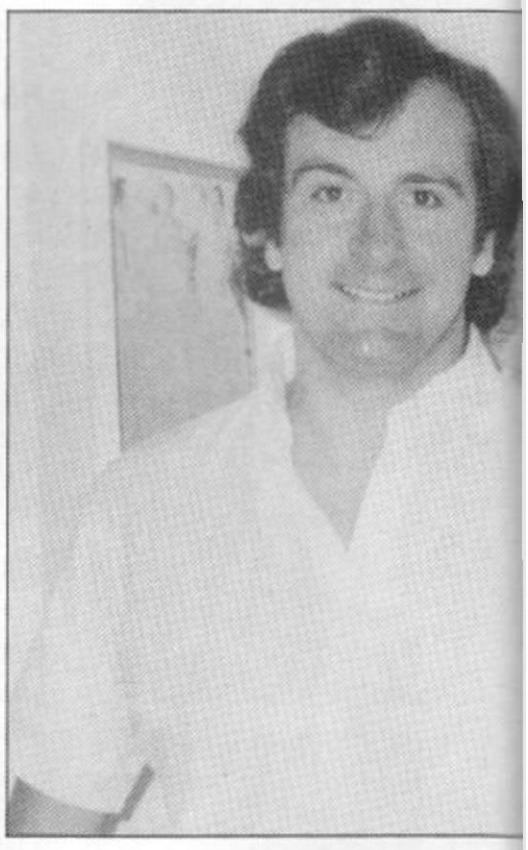
ALL AVAILABLE FROM

SILICON CHIP LTD.

302 HIGH STREET, SLOUGH, BERKSHIRE. TEL: 0753 70639

TECHNOLOG

Not many people could have made a personal computer into a star of stage, screen and television. But this is exactly what Douglas Adams did when he created *The Hitch-hiker's Guide to the Galaxy* — a hand-held electronic encyclo-aedia carrying a million pages of arcane information. His books chronicle the galactic wanderings of a bemused earthling. Meirion Jones asks Douglas Adams about life, the universe and everything.



HITCH

WHEN IT COMES to technology, Douglas Adams is about as single-minded as his two-headed fictional anti-hero Zaphod Beeblebrox.

On the one hand — or perhaps head — much of his fun is made at the expense of people who are easily impressed by the next box of silicon tricks. He refers to them in *The Hitch-hiker's Guide to the Galaxy* as "The ape-descended life-forms that were so amazingly primitive that they still thought digital watches were a pretty neat idea". On the other hand he admits to being fascinated by every technical innovation.

When he says that "the information and computer boom is going to make a fundamental difference to everything" he sounds more like an Information Technology Year hand-out than the creator of Marvin the Paranoid Android. So what is Douglas Adams trying to tell us about progress in general and computers in particular — are they a Godsend or a menace?

'We're interested in technology for its own sake'

"I don't think computers in general are a menace any more than hammers or saws are a menace — they are tools. A chainsaw in the hands of a lumberjack can be useful, but in the hands of someone who has just broken out of Broadmoor it's a different matter.

"I'm very interested in technology but I think we've reached the point of being interested in it for its own sake — we don't always compare the benefits of the technology with what we're putting up with to be able to use it. For instance, if you divide the number of miles the average American drives by the number of hours he either spends in or concerned with his car it comes out at roughly four miles an hour — and you can walk faster than that."

Adams concedes that cars and modern methods of transport have given people greater mobility but even that can have disadvantages: "The fact that we can travel much faster means that everywhere you go tends to be the same. Technology can be self-defeatng. It can also create new problems at the same time as it solves others. That perspective is behind a good deal of what I write.

"I was at Massachusetts Institute of Technology a year ago and they were showing me some research they were doing on video telephones. The main problem is the number of signals required for a television picture. You can either put a load of telephone calls down a wire or one call with a picture."

MIT had thought up a short cut using home computers: "They reckoned that everybody has a number of people they regularly speak to on the telephone. Therefore at your telephone you could have a small computer, storing video pictures of those people. When somebody rang you, a phonetic program would find the right picture and move the mouth in time with the words.

"They were very pleased with this compromise — after all, you could actually see a television picture of the person you were talking to. But if you look at that logically you'll see that this is not increasing communication — it is actually decreasing it.

"If you talk to somebody on the telephone your attention is concentrated on what they are saying. When you talk to somebody face to face or even on a television screen you get the message partly from their gestures and the expression on their face. But if you are seeing a picture which is not giving you any additional information the two impressions are totally contradictory.

"If someone rings up to say 'Oh God, I've just gone bankrupt' or 'My wife's run off' and you have this bright, smiling picture with the lips moving in an utterly grotesque way, it is not actually helping you to understand what the person is saying.

"The whole project is ludicrous and self-defeating but I couldn't get the researchers at MIT to understand that." Douglas Adams smiles as he glances around his flat which is a monument to the technical fetishism he has just been ridiculing. An Ansaphone, Entryphone and word processor poke out of a rubble of electronic executive toys.

Shamefacedly he admits "I sometimes get annoyed with myself — I'm a complete sucker for gadgets."

He waves a finger across the room over an abandoned psychiatrists couch, not to a chainsaw but to a yellowing Cambridge Footlights poster on the wall. "That's me in the turkey costume."

Douglas Adams started writing *The Hitch-hiker's Guide to the Galaxy* several unsuccessful years after he had first donned the turkey costume in the expectation of instant fame and fortune.

"I wanted to be a writer or performer in the same way the Monty Pythons are and therefore desperately wanted to go to Cambridge and get into the Footlights.

"While I was there I wrote, produced and performed in a number of reviews and when I left I rather expected that the world was going to beat a path to my door — which it absolutely refused to do.

"I started submitting bits and pieces for *Week Ending* on Radio 4 — but writing on the day to order was something I was hopelessly bad at so I was not making much of a living." At one stage some of Adams sketches were spotted by Graham Chapman of Monty Python. "We ended up writing together for nearly a year. I thought here I am, my big break — but it didn't work out. After directing a few shows on the Edinburgh fringe I realised I had done a lot of things without really getting anywhere.

"I was completely exhausted and utterly broke — couldn't pay the rent — could hardly pay the interest on my overdraft so I went home to Dorset and sat down to write *Hitch-hiker.*" The BBC accepted his script and Douglas Adams soon found himself in the radio comedy studio.

'Some of my best friends are pebbles'

"Nobody else knew how *Hitch-hiker* was supposed to go. So I had to sit behind the producer's shoulder annoying him. I would say precisely what I thought should be done and he would ignore me very thoroughly. We sat in the subterranean studio at the bottom of Regent Street — hours and hours poring over one sound effect in this cavern of a studio. You'd go completely crazy — every now and then you would emerge into the daylight, stuff yourself with a McDonalds and then disappear into the murky depths again."

When Douglas Adams thought up *The Hitch-hiker's Guide to the Galaxy* his idea of an electronic hand-held book containing a million pages of information was sheer fantasy. Five years on advances in home-computer technology have made it just a matter of time before his science fiction becomes science fact. "I bought *Encyclopaedia Britannica* the other day — and then saw that Sony is bringing out a computer with a video-disc interface which means you could put the whole encyclopaedia on one disc. That's very close to the technology of *The Guide* itself.

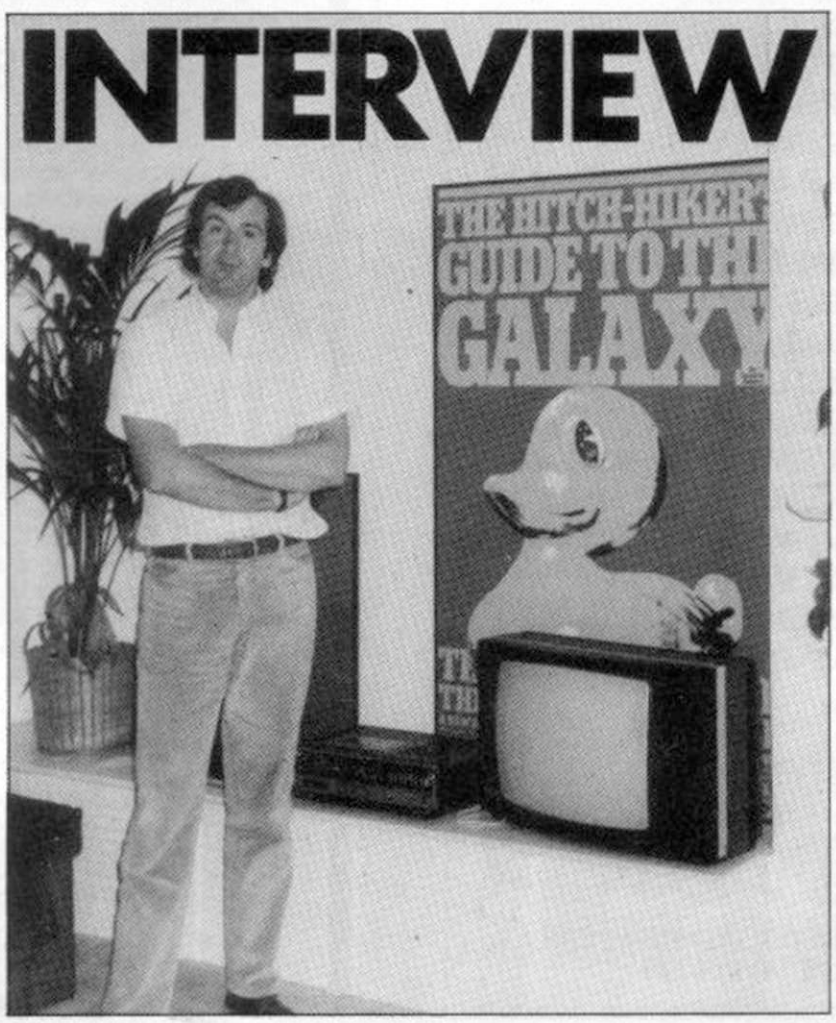
"On the one hand I get very excited by it all; on the other it does make me rather nervous. We are heading to a totally different world." A worried glance out of the window reveals that we are still seated comfortably in Islington north London, rather than hurtling towards a small planet somewhere in the vicinity of Betelgeuse.

"I don't think I'm in a very strong position to predict the future — I'm not Arthur C Clarke saying we're going to have communications satellites or whatever. Saying I write science fiction is like saying the

GICAL

H-HIKER

INTERVIEW



Nonetheless Douglas Adams denies that he is or ever has been a secret vegetarian despite a scene in *The Restaurant at the End of the Universe* which was enough to put the most hardened Beefeater off his meat.

"I'd heard a vegetarian talking about the extreme position — which is worrying about plants and about how they feel. Where do you go on from there — somebody is going to come along and say 'some of my best friends are pebbles' and you're in trouble — what are you going to eat in the end? The assumption behind all this is that people, things, animals, plants don't want to be eaten — that's what's actually holding you up. Turn the whole problem on its head — breed a cow or whatever it is that says 'Hey, come and eat me — I like it'."

Sure enough when Adams' celestial hitch-hikers visited the restaurant they found themselves confronted by a cow that not only invited them to eat it but also obligingly shot itself: "What was interesting for me was not the vegetarian issue but the solution — a piece of lateral thinking."

Likewise although Douglas Adams latest book *Life, the Universe and Everything* — concerns Arthur Dent's life-and-death struggle, against the natives of a distant planet called Krikkit, to regain the Ashes which they have stolen from Lord's he maintains "I am not a great cricket fan. I just came across an article about the history of the Ashes — a cricket stump which was burnt in Melbourne in 1882. I happened to read it in a daydreamy mood and it went from there. There was not deep significance to it. At school I had a career which was a sort of microcosm of Ian Botham's. At one stage I'd been playing fairly well — I was made captain of the house junior 2nd XI. It was a great moment for me — and I turned in a succession of ducks — this is where I suggest the parallel with Ian Botham. So I was relieved of the captaincy — unfortunately, there the parallel broke down because I continued to do very badly. I was terrible at all kinds of sports. It was one of those schools where if you're not any good at football or rugby you're made to feel rather stupid about it.

'I've been joking about computers for long enough'

From an early age Adams had been as prejudiced against computers as he had against organised sport. But his attitude changed when he bought a word processor to make his writing easier. "Although it's geared to a very simple task you begin to get glimpses into precisely what it is doing. The conceptual pictures you build up in your mind when you try and understand what it is doing are really fascinating.

"I suddenly thought 'Now I have to get a computer to find out all about that'. I've been making jokes about computers for long enough — it's about time I found out a bit more about them." Now he enthuses about the skills that the computer generation are acquiring.

"I met a director who was planning a verison of *Hitch-hiker* for American television. He explained that at first he thought he would have to strip the BBC version down and make the graphics simpler because he didn't think the audience would be able to cope. Then he visited a video arcade with his kid and realised that these kids playing Space Invaders, Puc-man and the like were acquiring a whole new range of skills, an ability to assimilate, process and react to any amount of information at any time.

"He thought: 'Which of the communications companies is in profit? — Warner Brothers — $2 billion profit. Why? — Atari. The kids aren't watching television — it's boring. They're down at the arcade or playing on a computer at home, which really stimulates and challenges their minds.' The director changed his mind about the TV production — the more information you pack in the more intriguing and seductive it's going to be."

Although *Hitch-hiker* was a very successful television series, Douglas Adams is not particularly keen to rework his last book for the BBC: "With *Hitch-hiker* the same stuff started on radio and then in a different form on record and then on TV — I was beginning to feel like a word processor rather than a writer.

"There were certain financial rewards in being able to rework the same material over and over again but you do get very depressed by it all. It becomes boring for me, boring for the audience — the only person it doesn't bore is my bank manager."

The only place you are likely to see his latest work other than on a bookstand is the cimema: "The idea has been in the air for years but the trouble with *Hitch-hiker* is the immense amount of information which must be conveyed at any point. All the ideas which are explained thoroughly in the book are likely to hold up the telling of the story. I went to see *Tron* recently. The film was terrible, but the techniques for transferring computer graphics direct to film were quite fascinating.

'We're heading to a totally different world'

"Now suddenly we have not only the technology but also an audience skilled at picking up visual images. Now is the time to put them together in a film which works fast but at the same time contains all the information that you want to put over — now is the moment to push the button." ■

Pythons make historical movies — strictly speaking it's true but it's a rather limited view. I am writing about precisely here and now and putting it on an extreme epic cosmic scale to make fun of it. I'm not interested in the predictive nature of science fiction."

Douglas Adams does not set out to make fun of anything in particular when he is writing: "However, when you sit down to write something that is funny your attitude comes across.

"Usually what starts me writing is getting annoyed about something — not necessarily a huge issue like nuclear arms which in the end I find it rather difficult to make jokes about because it doesn't merely make me angry it actually gets me extremely frightened — but the petty niggles of life. Some stupid bureaucrat — if I've had anything to do with the telephone company that's usually a very fertile period. I get so angry I just want to sit down and write it out of my system.

"Sometimes you perceive attitudes in your writing that you'd never realised you had. Looking through the books for instance I realise I must be concerned about animals which I'd never realised I was.

let the DRAGON 32 fire your imagination . . .

for only £199.50

Plus £5 Post & Packing

No other computer offers you all these features at any price . . .

- **32K RAM MEMORY**
- **PROFESSIONAL STANDARD KEYBOARD**
- **1 YEAR WARRANTY**
- **9 DISPLAY COLOURS**
- **5 DISPLAY RESOLUTIONS**
- **EXCEPTIONAL GRAPHICS CONTROL**
- **5 OCTAVE SOUND GENERATOR**
- **DIRECT MUSIC COMMANDS**
- **REAL-TIME CLOCK/TIMER**
- **MICROSOFT EXTENDED COLOUR BASIC**
- **PLUG-IN CARTRIDGES AVAILABLE**
- **CENTRONICS PARALLEL PRINTER PORT**
- **SOCKETS FOR JOYSTICKS**
- **SOCKETS FOR FULL CASSETTE CONTROL**
- **EXCELLENT CASSETTE FILE HANDLING**
- **COMBINED AUDIO/DATA INPUT FACILITY**
- **AUDIO OUTPUT VIA T.V.**
- **EXPANDABLE TO 64K RAM**
- **POWERFUL 6809E MICROPROCESSOR**
- **FREE 160 PAGE TRAINING MANUAL**
- **BRITISH MADE**

Available now from:

ComServe

98 TAVISTOCK STREET, BEDFORD MK40 2RX.
TELEPHONE: BEDFORD (0234) 216749

MICROWARE MICROWARE

MICROWARE MICROWARE

RETAIL SHOP IN

LEICESTER

FOR

SINCLAIR

COMPUTERS

Keyboards, Ram Packs I/O Ports, Monitors, G/Roms; Games, Serious, Home/Business, Education Programs; Books & Magazines.

Also — Now stocking Books and software for SPECTRUM, BBC, and VIC 20

MICROWARE

131 Melton Road
Leicester
Tel: 0533 681812

Closed Thurs

Open 9.30-5.30

MICROWARE MICROWARE

Top Quality ZX Software from CAMPBELL SYSTEMS

ZX81 16K

GULP II Spectacular machine coded arcade game "The best ZX81 game I have ever played." says John Fox of Osset W. Yorks, and others are saying it too. £4.75

ZX81 16-64K

THE FAST ONE business filing and reporting system, the best there is. Fully user-defined data and reports, sorting, totalling, complete with documentation and sample file. All machine coded, and bullet-proof. Now just £12.00

SPECTRUM

SPDE Disassembler & Editor, fast machine-coded self-relocating development tool. Shows all Z80 op codes and operands £5.95

SPECTRUM

MASTERFILE — the long asked-for equivalent to THE FAST ONE, with even more features which include separate files and full menu-driven report and data definitions. Machine coded for speed and function. Full documentation. 48K required. £15.00

SPECTRUM

GULPMAN is GULP II plus colour and sound, and has to be the favourite for Spectrum £5.95

All programs supplied double-recorded and sped 1st class return post. Prices include VAT and postage. SAE for full catalogue.

CAMPBELL SYSTEMS Dept YC
15 Rous Rd, Buckhurst Hill,
Essex IG9 6BL, England.

BBC MICRO

Software

Quality programs written by professional computer programmers using every aspect of BBC MICRO. Each games cassette contains 3 extra super games. All programs are written efficiently as possible and uses graphics, sound and colour

SPACE TREK (For Model B) with INVADERS, BLITZ, PINBALL
Not only has it got all the standard features of Startrek but this version includes additional secret weapon plus extra astronomical phenomena. Destroys the enemy battle cruisers and dodge the fast moving asteroids. **£6.00**

ADVENTURE (For Model B) with INVADERS, PONTOON, LUNARLANDER
Enter the DUNGEON at your peril but you have been warned you are likely to get killed if you don't use your imagination. Use your weapon, magic, food and treasure efficiently or else. Don't enter the RANDOM MAZE or you'll be shouting for help. **£6.00**

SCRAMBLE (For Model A and B) with INVADERS, BREAKOUT, BATTLESHIP
Written in machine code this fast moving action game will require your total concentration. Every game is different. Superb sound effects. Multiple players. **£6.00**

DISASSEMBLER (For Model A and B)
Look into BBC BASIC ROM and user machine code software. Full instruction on how to use the DISASSEMBLER will be supplied. **£5.00**

All Prices include VAT and Postage and Packing. Send cheque or Postal Order made payable to:

ORCHESTRATED COMPUTING

ORCHESTRATED COMPUTING!! 37B NEW CAVENDISH ST LONDON W1M

Computersmith

Acorn Atom Software

FINANCIAL YEAR (12K + 12K)
Be the manager of your own company fighting your way out of recession. Can you handle wage and price problems? Full graphics display of monthly trading figures with balance sheets. Tested with 'A' level Economic students **£4.95**

GOLF (12K + 12K)
Select your club and drive from the tee. Full graphics display of the fairway, trees, bunkers and the green — yes and the flag! See where your ball has landed and stroke by stroke display. Built-in problems of slicing. Colour version for the BBC due soon. This black and white version for the 12K + 12K ATOM..... **£4.95**

STOCK MARKET (12K + 12K)
Play the market buying and selling shares. Can you make a million? Share prices rise and fall, random features of booms and collapse. Company meetings and broker fees. Full display of your holdings and financial position **£4.95**

WORDGRAM (12K + 12K) Ideally with printer
Make your own puzzle of hidden words, and then find them. Puzzles can be printed either on the screen or a printer. Please state whether the TV or Printer version is required..... **£4.95**

DETECTIVE (12K + 12K)
Search the old manor house for clues to the murderer. Note your clues on the sheets provided and name the killer. Full graphics display of the rooms and your trail..... **£4.95**

NOTE: All prices are fully inclusive of postage, packing and insurance. Please make cheques or postal orders (no cash) payable to COMPUTERSMITH. Remember to include your NAME & ADDRESS. Send with your order to:

COMPUTERSMITH
40 Greenfields Avenue,
Bromborough, Wirral,
Merseyside. L62 6DD

hot stuff! DRAGON 32

for only £199.50

Plus £5 Post & Packing

I have a burning desire for the **DRAGON 32** *– Please send me:*

☐ **DRAGON 32 COMPUTER - £199.50**

DRAGON PLUG-IN SOFTWARE

☐ Berserk - £19.95
☐ Meteroids - £19.95
☐ Cosmic Invaders - £19.95
☐ Starship Chameleon - £19.95
☐ Ghost Attack - £24.95
☐ Cave Hunter - £19.95
☐ Tube Frenzy - £19.95

DRAGON CASSETTE SOFTWARE

☐ Special selection 1 - £7.95
☐ Special Selection 2 - £7.95
☐ Quest - £7.95
☐ Graphic Animator - £7.95
☐ Computavoice - £7.95
☐ Mazerace - £7.95
☐ Madness & Minataur - £7.95
☐ Examples from manual - £7.95

DRAGON PERIPHERALS

☐ Pair of Joysticks - £19.99
☐ Cassette Cable - £7.95

(Add £5 Post & Packing for DRAGON 32 – £1 for accessories)

*** Please debit my Barclaycard/Access account with**
I enclose Cheque/P.O. for £

*Delete as applicable

Name: .....

Address: .....

.....

.....

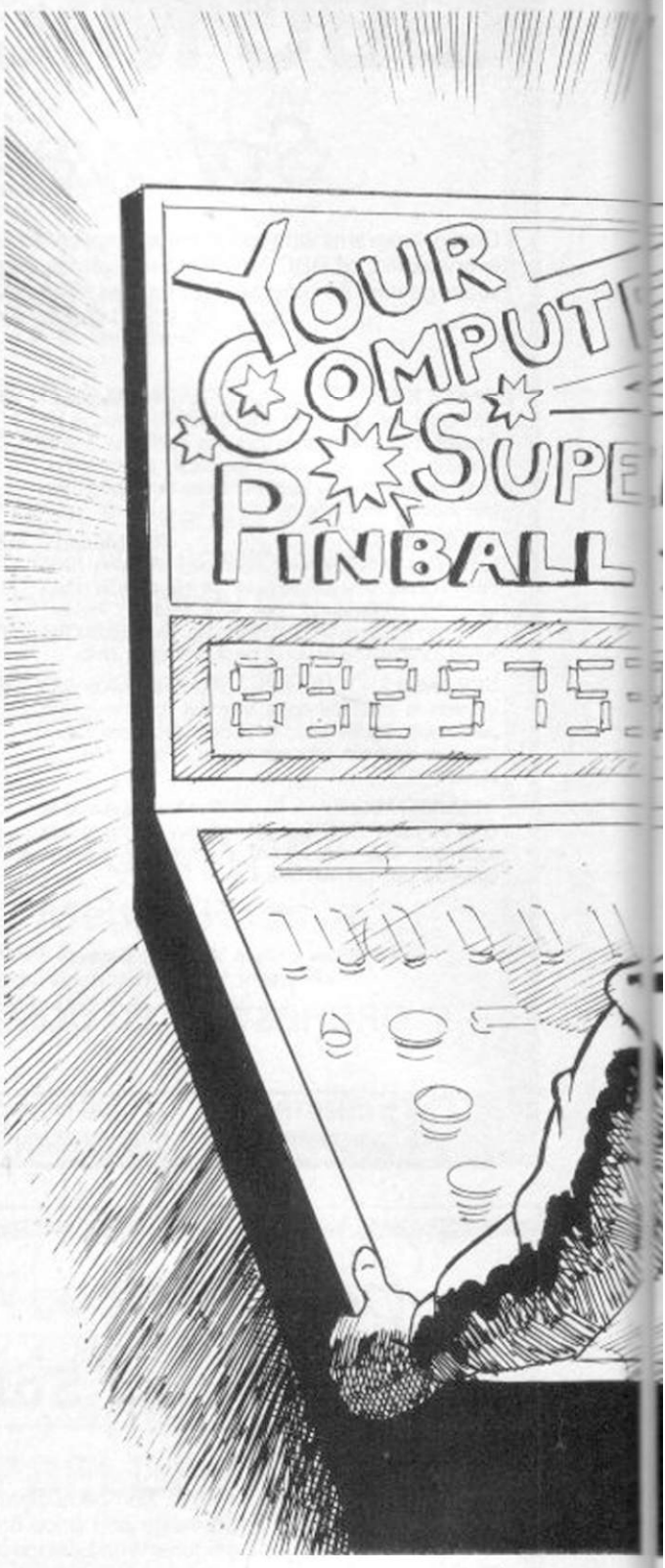
YC

ComServe

98 TAVISTOCK STREET, BEDFORD MK40 2RX.
TELEPHONE: BEDFORD (0234) 216749

PINBALL

Two generations have misspent their youths to the whirr and click of the pinball machine. Now Stuart Nicholls offers the game for your unexpanded ZX-81 with this machine-code program.



PINBALL IS A game loosely based on the well-known arcade game. A ball starts at the top of the playing area in different positions and moves in a random way, bouncing off the sides and top of the table. If the ball lands on a number square, the score is increased by that number. The ball is then bounced off the square in a random direction.

The pinball table flippers have been replaced by a bat at the base line of the table, due to the memory restrictions of a 1K ZX-81. The numbered squares, 1 to 9, are printed in a variable position on the table so that each game is different. The method of playing the game is as follows.

The player has control over the whole of the playing area, as well as the bat. By pressing any of the keys 1 to 5, the whole table playing area except the ball will roll left — that is, numbers and bat will move left as long as the key is held down. The ball continues moving normally. Anything leaving the left-hand side of the screen reappears on the right-hand side. To make the table and bat roll right, press any key 6 to 0.

With these controls you have to try and land the ball on a number square as it bounces around the table.

If the ball misses all the numbers, then by skilful use of the bat it can be kept in play and hit back up the table. If a ball evades the bat it is lost, and a new ball will be given.

Five balls are given altogether, and the number of the ball in play is displayed on the top left of the screen area. To start each ball the Shift key must be pressed; an instruction to this effect is given with each new ball. Your score is shown at all times at the top right of the screen area.

The machine code can be loaded using:

```
10 LET X = 16514
20 LET A$ = ""
30 IF A$ = "" THEN INPUT A$
40 IF A$ = "S" THEN STOP
50 POKE X, 16 * CODE A$ + CODE A$ (2) -476
60 PRINT AT 11,7;X;"SPC"; A$(1 to 2)
70 LET X = X +1
80 LET A$ =  A$ (3 to)
90 GO TO 30
RUN (IN FAST)
```

It requires two Rem statements each with 231 zeros. This is easily entered by typing 1 Rem (231 zeros) then edit line 1 and change it to line 2 Rem (231 zeros). When you have entered the machine code into the Rem statements in pairs or blocks i.e., 0D Newline — 00 Newline — F3 Newline or 0D00F3FF0F00 F1FF Newline and so on, enter S to end. Now type the only line of Basic necessary:

3 RAND USR 16565

and delete lines 10 to 90 as these are no longer required. I have given, in the listing, the addresses for the start of each routine, and those routines are shown in table 1.

The ROM subroutine for Print At requires the parameters column and line to be held in the BC register before being called. For example, the Basic order

PRINT AT 5, 3;

is rendered in machine code as

01 03 05 LD BC 0503
CD F5 08 CALL "PRINT AT"

The subroutine for Print String requires the start address of the string data to be held in the DE register and the number of characters in the string to be held in the BC register.

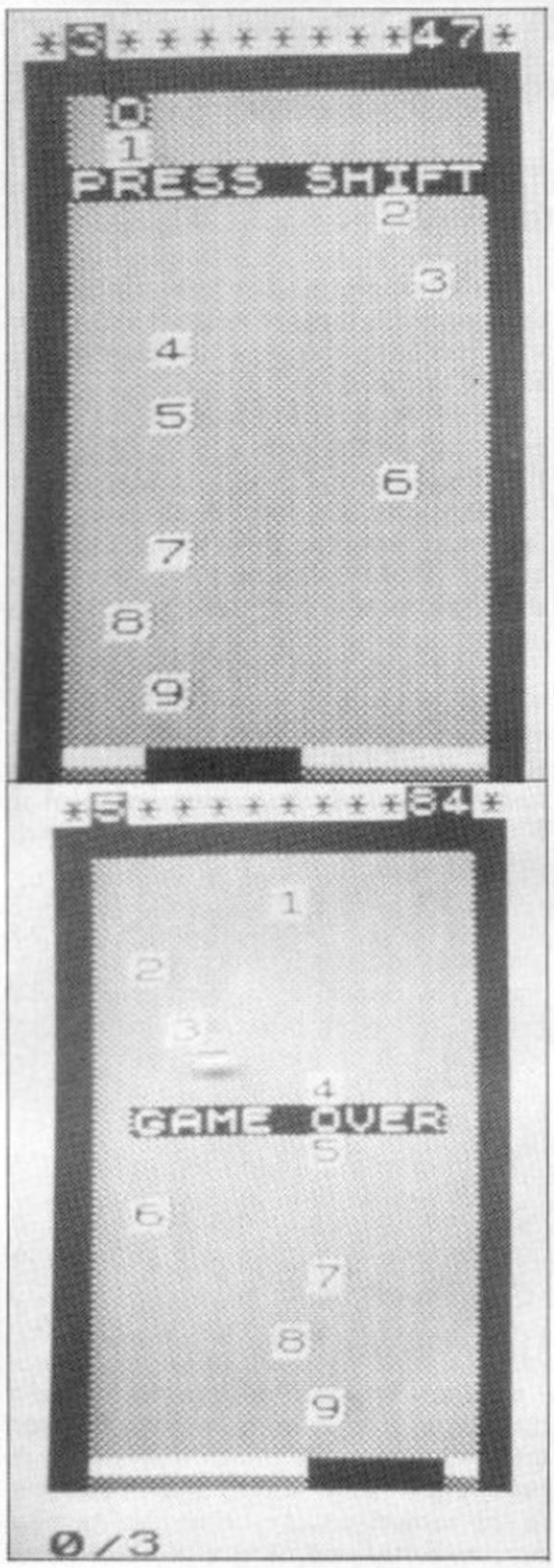
So in the print Game Over routine which begins at 16966, the Print At subroutine is called to get Print At to Line 10 Column 2. The BC register is then loaded with nine decimals — nine letters and one space. The DE register is loaded with 16957 decimals, the start address of the data, and the ROM subroutine CD 6B 0B is then called.

The machine code and display just about fill the unexpanded ZX-81 but if you have the 16K RAM then RAMtop could be set at 3K — that is, the collapsed display file leaves 2K for Basic instructions and so on. Do not increase the display file size while the game is running as the left and right roll routines may be corrupted — a CLS command would be necessary before

RAND USR 16565

Table 1.

16514	Random moves data +13, −13, +15, −15 decimal.
16522	Subroutine for selecting random change of direction but not reverse to give the correct bounce off the walls and bat. It uses "frames" as random-number generator.
16626	Initial random move for first ball, −13, is stored at address 40 40 H. This direction is upward so that it hits the top wall, and a random change of direction will be chosen.
16532	Places numbers 1 to 9 on alternate lines in random position. This uses seed-high frames low for the random number and sets seed for each number.
16668	Count next ball to be played and if 6 then Goto 16966.
16680	Print ball in random position at top of table and store position at address 403E.
16699	Print Press Shift. This uses the Print At subroutine in ROM CD F5 08* and print string subroutine CD 6B 0B*.
16714	Wait until shift key is pressed.
16721	Erase Press Shift.
16734	Delay to govern the speed of play.
16742	Jump over line 2 Rem data.
16745	Line 2 Rem data.
16751	Erase the ball.
16756	Print the ball number in play.
16767	Move the ball in direction stored at 40 40 H and check the new position.
a.	If table, then Goto 16802.
b.	If off bottom, then Goto 16668.
c.	If side top or bat, i.e., 80 H then Gosub 16522: then Goto a. If not b or c then must be number square so Goto 16879.
16802	Check keys 1 to 5 left. If they have not been pressed then Goto 16843.
16809	Roll the playing area and bat left then Goto 16879.
16843	Check keys 6 to 0 right, if they have not been pressed then Goto 16941.
16849	Roll the playing area and bat right.
16879	Check the ball position and, if not the number square, then Goto 16941.
16888	Print the number square in inverse video and increase the score by number value.
16923	Delay to hold the square in inverse video.
16931	Reprint the number square in normal video.
16938	Gosub 16522 to select random move from the number square.
16941	Print the ball in its new position.
16943	Goto 16734.
16946	Data for Press Shift and Game Over in inverse video.
16966	Print Game Over using ROM sub routines.
16981	Return to Basic.



L WIZARDRY

```
16514  0D 00 F3 FF
       0F 00 F1 FF
16522  2A 3E 40
       ED 5B 40 40
       E5
       3A 34 40
       E6 06
       C6 82
       6F
       26 40
       4E
       23
       46
       79
       BB
       28 03
       83
       28 EC
       E1
       09
       7E
       FE 80
       28 0D
       ED 43 40 40
       22 3E 40
       C9
16565  06 0D
       3E 17
       D7
       10 FD
       3E 76
       D7
       06 0D
       3E 80
       D7
       10 FD
       3E 76
       D7
       21 13 00
       3E 80
       D7
       06 0B
       3E 88
       D7
       10 FD
       3E 80
       D7
       3E 76
       D7
       2B
       7C
       B5
       20 EB
       3E 80
       D7
       D7
       D7
       06 07
       3E 09
       D7
       10 FD
       3E 80
       D7
       D7
       D7
16626  21 F3 FF
       22 40 40
16632  06 03
       3E 1D
       F5
       2A 32 40
       ED 5B 33 40
       19
       22 32 40
       7D
       E6 07
       C6 03
       4F
       C5
       CD F5 08
       23
       10 F9
       F1
       77
       23
       23
       23
       1B
       7A
       B3
       20 EA
       18 24
16843  FE EF
       20 5E
16847  2A 0C 40
       11 32 01
       19
       11 13 00
       7E
       F5
       06 0A
       2B
       7E
       23
       77
       2B
       10 F9
       F1
       77
       2B
       2B
       2B
       2B
       1B
       7A
       B3
       20 EA
16879  2A 3E 40
       AF
       7E
       FE 88
       28 35
16888  F6 80
       77
       DE 9C
       47
       2A 0C 40
       11 0C 00
       19
       7E
       FE 17
       20 04
       36 9C
       18 F7
       3C
       FE A6
       20 05
       36 9C
       2B
       18 ED
       77
       10 E3
16923  21 00 09
       2B
       7C
       B5
       20 FB
16931  2A 3E 40
       7E
       C6 80
       77
16938  CD 8A 40
16941  36 B4
16943  C3 5E 41
16946  B5 B7 AA B8
       B8 80 B8 AD
       AE AB B9 AC
       A6 B2 AA 80
       B4 BB AA B7
16966  01 02 0A
       CD F5 08
       01 09 00
       11 3D 42
       CD 6B 0B
16981  C9
16802  3A 25 40
       FE F7
       20 22
16809  2A 0C 40
       11 2B 00
       19
       11 13 00
       23
       7E
       F5
       06 0A
       23
       7E
       2B
       77
```

LANGUAGES ATOM F

Forth leads other languages for versatility and speed. John Robinson reviews Forth on the Atom.

FORTH IS A stack-based programming language with a lot of novel features. It is constructed from building blocks called "words". Stack and word are two terms which have special significance in Forth literature, so let me define them.

A stack is a pile of pieces of data. You may only store data on the pile by putting it on the top. If you want to take data from the pile, you can only take the topmost item.

Stack is just a smart word for this sort of pile — other names that you might see used are push-down stack or last-in, first-out queue. Forth expects you to use the stack to store your variables, in contrast to Basic which expects you to use variables or arrays.

```
(                                          )
( print formatted multiplication tables    )
( up to the limit of number found on stack )
(                                          )

: TABLE
( add one to limit and then                )
( make two extra copies of limit on        )
( stack for later use as loop index        )
1+ DUP DUP
( print a newline character                )
CR
( print four spaces                        )
4 SPACES
( print line of multipliers, each one      )
( right adjusted in a field four           )
( character position wide                  )
1 DO
   I 4 .R
LOOP CR
( now print multiplicand and product       )
( each multiplicand is on a new line       )
1 DO
   I 4 .R
   ( create new copy of loop index         )
   ( for inner loop                        )
   DUP
   ( loop to print product                 )
   1 DO
      I J * 4 .R
   LOOP CR
LOOP
( remove final loop index from stack       )
DROP
CR CR ;
```

Figure 1.

The nearest Basic equivalent to a Forth word is a subroutine. Both are lists of instructions which do things like move data, print on the screen, control the flow through the program or perform arithmetic. Both subroutines and words are written only once but called many times.

Atom Forth comes with nearly 200 words already defined. To write a program you just build your own words up from the predefined words or words that you have written yourself. Do not be put off by thinking that you have to learn all 200 — you only need to understand about 20 words to start writing useful programs.

Forth treats words that you have written in the same way as supplied words. So, when you write your own words as part of a program you are also extending the language.

The words supplied include structured programming goodies such as If . . . Then . . . Else, Do . . . Loop, Begin . . . Until and Begin . . . While. One final point: Forth is compiled, rather than interpreted so it will run very quickly — much faster than Basic — but it still allows you to write programs interactively, so that testing and changing programs is fast.

To start to use Forth on your Atom — which must, by the way, have the full 12K of RAM — you need the Acornsoft cassette and the accompanying *Forth Theory and Practice* manual. The cassette has an index at the start of the tape that helps you to set the playback level correctly.

After the index come the Forth system, a tape interface, a screen editor, a set of graphics commands and finally a demonstration program. The manual itself, *Forth Theory and Practice,* is a nicely-produced volume which serves as both a good introduction to the language and as a reference manual. By the end, it has reached the stage of telling you how to extend the language with your own chosen facilities.

Unfortunately, there is no index, and one or two mistakes have crept into the text to confuse the innocent reader.

Using Forth

Once you have loaded Forth you will see a message on your screen announcing that you are now in Atom Forth, followed by the Forth prompt OK. This is where you'll need to refer to the manual because, when the Atom is running Forth, most of what you have learnt about the Atom's operating system, its Basic and its assembler is of little use. In fact, the Atom is like a brand-new micro when it is running Forth.

At this stage, the obvious move seemed to be to add some new words and so explore some of the facilities in Forth in comparison with Atom Basic. Here are two simple Forth programs which are written as just one word. Square merely squares a number that you give it.

```
: SQUARED
  DUP * . ;
```

The colon tells Forth that a new word is to be defined. In this case, the word is called "squared". After the name comes a list of Forth words that define this new word. The first word used is Dup which duplicates the top item on Forth's stack. Our new word, "squared", expects to find a number on the stack — you would put a number there by typing it just before the word that needs it.

The second word is an asterisk — this counts as a word to Forth. It takes the two topmost items off the stack, multiplies them and places the result back on the stack. Thus, two

items are replaced by one. The last word is the dot or full-stop which is the Forth word to print the topmost number on the stack. The semicolon at the end of our new word tells Forth that we have finished our definition. As soon as we press the return key, Forth will compile the new word, "squared", and we may test it. As you may have guessed, all this word does is to print the square of the number that we give it, so if we type:

```
3 SQUARED
```

Forth will respond with

```
9 OK
```

Table is a word that prints out multiplication tables up to a number that you specify. So, 3 Table prints the one, two and three times tables formatted on the screen.

Note that Forth treats everything between brackets as a comment. Figure 1 shows how Forth words may be used to format the screen.

FORTH

The example is perhaps over-simple for a real program and shows only what Forth looks like. Some of the features that set Forth above Atom Basic and free the programmer from unproductive drudgery are shown in figure 2.

As I mentioned earlier, the Acornsoft Forth package also contains a screen editor and support for the Atom's high-resolution graphics.

The screen editor appears unconventional at first, mainly because the editor commands are supplied as a new set of Forth words and because it operates, as the name implies, on "screens".

This does not mean your TV screen, but a block of eight lines of Forth program — the chunk that the editor will display and that can be moved to and from tape.

A short time spent getting to know the editor is worthwhile, because of the powerful commands which put most micro editors to shame. The editor works both on complete lines of Forth and on strings of characters within lines.

I have listed some of the more interesting editor commands in figure 3. There is no need for anyone to produce a Forth toolkit like the Basic toolkits to enable the use of commands to find or delete a character string. All this and more is included in the system supplied. Indeed, since the editor commands are Forth words, it is possible to add your own commands to the editor — how many of you have an editor that lets you do that?

Formatted numeric output
IF . . . THEN . . . ELSE
Use of any base up to 36
Progress displayed during tape load
Equivalent of INKEY$ — not in Atom Basic
Variable names up to 31 characters long
Memory manipulation commands
Signed or unsigned numbers; no floating point
No memory penalty for writing plentiful comments
Both constants and variables allowed
Compatible with Forth on other machines

Figure 2. Forth features not in Atom Basic.

I was slightly confused to find the tape interface listed as one of the programs on the Forth tape. All became clear when the manual explained that Forth itself contained just enough of the tape interface to load the rest. The other parts allow you to save programs back on to tape and to list screens of Forth from a tape copy. The tape interface does not make it any easier to use tape for storing data as well as programs — this is one of the few things that is definitely easier in Basic. However, one pleasant surprise is that the tape interface gives you some idea of whether it is loading properly by displaying the last screen number read.

There is little to say about the graphics words supplied since the facilities are similar to those in Basic. You may plot points, draw lines or move from point to point without plotting.

The two exceptions are that there are no words supplied to use colour graphics and that the highest resolution graphics mode (256 points by 192) is unavailable because Forth uses part of the Atom's graphics memory. The whole area of graphics is probably the most effective area for using Forth facilities to add new words.

P	put text on to a line
D	delete a line
I	insert a new line
T	type the screen again
M	move editing cursor forward
C	insert text after editing cursor
F	find a character string and move cursor
N	repeat previous find command
TOP	move cursor to the top of the screen

Figure 3. Editor commands.

Some of the newer machines have graphics commands that do more than just draw straight lines — an example is the BBC Micro's inclusion of a Basic statement which will draw triangles. This is not a facility supplied in Forth but the manual does show the definition of a word that will do just that. Other possibilities would be for a Forth user to write words that display circles or even space-invader type graphics.

Adding new functions

Since the way to write Forth is to write new words and extend the language, it is encouraging that the manual has three good examples of adding new functions. These show how you can define character strings and one or two-dimensional arrays as new types of data and, incidentally, how you can decide whether or not to make Forth check whether you are accessing elements within the limits that you chose when you defined the array. A way of adding a form of case statement is also shown, together with methods of creating special graphics words.

Really, my only disappointment with Atom Forth is that I can no longer use the assembler sitting in the Atom's ROM. Some other Forths have a built-in assembler — it seems crude to have to hand-assemble or write down the machine code generated by the Atom assembler and include it in a Forth program by hand.

I have mentioned before that Forth is faster than Basic. To try to prove this, I wrote some very simple (and probably unrepresentative) programs in both languages that show the difference in speed. Each program loops 10,000 times so that timing is possible using a watch; within the loop, the programs can also store the number one in a variable in Basic or on the stack in Forth; add the loop index to itself — that is, double it; store the result in a Basic variable or on the Forth stack; multiply the loop index by itself and store the result. The results are shown in figure 4.

	Store 1 in a variable	Add a number to itself	Multiply a number by itself
Forth	2.5	4	31
Basic	16	19	28

Results shown in seconds.

Figure 4. Benchmarking Basic against Forth.

The multiplication is slower in Forth than in Basic because 32-bit arithmetic is double precision in Forth terms and is not coded as efficiently as 16-bit arithmetic. However, the other two cases show that Forth can be very much faster than Atom Basic — and Atom Basic is no slouch.

My overall impressions of Acornsoft Forth are very good. It is rich in facilities and well documented, and it is also very good value for money. The cassette is £11.50 and the manual £6 giving a total of £17.50 for a full system. This price compares very well for versions of Forth advertised to run on other machines. It should be attractive to many schools and colleges, as well as individual users. ■

PASCAL IS NOW available for most home micros, including the ZX-81. Some schools have been using it for quite a while now and the universities longer, making it available to a majority of *Your Computer's* readers. But what is Pascal and where did it come from?

Pascal was introduced 13 years ago by Niklaus Wirth. It had been preceded by Fortran — the world's first high-level programming language — in 1957, Cobol in 1960 and Basic in 1964. This makes Pascal the most modern of the popular high-level languages. Its origins lay in Algol, the algorithmic language, so it is ideal for solving complicated algorithms. Pascal could never be described as sloppy.

At first, a Basic programmer may feel restricted by the more complicated format of the Pascal Goto statement, but this is actually a good thing: this statement in Basic can often give rise to untidy hops about in the program which complicate its structure. Here is an extreme example:

```
10 GOTO 40
20 GOTO 60
30 GOTO 80
40 PRINT "1"
50 GOTO 20
60 PRINT "2"
70 GOTO 30
80 PRINT "3"
```

which could be boiled down to:

```
10 FOR A=1 TO 3
20 PRINT A
30 NEXT A
```

Perhaps none of us would make such a gross error, but this demonstrates how programs can be condensed into a loop to save memory and programming time, not to mention running time. Indeed, loops are the basis of the Pascal program structure. They serve to simplify it and give more user power.

The following sections serve as a simplified comparison between Basic and Pascal statements, and only begin to explain Pascal as a language in its own right.

The best place to start is always the beginning, and we will do so now, but the beginning of a Pascal program is not, as you might imagine, the first program statement. The program name and format are always declared first. The format of the program is the input and output status.

For example, if I were to write a program called Test and it was only used to output data then it would be declared as:

```
PROGRAM TEST(OUTPUT)
```

If the program Test used inputs and outputs then it would be declared as:

```
PROGRAM TEST(INPUT,OUTPUT);
```

In both cases the I/O status is within brackets and the program name is a single word containing no spaces, so that a program called *Your Computer* would not be accepted for compilation.

Next comes the declaration of all variables used in the program. Write down your program first. This way you can be sure that when you enter it you declare every variable. The four declarations with which we will deal are:

VAR	A letter which is a variable, that is, one which can contain any value.
CONST	A letter which has a pre-set value. For example, PI=3.1428571
PROCEDURE	A subroutine — fully discussed later.
TYPE	The type of a variable as described.

So if the program Test uses Pi and the variables X and Y then it would look like this:

```
PROGRAM TEST(INPUT,OUTPUT);
VAR X,Y:REAL;
CONST PI=3.1428571;
```

Having declared variables, constants and assuming that you have read on and declared all Types and Procedures, we are now ready to move on to the main body of the program which, believe it or not, begins with begin, thus:

```
BEGIN
```

which is unpunctuated. On, then, to the main Basic-Pascal statement comparisons.

Let: Most Basics do not require the reserved word Let, the supreme exception being the Sinclair Basics. To make the variable A equal to five in Basic would be:

```
LET A=5
```

or

```
A = 5
```

In Pascal we use the latter of the two, the only difference being in the equals sign:

```
A := 5
```

But that's not all. All Pascal statements, apart from the loops and jumps, end with a semicolon, so that our statement now becomes

```
A := 5;
```

The use of brackets is much the same as Basic, but many of the functions — Pi,Tan etc — have to be declared as constants, or otherwise as function-within-function statements.

The use of functions is not essential to someone learning the fundamentals of a language and so I would recommend anyone wishing to expand on this to read Findlat and Watts' book *Pascal — an introduction to methodical programming.*

Goto: This statement is used in Pascal in much the same way as it is in Basic, although Pascal has no line numbers. The Label statement replaces the line number with a numeric variable followed with a semicolon, and is declared at the beginning of the program as:

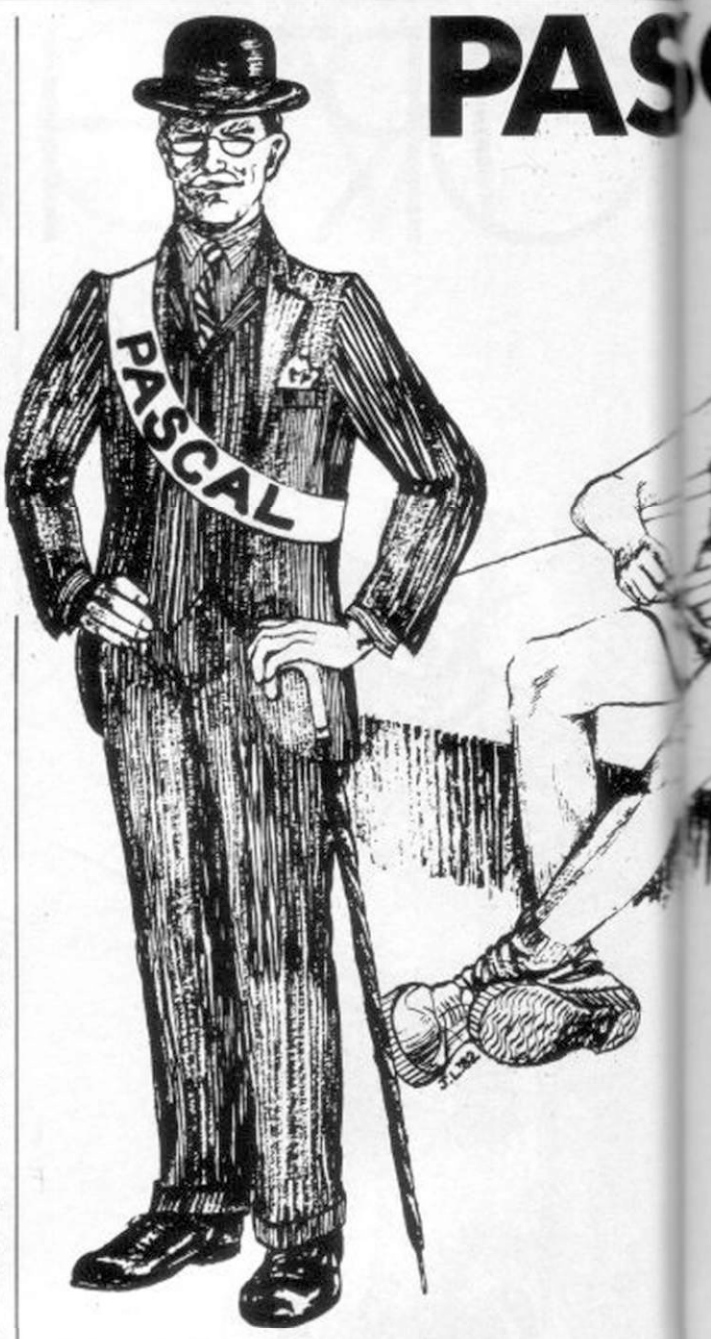
```
LABEL n;
```

where n is a number between 1 and 999. Having defined the Label it can now be jumped to from any Goto statement with the corresponding number. Each different label has to define individually at the beginning of the program. However, it is often simpler and more efficient to use conditional loops and jumps and normal loops.

For-Next and other loops: once again Pascal is almost the same as Basic so the use of For-Next should be quite elementary to a Basic user. The For statement is identical to the Basic with the exception of the equals sign which becomes := and three tag-on reserved words. These are simply Do and the routine encased with Begin and End; So a For-Next loop looks like this:

```
FOR A := 1 TO 10 DO
BEGIN
  routine
END;
```

Pascal has more Loops than the For-Next one. Some of these are available in a few Basics, but they rarely occur together. These other Loops are Repeat-Until, While-Do and If-Then-Do.



Repeat-Until will repeat a loop encased within Begin and End until a Boolean expression is satisfied. For example:

```
REPEAT
  routine
UNTIL A=10
```

The second loop is one which repeats a routine while a Boolean expression is satisfied. When the expression becomes "false" the loop will be exited at the End; statement. Thus:

```
WHILE A>10 DO
BEGIN
  routine
END;
```

The If-Then statement is self-explanatory to the Basic user. Again the Pascal version requires Do,Begin and the routine sandwiched between the latter and End;. For example:

```
IF A<10 THEN DO
BEGIN
  routine
END;
```

Dim and Dimensions: like Basic, one- and two-dimensional arrays are available in Pascal. These arrays have to be declared with the rest of the variables at the beginning of the program. If dimensioning A as 10 units length we would use:

```
A:ARRAY [1..10] OF REAL;
```

and if A were 5 by 10 this would look like:

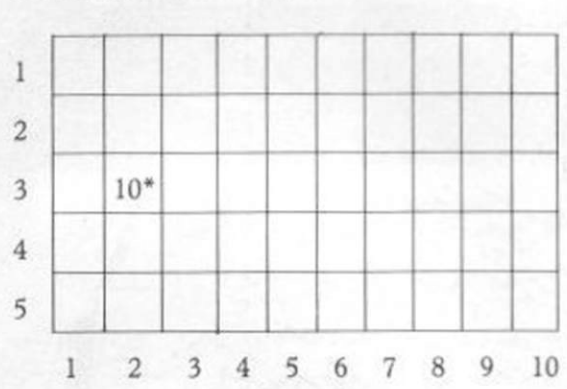
```
A:ARRAY [1..5,1..10] OF REAL;
```

Having declared the size of the array we can now use it. There are only two changes from Basic in this case. The brackets are square instead of Basic's rounded ones and within the

CAL FOR BASIC USERS

Pascal has been around for over a decade, and can be obtained for a wide variety of personal microcomputers. Ian Maclean introduces Basic users to one of the most elegant high-level languages.

brackets the X and Y co-ordinates are reversed to comply with the reversed dimensioning statement. So a matrix grid drawn from this data would look like this:



Using the array A (5 × 10) our statement would be along the lines of, for example:

A [3,2] : = 10

This means that on the grid the element which will become 10* will be found three down, from the top left-hand corner, and two right.

Rem: the Rem statement in Basic is extremely simple as it requires no argument, and the same applies to Pascal. The comment is encased within a bracket and star at each end, thus:

(*THIS IS A COMMENT*)

Note that the comment is not followed by any punctuation.

Input: the equivalent to Basic's Input in Pascal is Read and/or Readln. The two both come very close to being the same as Basic's version but differ slightly. Read will read in a string or numeric variable and allow the next data to be read from directly after it on the same line. Readln, however, reads from its start to the end of the line, including all blanks.

These two can be used together in an interesting combination. For example, a program has "told" the user that it requires the number of boys in a class and then the number of girls to be entered, in that order. The programmer has to anticipate worded answers, so he arranges Read and Readln to cater for this:

```
READ(BOYS);READLN;
READ(GIRLS);READLN;
```

Here the number of boys is read into "boys". Anything after that is read by Readln into a non-existent variable. So if "15 boys" were typed in, it would be recognised as just 15 because the "boys" would read away through the clever use of Readln. Note that the two variables (boys and girls) are within parentheses.

Print: as with Read and Readln, Print has two equivalents. These are Write and Writeln. These can be simulated in Basic by:

```
WRITE('IAN MCLEAN');
```

is the same as

```
PRINT "IAN MCLEAN";
```

and

```
WRITELN(X);
```

is the same as

```
PRINT X
```

Both Write and Writeln can be used to output strings and/or string variables. Variables inside the brackets must be separated by a comma, which does not space them into columns as in Basic.

Gosub: the word used to replace Gosub is Procedure. A procedure is usually defined at the beginning of the program, so be sure that you know exactly what each routine should contain. The Pascal jargon for a procedure is a sub-program, and in fact a procedure contains all of the "grown-up" features of its counterpart.

Firstly the procedure has to be named, again a single word containing no spaces. For example, we could call our procedure "Count" which would be represented in Pascal as:

```
PROCEDURE COUNT:
```

That is fine, but many sub-programs or routines require data from the main body of the program. For example, if a sub-program had been written to convert base 10 to binary, then it would need to be told the base 10 number. This variable would be indicated at the beginning of the procedure:

```
PROCEDURE CONVERT(VAR A:N);
```

which means that the variable A of a particular type N is used in the sub-program Convert. A procedural variable's type depends on whether it is real, an integer, a character or one of a number of types. Usually if it is a number then it will be real, as this covers all numbers. So if the variable A is real then its type (N) would be real. Therefore N would be declared as:

```
TYPE N:REAL;
```

Now, if there are any variables which the routine needs, like a Loop counter, they are declared in exactly the same kind of Var statement as in the main program. So if the procedure Convert contained a loop counter called C, then it would look like this:

```
PROCEDURE CONVERT(VAR A:N);
VAR C:INTEGER;
```

Of course, there is nothing to prevent you from using constants inside of your procedure too. Procedures end with End; always.

The sub-program can now be called from any point in the program, including from within other sub-programs. This is achieved by simply using the name followed by a semicolon. For example:

```
COUNT;
```

But we also have another type of procedure which requires data input from the main program. This was shown in the procedure Convert which required A as the number to be converted. When calling a routine this variable is always given in brackets to tell the computer what the particular routine requires in the way of data. So that our line to call Convert looks like this:

```
CONVERT(A);
```

which also makes sense in English.

Finally, a program written in Pascal to demonstrate some of the language briefly covered in this article. This may give some idea of when and where to use certain statements.

```
PROGRAM GRAPH(INPUT,OUTPUT);
VAR
A,B,D:INTEGER;
C:ARRAY[1..10] OF INTEGER;
PROCEDURE DRAW (E:N);
VAR F:INTEGER;
BEGIN(*PROCEDURE*)
FOR F:=1 TO E DO
BEGIN
WRITE ('*');
END;
WRITELN;
END;(*PROCEDURE*)
BEGIN(*MAIN PROG.*)
FOR A:=1 TO 10 DO
BEGIN
WRITELN('ENTER VALUE NO.',A);
READLN(B);
C[A]:=B;
END;
FOR A:=1 TO 10 DO
BEGIN
D:=C[A];
DRAW(D);
END;
(*END OF PROG.*)
END.
```

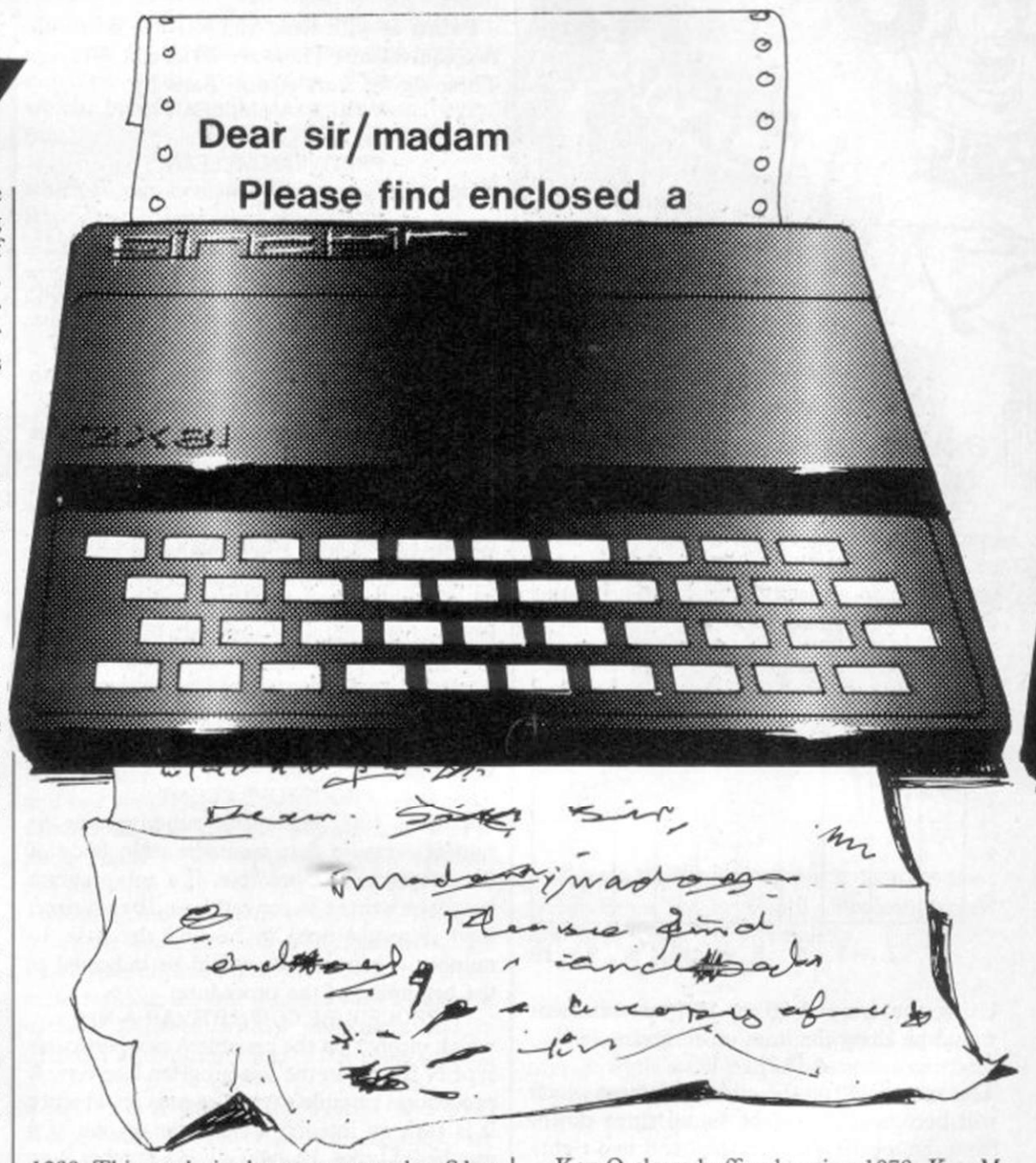
This program inputs 10 numbers and then prints out a horizontal bar graph to represent them. Note that the End. at the end of the program ends with a full stop; this distinguishes it from normal loop endings. ■

Machine	Company	Price	Where obtainable
ZX-81	Control Technology	POA	39 Glouster Road, Gee Cross, Hyde, Cheshire SK14 5JG.
MZ-80K	Sumlock	£51.75	Royal London House, 198 Deansgate, Manchester M3 3NE.
TI-99	Texas Dealers	£30 (approx)	Texas high street dealers.
Atom	Pascal not ready yet.		
BBC	Pascal not ready yet.		
Vic-20	No news as yet of Pascal.		

Wordy for the ZX-81 by A F Whiddet, and Spectrum Processor by Robert Daren will help you format deathless prose.

ZX WORD PR

ZX-81 WORDY



THIS PROGRAM provides ZX-81 users with the functional services of a word-processing facility. Written in Basic, it makes full use of the ZX-81's superb string-handling techniques. The program needs 14.7K of RAM but provides the user with 6,400 bytes of character storage available in a paged format of 10 pages containing 640 characters.

Unlike many word-processor programs for standard business microcomputers, Wordy communicates with its member pages via a buffer string, allowing data to be manipulated in easily-handled amounts. This increases speed and flexibility.

The program is made up of five subroutines.

The first option is the Save routine. This allows the user to save data and programs on cassette under a user-defined file name. The second option is the subroutine allowing the user to send a specified page which is numbered between 1 and 10 to the line printer. Entering 11 would print the entire text memory.

Writing mode is the third option. First, enter the desired page number. The ZX-81 can now be used like a typewriter except the Newline key is used instead of the space key. The space key is used to break out of the program. To operate the Newline facility push Newline then shift. To delete the last character entered, press shift D. To put the machine into Editing mode — the fourth option — without homing the cursor, press shift W.

In the program's Editing mode 21 keys are redesignated so they can be used to manipulate the text pages. The system appears to handle the entire text but in fact only deals with the specified page at any one time.

The redesignated keys are: keys 5 to 8 inclusive — those operate the cursor in the direction of the arrows on the keys; the line location is 920. These keys change the variable POS by −1,32, and negative 32,1, respectively.

Key D is the delete function. This deletes the character on the left of the cursor position; location 2200. This overlaps the positions from the beginning of the page to two spaces before the cursor. Use of this strips the first character from the buffer memory.

Key S adds a space to the left of the cursor position; location 1100. This strips the last character from the page, places it into the buffer, then adds the space before the cursor.

Key H homes the cursor; location 950. This sets the variable position to 1. Key L adds a line of spaces to the left of the cursor; location 1200. This works in the same way as key S but strips 32 characters instead.

Key 1 allows manipulative positioning of a specified amount of text. This can be from 0 to 639 characters; location 1800. This function strips the text within A$, replaces it into C$ then removes the contents of the text from A$, emptying B$ if full.

Key P drops the text held in C$ when used with key 1; location 1900. This transfers the end of A$ into B$, and places the contents of C$ between this cursor and the character on the left.

Key I inserts inputted text between the cursor and the character on the left; location 1300. Input X$ calculates length in variable A. It strips the appropriate end off A$ and stores it in the B$ and then dumps X$ to the left of the cursor.

Key T changes the character under the cursor to the character on the next key pressed; location 1700. This replaces A$ (X,POS) with the Inkeyed character.

Key O clears buffer; location 1070. Key M speeds up the cursor using movement keys. Newline is used to exit; location 8600. This operates in a similar manner to keys 5 to 8.

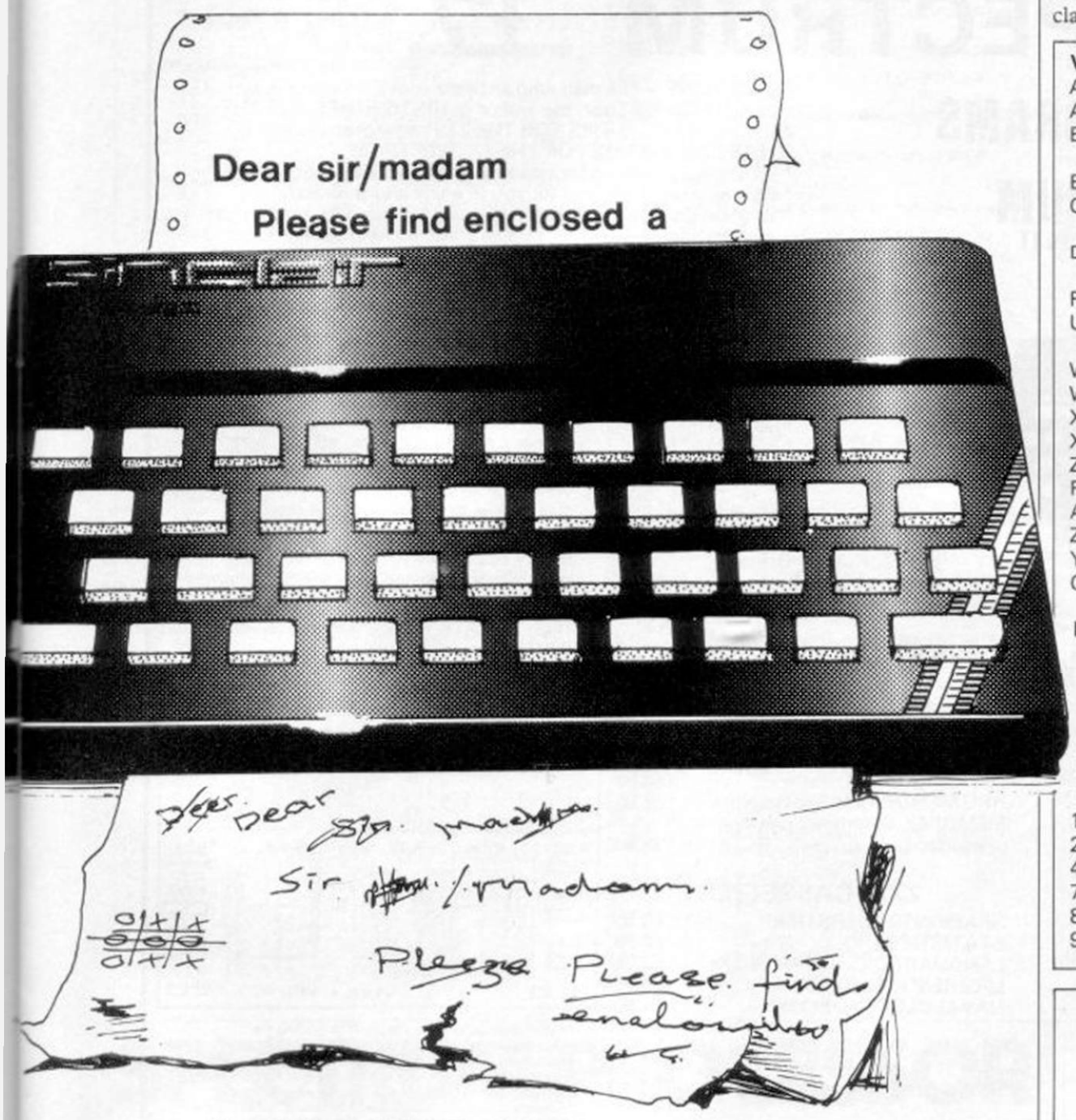
Key J justifies text to appear as even-ending lines in printed-matter fashion; location 7000. It works out the number of spaces at the end of the line and stores them in A; it then goes through that line of text dumping one space extra between words and in so doing decreases A by 1 until it reaches 0.

Key A advances a page through stored text; location 1500. It then restores the buffer, and adds 1 to X.

Key B steps back a page; location 1600. It then restores buffer, subtracts 1 from X. Key W exits from writing mode leaving the cursor in the previous position; location 3500. It restores the buffer and goes to writing mode.

Key E defaults to menu — exits; location 2400. It replaces the buffer and returns to the menu. Key R replaces the buffer; location 2000. Key C clears the character underneath

ROCESSING



cursor position; location 1400. This is the same as key T but uses an empty string instead of Inkey$.

Option five is the method by which pages of text are clear of previously inputted material. To clear a page, enter its number.

Due to the fact that the justification function within the Editing mode is indiscriminate, it is necessary to use two control characters to protect specified lines from the justification technique. These are: > which excepts that line from justification, and < which stops justification and returns to the Edit mode.

Missing out the final control character in a half-filled page will cause a substantial delay before the machine returns to Editing mode. During this time, it is possible the string will become corrupt and cause disalignment of justification.

After loading the cassette the system will go directly into the menu offering the five options. To enter large amounts of text, press 3. The system will then ask you to enter the page to write on. If you have not entered any text into the page storage, start at page 1. If you have previously inserted pages of data then enter the probable page number at the end of the text.

If you wish to continue where you left off, enter Editing mode by shift W and move the cursor down to the position you wish to start writing from. After this press W to take you back into Writing mode, leaving the cursor in the same position. This will then allow you to continue entering text.

In Editing mode most of the functions are obvious in their use; some however may appear obscure at first glance. In the function of "Pick up and drop" of text codes 1 and P, the facility allows the user to transpose up to 639 characters at a time by moving the cursor down to the last character needed to be picked up, by pressing 1, followed by the length of text required to be dropped.

The justification routine is best left until the text pages are input and edited to the operator's complete satisfaction prior to final print out of usable hard copy.

As regards program structures there are 18 variables controlling the program. This small number beneficially extends the character storage capacity. Some variables are used more than once but for different purposes during operation. The listing therefore appears confused in its form, so this table should clarify the position.

Variable	Function
A	Controls length of string splitting.
A$	Holds text.
B	Used as loop counter during buffer restore.
B$	Buffer store.
C$	Used as temporary store during buffer restore.
D$	Contains string used for pick up and drop.
POS	Holds location of cursor in A$.
UU	Increases POS to Modular 32 and so acts as Newline.
WC	Cursor column.
WL	Cursor line.
X	Holds page number.
X$	General input of information.
Z$	Used to save under file name.
F	Delay loop.
AS	
Z	Used to control justification.
Y	
GH	

Line	Routine
10- 60	Initiation of main variables.
70- 140	Save routine.
160- 330	Menu plus directional sorting routine.
350- 495	Print-out routine.
500- 750	Writing routine.
800-1090	Main-editing sorter.
1110-2470	Editing subroutines.
2502-2590	Buffer-restore system.
4000-4040	Page-clearing routine.
7005-8020	Justification.
8605-8690	Fast-movement routine.
9000-9999	Error trapping and messages.

```
  10 REM      -WORDY 3
              -A.F.WHIDDETT
              -24.3.82
  20 DIM A$(10,640)
  30 LET B$=""
  40 LET D$=""
  50 LET POS=1
  60 LET PAGE=1
  70 PRINT "WORDY3 ENTER PROGRAM
NAME-"
 110 INPUT Z$
 115 IF Z$="" THEN GOTO 9050
 120 PRINT "SET UP TAPE DECK THE
N PRESS(N/L)"
 130 INPUT X$
 140 SAVE Z$
 150 CLS
 170 PRINT "
"
 180 PRINT "    WORDY 3 BY A.F.WH
IDDETT"
 190 PRINT "
"
 200 PRINT AT 4,2;"  1:SAVE ON T
APE"
 210 PRINT AT 6,2;"  2:SEND TO P
RINTER"
 220 PRINT AT 8,2;"  3:WRITE PAG
E"
 230 PRINT AT 10,2;"  4:EDIT PAG
E"
 240 PRINT AT 12,2;"  5:CLEAR PA
GE"
 245 PRINT AT 14,0;"    ENTER OP
TION (1 TO 4)"
 250 PRINT AT 14,25;"■"
 260 LET X$=INKEY$
 270 IF X$="1" THEN GOTO 870
 280 IF X$="2" THEN GOTO 350
 295 PRINT AT 14,25;"?"
 300 IF X$="3" THEN GOTO 500
 310 IF X$="4" THEN GOTO 800
 320 IF X$="5" THEN GOTO 4000
 330 GOTO 250
 360 PRINT "ENTER PAGE TO BE PRI
NTED OUT"
 370 INPUT X
 380 IF X=11 THEN GOTO 420
 390 IF X=12 THEN GOTO 150
 395 IF X>11 OR X<1 THEN GOTO 90
30
 400 LPRINT A$(X)
 410 GOTO 430
 420 FOR X=1 TO 10
 422 LPRINT A$(X)
```

(continued on page 55)

20 BEST PROGRAMS for the ZX SPECTRUM £7.95

Mr HELPLINE — the man who answers your ZX queries in his column in *Sinclair User*, the author of HINTS & TIPS FOR THE ZX80 and HINTS & TIPS FOR THE ZX81 now presents his 20 BEST PROGRAMS FOR THE ZX SPECTRUM.

* 20 original programs for you to load into your Spectrum.
* 20 interesting programs for you to enjoy and learn from.
* 20 great programs to teach you about fixed and variable length records, binary searches, bubble sorts, floating point arithmetic, graphic displays and much, much more . . .
* **20 BEST PROGRAMS FOR THE ZX SPECTRUM.**

Program Titles Include:

Machien code editor — Write, modify, exend and load machine code using this all-Basic machine code editor. No need to use an Assembler when you have this program.

Index file — Learn about fixed length records, save numeric and string fields, add to, sort, modify, delete and print your records. Ideal as a computer based card index.

Duckshoot — Learn how to manipulate the attribute file *and* have fun at the same time.

Diary — Binary searches and variable record lengths are explained with this useful and interesting program.

PLUS: FOOTBALL, DIGITISER, DATA PLOT, FUNCTION PLOT, REGRESSION, HISTOGRAM and many more . . .

Z80 OP CODES £1.45

A must for the beginner and the experienced programmer alike. This hand ready reckoner lists all 600 plus Z80 machine code instructions in decimal and hexadecimal with their mnemonics. Each Op Code is succinctly explained and cross-referenced. Supplied in a protective transparent wallet for easy reference and durability.

PROGRAMMERS TOOLKIT ZX81 £6.50

Toolkit functions include:

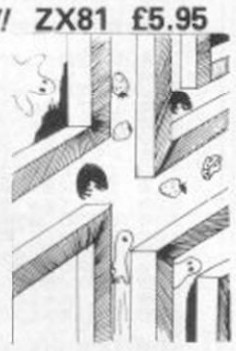
* RENUMBER including the destination lines of GOTO's and GOSUB's, START and Finish lines and Step size specified by you.
* DELETE part or all of a program at your command.
* REPLACE character(s) or token(s) with an equal number of others specified by you.
* EDIT to creat sub routines at a stroke by moving blocks of basic program lines.
* FIND a basic program string specified by you.
* INPUT prompts for a two digit hexadecimal code and pokes it in at a specified address.
* Separate version available for 48 + 8 and 64K memories (resides at 8192).

PILOT ★ ZX81 £5.95

New and exciting. Pilot challenges you to take off, fly between beacons, then land whilst watching wind speed and dodging craggy mountains – either could lead to disaster! If you take the challenge, you may soon learn to fly solo – so detailed are the flying instructions. Coast along in Autopilot – just to gain confidence, then battle your way through 6 further modes, 6 different ways of trying to steer your plane safely back to base, increasing in difficulty, testing your skills. Good luck with your fight against the unpredictable elements!

PUCKMAN *NEW!* ZX81 £5.95

* All action display
* Scour the maze for food
* Dodge the ghosts who come to devour you
* Automatic option – the machine plays itself
* Full keyboard display
* Full instruction display
* Continuous scoring
* Beat the best score to date
* Super graphics when used with Quick Silva graphics board



ZX81 HARDWARE

16K MEMOPAK (expandable)	£29.90
32K MEMOPAK (expandable)	£49.90
64K MEMOPAK	£79.00
56K Ram pack	£54.95
HRG MEMOPAK Hi Res Graphics	£59.80
MEMOPAK Centronics printer interface	£39.90

ZX81 CASSETTES

SPACE INTRUDERS (16K)	£5.95
STATISTICS (1K)	£3.75
LANGUAGE DICTIONARY (16K)	£3.75
LINE RENUMBER (16K)	£4.95
NAVAL BLOCKADE (16K)	£5.95

ZX81 BOOKS

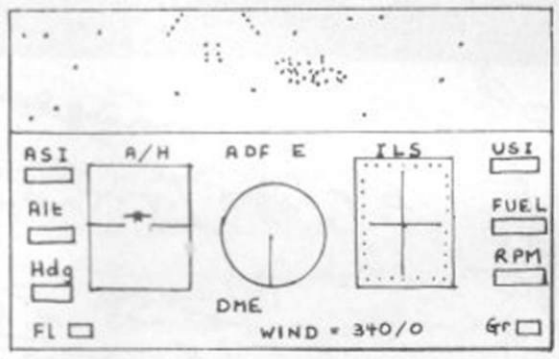
HINTS & TIPS for the ZX81	£3.95

ZX SPECTRUM CASSETTES

MACHINE CODE EDITOR	£4.95
MUSIC & SKETCH	£4.95
ASSEMBLER	£4.95
DISASSEMBLER	£4.95

NIGHT FLIGHT £5.95

For the 16K or 48K SPECTRUM



Fly your own aircraft from take off to landing via navigational beacons, over mountains and using a fully detailed direction finding and instrument landing system. *You are the Pilot of a light aircraft flying at night. *You must use your skill and judgment to fly your aircraft accurately over radio beacons and then land safely on the runway *Hazards are mountains and cross winds *Instruments: Artificial Horizon, Non Directional Beacon, VHF Omnidirectional Range, Instrument Landing System *Readouts: Gear, Flap, Air Speed, Distance Measuring Equipment, Vertical Speed, RPM and heading *Visual display of runway on approach *5 Modes from Take off to Autopilot *Happy landings *WRITTEN BY A QUALIFIED PILOT*

QUANTITY	PRODUCT	COST
	TOTAL	

MAKE CHEQUES/PO's PAYABLE TO: HEWSON CONSULTANTS.

NAME.....
(block capitals please)
ADDRESS.....

.....

My Access/Barclaycard No. is.....

Signed.....
Post to: **HEWSON CONSULTANTS, DEPT X, 60A ST MARY'S STREET, WALLINGFORD, OXON OX10 0EL.**
TEL (0491) 36307.

(continued from page 53)

```
 424 NEXT X
 430 PRINT "   ANYMORE"
 440 LET X$=INKEY$
 480 IF X$="Y" THEN GOTO 350
 490 IF X$="N" THEN GOTO 150
 495 GOTO 440
 520 PRINT "ENTER PAGE FOR WRITI
NG ON"
 530 INPUT X
 540 IF X>10 OR X<1 THEN GOTO 90
30
 545 LET POS=1
 550 PRINT AT 21,0;" MODE:WRITIN
G  ";AT 21,22;"PAGE:";X
 580 PRINT AT 20,0;"
                    "
 600 PRINT AT 0,0;A$(X)
 605 POKE 16441,20
 606 POKE 16442,30
 620 LET WL=INT (POS/32)
 630 LET WC=POS-WL*32-1
 635 IF POS/32=INT (POS/32) THEN
 GOSUB 8000
 640 PRINT AT WL,WC;"■"
 650 IF INKEY$="" THEN GOTO 650
 660 LET X$=INKEY$
 670 IF X$=CHR$ 224 THEN GOTO 15
0
 675 IF X$=CHR$ 121 THEN GOTO 73
1
 680 IF X$=CHR$ 118 THEN GOTO 74
0
 685 IF X$=CHR$ 228 THEN GOTO 30
00
 686 IF X$=CHR$ 217 THEN GOTO 85
0
 687 IF X$=CHR$ 121 THEN GOTO 85
00
 690 LET A$(X,POS)=X$
 700 PRINT AT WL,WC;A$(X,POS)
 710 LET POS=POS+1
 720 IF POS>640 OR POS<1 THEN GO
TO 3800
 730 GOTO 620
 731 LET UU=(WL+1)*32-POS
 732 LET POS=POS+UU+1
 733 PRINT AT WL,WC;A$(X,POS-UU-
1)
 734 GOTO 720
 740 LET X$=" "
 750 GOTO 690
 810 PRINT "ENTER PAGE FOR EDITI
NG"
 820 INPUT X
 830 IF X>10 OR X<1 THEN GOTO 90
30
 840 LET POS=1
 850 PRINT AT 20,0;"
                    "
 855 PRINT AT 21,0;" MODE:EDITIN
G  ";AT 21,22;"PAGE:";X
 860 PRINT AT 0,0;A$(X)
 870 LET WL=INT (POS/32)
 880 LET WC=POS-WL*32-1
 885 IF POS/32=INT (POS/32) THEN
 GOSUB 8000
 890 PRINT AT WL,WC;CHR$ (128+CO
DE A$(X,POS))
 900 PRINT AT WL,WC;A$(X,POS)
 905 IF INKEY$="" THEN GOTO 890
 910 LET X$=INKEY$
 920 LET POS=POS+(X$="8")-(X$="5
")+32*(X$="6")-32*(X$="7")
 930 IF POS>640 OR POS<1 THEN GO
TO 9070
 940 IF CODE X$<37 AND CODE X$>3
2 THEN GOTO 870
 950 IF X$="H" THEN LET POS=1
 955 IF X$="D" THEN GOTO 2200
 960 IF X$="S" THEN GOTO 1100
 970 IF X$="L" THEN GOTO 1200
 980 IF X$="A" THEN GOTO 1500
 990 IF X$="I" THEN GOTO 1300
1000 IF X$="C" THEN GOTO 1400
1010 IF X$="B" THEN GOTO 1600
1020 IF X$="T" THEN GOTO 1700
1030 IF X$="1" THEN GOTO 1800
1040 IF X$="P" THEN GOTO 1900
1050 IF X$="A" THEN GOTO 2000
1060 IF X$="E" THEN GOTO 2400
1070 IF X$="O" THEN LET B$=""
1075 IF X$="J" THEN GOTO 7000
1080 IF X$="U" THEN GOTO 3500
1085 IF X$="M" THEN GOTO 8600
1090 GOTO 870
1100 LET B$=A$(X,640)+B$
1120 LET A$(X)=A$(X,1 TO POS-1)+
" "+A$(X,POS TO 640)
1130 LET POS=POS+1
1135 IF LEN B$>200 THEN GOTO 909
0
1140 GOTO 860
1210 LET B$=A$(X,640-32 TO 640)+
B$
1220 LET A$(X)=A$(X,1 TO POS-1)+
"
 "+A$(X,POS TO 640)
1230 IF LEN B$>200 THEN GOTO 909
0
1240 GOTO 860
1310 PRINT AT 21,0;"ENTER TEXT
                "
1320 INPUT X$
1330 LET A=LEN X$
1340 LET B$=A$(X,640-A TO 640)+B
$
1350 LET A$(X)=A$(X,1 TO POS-1)+
X$+A$(X,POS TO 640)
1360 IF LEN B$>200 THEN GOTO 909
0
1370 GOTO 850
1410 LET A$(X,POS)=" "
1420 GOTO 860
1510 GOSUB 2500
1515 IF X=10 THEN GOTO 9010
1520 LET X=X+1
1530 GOTO 850
1610 GOSUB 2500
1615 IF X=1 THEN GOTO 9010
1620 LET X=X-1
1630 GOTO 850
1710 PAUSE 100
1720 IF INKEY$="" THEN GOTO 1720
1740 LET A$(X,POS)=INKEY$
1750 GOTO 860
1810 PRINT AT 21,0;"AMOUNT?"
1820 INPUT A
1830 LET D$=A$(X,POS-A TO POS-1)
1840 LET A$(X)=A$(X,1 TO POS-A-1
)+A$(X,POS TO 640)
1850 GOTO 850
1910 LET A$(X)=A$(X,1 TO POS-1)+
D$+A$(X,POS TO 640)
1920 LET D$=""
1930 GOTO 860
2010 GOSUB 2500
2020 GOTO 850
2300 IF B$="" THEN LET A$(X)=A$(
X,1 TO POS-2)+A$(X,POS TO 640)
2310 IF B$<>"" THEN LET A$(X)=A$
(X,1 TO POS-2)+A$(X,POS TO 640)+
B$(1)
2320 IF B$<>"" THEN LET B$=B$(2
TO )
2330 LET POS=POS-1
2340 GOTO 860
2410 GOSUB 2500
2420 GOTO 150
2502 IF B$="" THEN RETURN
2505 FAST
2510 LET A=LEN B$
2520 FOR B=X+1 TO 9
2530 LET C$=A$(B,640-A TO 640)
2540 LET A$(B)=B$+A$(B,1 TO 640-
A-1)
2550 LET B$=C$
2560 NEXT B
2570 LET B$=""
2580 SLOW
2590 RETURN
3000 LET POS=POS-1
3005 LET A$(X,POS+1)=" "
3010 GOTO 600
3500 GOSUB 2500
3510 GOTO 550
3800 LET X=X+1
3810 IF X>10 THEN GOTO 9010
3815 LET POS=1
3820 GOTO 550
4000 PRINT "   PAGE TO CLEAR?"
4010 INPUT X
4020 IF X>10 OR X<1 THEN GOTO 90
30
4030 LET A$(X)=""
4040 GOTO 150
7005 LET GH=0
7007 LET A5=2
7010 FAST
7030 FOR Z=1 TO 640-32 STEP 32
7040 FOR Y=Z+31 TO Z STEP -1
7042 IF A$(X,Y)=" (" THEN GOTO 71
15
7050 IF A$(X,Y)=")" THEN GOTO 71
00
7052 IF A$(X,Y)<>" " THEN GOTO 7
065
7055 LET GH=GH+1
7060 NEXT Y
7065 LET A$(X)=A$(X,1 TO Z+31-GH
)+A$(X,Z+31+1 TO 640)
7070 FOR Y=Z TO Z+31
7075 IF GH=0 THEN GOTO 7100
7080 IF A$(X,Y)=" " THEN GOSUB 7
500
7090 NEXT Y
7095 IF GH<>0 THEN GOTO 7800
7100 LET GH=0
7102 LET A5=2
7105 NEXT Z
7115 SLOW
7120 GOTO 850
7510 LET A$(X)=A$(X,1 TO Y-1)+"
"+A$(X,Y TO 640)
7515 LET GH=GH-1
7518 LET Y=Y+A5
7520 RETURN
7800 LET A5=A5+1
7810 GOTO 7070
8000 LET WC=31
8010 LET WL=WL-1
8020 RETURN
8600 FAST
8610 LET WL=INT (POS/32)
8615 FAST
8620 LET WC=POS-WL*32-1
8630 IF POS/32=INT (POS/32) THEN
 GOSUB 8000
8640 PRINT AT WL,WC;"■"
8645 SLOW
8650 IF INKEY$="" THEN GOTO 8650
8655 PRINT AT WL,WC;A$(X,POS)
8660 LET X$=INKEY$
8665 IF X$=CHR$ 118 THEN GOTO 85
0
8670 LET POS=POS+(X$="8")-(X$="5
")+32*(X$="6")-32*(X$="7")
8690 GOTO 8610
9010 PRINT AT 21,0;"<ERROR>YOU H
AVE USED ALL FILES"
9020 GOTO 9910
9030 PRINT AT 21,0;"<ERROR>THERE
 IS NO SUCH PAGE   "
9040 GOTO 9910
9050 PRINT AT 21,0;"<ERROR>PROGR
AM NAME IS INVALID"
9060 GOTO 9910
9070 PRINT AT 21,0;"<ERROR>RUNNI
NG INTO NEXT PAGE"
9080 GOTO 9910
9090 PRINT AT 21,0;"<ERROR>WORKI
NG BUFFER IS FULL"
9100 GOSUB 2500
9110 GOTO 9910
9120 PRINT AT 21,0;"ERROR>TEXT I
NSERTION IS TO LARGE"
9130 FOR F=1 TO 20
9140 NEXT F
9150 GOTO 850
9910 PAUSE 100
9920 GOTO 150
9999 REM (C) A.F.WHIDDETT
```

SPECTRUM PROCESSOR

HERE IS A short Basic word-processing program which will enable you to provide neat, left- and right-justified text.

This will enable you to put the write-up, your listings and your program on to tape, check them, and post the material on a cassette. There is enough space for 1,000 words.

To use the Spectrum word processor, first enter your text as a data string within a data statement with quotation marks.

Next, write each paragraph in a separate data statement. Having done this you can write each word in full. Do not use the Sinclair internal keywords to save space.

To produce a single line space, type a single space within quotation marks, for example Data ' '. The symbol ' is used here as quotation marks.

Indent each new paragraph by four spaces. Always follow a full stop, comma, or any other punctuation with a space.

If you want a formatted display, produce each line by a single Data statement — it is easier.

Replace Pause 350 with Copy in line 190 if you have a printer.

The Spectrum word processor copies a screen full of data at a time. This seems to cause less of a strain on the printer than copying a line at a time.

The listing for the word processor is given in figure 1.

d; number of lines printed on the screen
c; number of characters short in unprocessed line
f; loop constant stepping back along the line looking for spaces
a$; the string variable to be processed
b$; the temporary string while locating suitable end point for line
c$; processed string line with modified spacing
g$; space

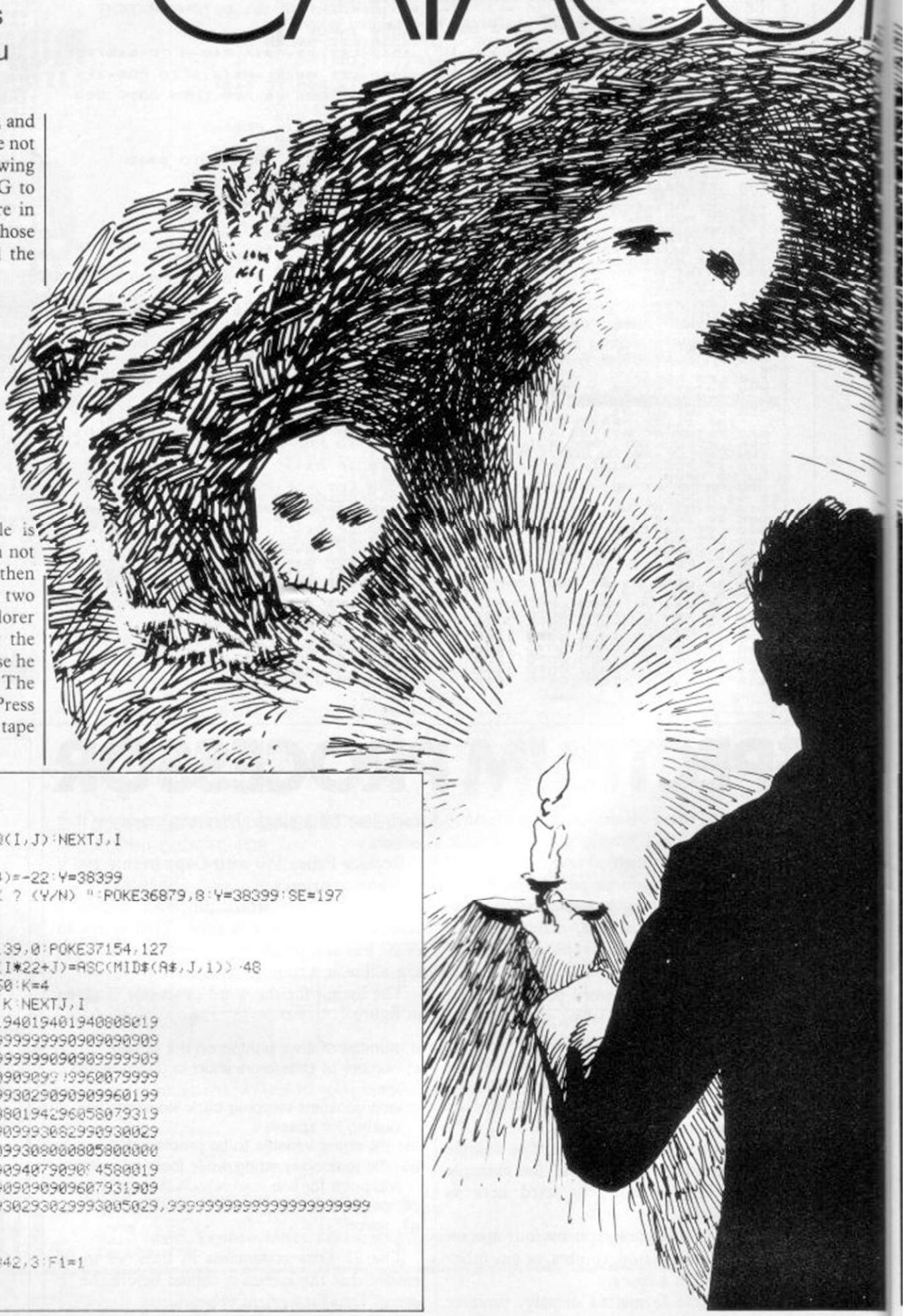
The 21 Data statements in lines 93 to 95 ensure that the screen is copied before the 'E out of Data' statement appears.

```
  93 DATA " ": DATA " ": DATA "
": DATA " ": DATA " ": DATA " ":
DATA " "
  94 DATA " ": DATA " ": DATA "
": DATA " ": DATA " ": DATA " ":
DATA " "
  95 DATA " ": DATA " ": DATA "
": DATA " ": DATA " ": DATA " ":
DATA " "
  97 LET d=0
 100 READ a$
 105 IF LEN a$>32 THEN GO TO 120
 110 PRINT a$
 112 GO SUB 180
 115 GO TO 100
 120 LET c=0
 125 IF c=32 THEN GO TO 150
 130 LET b$=a$(32-c)
 135 IF a$(33-c)=" " OR b$=")" O
R b$="," OR b$="." OR b$=";" OR
b$="'" OR b$="?" THEN GO TO 155
 140 LET c=c+1
 145 GO TO 125
 150 LET c=0
 155 LET c$=a$( TO 32-c)
 156 LET a$=a$(33-c TO )
 157 IF a$(1)=" " THEN LET a$=a$
(2 TO )
 160 GO SUB 200
 165 GO SUB 180
 170 GO TO 105
 180 LET d=d+1
 185 IF d<22 THEN RETURN
 190 PAUSE 350: CLS : LET d=0: R
ETURN
 200 LET g$=" "
 205 FOR f=LEN c$ TO 1 STEP -1
 210 IF LEN c$>31 THEN GO TO 240
 215 IF c$(f)=" " THEN GO TO 220
 216 NEXT f
 218 GO TO 205
 220 LET c$=c$( TO f-1)+g$+c$(f
TO )
 221 LET f=f-1
 225 LET c=c-1: IF c<=0 THEN GO
TO 240
 230 GO TO 216
 240 PRINT c$: RETURN
```

Figure 1. Robert Daren's Spectrum Processor. ■

THROUGH TH CATACO

As you wander Patrick Edmond's catacombs in search of gold coins, phantoms and evil winds conspire to snuff out you and your candle.



THIS GAME uses high-resolution graphics, and a joystick option is available too. If you are not working with a joystick, then use the following keys: Y to move up, B to move down, G to move left, and H to move right. You are in control of a human figure, an explorer, whose aim is to collect gold coins or dots and the following bonuses from the catacombs:

Object	Colour	Points
Orange	White	10
Cherries	Red	20
Pear	Cyan	30
Spider	Purple	40
Apple	Green	50
Crystal	Blue	60
Lemon	Yellow	70
Baby ghost	Blue/Green	10

The white orange — 10 points — doubles the explorer's speed.

After 30 seconds the explorer's candle is snuffed by a mysterious breeze, so he can not see to pick up the gold coins. He must then reach one of the sacred bells positioned in two corners, to relight it. At all times the explorer must avoid the ghosts, and occasionally the flickering block at the crossroads, otherwise he may lose a life, of which he has three. The game ends when he has lost all his lives. Press a key to restart. Be sure to switch off the tape play button before using joystick.

```
0 E=3
1 DIMX%(506),Q(8,2)
2 RESTORE:FORI=5TO8:FORJ=0TO2:READQ(I,J):NEXTJ,I
3 DATA4,3,1,4,1,2,4,2,3,3,2,1
4 Z=7679:Y(1)=1:Y(2)=22:Y(3)=-1:Y(4)=-22:Y=38399
5 VN=36874:PRINT"■■■■■■■ ■JOYSTICK ? (Y/N) ":POKE36879,8:Y=38399:SE=197
6 GETA$:IFA$=""THENGOSUB500:GOTO6
7 POKE36878,15
8 IFA$="Y"THENSE=37137:A8=1:POKE37139,0:POKE37154,127
10 FORI=0TO22:READA$:FORJ=1TO22:X%(I*22+J)=ASC(MID$(A$,J,1))-48
11 B=204:K=1:IFX%(I*22+J)=9THENB=160:K=4
12 POKE?+I*22+J,B:POKE38399+I*22+J,K:NEXTJ,I
20 DATA999999999999999999999,940019401940194080B019
21 DATA9099302930290909030909,9319999999990909090909
22 DATA9960000000190960293079,9909999999090909999909
23 DATA9450801940502909940029,9090909099?9960079999
24 DATA9094290?0940807990999,9090993029090909960199
25 DATA9385199999090909909099,9909380194296058079319
26 DATA9429909307990990909909,9099909993082990930029
27 DATA9319450199909990999999,9909099308000805800000
28 DATA0029319990909099099999,9999909407909090?4580019
29 DATA9400079090?09090909909,9099909090909607931909
30 DATA9094079090960290990909,9302930293029993005029,9999999999999999999999
50 IFQ9=0THENGOSUB1000
51 GR=1
70 P1=25:D1=1:M1=PEEK(Z+P1):POKEY+342,3:F1=1
80 P2=402:D2=3:M2=PEEK(Z+P2)
```

E VIC
MBS

```
90 P3=469:D3=3:M3=PEEK(P3+Z)
95 B=2:TI$="000000":POKEZ+24,205:POKEZ+483,205:POKEY+24,7:POKEY+483,7
96 A=INT(RND(1)*7)+210:POKEZ+42,A:POKEY+42,A-209:POKEZ+465,A:POKEY+465,A-209
97 A=RND(1)*9+150
100 POKEZ+P1,M1:P=P1:D=D1:GOSUB892
101 A=RND(1)*20+150
110 P1=P1+Y(D):D1=D:M1=PEEK(Z+P1)
115 IFM1=200THENM1=M3:GOSUB800
116 IFM1=202THENM1=203:POKEY+P1,6
120 POKEP1+Z,201:POKEVN+2,0
130 POKEZ+P2,M2:P=P2:D=D2:GOSUB892
140 P2=P2+Y(D):D2=D:M2=PEEK(Z+P2)
145 IFM2=200THENM2=M3:GOSUB800
146 IFM2=201THENM2=203:POKEY+P1,5
150 POKEP2+Z,202
160 FORF=1TOF1:POKEZ+P3,M3:P=P3:D=D3:GOSUB8 )0
161 POKEY+P3,1
170 P3=P3+Y(D):D3=D:M3=PEEK(Z+P3)
176 IFTI$)"000030"ANDB=2THENPOKEVN+3,248:FORI=1TO200:NEXTI:POKEVN+3,3:B=3
177 IFM3=160THENP3=P3-Y(D3):M3=PEEK(Z+P3):GOTO180
178 IFM3>209THENSC=SC+(M3-209)*10:GOSUB600:GOTO180
179 ONM3-200GOSUB400,410,420,430,440
180 POKEZ+P3,200:POKEY+P3,B-1
181 NEXTF
185 PRINT"■■■■■■■■■■";SC;TAB(16);"■ I";E:POKEY+14,B-1:POKEZ+14,331-B*57
186 POKEZ+342,206:IFRND(1)>.6THENPOKEZ+342,160:IFRND(1)>.8THENPOKEZ+34 ,202
190 IFW<239THEN100
199 POKEVN+2,0
200 W=0:FORI=1 0120:FORJ=-2TO2:POKEVN+2,130+I+J:NEXTJ,I:POKEVN+2,0
201 GOTO2080
400 M3=M1:GOSUB800:RETURN
410 M3=M2:GOSUB800:RETURN
420 M3=206:GOSUB700:RETURN
430 IFB<>2THENRETURN
431 M3=206:SC=SC+1:W=W+1:POKEVN+2,A:IFF1=2THENPOKEVN+2,235
432 RETURN
440 GOSUB500:RETURN
500 POKEVN+2,2 0:FORI=15TO0STEP-.3:POKE36878,I:NEXTI:POKEVN+2,0:B=2:TI$="000000"
510 POKEVN+ 237:FORI=15TO0STEP-.3:POKE36878,I:NEXTI:POKEVN+2,0:POKE36878,15:RET
URN
600 FORI=0TO2:POKEVN+I,200:POKEVN+I-1,0:FORJ=1TO100:NEXTJ,I:IFM3=21 THENF1=2
605 M3=206
610 FORI=2TO0STEP-1:PO EVN+I,200:POKEVN+I+1,0:FORJ=1TO100:NEXTJ,I:POKEVN,0:RETUR
N
700 POKEVN,250:POKEVN+2,145:FORI=1TO100:NEXTI:POKEVN,0:POKEVN+2,0:SC=SC+10:RETUR
N
800 FORJ=225TO0STEP-200:FORI=1TO3:POKEZ+P3,RND(1)*3+207:POKEVN+I,J:NEXTI
810 FORI=1TO100:POKEZ+P3,RND(1)*3+207:P KEY+P3,RND(1)*7+1:NEXTI,J
815 E=E-1:IFE<1THEN2050
820 RETURN
890 IFX%(P)>4THEN960
892 ONX%(P)+1GOTO900,910,920,930,920,950,950,950,950
900 RETURN
910 D=D-SGN(D-2):RETURN
920 D=5-D:RETURN
930 D=D+(D*2-5):RETURN
950 D=Q(X%(P),INT(RND(1)*3)):RETURN
960 T=PEEK(SE):IF(T=11ORT=250):NDX%(P3)<>8THEND=4
964 I AS=1ANDX%(P3)<>7ANDPEEK(37152)=119THEND=1
965 IFT=43ANDX%(P3)<>7THEND=1
970 IF(T=35ORT=246)ANDX%(P3)<>5THEND=2
975 IF(T=19ORT=238)ANDX%(P3)<>6THEND=3
977 IF(T=64ORT=254)ANDPEEK(37152)=247THEND=0
980 RETURN
1000 FORI=0TO7:POKE6400+I,PEEK(340 8+I):NEXT:POKE36866,PEEK(36866)OR128:POKE3686
9,253
1005 FORI=6528TO6608:POKEI,PEEK(32768+I-5120):NEX
1010 FORI=6720TO6863:READA:POKEI,A:NEXTI:RETURN
1020 DATA56,56,16,124,186,56,40,40,124,254,182,254,254,254,254,170
1030 DATA124,254,218,254,254,254,254,170,0,28,62,42,62,62,62,42
1040 DATA0,0,0,0,0,24,24,0,0,24,60,60,60,60,126,16
1050 DATA0,0,0,0,0,0,0,0,0,0,0,24,24,0,0,0,0,0,60,36,36,60,0,0
1060 DATA0,126,66,66,66,66,126,0,0,0,60,110,126,126,126,60,0
1070 DATA255,223,239,247,233,153,159,255,32,24,24,60,94,126,61,0
1080 DATA0,0,254,84,124,124,170,0,52,8,20,62,62,62,28,0
1090 DATA255,195,145,181,181,145,195,255,0,0,60,126,126,60,0,0
2000 DATA8,16,32,16,48,51,181,122
2050 FORI=0TO22:A=(INT(I/2)=I/2)*5+7:POKEVN+2,(INT(I/2)=I/2)*40+190:POKEY+1+I*22
,A
2051 POKEY+I*22+22,A:FORJ=1TO200:NEXTJ,I
2060 SC=0:W=0:E=3:POKEVN+2,0
2061 IFPEEK(197)=64THEN2061
2070 IFQA=0THEN1
2080 FORI=1TO506:B=204:K=1:IFX%(I)=9THENK=4:B=160
2090 POKEZ+I,B:POKEY+I,K:NEXTI:GOTO70

READY.
```

ATTENTION

VIC 20 Owners

Buy 1 Game

EACH CASSETTE CONTAINS:

7 EXCITING GAMES
by Clifford Ramshaw
for your Standard VIC 20

Clifford Ramshaw is undoubtedly one of the most creative programmers of games for the VIC. He is also the author of *The Wizard and the Princess* and *VIC Arcade Pack*, all available from Melbourne House.

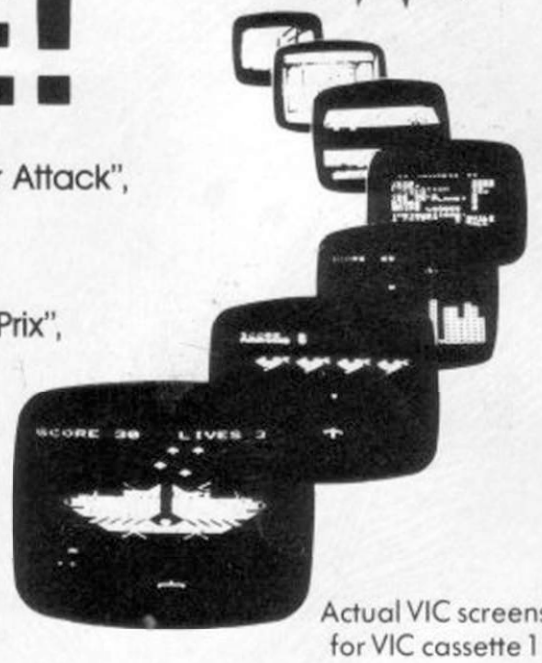
GET 6 FREE!

7 games on 1 cassette

VIC Innovative Cassette 1 "City Bomber", "Dumper", "Nuclear Attack", "Ganymede", "Space Fight", "Battleship", "Duck Shoot".

VIC Innovative Cassette 2 "Alien Overun", "Rat Trap", "Grand Prix", "Warlock", "Bomber Attack", "Hangman", "Siege".

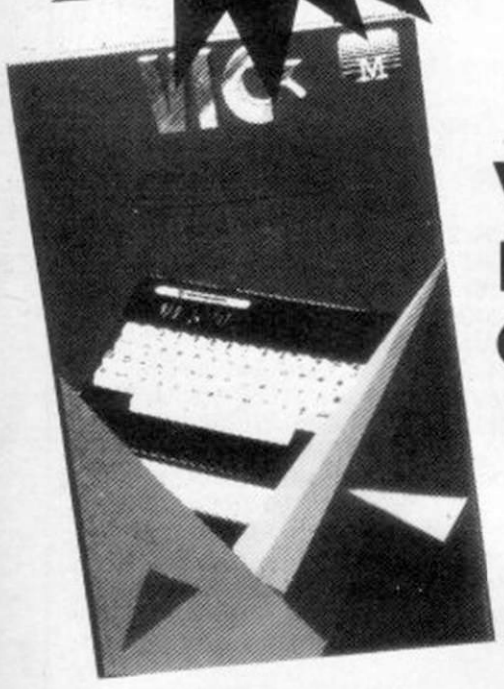
VIC Innovative Cassette 3 "Hoppy", "Save the Shuttle", "Invasion", "Dragons Lair", "Dungeon", "Blackjack", "Squash".



Actual VIC screens for VIC cassette 1

Only £5.95 each

NOW all the above games **PLUS** others in this **NEW BOOK**



VIC INNOVATIVE COMPUTING
by Clifford Ramshaw

£6.95

Orders to:
MELBOURNE HOUSE PUBLISHERS
131 Trafalgar Road, Greenwich, London SE10.
Correspondence to: Glebe Cottage, Station Road, Cheddington, Leighton Buzzard, BEDS LU7 7NA.
Please send me:
☐ VIC 1 £5.95 ☐ VIC 2 £5.95 ☐ VIC 3 £5.95
☐ VIC Innovative Computing £6.95
(please add 80p for post, pack & V.A.T.)

Name .....

Address .....

..... P'code YC10

MELBOURNE HOUSE PUBLISHERS

BASIC DICTIONARY

This dictionary, compiled by Tony Edwards, will explain the function of common Basic words as used in popular machines, enabling you to work out your own machine's equivalent. A useful complement to our recent series on Basic dialect translation.

A

A. Used in TRS-80 Level I and in some versions of Tiny Basic as an abbreviation for the ABS function. *See ABS*

ABS An almost universal function which returns the absolute value of the argument, that is, the expression in brackets following it. A number's absolute value is its numerical value without an accompanying + or – sign. This is an ANSI — American National Standards Institute — standardised word from the minimum Basic vocabulary.

ACS This is a function giving the arc-cosine of its argument in radians. It is rarely found but is in the extensions to BBC Basic.

ADVAL A BBC Basic function which returns the last value of the variable which follows it.

AND An operator used between two statements in logical arithmetic when both must be complied with to pass the test. For example:

```
10 IF X = 0 AND Y = 0 THEN 1000
```

Some computers use AND to compute the binary logical AND of two statements using Boolean algebra, rather than to make a direct comparison of value. An article on translating binary logic was published in *Your Computer* August 1982 page 58. This provides more details. This word can also be used to check the veracity of two statements on some micros. For example:

```
10 PRINT X = 0 AND Y = 0
```

will print –1 (True) if both X and Y are zero and 0 (False) if they are not.

ASC This function converts the first character of a string argument into the decimal equivalent of its standard ASCII code. If the argument is a null string it usually returns the value –1. In many cases the string argument may be longer than one character, but only the first character is evaluated and converted. Users of ZX-81 and ZX Spectrum machines will recognise this function as the equivalent of their CODE function.

ASN This is a function found in a few Basics, including BBC Basic, which returns the arc-sine of its argument, usually in radians. If it is not available to you, its direct equivalent is:

```
ATN(X/SQR(-X*(X+1)))
```

This uses the more readily available function ATN. *See ATN*

AT This word is used in conjunction with PRINT to print from a specific location on the VDU, in TRS-80 Level I Basic. In other interpreters the symbol @ is used.

ARCTAN This is the ZX-81 equivalent of ATN. *See ATN*

ATAN A variant of ATN. *See ATN*

ATN This is a function which returns the arc-tangent of its argument, usually in radians. It is widely available and is often the only inverse trig function available. Thus it is often used to return angles calculated via other trig functions using the standard trigonometrical conversions. It is in the ANSI minimim Basic vocabulary.

AUTO A command, not used in programs, which provides for automatic insertion of line numbers. It can usually be followed by two values the first indicating the start line number, and the second setting the increment value. On most micros both these values default to 10 if no values are entered.

B

BASE Although a word in the ANSI minimum Basic vocabulary, it is not often encountered on micro-computers. It is a statement which defines the lowest numbered variable array element. This is usually 0 to 1, but some compilers allow higher numbers. For instance:

```
10 BASE 10
20 DIM  15
```

will produce an array of six elements numbered 10 to 15. Most microcomputers have a fixed lowest array number of either 0 or 1.

BELL This is a statement from Apple II Basic which causes the computer's built-in speaker to produce a sound when it is encountered within a program.

BGET A BBC Basic extension function which takes a byte from the file whose channel number is the argument.

BPUT A BBC Basic extension function which places a byte in the file whose channel number is the first argument. This function passes the least significant byte of its second argument.

BREAK This is often a key command, but is found as a program statement in some Basics. When encountered, it stops the computer and places it in the monitor mode awaiting a command. It is thus similar to a STOP, but the program run can be continued with the direct command CO or CONT. When the BREAK statement is encountered the current values of all variables are retained, awaiting the command to continue the run sequence.

BYE A command used on the Atari and MZ-80K to close files and return to the operating system.

C

C. Used in TRS-80 Level I as an abbreviation for CONT. *See CONT*

CALL A statement used by some micros, including the BBC Micro and the Apple II, which causes the computer to leave Basic coding and execute a machine language routine, the argument being the address of the routine. It is similar to the statements USR(0) and LINK used by other machines.

CDBL A function which will change numbers, or numerical variables into double precision format. Usually to 17 significant figures of which 16 are printable.

CHAIN This is a statement, available on many micros, which allows a second and subsequent program to be loaded and run without nulling the values of the variables produced by the first program. On the BBC Micro this command nulls all variables except those whose second character is %. These are saved for use in the new program.

CHAR A function which returns the character represented by the ASCII decimal code number used as the argument.

CHAR$ A similar function to CHAR.

CHR A similar function to CHAR.

CHR$ A similar function to CHAR above. In many micros this function is used, in conjunction with numerically high or low arguments, to produce cursor control statements. *Your Computer* June and August 1982, page 43 gives more details.

CINT This function converts numbers or numeric variables into integer values. It differs from the INT function in that the original non-integer value is not lost and can be recalled later.

CLEAR This may be a command or a statement and has different uses on different machines. On some, such as the BBC Micro it clears all dynamically-declared variables, whilst on others, such as the TRS-80, it additionally sets up an area of reserved memory for string variables. It may also be used to clear terminal input or output buffers. Only careful consideration of the logic of the program can identify its intent, unless the dialect being used is familiar. ■

The NEW MPF II

Only available from Flight Electronics Limited

1. Massive 64K memory.
2. 3 Display Modes:-
   a) TEXT
   b) 6 colour high resolution graphics (53,760 pixel: 280 x 192).
   c) 16 colour low resolution graphics (1,920 blocks: 40 x 48)
3. Sound via 8 ohm 2.25", 0.25 w speaker/amp.
4. 6502 processor.
5. Applesoft compatible, BASIC.
6. Cartridges for ASSEMBLY, PASCAL, FORTH available soon.
7. ACCESSORIES: 40 character graphics, 150 lpm Thermal Printer, Games packages, RS232C network interface board, floppy disk driver, sound/speech synthesizer board, and many more on the way.

SEE EDITORIAL THIS ISSUE

FLIGHT ELECTRONICS LTD. Flight House, Quayside Rd, Southampton, Hants SO2 4AD. Tel: (0703) 34003/27721. Telex: 477793.

(by phone or post) **£235** + **carriage (£4.95)** + **V.A.T.**

I enclose cheque/P.O. for £.....

Name .....

Address .....

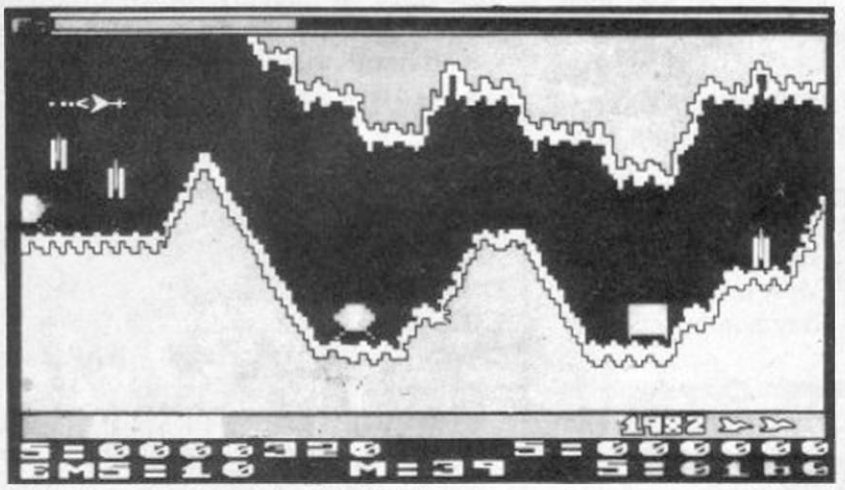
.....

.....

.....

.....

FLIGHT



AIRSTRIKE For The ATARI 400/800

● INTRODUCING THE NEW ARCADE GAME FOR ATARI COMPUTERS ! ● SUPERB SCROLLING GRAPHICS WITH DAZZLING COLOURS ! ● 100% MACHINE CODE PROGRAMME FOR ONE OR TWO PLAYERS ! ● MULTIPLE SKILL LEVELS – FIGHT YOUR WAY THROUGH CAVERNS AND TUNNELS WITH ATTACKING MISSILES FUEL AND AMMO DUMPS TO CONTEND WITH ! ● AVAILABLE NOW: 16K CASSETTE £19.95 } Plus 50p P & P
32K DISK £19.95 }

WE STOCK ATARI 400/800 COMPUTERS COMMODORE VIC COMPUTERS — CALL FOR BEST PRICES!

WE STOCK ALL ATARI, APOLLO, ACTIVISION & IMAGIC CARTRIDGES — CALL FOR BEST PRICES!

WE STOCK LOTS & LOTS OF VIC SOFTWARE — CALL FOR BEST PRICES!

WE STOCK LOTS & LOTS OF ATARI SOFTWARE E.g. Time Warp, Nautilus, Canyon Climber, Apple Panic, Centipede, Venus Voyager, Slime, Intruder, Alien Swarm, Preppie, Pacman, Mathpack, Shamus, Ali Baba, Micropainter, Clowns & Balloons – plus many, many more titles – Call now for our latest batch of detailed brochures ! We will keep you up to date on all the new software releases ! ! !

2 YEAR GUARANTEE ON **ATARI COMPUTERS**

WE SERVICE ALL ATARI & COMMODORE COMPUTERS

ATARI INDEPENDENT SERVICE CENTRE

FAST NATIONWIDE MAIL ORDER ON ALL PRODUCTS.

GEMINI ELECTRONICS

ATARI Dept. Y.C. 50 Newton St., Off Piccadilly, Manchester M1 2EA. Tel: 061-236 3083.

Buy it with Access BARCLAYCARD VISA

✸ COMPUTER CHESS GAMES

Commodore VIC 20
PLUS GAMES NOW IN STOCK!

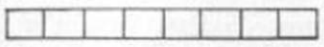
VIC 20

VIC BIG SCREEN

Space — the final frontier. Geoff Roberts shows you how to access more of the screen and boldly go where no Vic owner has gone before.

THE VIC 6561 chip has 16 control registers, all addressable, which control the display on the screen, the sound and the character set. Four of the registers are digital inputs for a light-pen and two joysticks.

The register we are looking at here controls the number of lines of characters that can appear on the screen. The address of this register is 36867 ($9003), and has the following format:



7 6 5 4 3 2 1 0

Bit numbers

Bits 1-6 are the number of lines or rows; bit 0 sets/resets double height characters, for use with high-resolution plotting; and bit 7 is part of the raster-scan line number.

The number-of-lines value starts at bit 1; this means that the values Poked into this register have to be double the number of extra lines required. Thus, if 25 lines are required, then 50 has to be Poked into this register.

If you Peek this register you will find the value 46 which is twice 23 — the usual number of lines. (Sometimes you will find the value 174 because bit 7 continually changes).

Try Poke 36867,60. The bottom part of the screen extends to reveal gibberish — there are now 30 lines on the screen. To re-centre this display, another register has to be altered. This is register 36865 ($9001) which sets the amount of border to be displayed at the top of the screen. Its normal value when Peeked is 38. For every line you have added to the display, reduce the contents of this register by two.

For example, we have just increased the screen by seven lines, so reduce the contents of 36865 by 14 to 24. Try Poke 36865,24. For most VDUs the display should now be centred again.

So, there are seven extra lines but the Basic operating system does not recognise them. The 6561 has extended the screen RAM by the necessary amount (in this case 7 × 22 = 154 bytes) but the operating system will not treat this extra memory area as part of the screen memory. What is this area anyway?

For Vics with 8K or less only the first six bytes of the extended memory actually exist and they are the left-overs of the screen memory; only 506 bytes out of 512 are used for the display.

For Vics with greater memory, this area is part of the Basic program area (apart from the first six bytes) and it is to these privileged Vics that the rest of the article refers.

The expanded part of the screen shows the contents of the Basic program area; the colour comes from the colour RAM, which the 6561 has also "expanded". The address of the beginning of these extra areas in the screen RAM and colour RAM are, respectively, Screen 4602 and Colour 38394.

One could Poke values into the screen and colour RAM to change the display. However, any Pokes into the extended screen area would corrupt the Basic program area. So, before this extended area can be used, the start of Basic has to be moved. The screen memory could be moved but this would unnecessarily restrict the Basic program area.

Let us first deal with the program area. Locations 44 and 43 together point to the start of Basic — they should currently contain 18 and 1. This means the program begins at 18*256+1 = 4609. The actual area begins at one less than this — 4608 — with the very first location containing zero. So to change the start of Basic and to keep the other pointers in the correct format use the following procedure:

```
POKE45,3: POKE46,20: POKE20*256,0:
POKE43,1: POKE44,20: NEW
```

The beginning of Basic is now at 20*256 = 5120.

You can now create or load any Basic programs as usual and the extra screen memory can be safely Poked into. However, Poking to the screen and colour RAM is not the quickest or easiest way of changing the screen display. Using Print, a whole line can be printed in one instruction, *and* the colour RAM is changed at the same time. The operating system can be "fooled" into Printing to the extended screen area by writing a program with, first, a subroutine positioning the cursor at the beginning of each line before printing on that line; and secondly, forbidding any carriage returns, vertical cursors, Tab or Spc functions to be used. The subroutine to position the cursor is as follows:

```
1000 POKE214,LN-1:POKE211,0
1010 A=4096+(LN-1)*22: MS=INT(A/256):
     LS=A-MS*256
1020 POKE210,MS: POKE209,LS
1030 RETURN
```

LN is the parameter used to select the line number required. For example, LN = 1: Gosub 1000 sets the cursor in the home position. LN = 30: Gosub 1000 in our case will set the cursor at the beginning of the very bottom line — a Print after these statements will print on that line. A Tab can be effected by Poking a value between 0 and 87 into 211. Note — to avoid trouble terminate each Print statement with a semicolon, so that a carriage return does not occur.

A useful routine using this subroutine clears the extended screen area.

```
2000 FOR LN=24TOLL
2010 GOSUB 1000: FOR I=1 to 21: PRINT " ";:
     NEXTI
2020 POKE A + 21,32: POKE37888+LN*22-1,1
2030 NEXT LN
2040 RETURN
```

LL is the number of the last line on the screen — in our case it should be replaced or set to 30. Line 2020 prints a space in the last column position on each line and is a precautionary measure to avoid a carriage return occurring.

If you are going to try these programs then remember to move the start of Basic first, as shown, and do not forget that you have moved it! This is one way to write a program that uses an extended screen, without having to move Basic everytime you load it. First, start with a fresh system, then create the following program:

```
10 POKE 44,20:RUN
```

Next, move the start of Basic — as previously shown — and create or load your main program. Do not Run it. Do Poke 44,18 — try a List. Save the program. You should now have a program that uses an extended screen which can be Loaded into the normal Basic area.

The examples in this article considered the new start of Basic to be 5120. The start of Basic can be moved almost anywhere — try replacing the value 20 in the move-Basic routine with different values; preferably greater than 18. ■

H&H SOFTWARE

Software for the BBC Computer

Model B only

ALPHABETA A complete Word Processing Package with instantaneous response. Features include automatic wraparound, insert, delete, over-write, title centring, tabs, merging and other editing facilities. Up to 224 lines of 80 characters can be produced. For longer documents editing between files is possible. Price includes a manual and labels for the red keys.....£28.50

BILLIARDS This is a game of skill and cunning. Key in the direction, pace and backspin on your cue ball and watch the result. The computer does the rest.....£8.50

TESS A program for graphic designers or one just for fun. Tesselations are shapes that fit together leaving no gaps. You start by drawing a shape and the computer makes sure it will tesselate. When you're ready, fill the screen with many copies of the shape in a variety of colours, patterns and sizes. Animations are possible too, the tape includes an example.....£8.50

Model A or B (Family games with sound and colour)

SHAPE and **RACE** For 6 year olds upwards. In SHAPE, a tracer bounces inside a blue box and rebounds off a hidden shape. Can you identify the shape before your opponent. The RACE is between a hare and a tortoise. First one to the flowers wins.....£5.50

SIGNALS and **MAGIC** Make up sums to reveal a hidden shape. Guess the shape to get bonus points. Complete a magic square to get promoted and hear the fanfare. The higher your rank, the better the fanfare. 3 levels of difficulty.....£5.50

Prices include cased cassette, instructions, postage etc.
Please send orders and cheques/PO/Transcash (No. 614 131 707) to:

H&H, Dept A, 53 HOLLOWAY, RUNCORN, CHESHIRE.

For further information please send S.A.E.

Keyboard with Electronics for ZX81

A full-size, full-travel 43-key keyboard that's simple to add to your ZX81 and requires no soldering in the ZX81.

Complete with the electronics to make "Shift Lock", "Function", and "Graphics 2" single key selections making entry far easier.

Powered from ZX81's own standard power supply – with special adaptor supplied.

Two-colour print for key caps.

Amazing low price only **£19.95** incl. VAT and carriage. Order As LW72P

Full details in the June 1982 issue of "Electronics – The Maplin Magazine" on sale at all good newsagents price 60p. In case of difficulty send 60p to address below, or £2.40 for annual subscription (4 issues).

MAPLIN Electronic Supplies Ltd

P.O. Box 3, Rayleigh, Essex SS6 8LR. Tel (0702) 552911

Retail shops at
159 King St., Hammersmith, London W6. Tel 01-748 0926
284 London Road, Westcliff-on-Sea, Essex. Tel (0702) 554000
Lynton Square, Perry Barr, Birmingham. Tel: (021) 356 7292
(Shops closed Mondays). All mail to Rayleigh address.

SPECTRUM RENUMBER DELETE

Dr Robert's done it again. This program consists of 600 BYTES of fast POSITION INDEPENDENT MACHINE CODE to be placed above a RAMTOP of your choice. The only BASIC required is a temporary 9999 REM into which the START & NEW START, the NEW INTERVAL & STOP line numbers are entered. RENUMBER will either renumber blocks or the whole program. That's not all a BLANK REM gives an AUTO-10 renumber. ALSO leading jump numbers in expressions and non-existent jump numbers are RESOLVED if they are affected. All GOTO, GOSUB, RUN, LIST, RESTORE, & LLIST jump numbers are catered for with FULL legality checks and ERROR REPORTS. DELETE simply requires a START and STOP line number and it's ready. Call from a line of BASIC or in immediate mode. In Robert's own words "A CRACKING RENUMBER PROGRAM"! Don't wait, YOU WON'T buy a better RENUMBER program for the SPECTRUM! £4.95 inc V.A.T. and post.

ZX81 RENUMBER-DELETE

Tucked safely away in high memory this fast M/C program really lives up to its name. Select either blocks single lines or the whole program. Specify the START number, the NEW start number, the INCREMENT, and the STOP number, HIT the KEY and it's ALL DONE. By ALL we mean ALL GOTOS, GOSUBS, LIST, LLISTS, & RNS which have branch addresses in the affected region. DELETE allows you to select LINES or BLOCKS and INSTANTLY remove them from the program. VERY FAST no waiting, an extremely well written program. £4.95 including V.A.T. and POST.

ZX81 TOOLKIT

Along with RENUMBER/DELETE, a further 3 utilities are included to make this a must for serious programmers. (1) FIRST REM EXPANDER. Expand the first REM by any specified length INSTANTLY. (2) DECIMAL REM LOADER. Load DECIMAL CODE instantly. Allows quick EDITING, Also handles TEXT and LABELS. Easy and quick. (3) 66 BYTE MEMORY LISTER. Specify the start address and immediately the contents and locations of 66 bytes will be DISPLAYED or PRINTED. One SINGLE KEYSTROKE wil then page FORWARD or BACK as you wish. Well written in M/code USEFUL AND FAST TOO!! £6.95 inclusive. If your not convinced send £1.00 and we'll send the instructions. If you buy within 14 days claim a refund.

WORK FORCE
140 Wilsden Ave, Luton, Beds.

FOR YOUR MICRO COMPUTER NEEDS

- MICRO COMPUTERS
- ACCESSORIES
- PERIPHERALS
- EXTENSIVE RANGE OF SOFTWARE
- WIDE RANGE OF BOOKS & MAGAZINES
- IN HOUSE AFTER SALES SERVICE DEPARTMENT

STOCKISTS FOR APPLE, OSBORNE, NEW BRAIN ETC.

Lion Micro Computers

THE SPECIALISTS

Lion House, 227 Tottenham Court Road, London W1P 0HX
Telephone: 01-580 7383 & 01-637 1601
Telex: 28394 Lion G.
Open 9 to 6 Mon-Sat

GRAPHICS AND TEXT

Problems caused by mixing text and graphics on your Atom should be resolved by adopting Stephen Yewdall's approach. Text and graphics in any mode can be mixed on-screen without interfering with normal program running.

IT WAS WHILE developing a program for Fourier analysis using the Atom's high-resolution graphics that I realised the difficulty of mixing text and graphics.

An article in August *Your Computer* page 43 showed a way of displaying three lines of text with the rest of the screen showing graphics. However, this had one disadvantage: it locked the micro in a timing loop and stopped program execution.

My solution is to use the VIA T2 timer as an interrupt generator when the mode needs changing, so allowing it to run normally but with a speed reduction of up to one third. This program enables text and graphics in any Mode to be mixed on-screen. The format is three lines of text at the top of the screen, and Mode 4 graphics of 256×154 pixels.

The program is in machine code and takes 72 bytes of RAM. This may be reduced to just 42 bytes, if there are no other interrupt routines and initialisation is only needed once. The advantage of using interrupts in this way is that the micro's switching between text and graphics is transparent to the normal running program.

Lines 2300 to 3200 are the machine code instructions to initialise the timer, T2, enable its interrupt, and set a dummy time to get an interrupt.

Lines 3400 to 3800 are the interrupt service routine and determine if the T2 timer has interrupted. If it was not T2, then an indirect jump is made. This takes the address of the next instruction from 3BF5, but can easily be changed to suit. Note that if T2 is the only possible interrupt, these lines can be omitted.

Lines 4000 to 6000 generate the main machine-code routine. First the flyback point, that is when the TV beam returns to the top of the screen is determined: lines 4000 and 4020. Then the current mode and keyscan data is saved: lines 4040 and 4050. The VDU is set to text mode, lines 4060 and 4100. Then the VIA T2 timer is synched to the start of the new TV frame and set to give another interrupt.

Provided the count is less than 40E0, hex, interrupts are synched to the flyback, lines 4110 to 4160. Because the T2 is synched to the start of the new frame, by reading its count one can determine when to change the mode.

To be really accurate, both the high byte and low byte should be read to find the correct point, although by adjusting the interrupt count to suit, only the high byte needs to be to read, lines 5100 to 5300. Then the original mode and keyscan data are restored, lines 5500 and 5600 and normal operation is resumed until the next interrupt, lines 5700 to 5800. Lines 200 to 1900 are the Basic program that assembles the machine-code routines — lines 300 to 700 — sets the interrupt vector to the start of the compiled code — line 800 — and finally links to the initialisation part. Subroutine 8000 demonstrates how to clear the top three lines of the screen. The number of lines of text can be varied by changing the value of the compare statement on line 5200. One unexpected advantage of using this program is that the keyboard-scan routines take longer, hence the keyboard is less prone to bounce.

Software clock

A lot of time is spent by the micro checking that the T2 count is correct before switching modes. By inserting a short routine between the lines 4160 and 5100 better use is made of the micro's time.

For example, what about a clock for telling the time of day? Since the main routine is entered at 60Hz — flyback rate — it is relatively simple to generate an accurate software clock. It is also possible to generate a machine-code program as a substitute for subroutine 8000, and to include the setting of the interrupt vector in machine code before the initialisation routine of the T2 timer.

For demonstration purposes, type in and run the program. All should be normal. In direct mode type:

```
GOSUB 8000;
```

This positions the cursor at the top left of the screen and blanks three lines following the cursor. Next, type:

```
CLEAR 4
```

This sets the lower half of the screen to graphics mode 4, and leaves the cursor on the second line. It also fills the first three lines with "@"s. Type:

```
MOVE 0,0; DRAW 256,192:
```

Unfortunately, this is not the diagonal line expected. Due to the switching between modes the Y axis has changed and it is necessary to add an offset as shown in the table, as Y=0 is off the bottom of the screen. Note also that some characters in the text lines have changed. This is due to the plot routines which expect the whole screen to be in graphics mode 4. The net result is that all subsequent plot statements must add an offset to the Y value and also limit its maximum value. Type:

```
CLEAR 4; GOSUB 8000;
```

then type:

```
MOVE 0, 33; DRAW 256,187;
```

This gives a diagonal line from bottom left to top right of the graphics screen. If you now type ESC you will be returned to normal mode 0 text. Thus it is possible to switch between normal mode and mixed graphics text easily. Should the Break key be accidentally pressed it will be necessary to reset the interrupt vector and initialise the timer, provided the machine code has been assembled to start at # 3BB0. Type:

```
? # 205 = # 3B; ? # 204 = # CI; LINK # 3BBO
```

■

```
300     DIM VV(10)
400     C = #3BB0
500     FOR I = 0 TO 10: VV(I) = C: NEXT I
600     P = C: GOSUB 2300
700     P = C: GOSUB 2300
800     ?#205 = VV1&#FFFF/256:?#204 = VV1
1000    LINK #3BB0
1900    END
2000    REM SET TIMER 2 AS ONE SHOT
2300    [
2500    .VV0 LDA #B80B
2600         AND @#DF
2700         STA #B80B
2900         LDA @#A0
3000         STA #B80E
3100         STA #B809
3200         RTS
3400    .VV1 LDA #B80D
3500         AND @#20
3600         BNE VV3
3800         JMP (VV6 + 1)
4000    .VV3 BIT #B002
4020         BMI VV3
4040         LDA #B000
4050         PHA
4060         LDA @#00
4100         STA #B000
4110    .VV5 BIT #B002
4120         BPL VV5
4130         LDA @#87
4140         STA #B808
4150         LDA @#40
4160         STA #B809
5100    .VV4 LDA #B809
5200         CMP @#2E
5300         BCS VV4
5500         PLA
5600         STA #B000
5700         PLA
5800    .VV6 RTI
5900    ]
6000    RETURN
8000    P.$30;Y = 95: LINK #FE24:RETURN
```

Program to mix text and graphics.

MODE	Y OFFSET	YMAX	RESOLUTION X	RESOLUTION Y
0	0	38	64	48
1A	4	55	64	51
1	4	55	128	51
2A	9	60	128	51
2	10	87	128	77
3A	15	92	128	77
3	28	182	128	154
4A	33	187	128	154
4	33	187	256	154

Table of Y offsets — for three lines.

Measurement and Control with your

ZX81

and our proven ANALOGUE PORT

Already many in use in industry, education, hospitals, labs., agriculture and the home. Now extremely low cost control operations and even robotics become a reality.
The ANALOGUE PORT plugs directly into your ZX81 and offers

- 8 separate analogue voltage measuring inputs
- 8 switching outputs for relays, LEDs, sound output.
- Amplifier for mV sensitivity on one input channel
- 6 control lines for further expansion
- Stackable connector for RAM pack, printer
- Self contained, no extra power supply etc. required

Thermometers, light sensors, microphones, joysticks . . . in fact anything which produces a varying voltage, resistance or current may be connected directly to your ZX81 via this port. A Comprehensive manual is included which assumes no previous expertise.

only **£29.95** ready built and tested
*** Return of post delivery ***

ZX FREQUENCY ANALYSIS SOFTWARE (Fast Fourier Transform) on cassette and with manual **£15.20**

Make cheques payable to:

UNIVERSITY COMPUTERS
5 ST. BARNABAS ROAD,
CAMBRIDGE CB1 2BU

Delivery return of post on all items (except EPROM prog.). Official, trade, bulk orders accepted. Please add £1 p&p to cost of order.

B B C SOFTWARE

ASTEROIDS NEW **— MODEL A OR B** **£7.80 + VAT**
Probably the best space game available for the BBC machines — very similar to the arcade original. Written entirely in machine code to make it both compact and fast. Makes full use of the high resolution graphics.

SNAKE — MODEL B **£7.80 + VAT**
This highly colourful arcade game has been acclaimed by all those who have reviewed it — see this issue and Beebug User Group magazine "— the game is really fun and very, very addictive."

HITCH-HIKER'S GUIDE — MODEL B **£5.80 + VAT**
An adventure based on the characters of the book 'Hitch-Hiker's Guide to the Galaxy". Hours can be spent exploring such places as the restaurant at the end of the Universe, Betelguese Spacedome, etc. searching for objects that have to be returned toi the Five Artefacts Inn.

Computer Concepts has the largest range of quality software for the BBC machine and unlike most other software on the market *ALL* our programs run on both the old and new operating systems. Write for details of our ever growing range.

COMPUTER CONCEPTS

Dept YC4
16 Wayside
Chipperfield
Herts WD4 9JJ
Tel: (09277) 69727

NEW

SPECTRUM GAMES
Two 16K programmes on cassette

AIRPORT This could be a nightmare! As a member of the airport groundstaff your task is to assist in the successful landing of an aircraft but beware, there are many obstacles in your path!

ALIEN Search for the alien hiding in the maze of air ducts on the spacecraft. Your only weapon is a flamethrower, so progress carefully as success relies on your skill and judgement.

Full animated instructions included with each game

BOTH ON ONE CASSETTE FOR ONLY £4.95

BATTLESHIPS & CRUISERS 16K - ZX81

First computer version of this popular game of strategy and tactics. Both grids on view together. Establish the position of your fleet then locate and destroy the computer's fleet. Visual display shows hits and misses made and gives running score.

ONLY £4.95 ($9.90)

GRAPHICS TOOLKIT
22 exciting MACHINE CODE routines that give you control over your screen as never before!
(ZX81 - 16K RAM ONLY)

Draw/Undraw
Foreground On/Off
Border/Unborder
Fill screen
Reverse screen

Print position controls - UP, DOWN, LEFT, RIGHT
Editprint - moves next PRINT position to first edit line.

Scroll Facilities - UPSCROLL, RIGHTSCROLL, LEFTSCROLL.

Onscreen/Offscreen
Background On/Off
Search and replace
Square draw

All these routines are in machine code for SUPER-FAST response! GRAPHICS TOOLKIT uses only 2K of your RAM and that includes space to load the programmer's TOOLKIT described below.

ALL FOR ONLY £5.95 ($11.90)

An ESSENTIAL addition to your 16K RAM ZX81

TOOLKIT
Provides the following additional facilities

Renumber - including GOTO's and GOSUB's
Search and list
Search and replace
Free space

Hyper graphics mode
Fillscreen
Reverse screen
Tape wait
All these routines are written in machine code and together take up only 1K of your precious RAM - an incredible achievement!!

FOR 16K - ONLY £4.95 ($9.90)

NEW

16K SPECTRUM + £42.50 = 48K SPECTRUM

We did it for the ZX81 - we've now done it for the ZX SPECTRUM! Add on memory at an amazingly low price. Increase your 16K to a massive 48K with the

32K RAM BOARD

ONLY £42.50

Using fewer components on a high quality double sided board to give you top performance, reliability and economy.
You can carry on writing larger programmes in sections ready to MERGE when your extra 32K RAM BOARD arrives within 21 days.
Installation is simple - the entire fitting is completed in just a few minutes (with the aid of a screwdriver - NO SOLDERING!)

FOR 16K SPECTRUM -ONLY £42.50

NEW

As reviewed in 'ZX Computing' August/Sept '82

ECONO TECH 16K RAM PACK

We believe the Econo Tech is the lowest priced 16K RAM available.

No frills - just a reliable and economical way to expand your ZX81

ONLY £20.95 ($39.95)

With advances in microtechnology we are now able to offer the

64K RAM PACK

Same quality as the 16K RAM below but giving massive memory to your ZX81, yet having external dimensions no larger than the 16K RAM.

ONLY £62.95 ($119.95)

As reviewed in 'Your Computer' March 82

16K RAM PACK

Quite simply the best available plus FREE 'Alien Attack' (7K M/code) on cassette - value £5.75 ($11.00)

Fully built, tested and guaranteed.
Uses existing power supply (Min. 600 m.a.)

Compatible with printer
No wobble problems
Gold plated edge connector for perfect contact with your ZX81
Normally despatched within 10 days of receipt of your order.

ONLY £26.50 ($49.95)

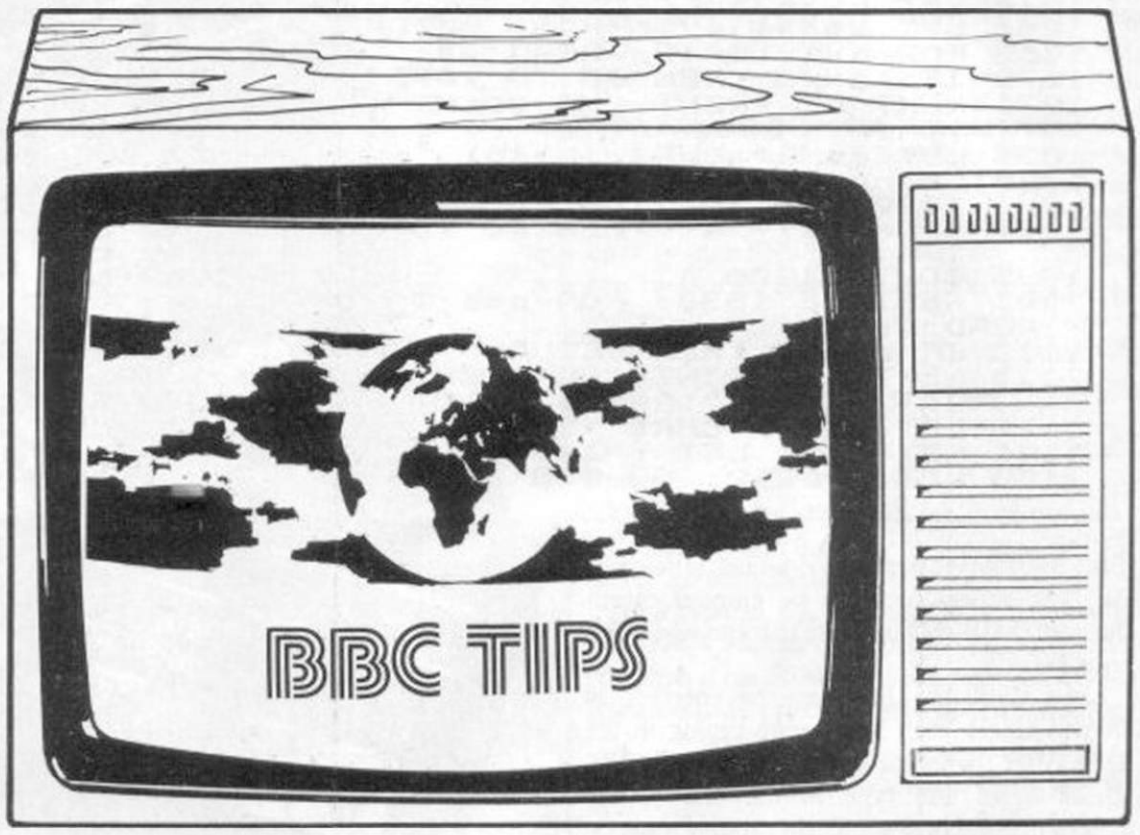
All prices are fully inclusive of post and packing.
OVERSEAS CUSTOMERS PLEASE NOTE: ALL PRICES ARE APPLICABLE FOR EXPORT, INCLUDING AIRMAIL POSTAGE. PAYMENT MAY BE MADE IN STERLING (MONEY ORDER AVAILABLE AT YOUR BANK) OR YOUR OWN U.S.$ CHEQUE, MADE PAYABLE TO JRS SOFTWARE. DESPATCH NORMALLY 7 DAYS FROM RECEIPT OF YOUR ORDER.

JRS SOFTWARE

19 WAYSIDE AVENUE, WORTHING, SUSSEX. BN13 3JU Telephone: (0903) 65691

CONTROL KEYS

Further operating wrinkles are revealed this month by *Your Computer's* own guide to the BBC Micro. Tim Langdell lifts the veil on control-key alternatives to the VDU commands which are not immediately apparent even in the new BBC manual. These should save you time and precious memory — but take care which keys you choose.



IF YOU HAVE explored the VDU commands on the BBC then you know how useful they can be. A particularly exciting feature of the machine is the ability of the CTRL key to duplicate these functions instantly. This can save a great deal of time compared to the equivalent VDU statement.

For a list of the CTRL possibilities, and corresponding VDU commands, see figure 1. In theory, pressing CTRL followed by any of the keys on the left above will cause the function on the right.

In practice, where the VDU statement takes several bytes after it, for example, VDU 19,1,4 0,0,0, the CTRL version does not produce readily predictable results.

Magenta screen

For instance, in Mode 4, try pressing CTRL with the S key followed by key D, and then CTRL S followed by key E. You will get a magenta screen with blue text. But quite probably the text will be blurred and the screen hazy. Pressing CTRL S lets you put in two bytes of information spaced by commas, as would a VDU command, but trying to enter CTRL S,1,2, does not give the same effect as VDU 19,1,2,0. CTRL T resumes the black and white text again.

Other CTRL commands may be even more useful though. For instance, CTRL B enables the printer, and CTRL C switches it off again. Using CTRL B can avoid the necessity of including the VDU 2 statement in your program.

CTRLs H, I, J, and K simply duplicate the cursor controls. CTRL L clears the whole screen in much the same way as the Clear key does on other computers.

A convenient function is performed by CTRL U. This deletes the line you have just typed in and puts you back at the start of the line again. CTRL M acts exactly like Return, so one must be careful when using Shifted M not to touch the CTRL key by mistake.

CTRL N turns the page mode on, and can thus be very useful when listing long programs. Simply use CTRL N followed by L and Enter. The listing will then occur a page at a time, moved on by pressing the SHIFT key. CTRL O switches the page mode off again.

Cursor return

CTRL^ sends the cursor back to Home — the top left-hand corner of the screen) — and whereas CTRL L clears the screen and sends the cursor back to Home, CTRL P clears the screen and leaves the cursor wherever it was.

A final very helpful CTRL command is CTRL V. Pressing this followed by a number gives you that mode — which is easier than typing in Mode x followed by Enter, or even the shortened form MO. x followed by Enter.

More than once before becoming fully acquainted with the CTRL features I hit the A key by mistake when shifting a letter. This unintentionally sent the very next character to the printer. CTRL W is much less likely to be hit by mistake, but it can lead to the next key you press being replaced by a random character square of dots which the micro has taken to be your newly-defined character.

Defining colours

Sadly, one cannot define a character using CTRL W just as CTRL S and CTRL Q are hard to predict, too. In case you have been misled by the way the VDU commands are described in the user's guide, you can define any two colours in Mode 0. Using CTRL Q or CTRL S is not to be recommended, although new text and screen colours are obtained. But VDU 19 will allow you to choose any two colours — not just the default black and white some have taken the guide to imply. ■

CTRL	VDU	Function	CTRL	VDU	Function
@	=0	Does nothing	N	14	Page mode on
A	1	Sends next CHR$ to printer	O	15	Page mode off
			P	16	Clear graphics area
B	2	Enable printer	Q	17	Define text colour
C	3	Disable printer	R	18	Define graphics
D	4	Write text at text cursor	S	19	Define logical colour
E	5	Write text at graphic cursor	T	20	Restores logical colours
			U	21	Disable VDU/Clear line
F	6	Enable VDU drivers	V	22	Select screen mode
G	7	Make a short beep	W	23	Program a new character
H	8	Backspace			
I	9	Forward space	X	24	Define graphics window
J	10	Cursor down	Y	25	Plot K,x,y
K	11	Cursor up	Z	26	Restore windows
L	12	Clear text area	/	28	Define text window
M	13	Cursor to start of next line/return	]	29	Define graphics origin
			^	30	Home cursor

Figure 1.

```
1000 REM ZX Spectrum Assembler
  © Chris Lam
1001 LET add=30000: LET k$="Loop
 Finished "
1002 INPUT "# of lines?",bb: FOR
 j=0 TO bb
1004 RESTORE 2000+j
1005 LET x=0: LET v=0: LET v1=0:
 LET v2=0
1006 DIM d$(3): LET t=2: LET b=1
121
1007 READ a$: LET y=LEN a$: LET
p=1
1008 IF a$(1)="#" THEN GO TO 160
0
1009 RESTORE 1820
1010 GO SUB 1020: GO TO 1060
1020 IF p>y THEN GO TO 1400
1021 FOR n=p TO y
1025 IF a$(n)=" " OR A$(N)="," T
HEN GO TO 1040
1030 NEXT n
1040 LET p2=n-1
1050 LET x$=a$(p TO p2): RETURN
1060 FOR n=1 TO 43: READ r$
1070 IF r$=x$ THEN GO TO 1075
1071 NEXT n: PRINT "NO SUCH
COMMAND AT";2000+J:STOP
1075 LET d$(1)=CHR$ (n+46)
1080 LET p=p2+2: GO SUB 1020: GO
 SUB 1090: GO TO 1120
1090 IF x$(1)="(" THEN GO TO 130
0
1095 GO TO 1200
1101 RESTORE 1830: FOR n=1 TO 28
: READ r$
1110 IF r$=x$ THEN RETURN
1115 NEXT n: PRINT "NO SUCH
REGISTER ETC AT";2000+J:STOP
1120 LET d$(t)=CHR$ (60+n)
1121 LET t=3: LET b=1135
1130 LET p=p2+2: GO SUB 1020: GO
 SUB 1090: LET d$(t)=CHR$ (60+n)
1136 RESTORE 1800: FOR n=0 TO 25
5: READ r$
1140 IF r$=d$ THEN GO TO 1150
1145 NEXT n: PRINT "NO SUCH
REGISTER ETC AT";2000+J:STOP
1150 POKE add,n
1155 IF x=1 THEN GO TO 1190
1160 IF x=2 THEN GO TO 1195
1170 LET add=add+1: NEXT j: PRIN
T k$: STOP
1190 POKE add+1,v1: LET add=add+
2: NEXT j: PRINT k$: STOP
1195 POKE add+1,v1: POKE add+2,v
2: LET add=add+3: NEXT j: PRINT
k$: STOP
1200 IF CODE x$(1)<58 THEN GO TO
 1215
1210 GO TO 1100
1215 LET v=VAL x$
1220 IF d$(1)="F" OR d$(1)="H" T
HEN GO TO 1235
1221 IF d$(2)="@" OR d$(2)="A" O
R d$(2)="B" OR d$(2)="M" THEN GO
 TO 1235
1225 IF v>=256 THEN GO TO 1235
1228 LET d$(t)="L"
1229 IF d$(1)=":" OR d$(1)="I" T
HEN LET d$(t)="S"
1230 LET v1=v: LET x=1: GO TO b
1235 GO SUB 1240: GO TO b
1240 LET d$(t)="D"
1241 LET v2=INT (v/256)
1242 LET v1=v-(v2*256)
1245 LET x=2: RETURN
1300 REM
1310 IF CODE x$(2)<58 THEN GO TO
 1330
1320 GO TO 1100
1330 LET v=VAL x$: LET d$(t)="W"
: GO SUB 1241
1340 GO TO b
```

THIS PROGRAM assembles Z-80 machine code. All Z-80 mnemonics can be entered except those after CB, ED or those that include index registers.

Lines 1800 to 1805 may be entered, as shown. Check each line before typing in the next. After that, type in lines 1820 and 1830. Check again and type in the rest of the program. All that is shown in capitals must be typed in capitals.

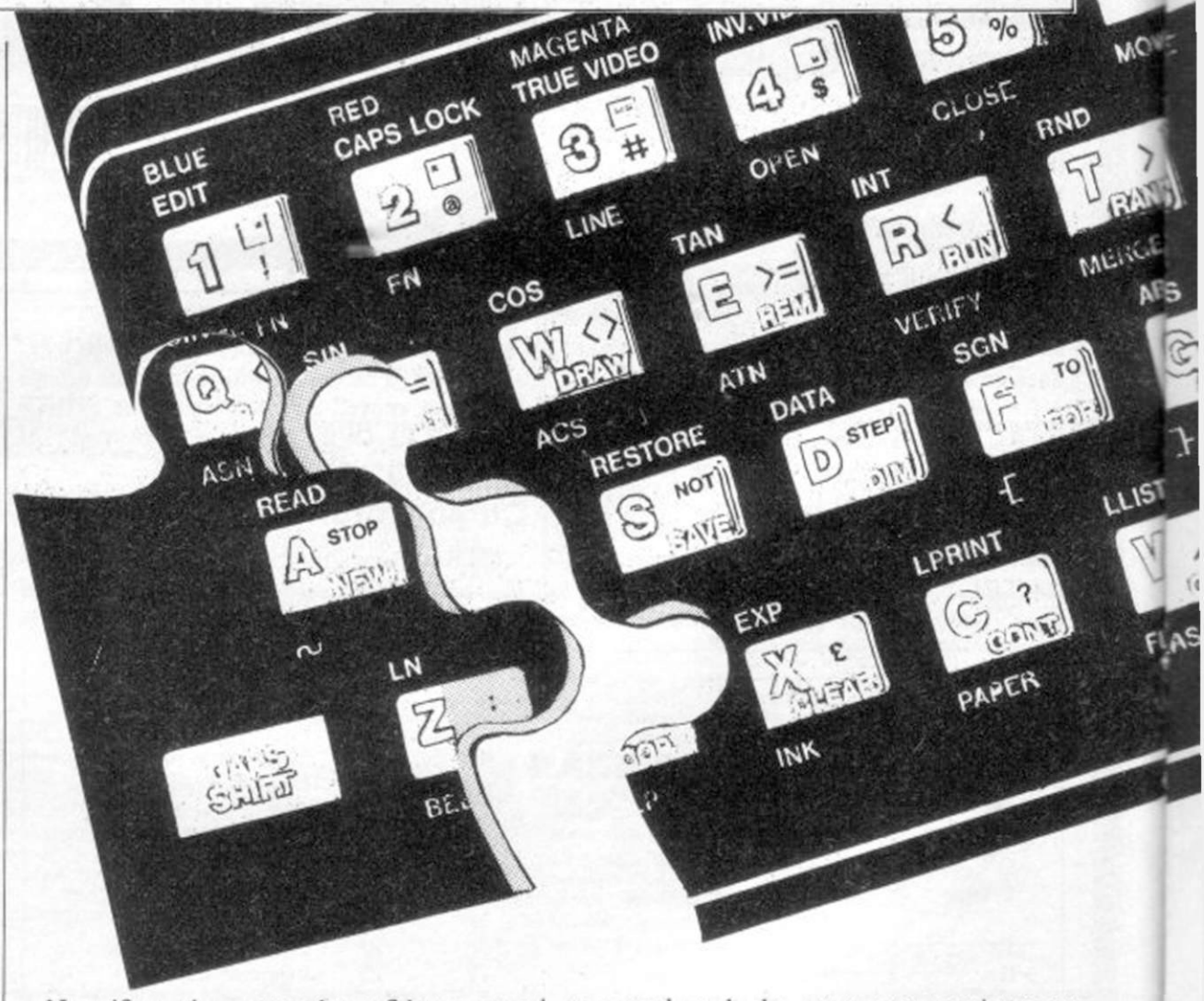
The program takes the mnemonics which start at line 2000 and converts them to three characters. This is compared against each string from the data at lines 1800 to 1805. The number of strings it had to read off against before finding a match is the Z-80 Op-code for that mnemonic.

Take a look at lines 1820 and 1830. Line 1820 contains the commands which you can enter. Note that all the RST commands are in decimal. Line 1830 are all the registers you can enter. "NN", "N", "(NN)" and "DS" are there solely to help the computer.

All your Z-80 mnemonics must start at line 2000. Each line after that must be incremented by one. See line 1004: the mnemonics must be in quotes and entered as a DATA statement. Only one mnemonic a line is permitted. Therefore type this in:

```
2000 DATA "LD BC,65535"
2001 DATA "RET"
```

and Run the program. It will ask you how many lines of mnemonics there are. In this case, type in 2. Wait a few seconds and a message "Out of DATA" should appear. These 4 bytes of code have been entered into the memory starting at the address 30000. This can easily be changed to any address at line 1001. Run 3000 and you shuld get 1, 255, 255, 201.

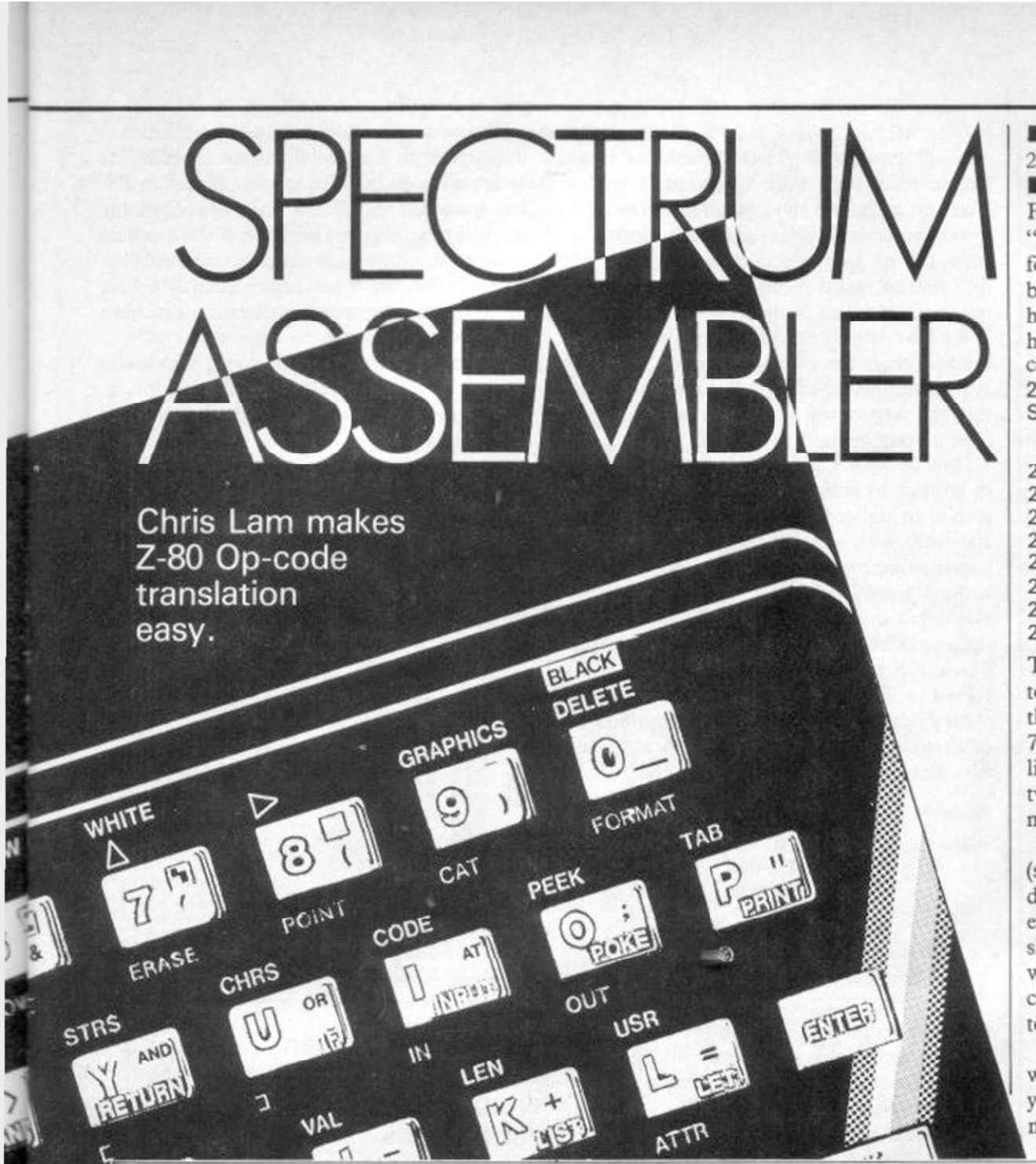


Now if you have enough confidence, type PRINT USR 30000 and you should get 65535. There are however some very important points on how you must enter your machine code program.

- There must be no spaces between the 1st quote and the 1st letter of the mnemonic.
- There must be only one space between the command and the next part, register or number. For example "LD (65535),a" is allowed while "LD (65534), a" is not. The same applies to the first register or number and second register or number, but it may be a comma, for example "LD A,B" is OK and "LD A B" is OK. See line 1025.
- There should be no spaces at the end.

SPECTRUM ASSEMBLER

Chris Lam makes Z-80 Op-code translation easy.



■ Enter mnemonics for Op-codes: 211 and 219 without the brackets.

■You can have negative displacements. For example, "DJNZ -3" is the same as "DJNZ 253" and both are allowed. Do not forget that "JR 0" jumps to the following byte. As mentioned before, mnemonics that have CB, ED or IX or IY, must be written in hexadecimal prefixed by a hash. Therefore you can write:

```
2000 DATA "# ED4BFF": REM LD BC, (65535)
See line 1008
```

Type in this demonstration program.

```
2000 DATA "LD HL,0"
2001 DATA "LD BC,100"
2002 DATA "ADD HL BC"
2003 DATA "DEC BC"
2004 DATA "JR NZ -4"
2005 DATA "PUSH HL"
2006 DATA "POP BC"
2007 DATA "RET"
```

This could easily be shorter but is lengthened to show how well this assembler can handle the mnemonics. Run the program and type in 7 to the prompt — despite the fact it has eight lines — and ENTER. It takes the computer two to five seconds to assemble one line of mnemonic, so this will take 20 to 30 seconds.

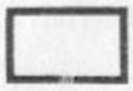
Finally it should display "Loop Finished" (see line 1002 and 1004). Now if you are still doubtful, Run 3000 first and check it. Then enter PRINT USR 30000 and the reply should be 5050. For those who haven't a clue why this printed, the machine code program calculates the total of all the numbers from 1 to 100 added together.

Now type in CLEAR 30000 and follow it with NEW. Again type in PRINT 30000 and you should get 5050 again. So now you have a machine-code program, safe above RAMtop.

```
1400 LET d$(t)="7": GO TO 5
1600 LET a$=a$(2 TO )
1610 FOR n=1 TO LEN a$ STEP 2
1620 LET x$=a$(n TO n+1)
1621 LET x=CODE x$(1)-48: IF COD
E x$(1)>64 THEN LET x=x-7
1622 LET y=CODE x$(2)-48: IF COD
E x$(2)>64 THEN LET y=y-7
1630 LET v=16*x+y
1640 POKE add+INT (n/2),v
1645 NEXT n: LET add=add+INT (n/
2): NEXT j
1800 DATA "U77","7BD","77E","8B7
","8J7","9J7","7JL","477","UCC"
"D@B","7E?","9B7","8K7","9K7","7
XL","077",":S7","7AD","7>E","8A7
","8H7","9H7","7HL","177","IS7",
"D@A","7E>","9A7","8I7","9I7","7
IL","377","INS","7@D","7W@","8@7
","8F7","9F7","7FL","277","IOS",
"D@@","7@W"
1801 DATA "9@7","8G7","9G7","7GL
","X77","IPS","7MD","7WE","8M7","
8=7","9=7","7=L","477","IQS","D
=M","7EW","9M7","8E7","9E7","7EL
","577","7JJ","7JK","7JH","7JI",
"7JF","7JG","7J=","7JE","7KJ","7
KK","7KH","7KI","7KF","7KG","7K=
","7KE","7HG","7HK","7HH","7HI",
"7HF","7HG"
1802 DATA "7H=","7HE","7IJ","7IK
","7IH","7II","7IF","7IG","7I=","
7IE","7FJ","7FK","7FH","7FI","7
F=","7FG","7F=","7FE","7GJ","7GK
","7GH","7GI","7GF","7GG","7G=","
7GE","7=J","7=K","7=H","7=I","7
=F","7=G","477","7=E","7EJ","7EK
","7EH","7EI","7EF","7EG","7E=",
"7EE","DEJ"
1803 DATA "DEK","DEH","DEI","DEF
","DEG","DE=","DEE","0EJ","0EK",
"0EH","0EI","0EF","0EG","0E=","0
EE","0J7","0K7","0H7","0I7","0F7
","0G7","0=7","0E7","NEJ","NEK","N
EH","NEI","NEF","NEG","NE=","N
EE","EJ7","EK7","EH7","EI7","EF7
","EG7","E=7","EE7","PJ7","PK7",
"PH7","PI7"
1804 DATA "PF7","PG7","P=7","PE7
","JJ7","JK7","JH7","JI7","JF7","G
JG7","J=7","JE7","GJ7","GK7","G
H7","GI7","GF7","GG7","G=7","GE7
","MN7","KB7","HND","HD7","FND","H
LB7","DEL","<77","MQ7","M77","H
QD","787","FQD","FD7","QEL","=77
","MP7","KA7","HPD","SLE","FPD",
"LA7","07L"
1805 DATA ">77","MQ7","T77","HQD
","REL","FQD","797","NEL","?77",
"MR7","K@7","HRD","UU@","FRD","L
@7","EL7","@77","MX7","H=7","7XD
","UA@","FXD","7;7","PL7","A77","
MT7","KC7","HTD","677","FTD","L
07","JL7","B77","MU7","7M@","HUD
","W77","FUD","797","GL7","C77","D
RA","RRA","SCF","CCF","DI","LD","
INC","DEC","DJNZ","HALT","RST0","
RST8","RST16","RST24","RST32","A
ND","CALL","CP","JP","JR","OR","X
OR","PUSH","RET","SBC","SUB","X
OR","ADC","IN","OUT","EXX","NOP
","EX","EI","CPL"
1830 DATA "(HL)","(DE)","(BC)","
HL","DE","BC","AF","NN","A","H","
L","D","E","B","C","N","SP","NZ
","Z","NC","C","PO","DS","P","M"
,"(SP)","(NN)","PE"
1999 REM Your Z-80 Data Starts
Here
3000 FOR n=30000 TO 30010: PRINT
PEEK n: NEXT n
```

```
   1 REM 5£RND????■ ;?????9,?9■?9
■?9■?9■?9■?9■?9■?9,)■ ;9■;9■;9■;
9■;9■????;9■;9■;9■;9■;9■?9■?9■?9
■?9■?9■?9■?9■TAN 01234567890123456
7890123456789012345678901234567890
123456789012345678901234567890
  2 REM ▒▒▒
 200 CLS
 210 SLOW
 220 FOR K=2 TO 7
 230 PRINT AT K,8;"*"
 240 NEXT K
 250 LET C=USR 16514
 300 STOP
 800 FAST
 801 FOR K=16514 TO 16664
 810 SCROLL
 820 INPUT J
 830 POKE K,J
 840 PRINT AT 7,0;K;TAB 8;J
 850 NEXT K
```

Program 5



Display of program 5

```
   1 REM 5£RND????■ ; FAST 9 ■■7
9■( CLS 79■)■ ■;9■( CLS ;9■ LPR
INT ■;9■( CLS ;9 ■■79■( CLS TAN
 67890123456789012345678901234567
8901234567890123456789012345678
9012345678901234567890123456789
  2 REM ▒▒▒
 200 CLS
 210 SLOW
 220 FOR K=2 TO 7
 230 PRINT AT K,8;"*"
 240 NEXT K
 250 LET C=USR 16514
 300 STOP
 800 FAST
 801 FOR K=16514 TO 16664
 810 SCROLL
 820 INPUT J
 830 POKE K,J
 840 PRINT AT 7,0;K;TAB 8;J
 850 NEXT K
```

Program 5a

```
   1 REM E£RND)■ ; FAST 9 ■■7
9■( CLS 79■)■ ■;9■( CLS ;9■ LPR
INT ■;9■( CLS ;9 ■■79■( CLS TAN
 67890123456789012345678901234567
8901234567890123456789012345678
9012345678901234567890123456789
  2 REM ▒▒▒
 200 CLS
 210 SLOW
 220 FOR K=2 TO 7
 230 PRINT AT K,8;"*"
 240 NEXT K
 250 LET C=USR 16514
 300 STOP
 800 FAST
 801 FOR K=16514 TO 16664
 810 SCROLL
 820 INPUT J
 830 POKE K,J
 840 PRINT AT 7,0;K;TAB 8;J
 850 NEXT K
```

Program 5b

```
   1 REM Y
1538 AT ( CLS :▒Y ■▒VAL NOT AT (
 CLS Y
 200 CLS
 250 LET C=USR 16514
 300 STOP
 800 FAST
 801 FOR K=16514 TO 16664
 810 SCROLL
 820 INPUT J
 830 POKE K,J
 840 PRINT AT 7,0;K;TAB 8;J
 850 NEXT K
```

Program 7

```
RNBKQBNR
PPPPPPPP
PPPPPPPP
RNBKQBNR
```

Display of program 7

Note: REM 1 is given as display on your screen, it is significantly longer.

SO FAR WE have looked at 19 different groups of Z-80 commands. These enable us to do simple maths and a bit of instant graphics. The next stage is to show you how to reach the system variable. If you read the list starting on page 177 of your Sinclair Manual, you will find several useful pieces of information — if only you could get at them.

We have already used D-File which contains the address of the display file's start. There is also an address which contains information on the last key pressed, another containing a random number and so on.

How do we get at them efficiently? We have to go back to indirect addressing. As we have seen in an earlier part of this series, an indirect statement with a pair of variables can be used to put a number or any single variable into an address given by the pair of variables HL, or else to put the contents of an address given by the pair of variables HL into a single variable. These can be extended to include the codes shown in Figure 1.

An example would be a further simplification of program 5. Reload version 5A and Run 800. Enter the following machine code:

Address	Mnemonic	Machine Code
16514	LD HL (NN)	42 12 64
	LD DE NN	17 3 0
	ADD HL DE	25
	PUSH HL	229
	NOP	0
	NOP	0
	NOP	0
		R

Save as version 5B. This shows a saving in program length that could make all the difference between getting a program into 1K and having to abandon a good idea.

The next instruction — we cannot call it a command — is Code 215 (RST 16). This will print a character at the next print position.

Load program 1, see *Your Computer* August, Enter in program 6 and Run. Change the values of B and C to alter the box size. If you understand how it is working, enter program 6A and Run. Now change the item being printed to spaces. Move the box up and down and change the width.

We can delete lines 2, 200, 800, 801, 810, 820, 830, 840, 850. This will give a better idea of the size and speed of a machine-code program needed to fill out the display. You will notice that I am no longer spelling out in fine detail how every stage of each program works.

You should be able to see blocks of previously-defined code coupled with new commands and be able to work out for yourself precisely what is happening — if not, you should re-read the previous sections.

```
   1 REM :▒Y*▒▒VAL NOT AT ( CLS
Y
 200 CLS
 250 LET C=USR 16514
 300 STOP
 800 FAST
 801 FOR K=16514 TO 16664
 810 SCROLL
 820 INPUT J
 830 POKE K,J
 840 PRINT AT 7,0;K;TAB 8;J
 850 NEXT K
```

Program 6

```
********
********
********
********
********
********
********
********
********
```

Display of program 6

We can now produce our final simplification to program 5. This entails using the machine code routine to produce any size of rectangular box (program 5C). There are ways of passing the box size from one segment of the machine code to another such that it need only be entered once, but it will not necessarily reduce the program size and has therefore not been included.

The original program 5 is given, which also needed the Basic display-creating routine, as well as the final program 5C which creates its own display file.

There is one other type of gaming board that

SYSTEM

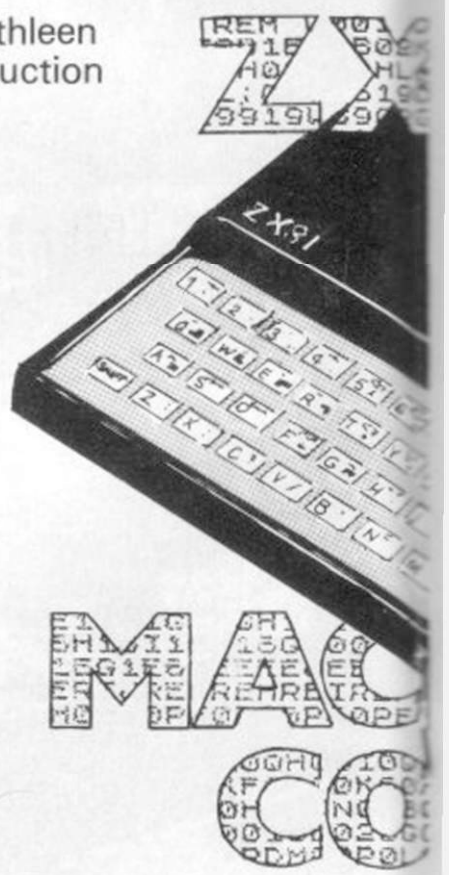
```
   1 REM Y
1538 AT ( CLS :▒Y*▒▒VAL NOT AT (
 CLS Y
 200 CLS
 250 LET C=USR 16514
 300 STOP
 800 FAST
 801 FOR K=16514 TO 16664
 810 SCROLL
 820 INPUT J
 830 POKE K,J
 840 PRINT AT 7,0;K;TAB 8;J
 850 NEXT K
```

Program 5c

```
********
********
********
********
```

Display of program 5c

Part 3 of Kathleen Peel's introduction to machine code takes you deeper.




```
   1 REM 12345678901234567890123
4567890123456789012345678901234
5678901234567890123456789012345
6789012345678901234567890123456
7890123456789012345678901234567
8901234567890123456789012345678
9012345678901234567890123456789
  2 REM ▒▒▒
 200 CLS
 210 SLOW
 250 LET C=USR 16514
 300 STOP
 800 FAST
 801 FOR K=16514 TO 16664
 810 SCROLL
 820 INPUT J
 830 POKE K,J
 840 PRINT AT 7,0;K;TAB 8;J
 850 NEXT K
```

Program 1, above, and program 1a, right.

is used and we can look at a method of implementing that — the chess/draughts board.

A technique is required that will plot a table of characters in sequence on the display. Try to print RNBKQBNR, using program 7; this will produce such a display.

The code has been separated into small blocks such that after entering the program code and saving, we can see the effect of each section-type.

```
POKE    16568,201
RUN

POKE    16568,6
POKE    16576,201
RUN

POKE    16576,6
POKE    16590,201
RUN

POKE    16590,35
POKE    16599,201
RUN

POKE    16599,35
RUN
```

The display is produced by a total of 101 bytes of machine code — from address 16514 to 16614 — and the Basic program 1c.

A full list of the machine code used in this introduction is given in Figure 2. The definitions given are, of necessity, a simplification and in some cases a distortion of the truth as far as the Z-80 processor is concerned, but if you are able to write your own machine-code routines based on what you have read here, then the approach will be vindicated.

As you are probably well aware, there are many more commands which I have omitted to define. What will be of significant interest is the level of programs that can be achieved with this limited subset. *Your Computer* will provide a free copy of D R Horne's 1K chess-playing game on cassette, plus the usual rates for any of your routines that we are able to publish, based on this series of articles.

(continued on page 73)

VARIABLES

This instalment tells you how to get at the system variables.

```
   1 REM Y
1538 AT ( CLS :▛Y*▛VAL NOT AT (
 CLS Y
 200 CLS
 250 LET C=USR 16514
 300 STOP
 800 FAST
 801 FOR K=16514 TO 16664
 810 SCROLL
 820 INPUT J
 830 POKE K,J
 840 PRINT AT 7,0;K;TAB 8;J
 850 NEXT K
```

Program 6a

```
********
********
********
********
********
********
********
********
```

Display of program 6a

```
   1 REM 12345678901234567890123
45678901234567890123456789012345
67890123456789012345678901234567
89012345678901234567890123456789
01234567890123456789012345678901
   2 REM ▓▓
 200 CLS
 210 SLOW
 220 FOR K=2 TO 7
 230 PRINT AT K,8;"*"
 240 NEXT K
 250 LET C=USR 16514
 300 STOP
 800 FAST
 801 FOR K=16514 TO 16664
 810 SCROLL
 820 INPUT J
 830 POKE K,J
 840 PRINT AT 7,0;K;TAB 8;J
 850 NEXT K
```

Code	Mnemonic
201	RETURN
0	NOP
24	JR DIS
40	JR Z DIS
32	JR NZ DIS
16	DJNZ DIS
245	PUSH AF
197	PUSH BC
213	PUSH DE
229	PUSH HL
241	POP AF
193	POP BC
209	POP DE
225	POP HL
50	LD (NN) A
34	LD (NN) HL
58	LD A (NN)
42	LD HL (NN)
215	RST 16
26	LD A (DE)
18	LD (DE) A

Mnemonic	Basic equivalent
LD (NN) A	POKE NN, A
LD (NN) HL	
LD A (NN)	LET A = PEEK NN
LD HL (NN)	
RST 16	
LD A (DE)	LET A = PEEK DE
LD (DE) A	POKE DE, A

Figure 2

Code	Mnemonic	Basic equivalent	Comments
50	LD (NN) A	POKE NN, A	Put into address NN the variable A
34	LD (NN) HL	POKE NN, H POKE NN + 1, L	Put into address NN the variable H and put into the next address variable L
58	LD A (NN)	LET A = PEEK NN	Load A with the contents of address NN
42	LD HL (NN)	LET H = PEEK NN & LET L = PEEK NN+1	load H with the contents of address NN and Load L with the contents of the next address.
26	LD A (DE)	LET A = PEEK DE	Load A with the contents of address DE
18	LD (DE) A	POKE DE, A	Put into address DE the variable A.

Figure 1

Address	Mnemonic	Machine code		
16514	LD HL NN	33	12	64
	LD E (HL)	94		
	INC HL	35		
	LD D (HL)	86		
	LD HL NN	33	3	0
	ADD HL DE	25		
	LD A L	125		
	LD C A	79		
	LD A H	124		
	LD B A	71		
16528	LD (HL) N	54	135	
	INC HL	35		
	LD (HL) N	54	131	
	INC HL	35		
	LD (HL) N	54	131	
	INC HL	35		
	LD (HL) N	54	131	
	INC HL	35		
	LD (HL) N	54	131	
	INC HL	35		
	LD (HL) N	54	131	
	INC HL	35		
	LD (HL) N	54	131	
	INC HL	35		
	LD (HL) N	54	4	
16555	LD DE NN	17	10	0
	ADD HL DE	25		
	LD (HL) N	54	5	
	ADD HL DE	25		

Address	Mnemonic	Machine code	
	LD (HL) N	54	5
	ADD HL DE	25	
	LD (HL) N	54	5
	ADD HL DE	25	
	LD (HL) N	54	5
	ADD HL DE	25	
	LD (HL) N	54	1
16572	LD A C	121	
	LD L A	111	
	LD A B	120	
	LD H A	103	
	ADD HL DE	25	
	LD (HL) N	54	133
	ADD HL DE	25	
	LD (HL) N	54	133
	ADD HL DE	25	
	LD (HL) N	54	133
	ADD HL DE	25	
	LD (HL) N	54	133
	ADD HL DE	25	
	LD (HL) N	54	2
16591	INC HL	35	
	LD (HL) N	54	3
	INC HL	35	
	LD (HL) N	54	3
	INC HL	35	
	LD (HL) N	54	3
	INC HL	35	
	LD (HL) N	54	3
	INC HL	35	
	LD (HL) N	54	3
	INC HL	35	
	LD (HL) N	54	3
	INC HL	35	
	LD (HL) N	54	3
	RET	201	

99 Bytes

Program 5

THE THOUGHT PROCESSOR

MiCROL© SPECTRUM

USE AND LEARN VOL.1: 25 BASIC PROGRAMS AVAILABLE NOW

£9.95

USE 25 PRACTICAL BASIC programs you can put to work immediately–

Programs to demonstrate the wide-ranging potential of your 16 or 48K Spectrum:— World Atlas — Cassette and Videocassette Index — Music Composer — Computer Term Glossary — Star Maps . . .

Personal Programming Aids to help you write your own programs more effectively:— Memory Map Monitor — System Diagnostic — Program debugging aids . . .

Time-saving routines to use in your own programs:– Text Editor — Flexible graph drawing routines — Sort and Search routines . . .

Plus much more.

And, of course, original games to entertain and challenge you.

LEARN New ways to get the most from your Spectrum. Over 100 pages packed with —

Powerful programming techniques:— use Structured Programming to save time and make your programs more reliable — Ideas to make your games more exciting — How and when to use trees, tables, sorts and searches (do you know the Monkey Puzzle sort?) . . .

Facts at your Fingertips:— Memory and runtime Benchmarks for every command — Display File Memory Map — Important PEEK and POKE locations you won't find in your Spectrum manual. Program Design Aids:–Screen Designers, for fast graphics and print layouts — Memory Manager, to keep track of every variable and array. PLUS:– All 25 BASIC programs explained line by line –a goldmine of practical hints and tips.

Send today for USE AND LEARN Volume 1– 25 BASIC Programs, and we'll also keep you posted with details of further important MiCROL products for your Spectrum. And USE AND LEARN comes with MiCROL's full 14-day money- back Guarantee.

To order simply complete the coupon, and FREEPOST with your cheque, made payable to **MiCROL** (UK Mail Order). Despatch normally by return.

Telephone orders—credit card holders can order by telephoning **(0223) 312866** from 9-5.30 Monday to Saturday, stating name and address, Card No. Access/Barclaycard/Visa. and item(s) required.

THE DATA BASE

PRACTICAL. POWERFUL. RELIABLE. AND ONLY FOR 48K SPECTRUMS

AVAILABLE NOW £9.95

Whether you want to update mailing lists, re-organise the filing, or simply produce an index of your stamp collection, THE DATABASE makes it easy and enjoyable:

Easy-to-use one-touch commands and full onscreen prompts for fast, confident operation.

Down-to-earth 40-page manual — full operating instructions plus practical examples to show how THE DATABASE helps you in almost every work and leisure interest.

Massive storage capacity for real-work capabilities — over 900 screens of information (or over 7,000 names and addresses) on a single C90 cassette.

Advanced features you won't find on most £100 + databases — Machine-code automatic sorts and six kinds of searches (including Find Smith, Find Smith And Croydon, Find Smith or Croydon).

Performance you can depend on — professional design and testing ensures the reliability you need for storing important information.

And, with THE DATABASE, you get FREE MiCROL UserCare — informed, intelligent assistance and advice, whatever your question — by letter or telephone.

You can put THE DATABASE to work immediately. And as your Spectrum system grows, THE DATABASE will grow too, with low-cost MiCROL add-ons for Microdrives and full-size printers available soon.

AVAILABLE NOW! ONLY £9.95

Find out for yourself how THE DATABASE puts real computing power at your fingertips.

Send for THE DATABASE today, and we'll also keep you posted with details of further important MiCROL products for your 48K Spectrum. And THE DATABASE comes with MiCROL's 14-day money- back Guarantee.

To order simply complete the coupon, and FREEPOST with your cheque, made payable to **MiCROL** (UK Mail Order). Despatch normally by return.

Telephone orders—credit card holders can order by telephoning **(0223) 312866** from 9-5.30 Monday to Saturday, stating name and address, Card No. Access/Barclaycard/Visa. and item(s) required.

THE THOUGHT PROCESSOR

MiCROL SPECTRUM

(0223) 312866

MAIL ORDER DISTRIBUTION EXCLUSIVELY BY TEMPUS OF CAMBRIDGE

38 Burleigh Street, Cambridge CB1 1BR.

Designed by Sesames (UK) Ltd

Post to:— **MiCROL (UK Mail Order) Freepost 38 Burleigh Street, Cambridge CB1 1BR**

Please send me ..... copy/copies of **THE DATABASE**

Please send me ..... copy/copies of **USE AND LEARN** Vol. 1

I enclose cheque/P.O. for ..... (£9.95 + 50p p + p – £10.45 total each).

Or I wish to pay by Access/Barclaycard/Visa

Card Number .....

Please print name and address

Name .....

Address .....

.....

..... YC 10

Credit card holder's signature .....

PUT YOUR MICRO TO WORK!

YOUR MACHINE

CONTROL MACHINES, ROBOTS, FACTORY OR HOME

Have you ever wanted your MICRO to control a machine for you, or manage your house? If so, the MDR 'MICROCOMPUTER CONTROL INTERFACE' will give you isolated channels of OUTPUT (8A @ 250 volts) and switch sensing INPUTS.

Available now for connection to PET USER, PORT, RS232 and IEEE488, allowing expansion up to more than 900 channels.

Supplied complete with connecting cables, full data and guarantee from £12.54 per channel. Complete preprogrammed systems or individual components available. Write or phone for details.

M D R (INTERFACES) LTD.
Little Bridge House, Dane Hill,
Nr. Haywards Heath, Sussex RH17 7JD.
Telephone: 0825-790294.

EAST LONDON ROBOTICS

The specialists in internal plug-in memories for ZX computers announce:

80K SPECTRUM

now attainable for the price of a 48K model!! with our SP80 low-power Sinclair look-alike.

Functionally identical to the Sinclair 32K internal plug-in expansion but with double the capacity (64K) the SP80 plugs into the sockets provided on the 16K SPECTRUM by Sinclair for his 32K expansion board. Instructions to our usual high standard makes fitting very simple indeed. The SP80 in no way interferes with Sinclair add-ons – ZX Printer, RS232 interface, Microdrive . . .

* New low prices on our highly successful internal memories for ZX81 to: **East London Robotics, 'Finlandia House', 14 Darwell Close, LONDON E6 4BT.**

ORDER FORM

Item	Item price	Quantity	Total
CHIPSWITCH kit doubles your ZX81 memory to 2K (this kit requires soldering)	£4.70		
INCREMENTAL internal 2K plug-in memory extension for ZX81 expandable to 16K	£17.75		
Additional 2K chips for above (HM6116P-3)	£4.50		
MAXIMEM 64K internal plug-in memory for ZX81	£49.95		
MINIMAX 16K version of MAXIMEM upgradeable to 64K with our chip exchange service	£34.95		
SP80 64K internal plug-in memory extension for ZX SPECTRUM giving 80K of user RAM	£50.00		
SP80 Kit version with full instructions	£44.00		
SP80 fitting service (price includes excess p&p)	£9.00		
Telephone equiries on 01 471 3308		Postage and Packing	45p
All prices already include VAT		TOTAL £	

Please tick if you require a VAT receipt. ☐
Refunds less £1.50 handling on all items returned within 14 days of receipt.
Send stamped addressed envelope plus additional 12½p stamp for catalogue.
Cheque/Postal Order payable to EAST LONDON ROBOTICS £ _____
Name: Mr/Mrs/Miss _____
Address: _____

STOP PRESS!!! Transfer all your ZX81 BASIC and Machine code programs and data onto your SPECTRUM in minutes with our new SLOWLOADER available soon!!

YC10

Bridge Software

Dept. YC, 36 Fernwood,
Marple Bridge, STOCKPORT, Ches. SK6 5BE

RAM Pack for the ZX81

with £1 OFF BS software

Both RAM packs fully assembled in neat black ABS plastic case (only 27×47×76 mm). Supplied with foam strip connector to improve mechanical stability. No annoying transformer hiss. Guaranteed. Fully compatible with ZX Printer. Sent by return, first class post.

16k RAM £26-95 64k RAM £59-95

All inclusive prices. When ordering, deduct £1 from price of any software item. **NOTE** 56k of the 64k RAM is user-addressable. Memory is in four areas:
0-8K Sinclair BASIC ROM (read only).
8-16K Machine code area unaffected by CLEAR, NEW, LOAD, SAVE.
16-32K BASIC program and display area.
32-48K BASIC variables and arrays and/or machine code.

Quality Software for the ZX80, ZX81, Spectrum, BBC, VIC20

NEW **BRIDGEMAN** (BBC "B") £7.90
Bridge Software's version of the popular gobbler game. Hi-res, colour, sound.

NEW **LYNCHMOB** (ZX81 16k) £4.95
A competitive game for 2 to 6 players loosely based on Hangman. Animated graphics. Full on-screen scoring. Great fun, educational too.

NEW **LYNCHMOB** (ZX Spectrum 16k) £6.50
As for the ZX81, but developed to make full use of Spectrum's hi-res graphics, colour and sound.

VIC INVADERS (unexpanded VIC 20) £6.90
Machine code, colour, sound.

4k INVADERS (ZX81 4k minimum) £4.00
(GALAXY INVADERS) Machine code, 10 difficulty levels. Top scoring game in Your Computer's May 1982 review of ZX81 software. "Deservedly popular . . . Good value" Pop. Comp. Weekly. "Great game!" S.F. Glos.

SUPER INVADERS (ZX81 16k) £4.95
Enhanced version of 4k INVADERS, *including on-screen league tables etc.*

MULTIGRAPHICS 2.3 (ZX81 16k) £6.90
A user-friendly menu-driven package of procedures giving you full control of the ZX81 graphics functions to compose designs, drawings, adverts etc. Incorporates advanced sketchpad, 3 sizes of text (including lower case), animation, printer output, SAVE displays etc. 20 pp. Manual included.

NEW **STATISTICS** (Spectrum 16k, 48k) Mean, SD, variance, regression, t, F tests. Full graphics. Send s.a.e. for details.

NEW **EPHEMERIS** (ZX81 16k) . . . £6.90 (Spectrum 16k) . . . £7.90
Interested in heavenly bodies? Input date, time and your position, Ephemeris computes altitude, azimuth, phase etc. etc. for sun, moon and planets.

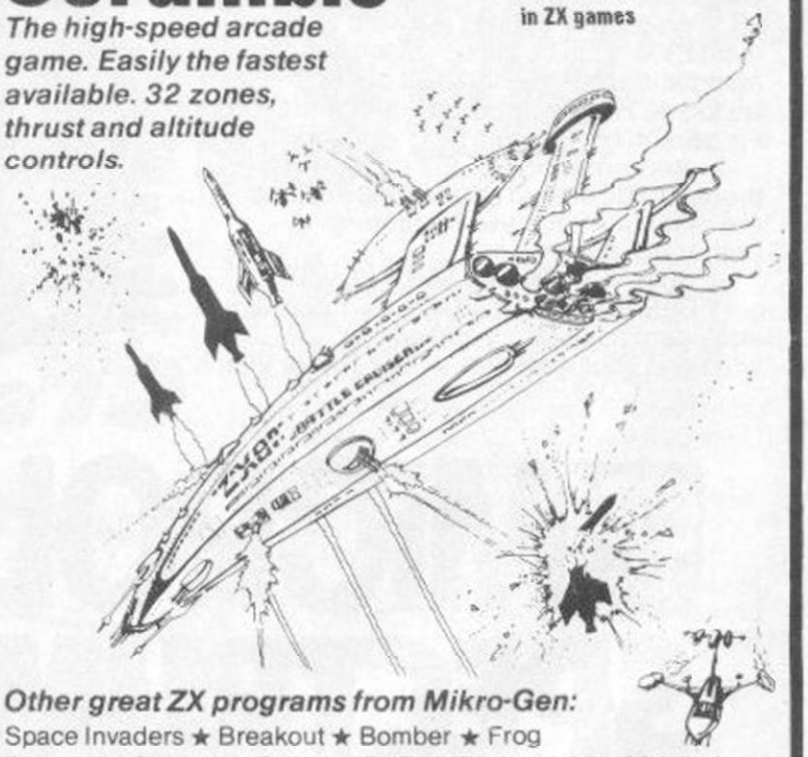
ZX81 1k **GRAPHICS**, 1k **STATISTICS** Send s.a.e. for details.

Send s.a.e. for further details, specifying Your Computer.
Prices include 1st class, return-of-post mail in U.K.
European customers please add 30p. per software item; 70p worldwide (Air Mail).
Overseas customers, please write for details of hardware mailing charges.
Available by mail order or from leading computer stores. Trade enquiries welcome.

Scramble

from MIKRO-GEN
the leaders in ZX games

The high-speed arcade game. Easily the fastest available. 32 zones, thrust and altitude controls.



Other great ZX programs from Mikro-Gen:
Space Invaders ★ Breakout ★ Bomber ★ Frog
Paxman ★ Sorcerer's Castle ★ DeBug (Disassembler/Monitor)

All on cassette, with library case **ONLY £3.95 EACH**

Write for full details of the Mikro-Gen range of programs and add-ons, available from local stockists or direct from the manufacturers (please make cheques/PO's payable to Mikro-Gen and add 40p post & packing)

Suppliers of Software to Sinclair

MIKRO-GEN

24 Agar Crescent Bracknell Berks RG12 2BK Tel: Bracknell (0344) 27317

(continued from page 69)

Address	Mnemonic	Machine code	Comments
16514	LD A N	62 118	Create blank display
	LD B N	6 2	
	PUSH BC	197	
	RST 16	215	
	POP BC	193	
	DJNZ DIS	16 251	
	LD C N	14 6	No of rows across
	LD A N	62 0	
	LD B N	6 9	No of columns down
	PUSH BC	197	
	RST 16	215	
	POP BC	193	
	DJNZ DIS	16 251	
	LD A N	62 118	
	RST 16	215	
	DEC C	13	
	JP NZ DIS	32 241	
16540	LD HL (NN)	42 12 64	Start of display file
	LD DE NN	17 3 0	
	ADD HL DE	25	
	PUSH HL	229	
16548	LD (HL) N	54 135	
	LD B N	6 7	no of steps across
	INC HL	35	
	LD (HL) N	54 131	
	DJNZ DIS	16 251	
	INC HL	35	
	LD (HL) N	54 4	
16560	LD DE NN	17 10 0	
	LD B N	6 4	no of steps down
	ADD HL DE	25	
	LD (HL) N	54 5	
	DJNZ DIS	16 251	
	ADD HL DE	25	
	LD (HL) N	54 1	
16573	POP HL	225	
	LD B N	6 4	no of steps down
	ADD HL DE	25	
	LD (HL) N	54 133	
	DJNZ DIS	16 251	
	ADD HL DE	25	
	LD (HL) N	54 2	
16584	LD B N	6 7	no of steps across
	INC HL	35	
	LD (HL) N	54 3	
	DJNZ DIS	16 251	
	RET	201	

78 Bytes

Program 5c

Address	Mnemonic	Machine code	Comments
16514	LD A N	62 118	Set up display file
	LD B N	6 2	
	PUSH BC	197	
	RST 16	215	
	POP BC	193	
	DJNZ DIS	16 251	
	LD C N	14 8	)
	LD A N	62 0	) Eight by eight empty
	LD B N	6 8	) display file
	PUSH BC	197	
	RST 16	215	
	POP BC	193	
	DJNZ DIS	16 251	
	LD A N	62 118	
	RST 16	215	
	DEC C	13	
	JP NZ DIS	32 241	
16547	JP DIS	24 8	Jump over table
16549		55 51 39 48	) Table of pieces
		54 39 51 55	)
	LD B N	6 8	Set up loop count
	LD DE NN	17 165 64	(16549) start of table
	LD A (DE)	26	Get contents of table
	LD (HL) A	119	and put into display
	INC HL	35	Next display position
	INC DE	19	next table position
	DJNZ DIS	16 250	Finished — no loop
16568	LD B N	6 8	Enter eight Ps
	LD A N	62 53	
	INC HL	35	
	LD (HL) A	119	
	DJNZ DIS	16 252	
16576	LD B N	6 18	Enter black and white squares
	LD C N	14 118	
	INC HL	35	
	INC HL	35	
	LD A (HL)	126	) Ensure we do not
	SUB C	145	) overwrite end of line
	JP Z DIS	40 2	) marker
	LD (HL) N	54 128	
	DJNZ DIS	16 246	
16590	INC HL	35	Enter eight black Ps
	LD B N	6 8	
	LD A N	62 181	
	NC HL	35	
	LD (HL) A	119	
	DJNZ DIS	16 252	
16599	INC HL	35	Enter black pieces
	LD C N	14 128	
	LD B N	6 8	
	LD DE NN	17 165 64	
	LD A (DE)	26	
	ADD C	129	Change white pieces
	INC HL	35	to black
	LD (HL) A	119	
	INC DE	19	
	DJNZ DIS	16 249	
	RET	201	

Program 7.

Address	Machine code	Mnemonic	Comments
16514	14 9	LD C N	No of rows across
	62 23	LD A N	Character printed
	6 8	LD B N	No of columns down
	197	PUSH BC	Save BC (It is altered by RST 16)
	215	RST 16	Print character A
	193	POP BC	Recover BC
	16 251	DJNZ DIS	Decrease column count
	62 118	LD A N	Enter end of line
	215	RST 16	Print end of line
	13	DEC C	Decrease row count
	32 241	JP NZ DIS	Finished no-loop
	201	RET	Return

Program 6

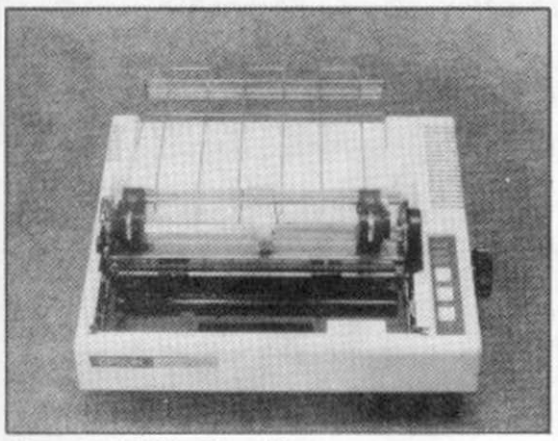
Address	Machine code	Mnemonic	Comments
16514	62 118	LD A N	)
	6 2	LD B N	)
	197	PUSH BC	) Step down B lines
	215	RST 16	) before commencing
	193	POP BC	)
	16 251	DJNZ DIS	)
16523	14 7	LD C N	No of rows across
	62 23	LD A N	Character to be printed
	6 8	LD B N	No of columns down
	197	PUSH BC	Save BC (It is altered by RST 16)
	215	RST 16	Print character A
	193	POP BC	Recover BC
	16 251	DJNZ DIS	Decrease column count
	62 118	LD A N	Enter end of line
	215	RST 16	Print end of line
	13	DEC C	Decrease row count
	32 241	JP NZ DIS	Finished no-loop
	201	RET	Return

Program 6A

PROJECT PICKING A

Buying the right machine in the first place is probably the most difficult part of computing. John Dawson offers some timely advice.

CHOOSING A COMPUTER necessitates systems analysis. Real computers only come into the process at the end, however, because the first thing you must do is to think about the job that a theoretical computer is intended for. It should be clear that if someone wants a computer for writing books, the machine will



Epson's MX-80 offers 80cps.

have to have a printer for producing draft copies of each chapter as the author works. Other requirements are more subtle but their effect may be just as disastrous if you miscalculate.

Probably the most important consideration when you start to look at serious uses for small computers is maintenance. What happens when the computer goes wrong? I know at least two organisations that run their records in parallel — once on a computer system and once using a handwritten, manual backup. That is not only inefficient, it denies the very purpose of the original computer installation. If you are going to trust a machine with information that matters then the machine must be trustworthy.

Maintenance considerations

Maintenance does matter on relatively expensive machines such as the BBC Micro and the Sharp MZ-80 range and it is also important in relation to the timescale of the operation. For example, if you have an application that requires the use of the computer once a month then, on average, a fault in the system will probably not stop or inconvenience the operation if it is corrected within two weeks. If, on the other hand, you need your computer all day for on-line record keeping, you need a maintenance contract that guarantees repair within half a working day. The only difference is in the price — you might reasonably expect to pay 12 percent of the original price of the computer system each year for a maintenance contract that promised repair within one working day and two or three percent less for a contract based on a longer repair time span.

Do you need a maintenance contract at all? It might be better to chance a major fault and reckon to buy another computer, or tape recorder, or printer, if one part of the system goes wrong. This is particularly likely to be true when you are dealing with a very cheap system such as the Sinclair ZX-81 or Spectrum.

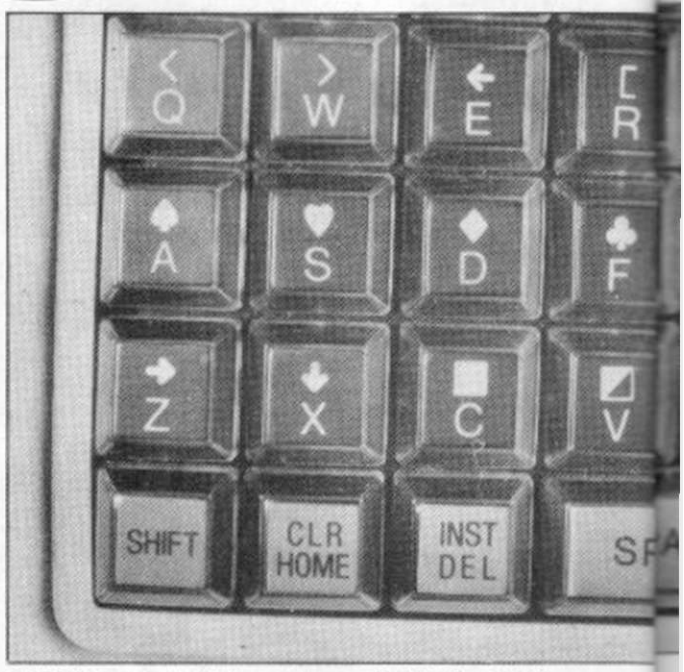
The second area to look at is size and speed. A Texas TI-58 calculator has more memory and operates faster than an IBM 650 mainframe from the 1950s; even so there are some jobs that will take too long to do on a Sinclair Spectrum or Acorn Atom. If you want to keep a file of records in the computer memory it is a simple matter to see whether they will all fit in at once, or whether you will have to load one section of the records, extract the information you require, then load a second set.

Access to records

Medical records are a good example; a typical system will allow 150 characters for the name and address, and about 50 characters for the NHS number, age and sex of the patient, medical facts about vaccination status and contraceptive advice that the GP may have given. A further 50 characters may be taken up with abbreviated details of the most recent illness, previous episodes of disease being recorded using seven-figure codes. Each record is allowed 250 characters. If there are 2500 patients in the practice it is clear that a theoretical computer system must be able to access at least 625,000 characters if the doctor wants to keep that sort of record.

The time in which the doctor requires access to a patient's record is also important. One medical system that ran on a Pet computer held about 250 characters of data about each patient on cassette tape. The system was used for repeat prescribing and the computer worked its way through the tape picking out the patients who had asked for more medicine. When it found the correct person the machine updated the record on another tape and printed a prescription. That took most of an afternoon, but it didn't matter because the system was designed that way and nobody expected it to do anything else while it was working.

Once you have arrived at some idea of the size and speed of machine you require, you might move on to think about the physical



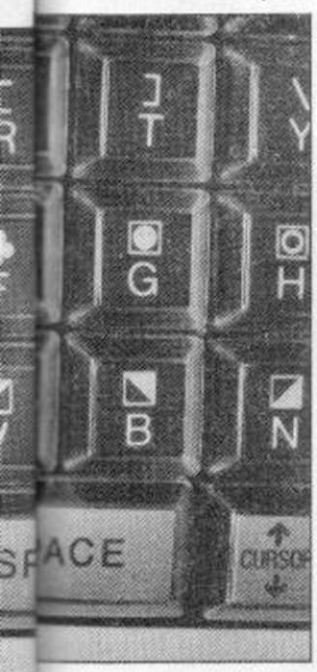
MZ-80 keyboard (above) is unsuitable for word processing. The Vic-20 (below) has typewriter keyboard but lacks serious software.

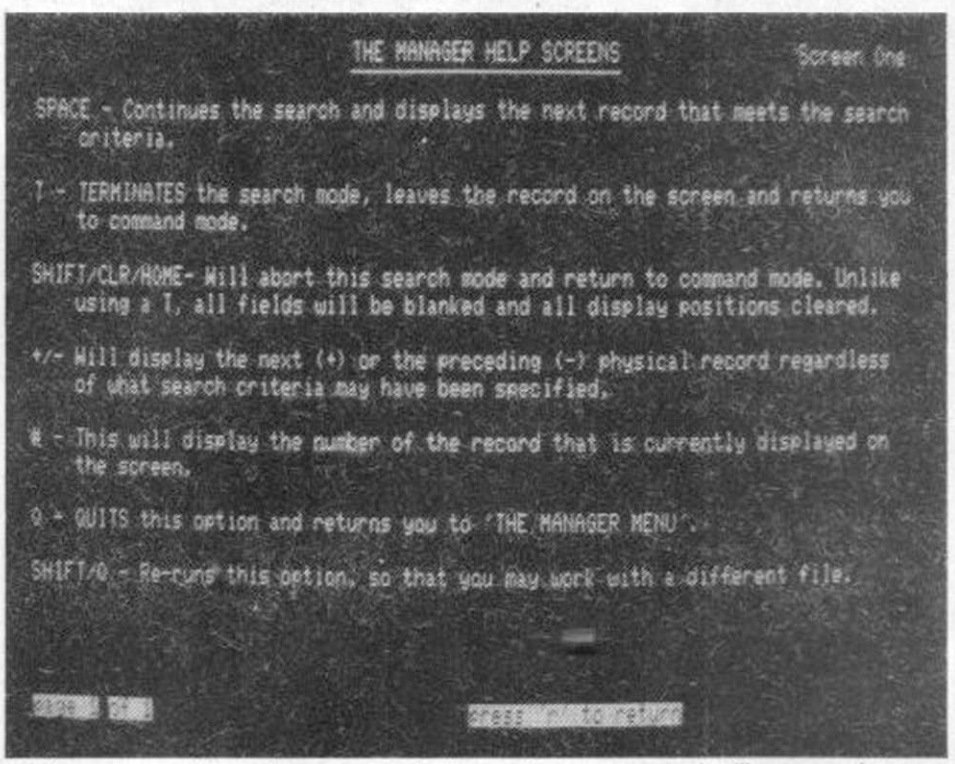
layout of the computer. Will the computer operator need to type in large quantities of information, or only small quantities of data? In other words, what is the balance between data entry and "computation"?

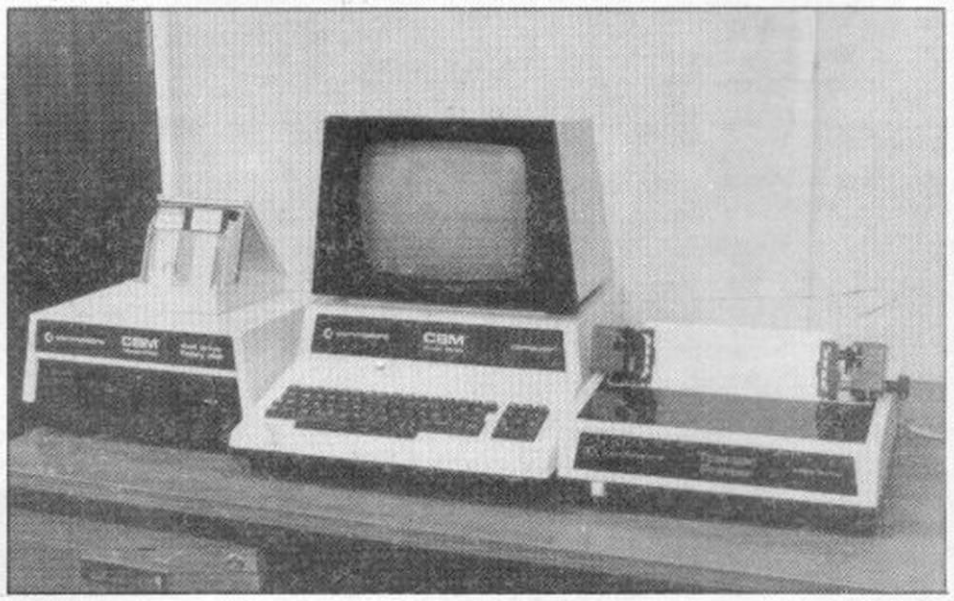
Type of task

A word processor is an example of very large data entry with minimal computing while the design of a boat hull may need only a small amount of information while involving a great deal of computer time. In the second case the keyboard design is relatively unimportant and a machine like the Sharp MZ-80K can do very well. However, the unorthodox keyboard on the Sharp makes it impossible for a touch typist to use and the machine is unsuitable,

MICRO







Will the screen display be uncomfortable on the eyes — and will you need a complete system? Will the peripherals suit the conditions of your task?

consequently, for use as a commercial word processor.

What about the visual display unit (VDU)? The ergonomics, or human factors engineering, of the display are important if the machine is to be used by one operator for long periods. Some of the early radar screens in the Second World War produced eye strain and styes among the operators and modern VDUs are still capable of precipitating visual instability, headaches and discomfort among long term operators. Amber displays are said to be the most relaxing to look at with green running a close second. Wobble and jitter in the display and the character design (true lower case descenders, legibility) are all important features for you to consider if the machine is to be used successfully by other people who may not have your degree of motivation.

Will cassette tapes be adequate for storing the records or documents produced on the machine? Most people think word processors can only be successful if they have floppy disc drives. As usual, it actually depends on what sort of word processing is to be done on the computer. If the machine is put into an office where the operator will spend most of the time composing standard letters by calling up paragraphs from a large selection then you need floppy or hard discs. If, on the other hand, the word processor is for a journalist or author who will work on one piece of text at a time then cassette tapes are entirely acceptable as a storage medium, provided that the whole of the article or a chapter can be held in the computer memory at once.

What sort of printer will the user require? Dot matrix printers work by firing needles at the typewriter ribbon and they produce a slightly ragged outline to each letter. Early dot matrix printers had only seven needles and were unable to produce proper lower case descenders. Later models have nine needles and some expensive printers now fill in the letters producing results that are comparable to an ordinary typewriter. The flexibility that comes of being able to change any character by altering the software makes dot matrix printers attractive for scientific work, graphics, and foreign correspondence. Some dot matrix printers cost considerably more than daisy-wheel printers.

Choosing peripherals

Daisy-wheel printers have formed characters which strike a fabric or carbon ribbon to give a clean character impression. As a general rule, these printers are suitable for business correspondence and the prices at the bottom end of this market are becoming competitive with some dot matrix printers. But, what about the speed of the cheap daisy-wheel machine? Is 12 characters per second (cps) acceptable or must you have the 80 cps that you can expect from an Epson MX-80 printer? How well will the printer wear in the conditions of your application? There is a great difference between printing bank statements for 12 hours a day and producing ten single page letters a week with a draft financial statement for the sports club on the side.

After looking at the hardware requirements from as many different angles as you can find, move on to the software. Really the two parts of the analysis co-exist. If the hardware is unsuitable it makes no difference what software is available. If the software won't do the job, the hardware is just an expensive doorstop. Does your friend want to buy the software ready-made or is someone going to write it specially for the application?

Development of the system

Many small machines like the Acorn Atom, Sinclair ZX-81, MZ-80K, Video Genie, and Texas TI-99/4 have some business software available. Other machines are more specialised, I have seen very little non-games software for the Vic-20, and the Nascom family is supposed to be more comfortable in laboratory or industrial applications. Is access to the huge range of software available under CP/M needed?

Choice of a real computer and the best programs depends on the systems analysis that you carry out. One of the most important parts of that analysis will be the future development of the system. Will the number of records that have to be stored increase in number and size or stay about the same? Will other applications be added to the original purpose of the machine and how will the available operating time be allocated?

Systems analysis is just a way of approaching a problem. It is a way of discovering what the limits of the problem are and how a way through can be found. ■

GRAPHICS TABLET

Here it is. A versatile graphics tablet at a price you can afford. And the only tablet that's been specially designed to complement BBC micros.

Transfer your designs from pad to screen — in seconds!

BIG pad, 2'6" square, gives you all the scope necessary for highly technical drawings. In colour. To scale.

Moves drawings on screen. Measures distances and areas. Many other features too.

MICRO MANAGEMENT

32 Princes Street, Ipswich, Suffolk
Telephone: (0473) 59181

Please send me literature on
the Micro Management Graphics Tablet

Name _____

Address _____

_____

RESPONSE FRAME

Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

ASTEROID SPIN

■ **I am 12 years old and use a Model A BBC Micro. I have recently been trying to make a program based on Asteroids. When programming it, however, I faced the problem of rotating the ship. Please tell me how I can do this.**

Andrew Charity,
Northwich, Cheshire.

AS YOU ARE working on a Model A, memory is at a premium. You do not say which mode you are working in, and this can make a difference. To rotate your ship, you need to define eight different ships, one facing in each direction, and then use a routine within the program to choose the correct ship for the direction you are moving. The alternative to this, and one which may be acceptable if you are short of memory, is to settle for four — rather than eight — directions, and use the A, V and the greater than and less than symbols to represent the ship facing up, down, right and left respectively.

FAMILY TREE

■ **As an amateur genealogist, I want to put my records into the more rapid retrieval system of the ZX-81. I have at present 42 different surnames which are connected with my family. Between the 42 families thre are 160 children. The ideal program would be in three distinct parts:**

■ A list of all the surnames in the directory
■ A list of all the people of each surname
■ Details of each family

I started working on the program, giving each name a unique code number, derived from the initial letter of the surname followed by a sequential number starting from one. I want to refer to that code number and get a list of all the people with that surname, each with its own unique code number. By referring to that code number, details of that person's family would be displayed. Am I expecting too much from my ZX-81?

Michael Brady,
Nottingham.

I SEE NO reason why the Sinclair Vu-File program, or a similar program, should not work perfectly for your needs. In essence you need a simple sort program, which allows elements from other parts of the file to be linked. You need a master array which holds the name and the code number, complete with the "extra information" such as birthplace, marriage, birth and death dates. The code number must be forced to carry more weight. It should hold the following information, to stop it being a deadweight:

■ Surname: the first four letters of the surname could be the first four elements of the code
■ A number showing whether married or not
■ A number showing offspring
■ A three-digit number for birth, and one for death — the birth date minus the leading 1, as 861 for 1861, and so on.

This is only a suggestion, as I do not know how you wish to manage the data. Your coding system is the key to the whole program. You should find that you can hold a limited amount of information on 160 people easily within 16K.

SPECTRUM SCROLL

■ **I have written a simple 1K ZX-81 Asteroids program which I would like to use on my Spectrum, adding, say, colour to the program, which in its ZX-81 version reads:**

```
10 LET D = 0
20 LET B = 15
30 PRINT AT 10,B;
40 IF PEEK (PEEK 16398 + PEEK
   16399*256) = CODE "*" THEN
   GOTO 110
50 PRINT "0"
60 LET D = D + 1000
70 PRINT AT 20,RND*30;"*"
80 SCROLL
90 LET B = B + (INKEY$ = "0") -
   (INKEY$ = "1")
100 GOTO 30
110 PRINT "KERBOOM"
120 PRINT "YOU TRAVELLED FOR
   ";D;" LIGHT YEARS"
130 PAUSE 4E4
140 CLS
150 RUN
```

Line 80 is the problem, because there is no Scroll command on the Spectrum. Could you suggest a solution?

David Matthews,
Carnforth, Leicestershire.

THERE ARE A few things you can simplify about this program on the Spectrum. Instead of using Scroll, you can use Poke 23692, –1. Change line 130 into Pause 0, and delete 140, as the Spectrum automatically clears the screen when running. Changle line 30 into

```
IF SCREEN$ (10,B) = "*" THEN
GOTO 110
```

and delete line 40. Change line 50 into

```
PRINT AT 10,B;"0"
```

POLICY FILE

■ **I have recently bought a 1K ZX-81 to replace my rather untidy filing system. I am an insurance agent, and I keep a record of all my customers in a card file. I would like to use my ZX-81 as a complete, easy-to-alter filing system, holding the customer name, addresses, etc. the policy held, and its maturity date. I need to enter over 500 customer details with space to expand as needed. Is there a program available which would meet my needs?**

P Gilbert,
Brighton, East Sussex.

YOUR PROGRAM NEEDS are not, in themselves, too complex, but you need to know what you are doing before you begin.

For a start, you could probably not have a file which was infinitely upwardly expandable. You would possibly need to specify at the beginning how many individuals you wanted to set up the file on, so arrays could be created to hold that information. It would not matter if some of the space was kept empty for the time being. This is much simpler than trying to expand a full system later on. I suggest that, in your case, Hilderbay could advise you as to what you would need. And for something as important as your business, I suggest a little extra outlay now could pay dividends. Video Software may also be able to help you.

SCREEN GLITCH

■ **I own a ZX-81 and 16K RAM. In May, I sent my computer back because it kept crashing too frequently. Now, almost every-time I switch on with the new ZX-81 I get a white bar about two inches wide. When it reaches the bottom of the screen it seems that the television loses its horizontal hold and moves up, then stops and the white bar starts again. What do you suggest I do?**

Matthew Field,
Kingston upon Thames, Surrey.

IT SOUNDS to me more like a RAM problem than a ZX-81 problem. I suggest you try out a friend's ZX-81 on your television, and with your RAM pack, and see if the problem occurs. That would isolate it to the RAM pack. Try cleaning the contacts at the back of your ZX-81 with surgical spirit, and then rig up something to ensure that the RAM pack does not wobble when you use it. If you find that these things do not help, I suggest you will have to go without your ZX-81 for a while. Send it back to Sinclair, saying you wrote to me, and that I suggested it could be a problem caused by the combination of the ZX-81 and your particular RAM pack. Send the RAM pack back as well, but make sure you point out in your covering letter that you are enclosing a RAM pack, or they might not send it back to you.

FAST RUNNER

■ **In a back issue of *Your Computer* you quoted timings for a simple loop counting from 0 to 1,000, printing out each number during the loop. The timings attained were as follows: Atom — 1 minute 23 seconds; MZ-80K Basic — 50 seconds; MZ-80K Pascal — 22 seconds; BBC Micro — 14 seconds. Spurred on by curiosity, and armed with my trusty stop-watch, I ran the following program:**

```
10 FOR P = 0 TO 1000
20 PRINT AT 0,0;P
30 NEXT P
```

These were my results: ZX-81 in Fast mode — 2 minutes 26 seconds; Slow mode — 9 minutes 49 seconds. I am led to ask the following questions:

■ **What makes one computer faster than the other?**
■ **Is it possible to increase the working speed of the ZX-81?**

J H Weaver,
RAF Gutersloh.

A NUMBER OF factors influence the speed of a microcomputer. The computer thinks in binary arithmetic, and must first translate your Basic program into zeros and ones. The efficiency of the process by which a program is changed from a high-level language like Basic to machine code is one factor which affects the speed. The next factor is changing the output back into human-readable information. In the case of the ZX-81, particularly, there is another important factor influencing the change — the way Slow mode works. In Slow mode, the computer spends most of its time keeping the screen picture steady, and only the time *between* refreshes of the picture doing its thinking. That is why Fast is so much faster than Slow. The method of printing on the screen also takes time. The ZX-81 is quite sluggish when printing out numbers on the screen. If you were to delete the middle line of your program you would get some increase in speed, but the only way to increase the speed of the ZX-81 dramatically is to program it in machine code. In fact, when you run tests for speed on various computers, with the test program written in machine code, all you are really testing is which processor the computer is built around, and how well the printing mechanism works.

BASIC NONSENSE

■ **We have been trying to type a machine-code loading program for the ZX-81 into a Spectrum. When we run it we get the message "Nonsense in Basic". Can you tell us why?**

J Baker,
Sowery Bridge, West Yorkshire.

YOU CANNOT run machine-code programs in their ZX-81 form directly on the Spectrum. Your loader depends on the use of information stored in a string, which is accessed and then Poked into position. The character set on the two computers is different, so you would be attempting to load information into the Spectrum which it could only interpret as rubbish. The Spectrum has been designed to make the acceptance of machine code relatively simple, with the use of the Clear to set RAMtop to give you a safe space where you can hold your machine code. ■

THE BEEB PRODUCES THE BEST TV PROGRAMMES IN THE WORLD . . .

Uncle Clive produces the World's best computers and Jack Gibbons A.I.B. produces the best Banking Programs in the World . . . *Anon.*

THE PERSONAL BANKING SYSTEM

is available direct from J.P. Gibbons A.I.B.
14 Avalon Road, Orpington, Kent, BR6 9AX.
Price £9.95 inclusive.
For Cassette and Users Manual
(Requires 16 to 48K Ram).
Specify whether ZX81 or Spectrum.
Bank reconciliation module.
Available soon £6.50.

* * * *

Also stocked at the **Buffer Micro Shop, Streatham — Microware Shop, Leicester — John Derby, Bournemouth** — and branches of the **Computer Bookshop Group.**

Full after sale maintenance available.

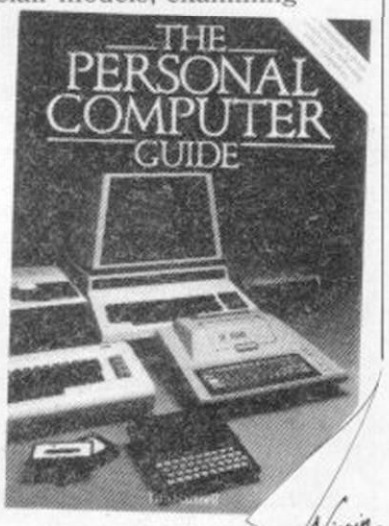
THE PERSONAL COMPUTER GUIDE

TIM HARTNELL

The Complete Handbook to Selecting and Using Small Computers

A unique introduction to the exciting world of personal computers, including:

- ★ An explanation of how they work and what they can do for you
- ★ A detailed analysis of the available systems including the BBC, Commodore and Sinclair models, examining specifications, commands, software and other vital information
- ★ How to get the most out of your computer
- ★ A step-by-step guide to programming
- ★ A complete set of over 40 programmes
- ★ Written by Tim Hartnell, the U.K.'s leading authority on small computers



Packed with ideas and fully illustrated with photographs, line drawings and information panels. **ONLY £5.95**

Available from all good bookshops everywhere, or by mail order (adding £1.00 to cover postage) from INTERFACE, 44/46 Earls Court Road, London W8 6EG.

Virgin

ZX81 ECONOMIC KEYBOARD £11.95

Individually handmade and thoroughly tested before dispatch, unconventional but practical,

A SINCLAIR USER'S ANSWER
TO A SINCLAIR USER'S PROBLEM

It's reliable, enjoyable and inexpensive; and it comes with a money-back guarantee if you don't agree.

It is NOT a full-sized typewriter keyboard with full-travel keys to be wired up in some way to your computer.

IT IS:
SIMPLICTY ITSELF TO ATTACH fitting directly onto Sinclair's flat keyboard
NEAT AND UNOBTRUSIVE, in no way interfering with any other expansion
SURE IN KEYSTROKE
FAST AND EASY TO OPERATE
ATTRACTIVE TO LOOK AT

IT HAS:
A SLIM BLACK BOARD with
ENLARGED AND RAISED KEYS which are
COLOUR-CODED AND EASY TO READ, and offers
SWIFT LOCATION OF FUNCTIONS etc.

MAKE YOUR ZX81 A REAL PLEASURE TO USE
Send cheque/P.O. for £11.95 to:

DAVID HEARTFORD
91, High Street, Evesham, Worcs, WR11 4DT

New Generation Software

Professionally Written and Produced Software for the Home Computer
From M.E. Evans the author of: —

3D MONSTER MAZE DEFENDER
comes a game for the
For the ZX81 **SPECTRUM**

ESCAPE

Can you find the axe to break down the exit door of the maze and ESPACE? The maze is inhabited by 5 hunting dinosaurs including a TRICERATOPS who has the habit of hiding behind the hedges, and a PTERANODON that soars over the maze to swoop down on you.

Send to: **NEW GENERATION SOFTWARE**
FREEPOST, oldland Common Bristol BS15 6BR
(no stamp reqd. in UK)

or for INSTANT CREDIT CARD sales ring 01-930 9232

Please send me a copy of Escape for the 16k Spectrum.
I enclose cheque/P.O. for £4.95

Mr/Mrs .....

Address .....

..... post Code .....

FINGERTIPS

Fingertips is our regular calculator column covering calculator news, programming hints and examples of unusual applications. The column is written and compiled by calculator enthusiast David Pringle who is glad to hear of any of your ideas. *Your Computer* pays £6 for each of your contributions published.

TEXAS AND SHARP owners have finally come out of their shells in the last couple of weeks and sent in some programs. Maybe they are afraid that their machines are due to be superseded and that this is their last chance.

The first program, by A J Gilbert, is a decimal to base n conversion for the PC-1211.

This program converts a decimal number to an n-base number, where n is any integer from two to 20. The result is accurate to 10 digits of decimal or base, whichever is the lesser.

Unlike other base conversion programs, this one is not truncated at the decimal point, and is very useful for producing hexadecimal or binary values for output to D-A converters.

The same calculation gives budding astronauts a more sophisticated moon-lander game.

This game uses 1,008 bytes of the machine's RAM, which leaves plenty of memory free. When programming the game, do not leave spaces between characters and commands, or you may not be able to complete some lines.

Multifunction lines and low-value line numbers have been used to save memory, for example Goto 170 takes an extra byte compared to Goto 17.

The gravity factor, which lies between three and 12, is a measure of free-fall acceleration. The higher it is, the faster you accelerate. Your height at the start is random between 9,000 and 11,000. Each time your position has changed you are again told your height and speed upwards, amount of fuel and your time.

To go down, burn at 0 — accelerating under gravity; to go upwards, burn at anything above.

The next program is included for its novelty — the only attempt at Golf I have seen on a progr ammable. It comes, of course, from A Scot.

When run, the calculator will show your hole number followed by the number of strokes taken so far, then the par after the hole you are on, thus: Hole n-n:n. Your number of strokes played so far is then displayed — Strokes=n, then your distance to the hole — Dist,=n.

"Club?" is then displayed. You input the club number you require from 1-8. Your drive distance is then shown: You Hit=n. The game ends after nine holes.

Here is a program by Roy Sirl of Andover which will give successively better approximations of irrational numbers as rationals — that is, fractions. Unfortunately it is not fast — it takes 11 minutes to find the well-known $\frac{355}{133}$ approximation for pi!

The numerator and denominator are stored in memories 5 and 6. The error is stored in memory 7.

Finally, Geoffrey Wood of Horsforth has written a topical program to keep track of petrol costs. This Texas TI-58C program was written originally for use on continental motoring holidays.

When buying petrol — always fill the tank right to the brim, this gives a more accurate figure for the petrol used — prime the program by entering the mileometer reading in Memory 22. You can also note it above the first line of your record card. No need to record the petrol at this stage; the figures from the next time you fill up are used to run the program. All times should be entered in hours and minutes using the 24-hour clock.

To select exchange rate press B. R/S..R/S.. to step through exchange rates. The one in display is the one used in all currency conversions until another is selected.

For a second car's performance press SBR EE to exchange memory banks. Exchange back to the first car is automatic after each run. User-defined keys may be used independently of the main program: A litres → gallons, A^1 gallons → litres, B select, C foreign currency → £, C^1 £ → foreign currency, D foreign currency per litre → pence per gallon.

All you have paid is summed into memory 26 in £s. If you want a running total press RCL 26. All results are displayed rounded to two decimal places. Keep the calculator in Fix 2 mode.

This program will handle both records for two cars independently. Prime memory 21 with the initial mileage of the second car, making sure the tank is full. Next time you fill the second car, press SBR EE to call the subroutine that exchanges the memory banks. This must be done every time you use the program for the second car as the memories for the first car are put back automatically after each run.

Pressing SBR EE also starts the program and causes the mileage at the previous fill-up to be displayed for checking purposes. You do not have to press R/S to start the run as you do for the first car. Otherwise the procedure is identical.

The conversion subroutines can be used independently of the program but since they return to program locations to display you must either switch off or press RST — to return the program pointer to step 0 — before you run the program. Failure to do this will result in the old mileage not being displayed. But you can still press RST and R/S to run the program without doing any damage to the memory contents.

You can put in what exchange rates you like according to the countries you are visiting. If rates alter you can amend the memories without having to edit the program.

Memories 5 to 14 contain exchange rates. You can quickly check through and/or select the memory required by pressing B. The number of each memory is displayed fleetingly followed by a steady display of the contents. R/S repeats this sequence returning to memory 5 after 14. To get out of the loop you must either press RST, switch off or call some other sub-routine. The value in display is also in memory 29 and is recalled for the currency conversion subroutines.

The program is listed with a few explanatory notes.

(continued on next page)

Approximating irrationals as rationals.

Key	Loc	Code
STO 0	00	32 0
1	01	01
STO 7	02	32 7
9	03	09
STO	04	32 1
2nd Lbl 2	05	86 2
1	06	01
SUM 1	07	34 1
RCL 1	08	33 1
÷	09	45
RCL 0	10	33 0
=	11	85
2nd Int	12	49
STO 2	13	32 2
1/x	14	25
×	15	55
RCL 1	16	33 1
+/-	17	84
+	18	75
RCL 0	19	33 0
=	20	85
2nd I×I	21	40
2nd Invx⩾t	22	76
CTO 0	23	51 0
1	24	01
SUM 2	25	34 2
RCL 0	26	33 0
−	27	65
RCL 1	28	33 1
÷	29	45
RCL 2	30	33 2
=	31	85
2nd I×I	32	40
2nd x⩾t	33	76
CTO 2	34	51 2
2nd Lbl 0	35	86 0
STO 7	36	32 7
RCL 1	37	33 1
STO 5	38	32 5
÷	39	45
RCL 2	40	33 2
STO 6	41	32 6
=	42	85
R/S	43	81
GTO 2	44	51 2

Golf program.

```
P0
MAC 9 Min00 LBL9 1 M+04 AC Min05 RAN                    9
× 400 + 100 = INT Min03 ( MR03 ÷ 70                    25
+ .5 ) = INT M+01 LBL3 "HOLE AR04-AR02:                42
AR01" HLT MR05 X=0 GOTO4 "STROKES=AR05"                59
HLT LBL4 "Dist.=AR03" HLT MR03 X=0 GOTO0               74
20 MinF MR03 X=F GOTO1 GOTO2 LBL1 AC                   83
"CLUB?" HLT Min06 X=0 GOTO1 9 MinF MR06                97
X=F GOTO1 MR06 × 20 = X ( RAN + .5                    110
) = INT Min07 "YOU HIT=AR07" HLT MR03-                128
MR07 = ABS Min03 1 M+05 GOTO3 LBL2                    136
":G:R:E:E:N:" PAUSE PAUSE MR03 ÷ 8 + 1                156
= INT Min07 "PUTTS=AR07" PAUSE PAUSE MR07             171
M+05 LBL0 MR05 M+02 "STROKES=AR05" HLT DSZ             188
GOTO9 MR02-MR01 = X=0 GOTO6 "# Below Pa                205
r" GOTO7 LBL6 "# Above Par" LBL7                       222
```

Contents in memories

00 COURSE LOOP	04 HOLE NUMBER
01	05 STROKES
02 TOTAL STROKES	06 CLUB NUMBER
03 DISTANCE	07 DRIVE + PUTT

1. Enter time 1
2. Press E
3. Enter mileage 1
4. Press R/S
5. Switch off Drive on.

1. Enter time 2
2. Press 2nd E^1
3. Enter mileage 2
4. Press R/S. Read average Kms/hr.

2. Enter time 3
2. Press 2nd B^1
3. Enter Km to destination
Press R/S
Read time of arrival

1. Enter time 4 (Desired time of arrival).

Press 2nd D^1. Read average mph required.

Average speed program for petrol costs.

1. Switch on, press R/S.* Read old mileage, enter new mileage.
2. Press R/S, enter fuel, press R/S. If gallons, display reads 0.

2A. If litres;† display reads gallons. Note, press R/S again.

3. Enter money, press R/S. If £; display reads elapsed miles.

3A. If foreign currency;† display reads £. Note, press R/S again.

4. Press R/S. Read mpg.
5. Press R/S. Read pence per mile.
6. Press R/S. Read pence per gallon.
   Press RCL 26 to read running total in £§

* For car No. 2 press SBR EE instead of first R/S.
† Conversions are automatic.
§ 0 STO 26 zeroes running total.

Main program for keeping track of petrol costs.

(continued from previous page)

```
000  43 RCL   120  95  =
001  23  23   121  61 GTO
002  77  GE   122  00  00
003  52 EE    123  13  13
004  43 RCL   124  76 LBL
005  22  22   125  16 A'
006  91 R/S   126  65  ×
007  42 STO   127  61 GTO
008  15  15   128  01  01
009  01  1    129  18  18
010  05  5    130  76 LBL
011  32 X:T   131  13  C
012  25 CLR   132  55  ÷
013  91 R/S   133  43 RCL
014  77  GE   134  29  29
015  11  A    135  95  =
016  42 STO   136  22 INV
017  16  16   137  86 STF
018  43 RCL   138  01  01
019  29  29   139  61 GTO
020  67  EQ   140  00  00
021  75  -    141  23  23
022  25 CLR   142  76 LBL
023  91 R/S   143  18 C'
024  87 IFF   144  65  ×
025  01  01   145  61 GTO
026  13  C    146  01  01
027  44 SUM   147  33  33
028  26  26   148  76 LBL
029  42 STO   149  14  D
030  17  17   150  65  ×
031  43 RCL   151  43 RCL
032  19  19   152  28  28
033  49 PRD   153  55  ÷
034  17  17   154  43 RCL
035  43 RCL   155  29  29
036  22  22   156  65  ×
037  94 +/-   157  43 RCL
038  85  +    158  19  19
039  43 RCL   159  95  =
040  15  15   160  91 R/S
041  95  =    161  81 RST
042  91 R/S   162  76 LBL
043  42 STO   163  75  -
044  18  18   164  22 INV
045  44 SUM   165  86 STF
046  22  22   166  01  01
047  55  ÷    167  61 GTO
048  43 RCL   168  00  00
049  16  16   169  22  22
050  95  =    170  76 LBL
051  91 R/S   171  15  E
052  43 RCL   172  88 DMS
053  17  17   173  94 +/-
054  55  ÷    174  42 STO
055  43 RCL   175  01  01
056  18  18   176  25 CLR
057  95  =    177  91 R/S
058  91 R/S   178  94 +/-
059  43 RCL   179  42 STO
060  17  17   180  02  02
061  55  ÷    181  91 R/S
062  43 RCL   182  76 LBL
063  16  16   183  10 E'
064  95  =    184  88 DMS
065  91 R/S   185  44 SUM
066  81 RST   186  01  01
067  76 LBL   187  25 CLR
068  52 EE    188  91 R/S
069  43 RCL   189  44 SUM
070  22  22   190  02  02
071  48 EXC   191  43 RCL
072  21  21   192  01  01
073  42 STO   193  22 INV
074  22  22   194  49 PRD
075  43 RCL   195  02  02
076  26  26   196  43 RCL
077  48 EXC   197  04  04
078  27  27   198  49 PRD
079  42 STO   199  02  02
080  26  26   200  43 RCL
081  43 RCL   201  02  02
082  23  23   202  91 R/S
083  94 +/-   203  76 LBL
084  42 STO   204  17 B'
085  23  23   205  88 DMS
086  61 GTO   206  42 STO
087  00  00   207  01  01
088  04  04   208  25 CLR
089  76 LBL   209  91 R/S
090  12  B    210  42 STO
091  01  1    211  20  20
092  05  5    212  55  ÷
093  32 X:T   213  43 RCL
094  05  5    214  02  02
095  42 STO   215  85  +
096  00  00   216  43 RCL
097  43 RCL   217  01  01
098  00  00   218  95  =
099  77  GE   219  22 INV
100  00  00   220  88 DMS
101  94  94   221  91 R/S
102  66 PAU   222  76 LBL
103  73 RC*   223  19 D'
104  00  00   224  88 DMS
105  42 STO   225  75  -
106  29  29   226  43 RCL
107  91 R/S   227  01  01
108  69 OP    228  95  =
109  20  20   229  35 1/X
110  61 GTO   230  65  ×
111  00  00   231  43 RCL
112  97  97   232  20  20
113  76 LBL   233  55  ÷
114  11  A    234  43 RCL
115  86 STF   235  04  04
116  01  01   236  95  =
117  55  ÷    237  91 R/S
118  43 RCL   238  00  0
119  28  28   239  00  0
```

Left, the petrol-cost program. Right, the memories section, and far right, the user-defined keys.

5.	00	117.	14	4.544	28		
3000.	01	52908.	15	15.	29		
113.2732758	02	11.55809859	16	068	52	EE	
0.	03	1754.	17	090	12	B	
1.609347088	04	340.	18	114	11	A	
15.	05	100.	19	125	16	A'	
80.5	06	164.	20	131	13	C	
4.68	07	52908.	21	143	18	C'	
4.27	08	45751.	22	149	14	D	
30.5	09	100.	23	163	75	-	
2320.	10	35.3254485	24	171	15	E	
3.4	11	33.20828258	25	183	10	E'	
10.35	12	10.76	26	204	17	B'	
93.	13	33.85	27	223	19	D'	

Decimal to base n conversion.

```
1:"A"A$(27)="0
  ":A$(28)="1"
  :A$(29)="2":
  A$(30)="3":A
  $(43)="G"
2:A$(31)="4":A
  $(32)="5":A$
  (33)="6":A$(
  34)="7":A$(3
  5)="8":A$(36
  )="9":A$(44)
  ="H"
3:A$(37)="A":A
  $(38)="B":A$
  (39)="C":A$(
  40)="D":A$(4
  5)="I"
4:A$(41)="E":A
  $(42)="F":A$
  (12)=".":A$(
  13)=" ":A$(4
  6)="J"
5:"B"INPUT "BA
  SE=";U:U=INT
  U
6:IF U<=20THEN
  8
7:PAUSE "TOO B
  IG":GOTO 5
8:IF U>=2THEN
  10
9:PAUSE "TOO S
  MALL":GOTO 5
10:INPUT "DECIM
  AL=";Z:GOTO
  50
11:GOTO 5
50:IF Z<1THEN 9
  5
55:W=Z
60:FOR Y=2TO 11
70:IF W<UTHEN 1
  00
80:W=W/U:NEXT Y
90:PAUSE "TOO B
  IG":GOTO 10
95:FOR Y=1TO 11
  :GOTO 150
100:FOR X=1TO Y-
  1
120:A(X)=INT W+2
  7
130:W=U*(W-INT W
  )
140:NEXT X
150:A(Y)=12:W=U*
  (Z-INT Z)
151:IF Y>9THEN 1
  65
152:FOR X=Y+1TO
  10
154:A(X)=INT W+2
  7
156:W=U*(W-INT W
  )
158:IF WTHEN 160
159:FOR V=X+1TO
  10:A(V)=13:
  NEXT V:X=10
160:NEXT X
165:Y=11:NEXT Y
170:PRINT A$(A);
  A$(B);A$(C);
  A$(D);A$(E);
  A$(F);A$(G);
  A$(H);A$(I);
  A$(J)
180:GOTO 10
200:"D"AREAD Z:
  GOTO 50
```

PROGRAM A: INITIALISES POINTERS — NEED ONLY BE DONE ON FIRST RUNNING. CAN ALSO BE ACCESSED BY 'RUN' COMMAND. THEN ENTERS PROGRAM B.

PROGRAM B: SETS BASE 'N' INPUT VALUE IS TRUNCATED, THEN CHECKED FOR BEING BETWEEN 2 AND 20. IF O.K. ENTERS PROGRAM D, OTHERWISE RE-ENTERS PROGRAM B.

PROGRAM D: INPUT DECIMAL VALUE IS CONVERTED TO N BASE AND DISPLAYED AS A 10 DIGIT OR 9 + POINT) FIXED POINT NUMBER WITH LEADING AND TRAILING ZEROS SUPPRESSED ENTERING WITHOUT A VALUE WILL RE-ENTER PROGRAM B.

NOTES: (1) DIGITS 10 THROUGH 19 ARE REPRESENTED BY LETTERS A THROUGH Z
□ = SHIFT ▭ = ENTER
(2) RE-ENTERING B

	Input	Display	Note		Input	Display	Note
1	□ A	BASE =		5	▭	BASE =	2
2	16 ▭	DECIMAL =		6	8 ▭	DECIMAL =	
3	12.5 ▭	C.8	1	7	10.5	12.4	
4	▭	DECIMAL =		8			■

Push your Sinclair to the limit

A GREAT CHESS GAME FOR YOUR ZX81 OR SPECTRUM

ZX CHESS II
A new improved version, with a faster response time, seven levels of play, analysis option and in addition a recommended move option. **£9.95**

SPECTRUM CHESS **£13.95**

ZX CHESS I
Very popular machine code program, with six levels of play and an analysis option. Available for ZX81. **£6.50**

PLUS! ZX 1K CHESS
An incredible game in 1K for only **£2.95**

*SPECTRUM CHESS 48K

ZX81 ARCADE GAMES

NEW

GOBBLEMAN — Escape from munching ghosts to eat power dots and then gobble up the ghosts. Similar to classic arcade game. **£3.95**

NAMTIR RAIDERS — High-speed, quick action arcade game with four separate groups of attackers. **£3.95**

GALAXIANS — Swooping attackers, explosions and personalised scoring. **£3.95**

NEW

UTILITIES:

TOOLKIT — Nine powerful new functions for your ZX81 (including: re-number lines (goto, gosub), program merge, string finding and replacement. **£5.95**

SPEC BUG — A 30 in 1 machine code tool and disassembler for your ZX Spectrum. **£6.95**

ASSEMBLER — Full editor assembler and monitor giving an extremely powerful tool for writing and running machine code programs on your ZX81 and Spectrum. Includes user manual. **£9.95**

ZX BUG — A 30 in 1 machine code tool and disassembler for your ZX81. **£6.95**

LOW COST ADDITIONAL RAM PACKS

16K Ram Packs	£29.50
32K Ram Packs	£38.95
64K Ram Packs	£64.95

ADVENTURE GAMES

JUST RELEASED

ESPIONAGE ISLAND
(Adventure D)

While on a reconnaisance mission your plane loses control and you are forced to land. Can you survive and escape with the island's hidden secret? **£8.00**

PLANET OF DEATH (Adventure A)
You find yourself stranded on an inhabited alien planet. Can you reach your ship and escape? **£5.00**

INCA CURSE (Adventure B)
In a jungle clearing you come across an ancient Inca temple. Your mission to enter, collect the treasure and escape alive. But beware! Includes a cassette save routine. **£6.00**

SHIP OF DOOM (Adventure C)
You are unavoidably drawn to an alien cruiser. Can you reach the control room and free yourself? Or will they get you first? Includes a cassette save routine. **£7.00**

ZX FORTH
Supplied on cassette with editor cassette, user manuals and keyboard overlay. ZX Forth combines the simplicity of basic with the speed of machine code all for only **£35.00.**

ARTIC COMPUTING

ALWAYS AHEAD WITH ZX81/SPECTRUM SOFTWARE
Cheques & P.O. made payable to: Artic Computing Limited.
Please state whether your order is for ZX81 or Spectrum.
(Dept. YC)

396 JAMES RECKITT AVENUE,
HULL, N. HUMBERSIDE, HU8 0JA

We welcome Access · VISA

sinclair SPECIALISTS

Lion Micro Computers

London's widest range of Computer Books & Computer Magazines

EXTENSIVE RANGE OF SOFTWARE ACCESSORIES AND PERIPHERALS

For experts and beginners alike

Lion House, 227 Tottenham Court Road, London W1P 0HX
Telephone: 01-580 7383 & 01-637 1601 Telex: 28394 Lion G.
Open 9 to 6 Mon-Sat
SEND LARGE SAE FOR OUR LISTS

YOU NEED CHRISCLUB

WHAT YOU GET:

***DISCOUNTS** — THE BENEFIT OF MASS BUYING POWER
***MONTHLY NEWSLETTER** WITH FEATURES ON ALL NEW MICRO-DEVELOPMENTS
***CHRISCLUB "BUG-LINE"** FOR TECHNICAL QUERIES AND PROGRAMMING PROBLEMS

Join Now — send coupon and £4.00 To:

CHRISCLUB
13 HIGHT ST,
BERKHAMSTED
HERTS

TEL:
04427
74569

VISA

YES! I want to inject new life into my micro-computing . . . Please enrol me into CHRISCLUB. (I enclose cheque/PO for £4.00 or debit my BARCLAYCARD/ACCESS account number).

Name:

Address:

Machine type:

Date: 19

BBC SOFTWARE

FROM **ABC**

LINK 4 PLUS

A FAST, CHALLENGING, ADVANCED FOUR-IN-LINE GAME FOR THE BBC MICRO (MODEL A or B) WITH

BBC SOFTWARE

4 WAYS TO PLAY

- ★ ONE PLAYER v COMPUTER ★
- ★ TWO PLAYER GAMES ★
- ★ ONE PLAYER SPEED GAMES OR ... ★
- ★ SEE THE COMPUTER PLAY ITSELF ! ★

4 SKILL LEVELS

4 FEATURES

- ★ PLAYER/COMPUTER THINKING TIMES ★
- ★ SOUND EFFECTS OPTION ★
- ★ FLASHING WIN LINES ★
- ★ VIDEO/INVERSE VIDEO OPTION ★

4 YOUR COPY SEND ONLY £6.95 TO
ABC SOFTWARE,
FREEPOST
CHORLEY, LANCS
PR7 1BR (no stamp required)

ABC SOFTWARE FOR INTELLIGENT GAMES

Now! For the SPECTRUM 48K!

FOOTBALL MANAGER

Addictive Games

for
ZX81
SPECTRUM
TRS80
VIDEO GENIE

★ AS MANY SEASONS AS YOU LIKE ★ 4 DIVISIONS ★
★ PROMOTION & RELEGATION ★
★ FULL LEAGUE TABLES ★
★ TRANSFER MARKET ★
★ INJURIES ★
★ 7 LEVELS OF PLAY ★
★ SAVE GAME FACILITY ★
★ MANAGERIAL RATING ★
★ PICK YOUR TEAM FOR EACH MATCH ★ F.A. CUP ★

JUST LOOK AT THESE FEATURES

This is NOT a mere simulation. This is an exciting and highly enjoyable game in which you play the part of a Football Manager coping with the problems and decisions involved in running your club. There are so many features it is impossible to list them here but included are form (top teams NORMALLY win), giant-killings, wage bills to pay, and you can even be sacked! It is a game requiring a great deal of skill, and people play it for literally hours on end (we have PROOF!).
WE GUARANTEE that this is one of the best computer games you've ever played!
BUT BEWARE, this game is extremely addictive!

HARDWARE REQUIRED	
Spectrum 48K RAM	TRS80/ Video Genie LEVEL II 16K RAM
ZX 81 16K RAM	

To Order send Cheque/P.O. £7.95 made payable to: ADDICTIVE GAMES at: Dept. Y.C. P.O. BOX 278
CONNIBURROW
MILTON KEYNES MK14 7NE
PLEASE STATE COMPUTER

SIR Computers Ltd.
Cardiff

BBC MICRO COMPUTERS available direct from stock

BBC Micro Computer Model A	£315.00
BBC Micro Computer Model B	£395.00
Conversion of your Model A to B	£80.00

ATOM PRICES SMASHED!

8K ROM + 2K RAM	£149.50
8K ROM + 12K RAM	£175.00
12K ROM + 12K RAM	£199.00
ATOM DISC DRIVE	£3.45

Large range of Atom and BBC software in stock

DRAGON 32 NOW IN STOCK

ZX SPECTRUM HARDWARE

8 bit input/output port with LED display	£18.95
4 channel analogue port (for joysticks)	£19.95
Joysticks (analogue board also needed)	£19.95
"Centronics" printer interface	P.O.A.

All Add-Ons are ZX81 compatible

All prices are inclusive of V.A.T.
Please add £7.50 for Securicor delivery of BBC Computers. Dragons + Atom Disc Drive, £2.50 for delivery of Atom £1.00 for all other items.

SIR Computers Ltd.
38 DANYCOED ROAD, CYNCOED, CARDIFF CF2 6NB, WALES
Tel: 0222 — 759015

OAKLEAF COMPUTERS LTD

Education Hobbyist & Small Business Computers

BBC Model B Computer
£399.00 + £7.50 carr.

Dragon 32
£199.00 + £7.50 carr.

Acorn Atom & BBC Twin User Joystick Interfaces £13.95
(Please state Model)

Oaktree Computer Workstation
£17.50 + £7.50 carr.

BBC & DRAGON SOFTWARE

ALL IN STOCK

S.A.E. FOR BOOKLIST

Please send your remitance to:
121 DUDLEY ROAD, GRANTHAM, LINCS NG31 9AD
Tel: (0476) 76994

ACORN SPECIALISTS

All prices include VAT

SOFTWARE FILE

Software File gives you the opportunity to have your programs, ideas or discoveries published. We will accept contributions for any personal computer and will group programs for like machines together in the file. Please double-check your listings before sending them, and specify the memory they require. Mark your letter clearly for *Your Computer*. We will pay £6 for each contribution published.

Small enterprise

Philip Pulsford,
Bristol,
Avon.

ZX-81

I HAVE WRITTEN a mini-version of Star Trek for the ZX-81 which fits in 1K of memory. It has been written using memory-saving techniques.

When the program is run there is a short delay, then the computer shows you which sector you are in and asks for a command.

Command 1 moves you around the galaxy. You will be asked what sector you wish to go to. You can move up, down, right or left.

Command 2 displays a status report from the ship's computer: how much energy you have, how many missiles you have, the number of remaining Klingons and a clue to which sector a particular one is in. For example, Klingons 14:5 means there are 14 Klingons left and one of them is in sector five. Klingons 2:0 means there are two Klingons left but it refuses to tell you where they are. There are three Klingons in the galaxy at one time but the computer will only tell you where one is. When a Klingon is shot another will take its place until all 14 Klingons are dead.

Command 3 fires a torpedo at a Klingon only if it is in the same sector as you, and only if you have some missiles left.

Command 19 will retire you from the game, when no Klingons are left. Your rating will then appear from −7 to +7. You will be automatically retired from the game if a Klingon missile hits you or if you run out of energy.

When you are in the same sector as a Klingon the message "Klingon missile" appears on the screen. The chance of being hit is one in 10.

When you run out of missiles the only way to get some more is to dock with the Starbase by moving into the sector it is in. When this happens the message "Docked" appears. My highest rating is five.

In order to save memory pi was used to great effect. For example:

SGIV = 1, SIN PI = 0

The codes of numbers were also used, for example, Code "▀" = 6. The whole list is in Appendix A in the ZX-81 manual. In some cases where the codes of numbers did not exist Val was used, for example:

VAL "4" = 4, VAL "3E3" = 3000

```
   2 LET P=SGN PI
   5 DIM A(CODE "▗")
   6 FOR T=P TO 50R EXP PI
  10 LET A(T)=INT (RND*EXP PI)+P
  20 NEXT T
  21 LET E=VAL "3E3"
  22 LET K=CODE ":"
  24 IF E<SGN PI THEN GOTO PEEK
PI
  30 IF P=A(SGN PI) OR P=A(CODE
"▄") OR P=A(PI) THEN GOSUB PEEK
SIN PI
  34 IF P=A(CODE "▗") THEN GOSUB
 PEEK PEEK PI
  35 PRINT "SECTOR=";P,,"COMMAND
?"
  40 INPUT C
  45 LET E=E-CODE "W"/C
  50 CLS
  60 GOTO C*PI*PI+CODE "W"
  70 PRINT "TO WHERE?"
  71 INPUT M
  72 LET C=ABS (M-P)*(M OR M)
  74 IF C=SGN PI OR C=CODE "▒" T
HEN LET P=M
  75 GOTO EXP PI
  80 PRINT "ENERGY=";E,"KLINGONS
=";K;":";A(PI),"MISSILES=";T
  85 GOTO EXP PI
  90 LET A(SGN C+(A(CODE "▄")=P)
+(A(C)=P)*CODE "▄"-(A(CODE "▄")=
A(C)))=INT (RND*EXP PI+SGN C)*(K
>PI OR A(CODE "▄")=P)
 100 PRINT "BOOM"
 105 GOTO EXP PI
 155 PRINT "DOCKED"
 160 LET E=E-CODE "PI"
 165 IF T<PI THEN LET T=T+INT PI
 170 RETURN
 220 PRINT "KLINGON MISSILE"
 225 IF K THEN LET K=K-(T>SGN PI
)
 230 LET T=T-(T>SIN PI)
 235 IF RND>VAL ".1" THEN RETURN
 255 PRINT "RATING=";CODE "▀"-K
```

Hidden depths

M and S Downes,
Glinton,
Peterborough.

BBC

THIS PROGRAM shows an object from any angle, which can then be rotated. In the program a pyramid is used in order to show its use, but any three-dimensional shape can be used. Instructions for this are given in the program. If the shape is plotted near the edge of the screen then the shape may become distorted.

The keys U, D, L, R are used to turn the shape to the required view. These angles are given at the top of the screen and allow standard views to be used. The images may be superimposed and the screen cleared by pressing "c". Line 30 gives red on a yellow background; line 70 gives blue on a white background; lines 120 to 240 contain the input routine for a new shape; lines 320 to 450 work out the screen co-ordinates; lines 560 and 580 contain the X, Y, Z co-ordinates of the pyramid; and line 690 contains the points to which the lines go.

```
>L.>L.
   10 REM 3-D BY M.DOWNES+S.DOWNES
   20  MODE 4
   30  VDU 19,0,3,0,0,0,19,1,1,0,0,0
   40 PRINT''
   50 PRINT "DO YOU WANT INSTRUCTIONS (Y/N)":IN$=GET$:IF IN$="Y" THEN 790 ELSE G
OTO60
   60 CLS
   70   VDU 19,0,7,0,0,0,19,1,4,0,0,0
   80 PRINT''
   90 PRINT"DO YOU WANT AN EXAMPLE OR MAKE YOUR OWN                (E/O)":IN$=GET$
:IF IN$="E"THEN 560 ELSE GOTO110
  100 GOTO560
  110 CLS
  120  INPUT "NO. OF POINTS",N
  130 INPUT "MAX. NO. OF LINES",M
  140 DIMP(N+1,3+N)
  150  DIM S(N+1,3)
  160 FOR K=1 TO N
  170 PRINT "X";K:INPUT "",P(K,1)
  180 PRINT "Y";K:INPUT"",P(K,2)
  190 PRINT "Z";K:INPUT"",P(K,3)
  200 INPUT "HOW MANY LINES LEAVING THIS POINT",Q
  210 FOR L=1 TO Q
  220 PRINT L;" THIS LINE GOES TO WHICH POINT":INPUT"P(K,3+L)
  230 NEXTL
  240 NEXT K
  250 CLS
  260  INPUT"ANGLE OF VIEW A",A1
  270  INPUT"ANGLE OF VIEW B",B1
  280  PRINT"OBJECT CAN BE MOVED BY USING KEYS:":PRINT' TAB(10)"U-p":PRINTTAB(10
)"D-own":PRINT TAB(10) "L-eft":PRINT TAB(10) "R-ight"''"MOVEMENT SUPERIMPOSED (Y
/N)":SUP$=GET$:IF SUP$="Y" THEN SUP =1 ELSE SUP =0
  290   IF SUP=1 THEN PRINT'"PRESS -C- TO CLS DURING PROGRAM"
  300  IF GET$<>""THEN CLS
  310  IF SUP=0 THEN CLS
  320 A=A1*PI/180:B=B1*PI/180
  330 SA=SINA
  340 CA=COS A
  350 CB=COS B
  360 SB=SIN B
  370 FOR K=1 TO N
  380 S(K,2)=(P(K,2)*CA+P(K,1)*SA)*CB+P(K,3)*SB
  390 S(K,1)=P(K,1)*CA-P(K,2)*SA
  400 NEXT K
  410 FOR K=1 TO N
  420  FOR LE=1 TO M
  430 Z=P(K,3+LE)
  440 X0=S(K,1):Y0=S(K,2):Y1=S(Z,2)
  450 X1=S(Z,1)
  460  MOVE ABS(X0),ABS(Y0):IF X1+Y1<>0 THEN DRAW ABS(X1),ABS(Y1)
  470  IF INKEY$(0)="C" THEN CLS
  480  NEXT LE
  490 NEXT K
  500  PRINT TAB(0,0)A1,B1
  510  A$=GET$:IF A$="L" THEN A1=A1+1
  520  IF A$="R" THEN A1=A1-1
  530   B$=GET$:IF A$="D" THEN B1=B1+1
  540  IF B$="U" THEN B1=B1-1
  550 GOTO310
  560  DATA 500,700,700,500,600
  570  DATA 0,0,200,200,100
  580  DATA 0,0,0,0,200
  590 DIM P(6,5)
  600 FOR A=1 TO 5
  610  READ P(A,1)
  620 NEXTA
  630 FOR A= 1 TO 5
  640  READ P(A,2)
```

(continued on next page)

(continued from previous page)

```
650  NEXT A
660  FOR A=1 TO 5
670  READ P(A,3)
680  NEXTA
690  DATA 2,5,3,5,4,5,1,5,0,0
700  FOR A=1 TO 5
710  FOR B=1 TO 2
720  READ P(A,3+B)
730 NEXTB
740 NEXTA
750  N=5:M=2
760  DIM S(N+1,3)
770 CLS
780 GOTO260
790  CLS :PRINT"FOR AN INPUTED OBJECT COUNT THE NO. OF  VERTICES"'"A SQUARE BA
SED PYRAMID HAS 5 VERTICES"'''TO FORM THE OBJECT, LINES ARE NEEDED.   THE MAX NO
 OF LINES COMING FROM 1 POINT IS COUNTED"'
800 PRINT"A SQUARE BASED PYRAMID HAS A MAX. NO. OF2(THOUGH 3 LINES COME OUT 1
IS COVERED  BY ANOTHER VERTIX)"
810 PRINT
820  PRINT"IF THE OBJECT IS IMAGINED IN A 3-D GRID THEN THE CO-ORDINATES CAN B
E ENTERED    USING X,Y,Z"
830 PRINT
840  PRINT"X WORKS BEST BETWEEN 500-700"
850  PRINT"FOR BASE Y=0"
860  PRINT"FOR FOREGROUND Z=0"
870  IF GET$<>"" THEN GOTO60
>VDU3
```

Scroll colour

Bill Longley,
Colchester,
Essex.

SPECTRUM

MOST ZX-81 USERS will have a selection of machine-code routines for inverting the display and scrolling in different directions. Unhappily for those who upgrade to a Spectrum, these are not compatible with the high-resolution display file. But many of the principles remain the same and here are three typical subroutines for the Spectrum.

The first two are the up-and-down scrolling routines, but here they scroll colour while the text remains still.

The third is an ordinary screen invert routine. It will exchange the ink dots for paper dots, and vice versa. This probably only makes sense to Spectrum users.

Three separate Rems are used to store the routines, so one routine can be used on its own. If you make sure each Rem has 32 characters — remember a colour control code is two — then each routine starts at an address which is 38 greater than the last: so the first starts at 23760, the next at 23798, the third at 23836 and so on.

One last point: it makes good sense to save each routine on tape — with different line numbers — and Merge them into your program as you need them.

```
   1 REM zzzzzzzzzzzzzzzzzzzzzzz
zzzzzzzzz
   2 REM zzzzzzzzzzzzzzzzzzzzzzz
zzzzzzzzz
   3 REM zzzzzzzzzzzzzzzzzzzzzzz
zzzzzzzzz
  10 FOR g=23760 TO 23785: READ
a: POKE g,a: NEXT g
  20 FOR g=23798 TO 23823: READ
a: POKE g,a: NEXT g
  30 FOR g=23836 TO 23855: READ
a: POKE g,a: NEXT g
 497 REM
 498 REM   COLOUR SCROLL UP
 499 REM
 500 DATA 13,17,0,88,33,32,88
 501 DATA 1,160,2,237,176
 502 DATA 1,160,90,58,141,92
 503 DATA 30,32,2,3,29,200,24,25
0
 997 REM
 998 REM   COLOUR SCROLL DOWN
 999 REM
1000 DATA 13,33,223,90,17,255,90
1001 DATA 1,255,2,237,184
1002 DATA 1,0,88,58,141,92,30,32
1003 DATA 2,3,29,200,24,250
1497 REM
1498 REM     INVERTER
1499 REM
1500 DATA 33,0,64,1,0,24,126,47
1501 DATA 119,35,11,62,0,184
1502 DATA 32,246,185,32,243,201
7
USR 23761 CALLS SCROLL COLOUR UP
USR 23799 CALLS SCROLL COLOUR
DOWN.
USR 23836 CALLS THE INVERTING
ROUTINE.
```

Sketchpad

J Laidlaw,
Aberdeen.

MZ-80K

SKETCHPAD is a program that writes programs. It enables the user to draw a map, diagram, or picture on the screen using the Set and Reset functions. Sketchpad then writes a very simple program to recreate the drawing, which can then be incorporated into a larger program.

This program was written for a Sharp MZ-80K, but should be easy to convert to the MZ-80A, and other similar micros. Sketch-Pad itself occupies only 1.6K, but requires about 23K of free memory in which to store an array and the new program. Instructions and comments are contained within the program, but here is a list of the more important variables:

I is the increment between line numbers: H is the first line number minus I; J is the number of program lines on the screen; L is the number of groups of data per program line; Q is the total number of data items: X and Y are the co-ordinates of the cursor. The program also contains three Pokes. The first removes the Peek protect, whilst the other two allow a computed Goto statement.

```
 10 REM  *** SKETCH PAD in 1.6K ***
 20 REM Set up array & variables
 30 DIMZ(49,79):H=4990:I=10:L=11:J=0:G=16:X=39:Y=24:F$=","
 40 REM Pokes to remove peek protect & allow computed GOTO
 50 POKE10167,1:POKE7388,140:POKE7389,25
 60 REM Instructions
 70 PRINT"■";TAB(G-2);"SKETCH PAD"
 80 PRINT"■YOUR CONTROLS:-"
 90 PRINTTAB(G);"Q W E":PRINTTAB(G);" \|/ ":PRINTTAB(G);"A-S-D"
100 PRINTTAB(G);" /|\ ":PRINTTAB(G);"Z X C"
110 PRINT"■Pressing 'S' will let the moving cursor draw a line."
120 PRINT"■Pressing 'CR' will let the cursor move  without drawin
g a line."
130 PRINT"■Press the bottom-right graphic key to   end."
140 PRINT"          Press CR to continue"
150 GETA$:IFA$=""GOTO150
160 PRINT"■":SETX,Y
170 REM Control the 'cursor'
180 GETA:K=PEEK(17828)
190 REM K=the ASCII code of the key currently depressed
200 IFK=102THENP=2
210 IFK=83THENP=1
220 IFP=1THENSETX,Y:Z(Y,X)=1
230 IFP=2THENRESETX,Y:Z(Y,X)=0
240 IFK=124GOSUB390
250 IFK=81THENX=X-1:Y=Y-1.
260 IFK=87THENY=Y-1
```

```
270 IFK=69THENX=X+1:Y=Y-1
280 IFK=65THENX=X-1
290 IFK=68THENX=X+1
300 IFK=90THENX=X-1:Y=Y+1
310 IFK=88THENY=Y+1
320 IFK=67THENX=X+1:Y=Y+1
330 IFX>79THENX=79
340 IFY>49THENY=49
350 IFX<0THENX=0
360 IFY<0THENY=0
370 SETX,Y:Z(Y,X)=1:GOTO180
380 REM Sort out elements of array that are SET (contain 1)
390 PRINT"■■■■":FORA=0TO49:FORB=0TO79
400 IFZ(A,B)=1GOSUB430:Q=Q+1
410 NEXTB,A:PRINT"■  ";:GOSUB520:GOSUB480:GOTOH+1
420 REM     *** Subroutines ***
430 REM Sort array into data lines
440 IFL>10THENL=0:H=H+I:J=J+1:IFJ>7GOSUB480
450 IFL=0THENPRINT"■ ":PRINTH;" DATA ";
460 A$=STR$(A):B$=STR$(B):PRINTB$+F$+A$+F$;:L=L+1:RETURN
470 REM End one page of DATA & resume
480 PRINT"■ ":PRINT"GOTO500":PRINT"Enter the above lines by using
'CR'.■":END
490 REM Restart line for GOTO command
500 PRINT"■■■■":J=1:RETURN
510 REM Print line that READS & SETS the DATA
520 PRINT"■ ":PRINTH+1;" FOR A=1 TO";Q;":READ B,C:SET B,C:NEXT A■
":RETURN
```

Standard deviations

L Cooper,
Bulwell,
Nottingham.

ZX-81

THIS PROGRAM is for normally-distributed samples where X is the size of each category and F(X) is the number of times this value occurs in the sample.

The mean, standard deviation and variance are calculated. These values are of particular use in comparing different samples.

```
STANDARD DEVIATION
  1 REM L COOPER
 10 LET N=0
 11 LET SUM FX=0
 12 LET SUM F=0
 13 LET SUM D2=0
 14 LET D=0
100 PRINT "HOW MANY VALUES OF X
?"
110 INPUT NX
120 DIM X(NX)
130 DIM F(NX)
140 PRINT "FIRST X=?"
150 INPUT FX
160 PRINT "LAST X=?"
170 INPUT LX
180 PRINT "INTERVAL=?"
190 INPUT IN
200 FOR Z=FX TO LX STEP IN
210 PRINT "FOR X=";Z;"  INPUT F
(X)"
215 INPUT F
220 LET X(Z)=Z
230 LET F(Z)=F
240 PRINT "X=";X(Z),"F(X)=";F(Z
);"          CORRECT ?   (Y,N)"
250 INPUT A$
260 IF A$="N" THEN GOTO 210
270 CLS
280 NEXT Z
300 PRINT "ALL VALUES OF X AND
F(X) ENTERED"
400 FOR Z=FX TO LX STEP IN
410 LET N=N+F(Z)
420 LET SUM FX=SUM FX+X(Z)*F(Z)
430 LET SUM F=SUM F+F(Z)
440 NEXT Z
450 PRINT "MEAN OF X=";SUM FX/S
UM F
460 PRINT "SAMPLE SIZE=";NX
470 LET MEAN=SUM FX/SUM F
490 FOR Z=FX TO LX STEP IN
500 LET D=MEAN-X(Z)
505 IF D<0 THEN LET D=0-D
510 LET SUM D2=SUM D2+(D*F(Z))*
*2
520 LET N=N+F(Z)
530 NEXT Z
540 LET SD=SQR (SUM D2/N)
550 PRINT "STANDARD DEVIATION="
SD
560 PRINT "VARIANCE=";SD**2
570 PRINT ,,"ONE STANDARD DEVIA
TION=          ";MEAN-SD;" TO ",
MEAN+SD
580 PRINT ,,"TWO STANDARD DEVIA
TIONS=          ",MEAN-SD*2," TO
 ";MEAN+SD*2
590 PRINT ,,"THREE STANDARD DEV
IATIONS        ";MEAN-SD*3," TO
";MEAN+SD*3
600 PRINT " CONT ?"
610 IF INKEY$="" THEN GOTO 610
615 CLS
620 PRINT "X=","F(X)="
630 FOR Z=FX TO LX STEP IN
640 PRINT X(Z),F(Z)
650 NEXT Z
```

Little black book

P Hintjens,
Edinburgh.

VIC-20

THIS PROGRAM allows you to store names and telephone numbers on a tape file. Entries can be retrieved and amended. Instructions are given in the listing.

```
100 REM "PHONE PAD (C) P.HINTJENS 7/7/82
110 POKE650,255:IFFRE(I)<1000THENMAX=25:GOTO150
120 IFFRE(I)<4100THENMAX=110:GOTO150
130 IFFRE(I)<10000THENMAX=250
140 IFFRE(I)>15000THENMAX=490
150 Y$="■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■"
160 N$="                                    "
170 DIMT$(MAX,2):TN=0
180 GOTO440
190 PRINT"□■PAGE "P$
200 PRINTLEFT$(Y$,20)"■──────────────────────■■"
210 PN=0:IFTN=0GOTO260
220 FORI=1TOTN:IFLEFT$(T$(I,1),1)=P$GOTO240
230 NEXT:GOTO260
240 FORJ=1TOTN:IFLEFT$(T$(J,1),1)<>P$THEN260
250 PRINTT$(J,1)TAB(11)T$(J,2):PN=PN+1:NEXT
260 PRINT"■■■■■■■■"PN"OF"TN"NAMES":RETURN
270 P=P+1:IFP=27THENP=1
280 P$=CHR$(P+64):GOTO550
290 P=P-1:IFP=0THENP=26
300 P$=CHR$(P+64):GOTO550
310 PRINT"□■"TAB(8)"HELP"
320 PRINT"■■ COMMANDS AVAILABLE IN DISPLAY/EDIT MODE"          "
330 PRINT"■ (FUNCTION KEYS)"
340 PRINT"■ ■+ ■-SEE ■NEXT■ PAGE":PRINT" ■- ■-SEE ■PREVIOUS■ PAGE"
350 PRINT"■ ■F1■-■ADD NEW■ ENTRY":PRINT" ■F3■-■ALTER■ ENTRY":PRINT" ■F5■-■DELETE
■ ENTRY"
360 PRINT" ■F7■-RETURN TO ■MENU■"
370 PRINT"■■■PRESS 'F7' TO CONTINUE■";
380 GETA$:IFA$<>"■"GOTO380
390 RETURN
400 INPUT">NAME";A$:A$=LEFT$(A$,10):P$=LEFT$(A$,1):IFJ=1THENRETURN
410 PRINTLEFT$(Y$,22)N$LEFT$(Y$,21):INPUT">NUMBER";B$:B$=LEFT$(B$,10):RETURN
420 FORI=1TOTN:IFA$=T$(I,1)THENRETURN
430 NEXT:PRINTLEFT$(Y$,22)A$" NOT FOUND";:FORI=1TO2000:NEXT:GOTO550
440 PRINT"□■ ***  PHONE PAD  ***  ■";
450 PRINT"■ ■MENU■":PRINT"■ CHOOSE ONE OF:":PRINT"■■ 1-LOAD OLD NAME FILE"
460 PRINT"■ 2-SAVE NEW NAME FILE":PRINT"■ 3-ALTER/DISPLAY FILE"
470 PRINT"■■■■■■■■■■──────────────────────"
480 PRINT"□ FOR HELP,TYPE ■H■"
490 POKE198,0:PRINT"□□□□□□□□ ■CHOICE■ ? ■■I";:WAIT198,1:GETA$:PRINTA$;
500 IFA$="H"THENPRINT"ELP":FORJ=1TO600:NEXT:GOSUB310:GOTO440
510 PRINT:IFA$<"1"ORA$>"3"THENPRINT"■ DON'T BE SILLY!":FORJ=1TO600:NEXT:GOTO440
520 I=VAL(A$):PRINT"■ OKAY":FORJ=1TO600:NEXT
530 ONIGOTO770,880,540
540 P=1:P$="A"
550 GOSUB190:PRINTLEFT$(Y$,21)">■■I";
560 GETA$:IFA$=""GOTO560
570 IFA$="+"GOTO270
```

(continued on page 87)

ZX99

AUTOMATIC TAPE CONTROLLER FOR THE SINCLAIR ZX81

● DATA PROCESSING

The ZX99 gives you software control of up to four tape drives (two for reading, two for writing) allowing merging of data files. This is achieved by using the remote sockets of the tape drives, controlled by USR statements or commands.

● RS232C INTERFACE

The ZX99 has an RS232C output allowing connection with any such printer using the full ASCII character code (you can now print on plain paper in upper or lower case, and up to 132 characters per line) at a variable baud rate up to 9,600

● SPECIAL FEATURES

There are so many special features it is difficult to list them all, for example:

AUTOMATIC TAPE COPY: You can copy a data file regardless of your memory capacity as it is processed through the Sinclair block by block.
TAPE BLOCK SKIP: Without destroying the contents of RAM
DIAGNOSTIC INFORMATION: To assist in achieving the best recording settings.

The ZX99 contains a 2K ROM which acts as an extension to the firmware in the Sinclair ROM. The ZX99's ROM contains the tape drive operating system and the conversion to ASCII for the RS232C output.

There is an extension board on the rear to plug in your RAM pack (larger than 16K if required). The unit is supplied with one special tape drive lead, more are available at £1 each.

Now only

£49.95

plus
£2·95p+p

● ZX99 SOFTWARE

We now have available "Editor 99", a quality word processing program including mail-merge, supplied on cassette for £9.95. Also following soon:

- **Stock Control (October)**
- **Sales Ledger (November)**
- **Business Accounts**
- **Debtors Ledger**
- **Tax Accounting**

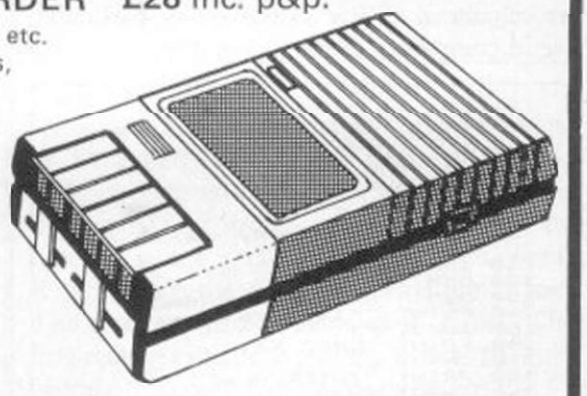
Dept. YC5 Data – Assette, 44 Shroton Street, London NW1 6UG. 01-258 0409

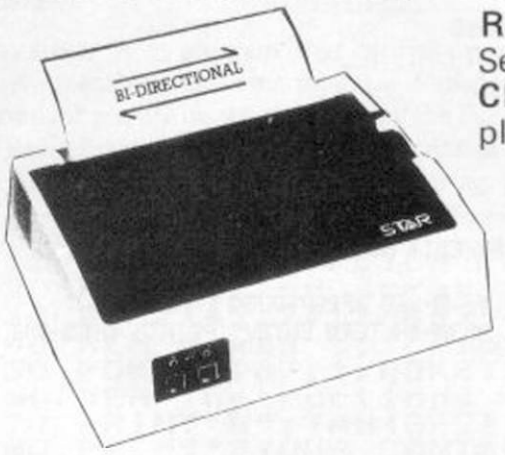
---

data-assette®
44, Shroton Street
London NW1
Tel 01-258 0409

● FERGUSON CASSETTE RECORDER £28 inc. p&p.

Tested with ZX81, Acorn, BBC, Dragon etc. etc.
Features: Din, Ear, Mic. and Remote sockets, Tape Counter, Tone Control, Built-in Mic., Autostop. Battery/mains. Recommended by Acorn for use with BBC computer.





● STAR DP8480

RS232C (SERIAL) **£285** plus £6 Securicor delivery
CENTRONICS (PARALLEL) **£265** plus £6 Securicor delivery

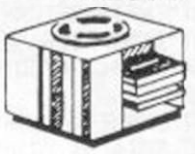
This professional printer works with almost any computer with very good upper and lower case typeface.

- Bi-directional
- 80 column width (10" paper)
- Switchable – Tractor or Friction Feed
- 80 chrs. per second

● 2,000 SHEETS OF PRINTER PAPER

£19.50 plus £3.50 p&p.

● E690 REVOLVING CASSETTE RACK



Single – **£2.99** (holds 32 tapes or 20 in cases)
Double – **£5.99** (holds 64 tapes or 40 in cases)
Treble – **£8.99** (holds 96 tapes or 60 in cases)
Quad – **£11.99** (holds 128 tapes or 80 in cases)

All plus £1 p&p.

● BBC CASSETTE LEAD

7 pin plug to two 3.5mm plugs and one 2.5mm plug.
Only **£2** inc. P & P.

Other leads available – please telephone.

COMPUTER CASSETTES

High quality, screw assembled cassettes supplied with library boxes. Any lengths available.

C5 – 35p	C10 – 37p	C12 – 38p
C15 – 39p	C20 – 41p	C25 – 43p
	C30 – 44p	

P&P 10% (min. charge £1.50)

ORDER FORM

Dept YC10 Data – Assette, 44 Shroton Street, London NW1 6UG. 01-258 0409

Code	Item	No.	Price	P & P	Total

Cheques/PO made payable to Storkrose Ltd.
Charge my Access/Visa No. .....

Signed _____ Name _____

Address _____

(continued from page 85)

```
580 IFA$="-"GOTO290
590 IFA$="■"GOTO440
600 IFA$="H"THENGOSUB310
610 IFA$="■"THENPRINT"■ALTER NAME■":GOTO720
620 IFA$="■"THENPRINT"■NEW NAME■":GOTO650
630 IFA$="■"THENPRINT"■DELETE NAME■":GOTO750
640 GOTO550
650 IFTN=MAXTHENPRINT"SORRY, LIST IS FULL":FORI=1TO2000:NEXT:GOTO550
660 J=0:GOSUB400
670 FORI=0TOTN:IFT$(I,1)>A$THEN690
680 NEXT
690 TN=TN+1:IFTN=ITHEN710
700 FORJ=TNTOI+1STEP-1:T$(J,1)=T$(J-1,1):T$(J,2)=T$(J-1,2):NEXT
710 T$(I,1)=A$:T$(I,2)=B$:GOTO550
720 J=1:GOSUB400
730 GOSUB420:PRINTLEFT$(Y$,21)">NEW NAME AND NUMBER:"
740 J=0:GOSUB400:T$(I,1)=A$:T$(I,2)=B$:GOTO550
750 J=1:GOSUB400
760 GOSUB420:TN=TN-1:FORJ=ITOTN:T$(J,1)=T$(J+1,1):T$(J,2)=T$(J+1,2):NEXT:GOTO550
770 PRINT"■■ ■■■  PHONE PAD  ■■■ ■";
780 PRINT"■ PLEASE POSITION THE   TAPE CONTAINING YOUR  OLD NAME LIST."
790 PRINT"■ PRESS 'F7' WHEN YOU   HAVE THE FILE READY."
800 GETA$:IFA$<>"■"GOTO800
810 OPEN1,1,0
820 PRINT"■ OKAY, READING"
830 INPUT#1,TN:PRINT"■"TN"ENTRIES IN FILE"
840 FORI=0TOTN:INPUT#1,A$:INPUT#1,B$
850 IFI<=MAXTHENT$(I,1)=A$:T$(I,2)=B$
860 NEXT:CLOSE1
870 GOTO440
880 PRINT"■■ ■■■  PHONE PAD  ■■■ ■";
890 PRINT"■ PLEASE POSITION THE   TAPE FILE FOR YOUR    NEW NAME LIST."
900 PRINT"■ PRESS 'F7' WHEN YOU   HAVE THE FILE READY."
910 GETA$:IFA$<>"■"GOTO910
920 OPEN2,1,1,"PHONE LIST"
930 PRINT"■ OKAY, WRITING"
940 PRINT#2,TN:PRINT"■"TN"ENTRIES IN FILE"
950 FORI=0TOTN:PRINT#2,T$(I,1):PRINT#2,T$(I,2):NEXT
960 CLOSE2
999 GOTO440
```

High-res graph

Julian Stradling,
Portsmouth,
Hampshire.

ZX-81

THIS IS A high-resolution graph-plotter and regressional analysis program for the ZX-81 with the ZX Printer. This program will accept any number of pairs of co-ordinates, plot them on an accurate graph, and plot a best-fit line through them, giving the gradient and the intercepts of that line on both axes.

Listing 1 shows the high-resolution plot routine contained in programs 6 and 7 of the ZX Printer manual, with line 2 reserving the necessary memory, and line 3 switching the computer to fast mode.

Listing 2 first asks for the number of pairs of co-ordinates, which should be numbered 1 to N, and then requests the scale of the graph. For maximum accuracy, the smallest and largest X and Y co-ordinates should be entered. If you want to highlight one particular area of the graph, then it is more accurate to enter the smallest and largest X and Y co-ordinates of the area you wish to display.

Lines 105 to 120 make sure that the axes are included on the graph but, here again, in some cases it would be more accurate to omit these lines, and to include the axes in the display.

Listing 3 asks for each pair of co-ordinates to be entered in turn and line 197 records them on the printer.

Lines 220 and 225 convert them into a number between 0 and 255 to be plotted on the printer. Note that the bottom line of the plot is not printed using the Sinclair high-resolution plot routine, and the Y-co-ordinate scale is adjusted accordingly in line 225.

Lines 230 to 240 record each point as a tiny cross, as a dot is particularly difficult to see.

Listing 4 prints the gradient of the best-fit line, and the intercepts on both axes. The machine will at this point go quiet for three minutes before it starts to plot the graph, and it takes about nine minutes before the graph is finished.

Listing 5 plots the best-fit line. It does this by drawing a straight line between the co-ordinates (U,V) and (W,Z) which are the extremities of the best-fit line on the display used.

Lines 270 to 308 calculate U,V,W and Z, and lines 325 to 365 draw the line.

Listing 6 plots the X- and Y-axes, if they appear on the display. The example I have included is taken from an experiment to measure the speed of sound using a resonance tube. The reciprocal of the frequency of various tuning forks is plotted on the X-axis against the length of tube producing resonance on the Y-axis. The speed of sound is calculated from the gradient of the best-fit line, and the end-correction of the tube is calculated from the intercept on the Y-axis.

Graph 1 shows the plot with both axes. The smallest Y co-ordinate was entered as -2 in order to show the best-fit line cutting the Y-axis.

Graph 2 shows the upper section of the plot in more detail, by deleting lines 105 to 120, and does not display the axes. Note that the numerical values for the gradient and intercepts do not depend on the accuracy of the display.

Each plotted point is given equal weighting when calculating the best-fit line. Hence any obviously wayward point, produced by a hiccup in the results, should not be included when plotting the graph.

LISTING 1

```
   1 REM U■RND.U■RND■■ .TAN ..
   2 POKE 16389,124
   3 FAST
   5 FOR I=0 TO 112
   6 POKE 31744+I,PEEK (2161+I)
   7 NEXT I
   8 POKE 31800,63
   9 POKE 31857,201
  10 POKE 16517,95
  11 POKE 16524,79
  12 DIM A$(32,256)
9981 IF X<0 OR X>255 OR Y<0 OR Y
>255 THEN RETURN
9982 LET C=1+INT (X/8)
9983 LET R=256-INT Y
9984 POKE 16526,CODE A$(C,R)
9985 POKE 16527,2**(8*C-INT X-1)
9986 LET A$(C,R)=CHR$ (USR 16514
)
9987 RETURN
9989 FOR I=0 TO 246 STEP 8
9990 FOR J=1 TO 32
9991 FOR K=1 TO 8
9992 POKE 32255+K+8*(J-1),CODE A
$(J,K+I)
9993 NEXT K
9994 NEXT J
9995 FOR H=0 TO 31
9996 POKE 16444+H,H
9997 NEXT H
9998 LET HPRINT=USR 31744
9999 NEXT I
```

LISTING 2

```
  20■PRINT "ENTER NO. OF PTS TO
BE PLOTTED"
  25 INPUT L
  30 PRINT L
  35 PRINT "ENTER LARGEST X-COOR
DINATE"
  40 INPUT BX
  45 PRINT BX
  50 PRINT "ENTER SMALLEST X-COO
RDINATE"
  55 INPUT SX
  60 PRINT SX
  65 PRINT "ENTER LARGEST Y-COOR
DINATE"
  70 INPUT BY
  75 PRINT BY
  80 PRINT "ENTER SMALLEST Y-COO
RDINATE"
  85 INPUT SY
  90 PRINT SY
  95 PRINT "■■■■■ ■■■■■■■■"
 100 INPUT O$
 105 IF BX<0 THEN LET BX=0
 110 IF SX>0 THEN LET SX=0
 115 IF BY<0 THEN LET BY=0
 120 IF SY>0 THEN LET SY=0
```

LISTING 3

```
 125■LET D=0
 130 LET E=0
 135 LET F=0
 140 LET G=0
 150 FOR J=1 TO L
 155 CLS
 160 PRINT "ENTER X-COORDINATE N
O. ";J
 165 INPUT S
 170 PRINT S
 175 PRINT "ENTER Y-COORDINATE N
O. ";J
 180 INPUT T
 185 PRINT T
 190 PRINT "■■■■■ ■■■■■■■■"
 195 INPUT O$
 197 LPRINT J;". (";S;",";T;")",
 200 LET D=D+S
 205 LET E=E+T
 210 LET F=F+S*T
 215 LET G=G+S*S
 220 LET X=INT ((S-SX)*249/(BX-S
X)+3)
 225 LET Y=INT ((T-SY)*242/(BY-S
Y)+11)
 230 GOSUB 9980
 232 LET X=X-1
 233 LET Y=Y-1
 234 GOSUB 9980
 235 LET Y=Y+2
 236 GOSUB 9980
 237 LET X=X+2
 238 GOSUB 9980
 239 LET Y=Y-2
 240 GOSUB 9980
 245 NEXT J
 247 LPRINT
 248 LPRINT
```

LISTING 4

```
 250■LET M=(F-D*E/L)/(G-D*D/L)
 255 LET A=(M*D-E)/M/L
 260 LET B=(E-M*D)/L
 261 LPRINT "GRADIENT = ";M
 262 LPRINT "WHEN X=0, Y=";B
 263 LPRINT "WHEN Y=0, X=";A
 264 LPRINT
 265 LPRINT
 266 LPRINT
```

LISTING 5

```
 270■IF (BY-B)/M>=SX AND (BY-B)/
M<=BX THEN GOTO 286
 272 IF M>0 THEN GOTO 280
 274 LET U=SX
 276 LET V=M*SX+B
 278 GOTO 290
 280 LET U=BX
 282 LET V=M*BX+B
 284 GOTO 290
 286 LET U=(BY-B)/M
 288 LET V=BY
 290 IF (SY-B)/M>=SX AND (SY-B)/
M<=BX THEN GOTO 306
 292 IF M>0 THEN GOTO 300
 294 LET W=BX
 296 LET Z=M*BX+B
 298 GOTO 310
 300 LET W=SX
 302 LET Z=M*SX+B
 304 GOTO 310
 306 LET W=(SY-B)/M
 308 LET Z=SY
 325 LET D=W-U
 330 LET E=Z-V
 335 LET F=ABS D
 340 IF ABS E>F THEN LET F=ABS E
 345 FOR G=0 TO F STEP (F/256)
 350 LET X=INT ((U+G*D/F-SX)*249
/(BX-SX)+3)
 355 LET Y=INT ((V+G*E/F-SY)*242
/(BY-SY)+11)
 360 GOSUB 9980
 365 NEXT G
```

LISTING 6

```
 450■FOR Y=0 TO 255
 455 LET X=INT (-SX*249/(BX-SX)+
3)
 460 GOSUB 9980
 465 NEXT Y
 470 FOR X=0 TO 255
 475 LET Y=INT (-SY*242/(BY-SY)+
11)
 480 GOSUB 9980
 485 NEXT X
 500 GOTO 9988
```

(continued on page 89)

DOWNSWAY

ELECTRONICS (UK) LTD.

MORE MEMORY FOR YOUR ZX81 OR SPECTRUM!

NEW!

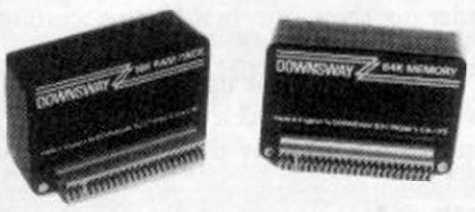
Stand 249

The 5th Personal Computer World Show

32K RAM FOR SPECTRUM

A full 48K of memory for the 16K Spectrum — simple D.I.Y. installation by just undoing 5 screws and plugging in! "State of the art" technology — advanced design using fewer ICs for high performance, reliability and economy.

ONLY £42.50 plus p & p.



MEMORIES FOR THE ZX81

The Downsway 64K Memory* slots directly on to the computer, without needing an additional power supply, or adding any extra load to the internal 5v regulator. Trade in your old 16K RAM Pack (any make, any age, any condition) for £12.50 against a Downsway 64K Memory to bring the price down to only **£47.45** plus p & p. Without trade-in, it costs just **£59.95** plus p & p — still incredible value!

If you only want 16K of memory for your ZX81, the Downsway 16K RAM Pack offers the same benefits of high quality and low price at only **£24.95** plus p & p.

Both memories measure only 2½ x 1½ x 1in. and are supplied with a foam cushion strip to provide added mechanical stability.

* Reviewed in ZX Computing Aug/Sept 1982 and Popular Computing Weekly 22/7/82.

Naturally Downsway add-on memories are fully tested and guaranteed, but should you be dissatisfied for any reason, just return the memory within 14 days for a full refund (and your old 16K RAM pack, where appropriate).

Please allow up to 28 days for delivery.

To: Downsway Electronics (UK) Ltd
Dept. M, Downsway House, Epsom Road,
Ashtead, Surrey.

Please send me:

Qty.	Item	Price	Total
	32K RAM for Spectrum	£42.50	
	64K Memory for ZX81 at trade-in price (my old 16K RAM Pack is enclosed)	£47.45	
	64K Memory for ZX81 at normal price without trade-in	£59.95	
	16K RAM Pack for ZX81	£24.95	
Post and Packing			£2.00
Total			£ .

My cheque/P.O./Money Order is enclosed

NAME: _____

ADDRESS: _____

_____ YC 10

NEW. SOFTWARE SUPERMARKET

YOUR ONE-STOP POSTAL SHOP FOR ALL THE BEST ZX81 PROGRAMS. FROM £4.50.

Now you can order the very best ZX81 programs with just one postage stamp. We've started SOFTWARE SUPERMARKET to make it easy for you to buy more programs. And, to help you choose, we've selected the games we've enjoyed most: games that give lasting pleasure, games that stretch the ZX81.

All games need a ZX81 with 16K Ram.

1. MAZOGS. (Bug Byte). £9.95. "Great," said Popular Computing Weekly "a grossly addictive game." We agree. It's a maze game with great graphics. You'll really feel you're running through the maze, sword in hand. 3 different variations on this one tape. Great value.

2. ZUCKMAN. (D.J.L.) £5.95. "Very user-friendly...a fast and interesting game." (Sinclair User). A very good version of the famous arcade game. If you're skillful, your name and score are displayed in the Zuckman Hall of Fame for your friends to admire.

3. 3D MONSTER MAZE. (J.K. Greye). £4.95. "The graphics are incredible...and the game is very good indeed." (ZX Computing.) Until you've seen the full-screen tyrannosaurus rex chase you through his 3-D maze, you won't believe it either.

4. 3D DEFENDER. (J.K. Greye). £4.95. "Amazing 3-D graphics effects are created as the enemy draws closer...another winner." (Sinclair User). Watch through your spacecraft windows as the alien craft attack in astonishing 3-D detail.

5. TRADER. (Pixel). £9.50. The most astonishing graphics as you travel round 6 planets. This is a 48K game but only needs 16K Ram. The print-out alone is 6½metres long! Starts with a 25-second Test load.

6. THE ZX ARCADE PACK. (Control technology). £4.95. A brilliant collection of fastmoving machine code arcade games. Two kinds of invaders, one traditional, the other swooping, soaring Galaxians. Plus 6 more games, including a great graphic gunfight.

7. VOLCANIC DUNGEON. (Carnell). £4.50. One of the great adventure games. Rescue the princess, if you can. It took us 3 months – and we never got bored... Fast, single-key entry: map included. PLUS a good graphic HANGMAN game: 400 word vocabulary (or enter your own words). Our children's favourite.

8. THE DAMSEL AND THE BEAST. (Bug Byte). £6.50. Another exciting adventure. Find the damsel, then kill the beast (club and torches provided), lead the damsel out before she starves. But wait until she screams... 3 game variations.

9. ZX OTHELLO. ™ (M.o.I) £6.95. "Recommended without reserve... it is a superb opponent." (Your Computer). The classic board game in its very best computer form. You'll see plenty of 'Reversi' listings, but this program makes it as challenging as chess.

10. ZX CHESS II. (Artic). £9.95. "The seemingly impossible has happened – you can play high resolution chess on a Sinclair." (C. and V.G.) The strongest ZX81 Chess Game around. All legal moves: 32 opening moves: 7 play levels – 4 within competition time limits. (Full Board Graphics available with Quicksilva CHR $ Board).

To order these games, please complete the coupon. ADDRESSES ABROAD, please add 20p per £ for extra p&p.
PROGRAMMERS! If you would like us to evaluate your software for possible future inclusion, please send cassette, price list.

POST TO: SOFTWARE SUPERMARKET, 87 Howard's Lane, London SW15 6NZ.
I have a 16K ZX81. Please send me the programs indicated below.
I enclose a cheque/PO for £ (total order value) made payable to Software Supermarket.

Name (Mr/Mrs/Miss) _____

Address _____

Postcode _____

U.K. ADDRESSES ONLY. FOREIGN ADDRESSES ADD 20p per £

PROGRAM	PRICE	NO. ORDERED	TOTAL PRICE
1. MAZOGS	£9.95		
2. ZUCKMAN	£5.95		
3. MONSTER MAZE	£4.95		
4. 3D DEFENDER	£4.95		
5. TRADER	£9.50		
6. THE ZX ARCADE PACK	£4.95		
7. VOLCANIC DUNGEON HANGMAN	£4.50		
8. THE DAMSEL AND THE BEAST	£6.50		
9. ZX OTHELLO	£6.95		
10 ZX CHESS II	£9.95		
	TOTAL ORDER VALUE		£

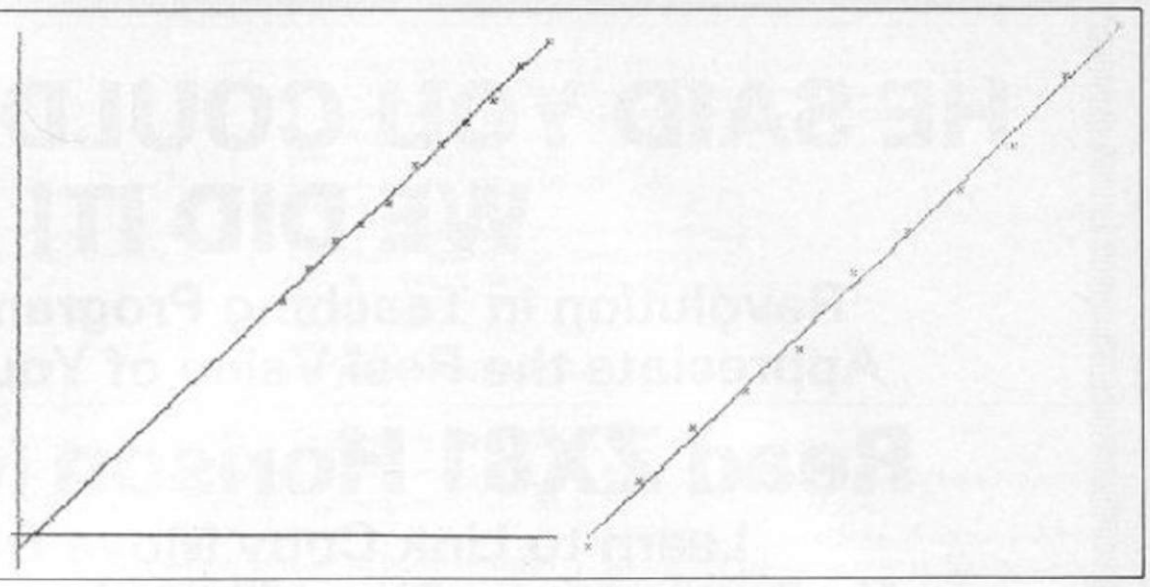
(continued from page 87)

```
1.  (2,15.6)        2.  (2.2,17.8)
3.  (2.4,19.6)      4.  (2.6,20.8)
5.  (2.8,22.2)      6.  (3,24.8)
7.  (3.2,26.2)      8.  (3.4,27.6)
9.  (3.6,29)        10.  (3.8,31.4)
11.  (4,33)

GRADIENT = 8.5090908
WHEN X=0, Y=-1.163636
WHEN Y=0, X=0.1367521
```


```
1.  (2,15.6)        2.  (2.2,17.8)
3.  (2.4,19.6)      4.  (2.6,20.8)
5.  (2.8,22.2)      6.  (3,24.8)
7.  (3.2,26.2)      8.  (3.4,27.6)
9.  (3.6,29)        10.  (3.8,31.4)
11.  (4,33)

GRADIENT = 8.5090908
WHEN X=0, Y=-1.163636
WHEN Y=0, X=0.1367521
```

Label finder

L Kneeling,
South Woodford,
London.

ATOM

YOU ARE NOT supposed to write programs directly on to the screen — you are supposed to do flow diagrams first — but for those who do not know how the program will turn out, here is a facility for the Atom.

This program will print out all those Atom labels with the relevant line number, no matter which text space they are in. All it does is look for the line terminator £0D, and check the memory three bytes ahead, which is where the label should be. It checks that the label and the line number are valid. If they are, then the program prints them out in a table.

The program starts reading memory from £0400, but if you have not expanded your Atom fully, change line 80 to LDA@£29. It finishes at £98 — but if you wish it to stop before it gets to the graphics RAM, then change line 240 to £80.

The two routines in the Atom operating system are C589, which takes a number from £16,£25,£34 and £43, converts it from hex to decimal and prints it in the field width stored in £321. F7FD prints one space.

I am sure that everybody has already found £FFF4 — it is in the manual. If you do not wish to write in the assembly program the hex dump can be entered in with the following routine:

```
10 FOR A=£2890 TO £28EF
20 P.A
30 IN.B
40 ?A=B
50 NEXT
60 END
```

This will put the program into the free space between the FP variables and £2900.

```
10  DIM LL(4)
20  FOR A=1 TO 2;DIM P(-1)
30  P.$21
40
50 :LLO
60  LDA@12
70  JSR£FFF4
80  LDA@£04
90  STA£91
100 LDA@£00
110 STA£90
120 LDY@£00
130 :LL1
140 LDA(£90),Y
150 CMP@£00
160 BEQ LL3
170 :LL4
180 INY
190 CPY@£00
200 BNE LL1
210 :LL2
220 INC£91
230 LDA£91
240 CMP@£98
250 BNE LL1
260 RTS
270 :LL3
280 INY
290 INY
300 INY
310 LDA(£90),Y
320 CMP@96
330 BMI LL1
340 CMP@122
350 BPL LL1
360 DEY
370 DEY
380 LDA(£90),Y
390 CMP@£80
400 BCS LL4
410 STA£25
420 INY
430 LDA(£90),Y
440 STA£16
450 TYA;PHA
460 LDA@£00
470 STA£34
480 STA£43
490 LDA@£05
500 STA£321
510 JSR£C589
520 JSR£F7FD
530 PLA;TAY
540 INY
550 LDA(£90),Y
560 JSR£FFF4
570 JSR£F7FD
580 JMP LL4
590
600 NEXT;P.$6;END
```

HEX DUMP

```
2890  A9  0C  20  F4  FF  A9  04  85
2898  91  A9  00  85  90  A0  00  B1
28A0  90  C9  0D  F0  0E  C8  C0  00
28A8  D0  F5  E6  91  A5  91  C9  98
28B0  D0  ED  60  C8  C8  C8  B1  90
28B8  C9  60  30  E3  C9  7A  10  DF
28C0  88  88  B1  90  C9  80  10  DD
28C8  85  25  C8  B1  90  85  16  98
28D0  48  A9  00  85  34  85  43  A9
28D8  05  8D  21  03  20  89  C5  20
28E0  FD  F7  68  A8  C8  B1  90  20
28E8  F4  FF  20  FD  F7  4C  A5  28
```

Sharp breakout

Brian Russell,
Upton St Leonards,
Gloucester.

MZ-80K

HAVING SEEN many games similar to "Breakout" for machines other than the MZ-80K, I decided to write one myself. The program — it is under 2K — will fit any size MZ-80K. The method used to change the ball direction is the same as in the program "Ball Bounced" in the Sharp manual; variables A and B being substituted for S and Z.

The graphics characters in line 40 are a top right-hand graphic, a bottom-right graphic and the rightmost graphic on the second row.

You have six balls. The number of balls left, and also the score, are shown after every ball.

```
10 POKE10167,1
20 SC=0:N=53248+40*(20)+20
30 PRINT"■"
40 FORX=0 TO7:PRINT"▗  ";:FORI=1TO33:PRINT"▀";:NEXTI:PRINT"  ▖":NEXTX
50 FORX=1TO15:PRINT"▐";TAB(38);"▌":NEXT
60 FOR X=1 TO 39:PRINT"▀";:NEXT:PRINT"■"
65 STOP
70 FOR X=6 TO 1 STEP -1
80 PRINT"■BALL";X;"   SCORE=";STR$(SC)
90 POKE N+1,0:POKE N,0:POKE N-1,0
100 A=54:C1=39:D=0:E=53248:E1=40:E2=41:E3=39:N=53248+40*(21)+20
110 V=53248+40*(10)+20:V1=71
120 Z=10:S=20:Z1=1:Z2=1:F=220:P=67
130 USR(62)
140 POKE N,A:POKE N+1,A:POKE N-1,A
150 GETA$:A$=CHR$(PEEK(17828))
160 IF A$="▖" THEN N=N-1:POKE N+2,D
170 IF A$="▗" THEN N=N+1:POKE N+2,D
180 USR(71)
190 IF N<54090 THEN N=N+1
200 IF N>54124 THEN N=N-1
```

(continued on page 91)

HE SAID YOU COULDN'T DO IT
WE DID IT!

Revolution in Teaching Program Technics
Appreciate the Real Value of Your Computer

Read ZX81 Horison (with tape)

Learn to Link Copy Move & Merge
No Programmer Should be without This Book

CONTENTS:
Detective,
Billards,
Machine Code Programmer,
Call Back ROutine,
Fill Text,
Animated Cylist,
Load & Save,
We can accept no responsibility for any illegal use of these programs.

From:

NAME_____

_____

ADDRESS_____

_____

To:

Uitgeverij Wolfkamp
Postbus 70254
(1007KG) Amsterdam.
Netherlands.
Tel: Amsterdam 020-278931

Payment must be included with order. Price £12.00 POUNDS
Credit cards are accepted.
Cheques payable to J. McNamara/ZX81

Scotch 3M

Top Quality Digital Computer Tapes & Diskettes

0, 10, 16 Sectors.

	In Packs of 10
5-25"	
No 744 Single Side/Single Density @ £2.30 ea	£23.50
No 744D Single Side/Double Density @ £2.80 ea	£28.00
No 745 Double Side/Double Density @ £3.40	£34.00
8"	
No 740 Single Side/Single Density @ £2.60 ea	£26.00
No 741 Single Side/Double Density @ £3.30	£33.00
No 743 Double Side/Double Density @ £3.80	£38.00

3M Personal Computing Cassettes
C-10 Digital Tapes, 5 min. each side

C10 — 5 min. each side @ £0.78 ea	£7.80 for 10
C30 Digital Tapes 15 min. eac side @ £0.88 ea	£8.80

Other sizes are available on request.
Add 15% VAT to the total cost.
Cheques or P.O.'s to be made payable to:

SHADALE LTD
23, 24 HIGH SKELGALE,
RIPON, NORTH YORKSHIRE
HG4 1BD. 0765-3452

MAJOR
FINANCIAL GAMES
for
SPECTRUM — BBC — ZX81

Remember those marvellous old board games you used to play? Hours of enjoyment are GUARANTEED with FINANCIAL GAMES

No. 1 INHERITANCE: A 2 Part game. Prove your financial acumen in PART 1 by investing wisely at the STOCK and METAL MARKETS; (If desperate you can try the CASINO or the HORSE RACES). If you are successful you will enter the world of BIG BUSINESS in PART 2. Find the SECRET FORMULA for PARADISE COLA; manufacture and market the drink; cope with STRIKES, FIRES, FRAUDS, CASH SHORTAGES, ETC. Your ultimate aim is to become a MILLIONAIRE!

A MAMMOTH GAME PACKED FULL OF FEATURES

No. 2 GREAT BRITAIN LIMITED: You are PM and Chancellor of "GREAT BRITAIN". You must select the Party you wish to represent and your AIM is to stay in office for as long as possible. You must control INFLATION and UNEMPLOYMENT, maintain the EXCHANGE RATE, introduce SOCIAL REFORMS and stay POPULAR. The game is split into SECTORS: COUNTRY PROFILE, SHOPPING BASKET, BUDGET DAY, REFORM OPPORTUNITIES, MANIFESTO, and most important ELECTION NIGHT (a telling time).

A COMPLEX GAME THAT YOU WILL NOT TIRE OF IN A HURRY

All Games are on quality cassettes with full instructions

SPECTRUM 48K — £5.95 ea. — BBC 32K — £5.95 ea. — ZX81 16K — £4.95 ea.

SPECIAL OFFER: Deduct **£1.50** from total cost if you buy 2 games.

SIMON W. HESSEL (Dept. YO)
15, Lytham Court, Cardwell Crescent,
Sunninghill, Berks. Tel: Ascot 25179

All orders despatched within 24 hours.
One year guarantee Money-back if not satisfied.

(continued from page 89)

```
210 G=E+E1$(Z)+S
220 IF Z<1 THEN Z1=-Z1
230 POKE G,V1:FOR I=1TO 10:NEXT I
240 IF PEEK(G-E1)=FTHEN Z1=-Z1:GOTO 350
250 IF PEEK(G-E2)=F THEN 360
260 IF PEEK(G-E3)=F THEN 370
270 IF PEEK(G+40)=P THEN 330
280 IF PEEK(G+E1)=A THEN POKE 4514,20:USR(68):Z1=-Z1
290 IF(S>36)+(S<2)THENPOKE 4514,100:USR(68):Z2=-Z2
300 POKE G,D
310 Z=Z+Z1:S=S+Z2
320 GOTO 140
330 POKE G,D:NEXT X
340 GOTO 380
350 POKE G+E1,0:POKEG,D:SC=SC+1:GOSUB480:GOTO310
360 POKE G+E2,0:POKE G,D:SC=SC+1:Z1=-Z1:GOSUB 480:GOTO 310
370 POKE G+E3,D:POKE G,D:SC=SC+1:Z1=-Z1:GOSUB 480:GOTO 310
380 PRINT"■"
390 PRINT"HIGH SCORE=";
400 IF SC>HS THEN HS=SC
410 PRINTHS
420 PRINT"■■YOUR SCORE=";STR$(SC)
430 PRINT"■■ANOTHER GAME ?(Y/N)"
440 GET R$:IF R$="" THEN 440
450 IF R$="Y" THEN  20
460 IF R$="N" THEN END
470 GOTO 440
480 POKE 4514,1:USR(68):RETURN
```

Pattern memory

John Billingham,
London N21.

BBC

IN THIS PROGRAM, written for the BBC Micro in Mode 5, a series of notes is randomly selected and played. You must try to remember the series, which gradually grows longer, and play it back by using the four cursor keys. Coloured squares also flash on the screen to aid memory. Here are the main variables:

NTE ():	list containing sequence of 30 random numbers
C:	number of notes to be remembered
CC:	note required

These notes should help you understand the program:

10:	dimensions NTE for 30 notes, removes flashing cursor, sets mode, sets character 240 to an inverse space
20:	makes the cursor keys return values
30:	sets colours
40 to 70:	draws blocks of colour and border
80:	randomly selects note sequence
120:	plays note sequence
130:	clears keyboard buffer
140 to 210:	Repeat-Until loop for input of notes
280:	resets cursor keys to editors
290:	resets colours and flashing cursor
300 to 500:	procedures.

```
5     REM Pattern Memory by J.Billingham
10    DIM NTE(30): MODE 5: VDU 23; 8202; 0; 0; 0; 23, 240, 255,
      255, 255, 255, 255, 255, 255, 255
20    *FX 4, 1
30    PROCRESET
40    FOR Y = 0 TO 1: FOR X = 0 TO 1
50    PROCBLOCKS
60    NEXT X: NEXT Y
70    PROCBORDER
80    FOR J = 1 TO 30: NTE(J) = RND(4): NEXT J
90    C = 0
100   C = C + 1
110   CC = 0
120   FOR Q = 1 TO C: PROCFLASH(Q): NEXT Q
130   *FX 15,0
140   REPEAT
150   CC = CC + 1
160   A = GET: IF A > 136 THEN 160
170   IF A = 139 THEN A = 138: GOTO 190
180   IF A = 138 THEN A = 139
190   IF A = NTE(CC) + 135 THEN end = FALSE ELSE end = TRUE
200   IF end = FALSE THEN PROCFLASH(CC) ELSE SOUND 0,-15,1,17:
      SOUND 0,-15,2,7
210   UNTIL end OR CC = C
220   IF end THEN 240
230   FOR Z = 1 TO 2000: NEXT Z: GOTO 100
240   CLS: PRINT ' "YOU MANAGED"; C-1' "ANOTHER GAME?"
250   *FX 15,0
260   IF GET$ = "Y" THEN CLS: GOTO 20
270   IF GET$ <> "N" THEN 250
280   *FX 4,0
290   VDU 23; 29194; 0; 0; 0; 20: END
300   DEF PROCBLOCKS
310   COLOUR (X + 2*Y)
320   FOR X1 = X*9 + 1 TO X*9 + 9: FOR Y1 = Y*15 + 1 TO Y*15 +15
330   PRINTTAB(X1,Y1); CHR$(240);
340   NEXT Y1: NEXT X1
350   ENDPROC
360   DEF PROCBORDER
370   FOR J = 0 TO 30: PRINTTAB(0,J); "S"; TAB(19,J); "S";:
      NEXT J
380   FOR J = 0 TO 18: PRINTTAB(J,0); "S"; TAB(J,31); "S";: NEXT J
390   ENDPROC
400   DEF PROCFLASH(S)
410   SOUND 2,-15,100 + 20*NTE(S),5
420   VDU 19, NTE(S) - 1, NTE(S) + 4,0,0,0
430   FOR JJ = 1 TO 200: NEXT JJ
440   PROCRESET
450   IF CC = 0 THEN F = 500 ELSE F = 1
460   FOR JJ = 1 TO F: NEXT JJ
470   ENDPROC
480   DEF PROCRESET
490   VDU 19,0,7,0,0,0,19,1,1,0,0,0,19,2,2,0,0,0,19,3,3,0,0,0
500   ENDPROC
```

Code storage

D L Clay,
Binley Woods,
Coventry.

ZX-81

THERE ARE three ways of storing machine code: in a Rem statement in line 1, in a variable, and above RAMtop.

An alternative method is necessary because if one wants to load a machine-code program for renumbering, and then load in a Basic program to be renumbered, all these methods are useless.

The first two methods lose the machine code on loading the Basic program, and with the third method machine code cannot be loaded.

This difficulty can be overcome by the following method. The code is stored in the spare memory. Here it is not affected by Run or Clear, or by loading a Basic program unless overrun by the program.

This program will give a display showing the various addresses affecting the spare memory. Tests show that the address of the E-Line, for example, may vary by 200 bytes during running, and one may not catch it at its highest. Also, the program, being in Basic, will only test itself.

The Save facility is not required, except during the actual process of Saving. During Save and Load the Run and Clear keys will not be pressed, since no keys are pressed during these periods.

Hence all requirements will be met by using a safe mode normally and switching, when required, to a mode which will save. It is the E-Line which controls the upper limit of saving. So if the E-Line address is moved up by, say, 1K bytes just before saving, then any code in that 1K will be saved. It is necessary to move the E-Line back afterwards for normal use. Also, since in the saved program the E-Line is in the upper position, the E-Line must be moved back after Loading.

All this can be done automatically by three lines added to the end of a Basic program, as shown in figure 1. The lines are saved with the program.

16405 is the address where the upper byte of the E-Line address is stored. The +4 increases the address by four blocks of 256 bytes. The four can, of course, be set as required.

The whole of the spare memory could be saved, but at about 25 seconds per 1K bytes this would take rather a long time on a 16K machine. To start the Save, key Goto 9992 or Run 9992 to save or clear the Basic variables as required. This makes no difference to the machine code.

If the Basic program is not terminated with Stop, or the equivalent, then 9990 Stop should be added. If it is required that the program should run automatically after Saving and Loading then add 9998 Goto N. To understand fully the action one needs to know exactly what Save does when in a program. Save means: Gosub, Save the program from start to finish regardless of where Save occurs in the program. Return to the line following Save and start executing.

When you type Load "PGM", you are telling the micro to Gosub, Load the program, Return to the line after Save, and start executing. Thus the E-Line is automatically moved up before Saving and then back again. After Loading, the E-Line is moved back so that in both cases the program in the computer is ready for normal use.

The only need for care is if, after starting a Save, the Break key is pressed. One should then key Goto 9996 to return the E-Line to normal. Figure 2 shows a simple program which may be used to test the method. Key in the program and then key in as figure 3a.

A(100) is a dimensioned variable and the two numbers Poked in simulate a machine-code program. Now key Goto 10 and one should see the first result shown in figure 3b.

Save everything by keying Goto 9992. Key New, Newline, or switch off and on, and then Load. Goto 10 will give the data as before,

(continued on page 93)

abacus electronics

ZX 81 Spectrum

ABACUS CONTROLLER

Developed to eliminate tedious swapping of plugs when LOADING or SAVING programs on cassette.
ZX SPECTRUM CONTROLLER: Single switch selection of SAVE, LOAD & AMP modes. Built in amplifier and loudspeaker boosts Spectrum sound output. Price £14.95
ZX81 CONTROLLER: Single switch selection of TALK, SAVE, CUE & LOAD modes. Built in microphone/speaker for fast and reliable program naming and cueing. Price £9.95.

All items in this advertisement can be viewed before buying at the Buffer Micro Shop, London.

ZX Spectrum games

1. ANDROID PIT RESCUE: Rescue the trapped miners before they are trapped in the flooding mines.
2. ICEBERG: Steer your icebreaker through thickening pack-ice to pick up survivors.
3. DESTROYER: Find and destroy the submarines before they sink the merchant ships. Novel use of sound.
5. DOMAIN: Probably the best versions of "KINGDOMS" you are ever likely to see.
4. BATTLE: Destroy missile sites while avoiding mines and the enemy tanks that are out to get you.

All Spectrum games have User Defined Graphics, sound, full colour and highscore.

ZX81 games

5. DEFENDER: A fast action **machine code game** with five levels of play, on screen scoring and highscore.
6. AVENGER: Destroy targets on the planet's surface with bombs and lasers while fending off guided missiles. **Machine code,** five levels of play, time and highscore.

Games 1 & 2 on one cassette price £5.95
All other games price £4.95 each including P&P.
All games are in stock and we guarantee to despatch them within seven days. Money back guarantee on all items.

ABACUS ELECTRONICS
186 St. Helens Ave, Swansea, W. Glam. Tel: (0792) 50282

The ultimate
SINCLAIR ZX 81 (16K)
DATABASE FILING SYSTEM

by DALE HUBBARD

Fed up with boring games — make your ZX81 work for you!
The one you've been waiting for!!

Cassette based
Clear "menu" operation
Facilities include sort, search, list, delete, change, total numeric field, save and load file, line print, etc.
Complete with demonstration file and full instruction/application leaflet.
Requires 16K Ram pack.
Applications: Recipe file
Stamp/coin collections
Inventory Control
Employee Data
Record Collections
Magazine article catalogue
May be used for any application where fast access is required to stored information

Access accepted
Send cheque or P.O. or credit card number to:
GEMINI MARKETING LTD.
9 Salterton Road, Exmouth, Devon EX8 2BR.
Or telephone us with your credit card order on Exmouth (03952) 5832

DESPATCH BY RETURN

ONLY £5.95 FULLY INCLUSIVE!

Special Offer FREE Computerised decision making program

(continued from page 91)

showing that the variable and code have been Saved and Loaded. Run 10 will show that the variable has gone but the machine code remains. The E-Line address has been reduced by 506 bytes, but if the Save and Load procedure is repeated it will be found that the code remains within the 1K band.

Although the words machine code have been used throughout, data could be saved, and possibly Basic programs parked, ready, after Loading for instant recall.

```
9992 POKE 16405,PEEK 16405+4
9994 SAVE "PGM"
9996 POKE 16405,PEEK 16405-4
9998 GOTO 10
```

FIG.1

```
  10 REM "PGM"
  20 PRINT PEEK 16404+256*PEEK 1
6405
  30 PRINT PEEK 18100;",";PEEK 1
8200
  40 PRINT A(50);",";A(100)
  50 STOP
9992 POKE 16405,PEEK 16405+4
9994 SAVE "PGM"
9996 POKE 16405,PEEK 16405-4
9998 GOTO 10
```

FIG.2

```
DIM A(100)
LET A(50)=50
LET A(100)=100
POKE 18100,10
POKE 18200,20
```

FIG.3A

```
18037
10,20
50,100

17531
10,20
```

FIG.3B

Poly-pen music

Richard Barton, Dagenham, Essex.

VIC-20

THIS PROGRAM will turn your Vic-20, together with a light-pen, into a kind of Stylophone. Simply point the light-pen at the appropriate position on the screen, and touch the pen sensors to start the tone. Chords can be built up as you go.

To stop the tones, just point the pen at the column furthest to the left, touch the sensors and hit any key. All the tones will stop together — tones cannot be stopped selectively. This program uses the Stack light-pen, but others can be substituted with appropriate adjustment of values.

```
1 REM POLYPHONIC PEN.
2 REM FOR UNEXPANDED          VIC,
3 REM USING STACK LIGHT         PEN.
4 REM BY R.BARTON.
10 DEFFNX(X)=INT((PEEK(36870)-49)/4):DEFFNY(Y)=INT((PEEK(36871)-32)/4)
20 PRINT"J"
30 S1=36874:S2=36875:S3=36876:S4=36877:V=36878
50 PRINT"■■■■■■■■■■PITCHES"
60 PRINT"■■■■|||||||||||||||||||||"
62 PRINT"■■VOICES.
63 PRINT"■■■■■■■■-S1----------"
64 PRINT"■■■■■■■■-S2----------"
65 PRINT"■■■■■■■■-S3----------"
66 PRINT"■■■■■■■■-S4----------"
67 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■"
68 PRINT"■■■■KILL TONE WITH PEN   AND A KEY IN THIS TAB"
70 POKEV,4
75 WAIT37137,16
76 IFFNY(Y)=10THENP=S1
77 IFFNY(Y)=13THENP=S2
78 IFFNY(Y)=16THENP=S3
79 IFFNY(Y)=19THENP=S4
81 IFFNX(X)=3THENPOKEP,135
82 IFFNX(X)=4THENPOKEP,147
84 IFFNX(X)=5THENPOKEP,159
86 IFFNX(X)=6THENPOKEP,163
88 IFFNX(X)=7THENPOKEP,175
90 IFFNX(X)=8THENPOKES1,183
92 IFFNX(X)=9THENPOKEP,191
94 IFFNX(X)=10THENPOKEP,195
96 IFFNX(X)=11THENPOKEP,201
98 IFFNX(X)=12THENPOKEP,207
100 IFFNX(X)=13THENPOKEP,209
102 IFFNX(X)=14THENPOKEP,215
104 IFFNX(X)=15THENPOKEP,219
106 IFFNX(X)=16THENPOKEP,223
108 IFFNX(X)=17THENPOKEP,225
110 IFFNX(X)=18THENPOKEP,228
112 IFFNX(X)=19THENPOKEP,231
200 GETS$:IFS$=""THEN75
220 POKES1,0:POKES2,0:POKES3,
    0:POKES4,0:GOTO75
```

Graphic recall

Tony Gillett, Southampton, Hampshire.

ATARI

I HAVE MADE a discovery which should be of interest to Atari users. First, type in this program:

```
10 GRAPHICS 8:COLOR 1
20 PLOT 20,20:DRAWTO 200,20:PLOT 20,150:
   DRAWTO 200,150
```

Now Run it. You should have a rectangle. Now press the System Reset key. Watch what happens when you type:

```
GRAPHICS 1000
```

The rectangle should have reappeared. This will work for any picture or graph that was drawn in graphics mode 8.

Also, this program simulates the Get command in Vic Basic.

```
10 COM A$(1):OPEN# 1,4,0,"K:":GET # 1,A:
   CLOSE# 1:
   A$=CHR$(A)
```

A$ will be what was pressed on the keyboard.

Column Scroll

John Hirst, Chaddesden, Derby.

ZX-81

THIS MACHINE-CODE program fulfils the need of those people requiring to scroll only a limited number of columns, for example, only one half of the screen. With this program it is possible to scroll from one to 32 columns. It is only possible to use this on a ZX-81 with at least 4K of memory, as it requires the display file to be fully expanded.

The following program can be used to enter the machine-code decimal values in figure 1 one number at a time. Line 1 has 40 Xs.

```
 1 REM XXXXXXXXXXXXXXXXXXXXXXXXXX
   XXXXXXXXXXXXXXX
10 FOR N=16514 TO 16552
20 SCROLL
30 INPUT I
40 POKE N,I
50 PRINT "ADDRESS ";N;"=";I
60 NEXT N
```

After entering the values in figure 1, list the program. At the end of the Rem statement there should be a single X left; if not then you have made a mistake somewhere. Start again.

If all is correct then delete lines 10 to 60 — not line 1, as this holds the machine code. Input as a direct command:

```
RAND USR 16514
```

Now 0/0 should be returned to the bottom left corner of the screen. Now Save the program, and try the following, added to line 1:

```
10 FOR N=0 TO 21
20 FOR I=0 TO 31
30 PRINT AT N,I;CHR$ (N-38)
40 NEXT I
50 NEXT N
60 LET Z=USR 16514
70 PRINT AT 21,16+INT (RND*16); "*"
80 GOTO 60
```

Notice that the machine-code program has been set to scroll the right-hand side of the screen. The scrolled columns are controlled by three locations in the machine code. The first,

(continued on next page)

(continued from previous page)

16518, is the number of the left-most scroll column — this must be in the range 0 to 32. The second, 16532, is the number of columns to be scrolled — this must be in the range 1 to 32. The values of these two locations, when added, must not be greater than 32. The third location, 16542, is used by the program as a control — this must be in the range 33 to 1. The values in 16532 and 16542 when added together must always equal 33.

To alter these values either Poke new values in directly, or from within a program. Here are some examples:

To scroll columns 16 to 31 as in the listing.
POKE 16518,16
POKE 16532,16
POKE 16542,17
To scroll columns 0 to 15 — left-hand side.
POKE 16518,0
POKE 16532,16
POKE 16542,17
To scroll columns 6 to 15, 10 columns.
POKE 16518,6
POKE 16532,10
POKE 16542,23

The scroll can be called in your programs by

LET Z = USR 16514

but do not use Z as a variable in your program as this will change its value.

Figure 1.

Decimal Z-80 Assembler					
42	ld HL, (NN)	1	ld BC, NN	40	jr z dis
12		33		11	
64		0		1	ld BC, NN
1	ld BC, NN	9	add HL, BC	17	
16		62	ld A, N	0	
0		0		229	push HL
3	inc BC	1	ld BC, NN	235	ex HL, DE
9	add HL, BC	16		9	add HL, BC
229	push HL	0		235	ex HL, DE
235	ex HL, DE	237		225	pop HL
225	pop HL	176	ld ir	9	add HL, BC
		60	inc A	24	jr dis
		254	op N	235	
		22		201	ret

More character

Colin Ridley,
Bentley,
Walsall.

SPECTRUM

THE ZX SPECTRUM can redefine character codes 144 to 164, but to do this one must enter eight binary digits for each new character. The following program will make this easier and enable Saving and Loading of the whole character set to tape.

Firstly, it prints an eight-by-eight grid with a flashing cursor which can be moved about using 5, left; 6, down; 7, up; and 8, right; to draw the character the same keys are used with the Caps Shift key also depressed.

When the new character is fully drawn, it can be fixed in memory by Caps Shift F. At all times the whole 21 user-definable characters are displayed at the bottom of the screen and the current character is displayed below the grid.

By pressing various keys, the following functions can be obtained:

CAPS SHIFT C	Allows you to decide which of the 21 characters you wish to alter.
CAPS SHIFT D	Delete current character from memory: becomes a space.
CAPS SHIFT V	Prints the current character on to the eight-by-eight grid ready for modification.
CAPS SHIFT S	Save character set to tape.
CAPS SHIFT L	Load character set from tape.

Once you have saved your required character set it is only necessary to add the line Load "File name" Code into your program to load the graphics.

```
5 REM *** CHARACTER GENERATOR --- BY COLIN RIDLEY *** 27.6.1982
10 LET C=145
20 FOR N=0 TO 6: POKE USR "A"+N,128: NEXT N: POKE USR "A"+7,255
30 PAPER 5: INK 0
40 CLS
50 PRINT AT 1,12;PAPER 7;"Character Generator"
60 PRINT AT 2,12;"Options": PRINT AT 4,12;"C - FIX CHARACTER": PRINT AT 5,12;"C -
CHANGE CHARACTER"
70 PRINT AT 6,12;"D - DELETE CHARACTER": PRINT AT 7,12;"V - VIEW CHARACTER": PRINT
 AT 8,12;"S - SAVE CHARACTER SET": PRINT AT 9,12;"L - LOAD CHARACTER SET"
80 PLOT 0,168: DRAW 64,0: DRAW 0,-64: DRAW -64,0: DRAW 0,64
90 FOR N=16 TO 64 STEP 8: PLOT N,168: DRAW 0,-64: NEXT N
100 FOR Y=160 TO 112 STEP -8: PLOT 0,Y: DRAW 64,0: NEXT Y
110 LET D#="": FOR D=145 TO 164: LET D#=D#+CHR$ D + " ": NEXT D: PRINT AT 19,1;PAPER
 7;D#
120 LET X=1: LET Y=8
130 PRINT AT 8,Y;PAPER 6;FLASH 1;CHR$ 144
140 PRINT AT 10,1;"CHAR ";CHR$ C;" PRINT AT 11,1;"CODE ";C
150 PRINT AT 10,1,"Definable Character"
160 LET CR=CHR$ C
200 PAUSE 0: LET D#=INKEY$: LET D=CODE D#
210 IF D=67 THEN GOTO 400
220 IF D=70 THEN GOTO 500
230 IF D=68 THEN GOTO 600
240 IF D=86 THEN GOTO 700
250 IF D=83 THEN GOTO 800
260 IF D=76 THEN GOTO 900
270 IF D=53 AND X>1 THEN PRINT AT X,Y;CHR$ 144: LET X=X-1
280 IF D=54 AND Y<8 THEN PRINT AT X,Y;CHR$ 144: LET Y=Y+1
290 IF D=55 AND Y>1 THEN PRINT AT X,Y;CHR$ 144: LET Y=Y-1
300 IF D=56 AND X<8 THEN PRINT AT X,Y;CHR$ 144: LET X=X+1
310 IF D=11 AND X>1 THEN PRINT AT X,Y;PAPER 0;" ": LET X=X-1
320 IF D=10 AND X<8 THEN PRINT AT X,Y;PAPER 0;" ": LET X=X+1
330 IF D=9 AND Y<8 THEN PRINT AT X,Y;PAPER 0;" ": LET Y=Y+1
340 IF D=8 AND Y>1 THEN PRINT AT X,Y;PAPER 0;" ": LET Y=Y-1
350 GOTO 130
400 INPUT "Enter Character 0 (144-164)";B: IF B<144 OR B>164 THEN GOTO 400
410 GOTO 90
500 PRINT AT X,Y;PAPER 0;" ": LET B=0
510 FOR X=1 TO 8: LET Z=256
520 FOR Y=1 TO 8: LET Z=Z/2: IF SCREEN$ (X,Y)=" " THEN LET B=B+Z
530 NEXT Y: POKE USR CR+(X-1),B: LET B=0: NEXT X
540 IF B>144 AND B<164 THEN LET B=B+1
550 GOTO 90
600 FOR N=1 TO 8: POKE USR CR + (N-1),0: NEXT N
610 GOTO 90
700 FOR Y=1 TO 8: LET Z=128: LET S=PEEK (USR CR + (Y-1))
710 FOR Y=1 TO 8
720 IF S>=Z THEN PRINT AT X,Y;PAPER 0;" ": LET S=S-Z
730 LET Z=Z/2: NEXT Y: NEXT X
740 GOTO 120
800 INPUT "Enter File Name ";N$
810 SAVE N$ CODE USR "A",160
820 GOTO 130
900 INPUT "Enter File Name ";N$
910 INPUT "Start Cassette and hit <ENTER>";A$
920 LOAD N$ CODE
930 GOTO 130
```

Word puzzles

Chris Callender,
Helensburgh,
Strathclyde.

ZX-81

YOU MUST at some time have seen puzzles where you have to find hidden words on a grid. In this program the 16K ZX-81 makes up a puzzle for you, on a 16 by 16 grid with the option of a solution.

When the program is Run the computer will ask for the title of the puzzle. Then it will ask the number of words you want in the puzzle and then what each word is. If you want a difficult puzzle have a friend input the words.

```
 10 REM WORDPUZZLE BY CHRIS
     CALLENDER.
 20 SCROLL
 30 PRINT "WHAT IS THE TITLE?"
 40 INPUT T$
 50 SCROLL
 60 PRINT "HOW MANY WORDS?";
 70 INPUT W
 80 PRINT W
 90 DIM W$(W,16)
100 DIM M$(256)
110 FOR A=1 TO W
120 SCROLL
130 PRINT "WORD ";A;"?"
140 INPUT W$(A)
150 SCROLL
160 PRINT W$(A)
170 NEXT A
180 FOR A=1 TO W
190 LET L=INT (RND*8)+1
200 IF L=1 THEN LET S=1
210 IF L=2 THEN LET S=-1
220 IF L=3 THEN LET S=16
230 IF L=4 THEN LET S=-16
240 IF L=5 THEN LET S=15
250 IF L=6 THEN LET S=-15
260 IF L=7 THEN LET S=17
270 IF L=8 THEN LET S=-17
280 LET Z$=""
290 FOR B=16 TO 1 STEP -1
300 LET Z$=Z$+W$(A)(TO B)
310 IF W$(A,B)=" " THEN NEXT B
320 LET P=INT (RND*256)+1
330 LET N=LEN Z$*S
340 IF N+P>256 OR N+P<=0 THEN G
OTO 320
350 FOR B=P TO P+N STEP S
355 IF B/16=INT (B/16) THEN GOT
O 390
360 IF M$(B)<>" " THEN GOTO 390
370 NEXT B
380 LET Z=1
390 FOR B=P TO P+N STEP S
400 IF Z>LEN Z$ THEN GOTO 440
410 LET M$(B)=Z$(Z)
420 LET Z=Z+1
430 NEXT B
440 NEXT A
450 LET S$=M$
460 CLS
470 FOR A=1 TO 256
480 IF M$(A)=" " THEN LET M$(A)
=CHR$ (38+INT (RND*26))
490 NEXT A
500 FOR A=1 TO 256 STEP 16
510 PRINT M$(A TO A+15)
520 NEXT A
530 PRINT '' "FIND THE FOLLOWING
HIDDEN WORDS"
540 POKE 16418,0
550 FOR A=1 TO W
560 PRINT W$(A);
570 NEXT A
580 PRINT AT 23,0;"SOLUTION?"
590 PAUSE 4E4
600 IF INKEY$<>"Y" THEN GOTO 64
0
610 FOR A=1 TO 256
620 IF S$(A)<>" " THEN PRINT AT
INT (A/16),A-16*INT (A/16);CHR$
(CODE S$(A)+128)
630 NEXT A
640 PRINT AT 23,0;"PRINTER COPY
?"
650 PAUSE 4E4
660 IF INKEY$<>"Y" THEN STOP
670 LPRINT TAB ((32-LEN T$)/2);
T$
680 COPY
```

Undercut

R Vanhove,
Merelbeke,
Belgium.

ZX-81

THE IDEA of this game is as follows: both opponents have to choose numbers. The one marked with an asterisk chooses numbers in the range 2 to 6. The other one chooses integers within the range 1 to 5. If the difference between the two numbers given does not equal 1, for example, 3 and 6, 5 and 1, or 4 and 4, both opponents may add that number to their score.

If the difference is 1, however, the player with the lower number must add both to his score, whereas the player with the higher score gets nothing at all. Thus, if A says 3 and B says 2, A gains five points and B nothing. An added frustration which was not in the original game: to win, or draw if your opponent has 100 too, you need 100 exactly — all surplus points are subtracted from 100. The game is for a 1K ZX-81. If you have more memory, you may either improve the computer's end-game or have the computer look for patterns in the human choice — so as to "undercut" him at a hurtful moment — when he plays that six again.

```
1     LET S = PI - PI
2     LET T = S
3     LET V = S
4     CLS
5     PRINT "YOUR TOTAL =";S;"ZX81 TOTAL = ";T; AT 2,16*(NOT V);"*"
6     PRINT,," YOU CHOOSE  ";
7     IF INKEY$ = "" THEN GOTO VAL"7"
8     LET A = VAL INKEY$
9     IF A > VAL "5" + V OR A < PI/PI + V THEN GOTO VAL"7"
10    LET C = RND*CODE "PI"
11    LET B = PI/PI + V*((C > 10) + (C > 36) + ( C > 49)
      + (C > 62.8)) + (NOT V)*(PI/PI + (C > 32) + ( C > 44)
      + (C > 63) + (C > 65).)
12    PRINT A,"ZX81 CHOSE  ";B
13    LET C = A*(A - B <> PI/PI) + B*(B - A = PI/PI)
14    LET D = A*(A - B = PI/PI) + B*(B - A <> PI/PI)
15    LET T = T + D
16    LET S = S + C
17    LET U = VAL"100"
18    IF S = U OR T >= U THEN GOTO CODE "2"
19    IF S > U THEN LET S = U + U - S
20    LET V = (NOT V)
21    GOTO VAL"4"
30    PRINT,,,,S;"-";T;" YOU WIN" AND S > T;"ZX81 RULES" AND T > S;
      "THAT WAS CLOSE" AND S = T;W
```

Screen flash

R M Taylor,
Spalding,
Lincolnshire.

ZX-81

THIS MACHINE-CODE routine will work on any ZX-81 with 4K or greater memory. Enter a line 1 Rem followed by at least 43 spaces. When you have completed this you must enter the code from address 16514 onwards.

You have no doubt seen many hexadecimal and decimal loader programs for entering machine code so I have not repeated one here. After the code is entered enter, as a direct command,

POKE 16514,1

and run the routine by using

RAND USR 16516

The program should go through the ZX-81's entire character set, ordinary and inverse. The speed at which this happens produces a stunning effect.

The speed can be altered by the value in 16514-16515. It should be noted that a zero in both 16514 and 16515 produces the longest delay. If the screen is filled with different characters before the routine is called, using

RAND USR 16516

as a program line to avoid the screen being cleared, then each character is treated individually which produces an even better effect. It may also be noticed that the screen is always set to its original contents when the routine returns to Basic. This program is useful for producing effects at the end of games.

ADDRESS	DECIMAL	HEX	MNEMONICS
16514	0	00	NOP
16515	0	00	NOP
16516	6,128	06 80	LD B,128
16518	42,12,64	2A 0C 40	LD HL,(16396)
16521	35	23	INC HL
16522	197	C5	PUSH BC
16523	14,24	0E 18	LD C,24
16525	6,32	06 20	LD B,32
16527	126	7E	LD A,(HL)
16528	60	3C	INC A
16529	203,119	CB 77	BIT 6,A
16531	40,4	28 04	JR Z (TO 16537)
16533	203,183	CB,B7	RES 6A
16535	238,128	EE 80	XOR 128
16537	119	77	LD (HL),A
16538	35	23	INC HL
16539	16,242	10 F2	DJNZ (TO 16527)
16541	35	23	INC HL
16542	13	0D	DEC C
16543	32,236	20 EC	JR NZ (TO 16525)
16545	193	C1	POP BC
16546	42,130,64	2A 82 40	LD HL,(16514)
16549	43	2B	DEC HL
16550	124	7C	LD A,H
16551	181	B5	OR L
16552	32,250	20 FA	JR NZ (TO 16549)
16554	16,218	10 DA	DJNZ (TO 16518)
16556	201	C9	RET ■

MEMOTECH Explores the Excellence of your ZX81

THIS MONTH- 2 NEW PAKS!

Memotech's Memopak Range

All five of the currently available Memopaks are housed in elegant black anodised aluminium cases, and are styled to fit wobble-free onto the back of the ZX81, allowing more add-ons (from Memotech or Sinclair) to be connected.

£68.70 plus VAT

MEMOPAK 64K MEMORY EXTENSION

The 64K Memopak extends the memory of the ZX81 by 56K, and with the ZX81 gives 64K, which is neither switched nor paged and is directly addressable. The unit is user transparent and accepts commands such as 10 DIM A(9000).
Breakdown of memory areas...0-8K-Sinclair ROM. 8-16K-This area can be used to hold machine code for communication between programmes or peripherals. 16-64K-A straight 48K for normal Basic use.

£43.43 (32K) / £26.00 (16K) plus VAT

MEMOPAK 32K and 16K MEMORY EXTENSIONS

These two packs extend and complete the Memotech RAM range (for the time being!) A notable feature of the 32K pack is that it will run in tandem with the Sinclair 16K memory extension to give 48K RAM total.

£52.00 plus VAT

MEMOPAK HIGH RES GRAPHICS PACK

HRG Main Features — • Fully programmable Hi-Res (192 × 248 pixels) • Video page is both memory and bit mapped and can be located anywhere in RAM. • Number of Video pages is limited only by RAM size (each takes about 6.5K RAM) • Instant inverse video on/off gives flashing characters • Video pages can be superimposed • Video page access is similar to Basic plot/unplot commands • Contains 2K EPROM monitor with full range of graphics subroutines controlled by machine code or USR function

£34.70 plus VAT

MEMOPAK CENTRONICS TYPE PARALLEL PRINTER INTERFACE

Main Features — • Interfaces ZX81 and parallel printers of the Centronics type • Enables use of a range of dot matrix and daisy wheel printers with ZX81 • Compatible with ZX81 Basic, prints from LLIST, LPRINT and COPY • Contains firmware to convert ZX81 characters to ASCII code • Gives lower-case characters from ZX81 inverse character set

Coming Soon...

A complete range of ZX81 plug-in peripherals

Digitising Tablet **RS232 Interface**

We regret we are as yet unable to accept orders or enquiries concerning the above products, but we'll let you know as soon as they become available.

Access/Barclaycard Holders Please Tel. Oxford (0865) 722102 (24 Hrs)

Please send me	Price	No	Total
64K RAM £68.70 + £10.30 VAT	£79.00		
32K RAM £43.43 + £6.52 VAT	£49.95		
16K RAM £26.00 + £3.90 VAT	£29.90		
HRG £52.00 + £7.80 VAT	£59.80		
CENTRONICS I/F £34.70 + £5.20 VAT	£39.90		
Packaging & Postage £2.00 per unit			
		TOTAL ENC	

Please make cheques payable to MEMOTECH Ltd.

Please Debit my Access/Barclaycard* account number

*Please delete whichever does not apply

SIGNATURE _____ DATE _____

NAME _____ ADDRESS _____

TELEPHONE _____

© R. Branton & G.A.C. Boyd 1982

We want to be sure you are satisfied with your Memopak – so we offer a 14-day money back Guarantee on all our products.

Memotech Limited, 3 Collins Street, Oxford OX4 1XL, England Tel: Oxford (0865) 722102 Telex: 837220 Orchid G

COMPETITION CORNER

A £15 book token will be awarded to the first correct solution drawn from the competition bag. All entries must be at the *Your Computer* offices by the last working day in October. The name of the winner, the solution, and a competition report will be published in the December issue of *Your Computer.*

If you want to set a competition for Competition Corner, remember that the simplest solution should be calculable by a short program rather than by any other form of reckoning.

ENIGMA CODE

BY ANTHONY ROBERTS

THIS CODED note was passed to you by a strangely-dressed man at a time-traveller's convention: He had the month right, but not the year. It is a simple substitution code: each letter of the original message, in sequence, has been substituted by the code corresponding, in sequence, with that letter of the alphabet: what is the message?

Competition results

DESPITE A LARGE number of entries, the August competition for a Dragon 32 did not inspire such flights of imagination as we have witnessed in previous months. After much pondering we made the winner S J Dawes of Lilac Cottage, Viking Hall, Ripple, Tewksbury, Gloucestershire. He completed the sentence "If I found a Dragon 32 in an Adventure game, I would . . ." with "keep it on a good Basic diet with lots of raw data".

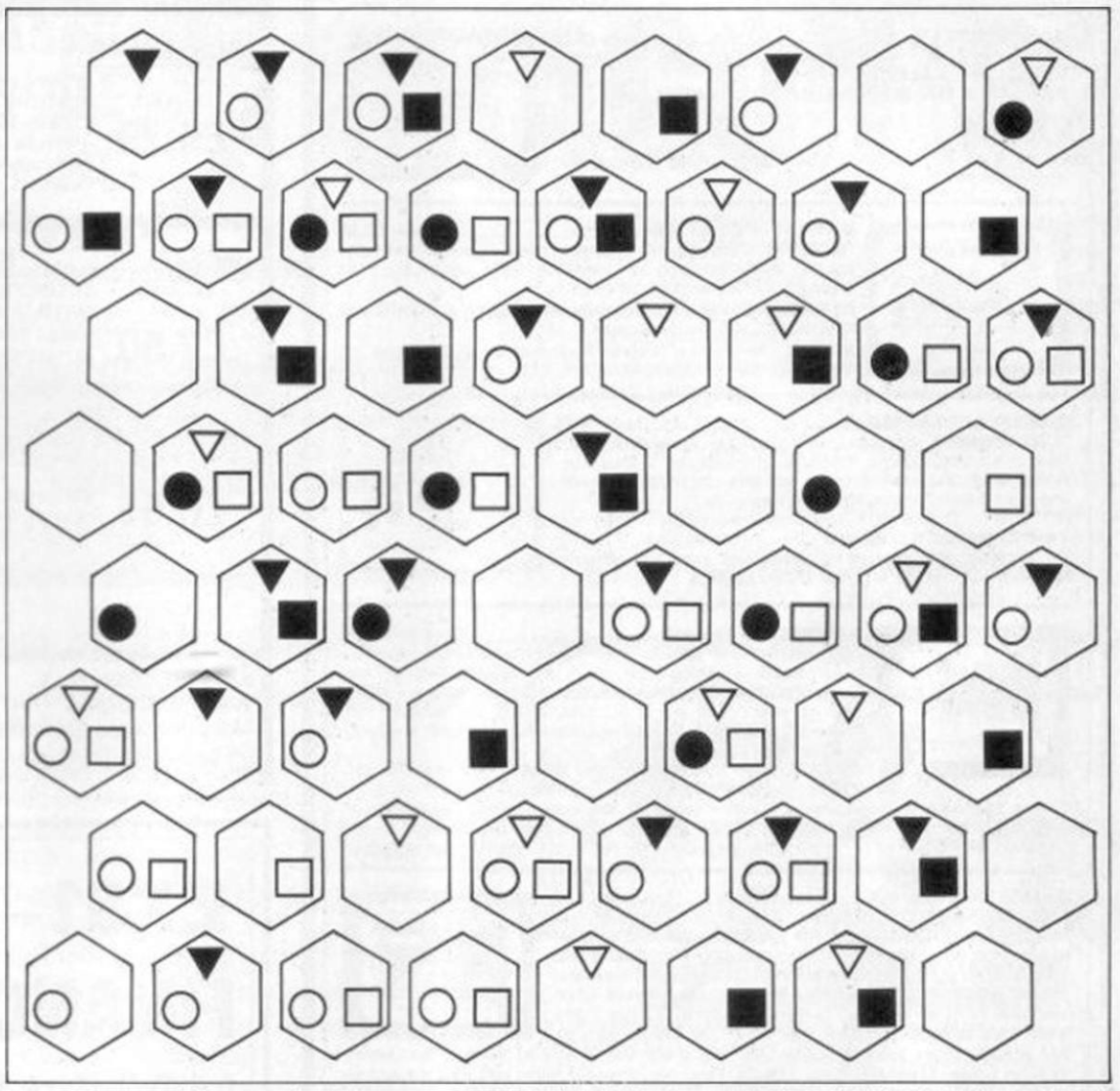
Punsters — as incorrigible as ever — were in good form; as in D Clarke's "try Tolkien to him — then hob it" and D Slinn's "ROMp home singing fangs for the memory".

While a dragon suggested St George and a distressed damsel to many people, R Patterson planned to "make it a Pet by feeding it on Acorns and Apples". Similarly D Blakemore intended to "befriend him by feeding him on nutty slack and fire-lighters".

P Abraham struck a familiar note with "tickle his keys, Peek at his bytes and Poke him to bits"; rather different was J Pittam's nicely irrelevant "turn left at Swansea and take the M4 home".

All the entries for the Power Cube problem gave the correct answer — the black square. Most of them found the problem quite easy to solve without a program. As A While put it "there is really no reason to awaken my BBC model A".

A simple solution can be arrived at if you pair up the symbols on a face. The symbols in the middle positions at the edge cannot be left unpaired. The black square is the only symbol which does not occupy a middle position on any of the faces.



The first solution picked from the bag came from A Smith, "Cwa Ben", Sachelcourt Avenue, Bishopton, Renfrewshire, Scotland, who receives the £15 book token. ■

```
10 REM POWER CUBE SOLUTION BY A.B.SMITH
20 DIMA%(9),A$(9),S%(6,3,3)
30 FORF=1TO6:FORY=1TO3:FORX=1TO3
40 READ V:S%(F,Y,X)=V
50 NEXT:NEXT:NEXT
60 DATA1,7,5,3,9,2,4,8,6
70 DATA4,3,5,8,6,9,2,1,7
80 DATA7,8,6,9,3,1,2,4,5
90 DATA2,4,7,1,5,8,6,9,3
100 DATA5,1,3,8,4,9,7,6,2
110 DATA8,3,4,2,9,6,7,1,5
120 A$(1)="BLACK CIRCLE":A$(2)="WHITE CIRCLE":A$(3)="BLACK TRIANGLE"
130 A$(4)="WHITE TRIANGLE":A$(5)="BLACK SQUARE":A$(6)="WHITE SQUARE"
140 A$(7)="BLACK DIAMOND":A$(8)="WHITE DIAMOND":A$(9)="HEXAGON"
150 FORX=1TO9:A%(X)=X
160 FORF=1TO6
170 IFS%(F,1,2)=XORS%(F,2,1)=XORS%(F,2,3)=XORS%(F,3,2)=XTHENA%(X)=0
180 NEXTF:IFA%(X)<>0THENPRINTA$(X)" IS ACCEPTABLE"
190 NEXTX:PRINT"NO OTHER SYMBOLS ACCEPTABLE"
200 END
```

Solution to the August crossword.

ZX81 GAMES

from

J.K. GREYE SOFTWARE LTD

THE NEW GENERATION SOFTWARE HOUSE

"Without question the finest machine code games available today"..... J.N. ROWLAND Product Manager for W.H. SMITH.

GAMESTAPE 1 for 1K _____ **only £3.95**
10 Games incl. ASTEROIDS, UFO, CODE, BOMBER, GUILLOTINE, KALEIDESCOPE, etc.
PROBABLY THE BEST VALUE 1k TAPE AVAILABLE.

We've done in 1k, games which some of our competitors require 16k to do!

GAMESTAPE 2 for 16K _____ **only £3.95**
***STARFIGHTER** Superb machine code Space Battle. Set against a background of twinkling stars, with stunning explosions — if you can hit the enemy!
PYRAMID Can you move the Pyramid? Make a mistake and it will collapse! A Thinkers game.
ARTIST The ultimate Graphic Designers aid. 8 Directions, 10 Memories. SAVE. COPY. RUBOUT. CLS. etc.

GAMESTAPE 3 for 16K _____ **only £4.95**
***CATACOMBS** A Multi-Level Graphics Adventure. Each level can contain up to 9 Rooms, 8 Passages, 7 Monsters, Food, Gold, Traps, Phantoms, an Exit (to the next level), and there's an infinite number of levels.
NOTE. . . . This is NOT one of the necessarily limited text Adventures as sold elsewhere.
"An excellent addictive game which will keep you amused for hours.". . . . *COMPUTER & VIDEO GAMES.*

GAMESTAPE 4 for 16K _____ **only £4.95**
***3D MONSTER MAZE** The Game to Top All Others. Unbelievable Graphics! Can you find your way through the Maze? The EXIT is there somewhere, but then so is a T.REX, and its after YOU! All in 3D (the T.REX will actually run towards you in full perspective!), you've never seen anything like this before!
"3D MONSTER MAZE is the best game I have seen for the ZX81". . . . COMPUTER & VIDEO GAMES
"If I had to choose just one programme to impress an audience with the capabilities of the ZX81, then J.K. Greye's 3D MONSTER MAZE would be the one without doubt" . . . . ZX COMPUTING. *"Brilliant, brilliant, brilliant!"....POPULAR COMPUTING WEEKLY*

GAMESTAPE 5 for 16K _____ **only £4.95**
***3D DEFENDER** The Ultimate Space Game. Super fast Machine Code 3D version of the Arcade favourite. You have to save your home planet from the marauding Alien Spacecraft. This is all in 3D, your viewscreen shows you the view out of your fighters cockpit window. The backdrop moves when you turn, or fly up or down (8 flight directions), just as if you were really flying it! But then YOU ARE! The Enemy Saucers will actually zoom towards you in 3D, and shoot you if you let them! Your display includes Score, Shield Strength, Altitude, Proximity, Forward Radar and your viewscreen, which shows your rotating home planet, backdrop of Stars, Meteors, Explosions, Plasma Blasts, your Photon Beams, up to 4 Enemy Saucers and of course its all in full 3D!
A SMASH HIT at the ZX Microfair (most of the other software houses wanted a copy), a game not to be missed!

GAMESTAPE 6 for 1K _____ **only £1.95**
***BREAKOUT** Super Fast Full Screen Display Game. Your all time favourite with an added twist. See how much Money you can win and watch the pounds convert to Dollars. All in Machine Code for Fast Action with 3 Speeds, 2 Bat Sizes and three angles of rebound! The best BREAKOUT around and at this price you can't go wrong!

GAMES MARKED * INCL. MACHINE CODE.
Prices include VAT and U.K. P. & P.
(Add appropriate Postage on Foreign Orders). Cheques/P.O.s to

J.K. GREYE SOFTWARE LTD

16 Brendon Close, Oldland Common, Bristol BS15 6QE
CREDIT CARD SALES: Phone: 01-930-9232 (9 a.m. - 7 p.m.)
FOR INSTANT DESPATCH

If you prefer to see before buying, our range of **GAMESTAPES** are stocked by the following stores.

BUFFER MICROSHOP	374A Streatham High Rd., London SW16:
GAMER	24 Gloucester Rd., Brighton;
GEORGES	89 Park St., Bristol, Avon;
MICROSTYLE	29 Belvedere, Lansdown Rd., Bath, Avon;
MICROWARE	131 Melton Rd., Leicester;
SCREEN SCENE	144 St. Georges Rd., Cheltenham, Glos;
W.H. SMITH	Over 200 Computer Branches;
ZEDXTRA	5 School Lane, Kinson, Bournemouth, Dorset:

TRADE & EXPORT ENQUIRIES WELCOME

Spectrum MONITOR

MACHINE CODE DEBUG/DISASSEMBLER

- Enter, Run, Debug machine code programs
- Compatible with Basic
- Breakpoints & Registers Display
- Disassembly to Screen and/or ZX Printer
- Number converter — Hex/Dec/Hex
- 16K and 48K versions on one cassette + 30 page Manual

£7.50

EDITOR/ASSEMBLEY available soon — please send SAE for details

ZX81

SCREEN KIT 1 — **More Power to Your Screen**
in all your BASIC Programs

4K to 64K **£5.70**

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 & LOAD Basic variables: Double Speed. 880 bytes machine code for INSTANT RESPONSE. Becomes part of Basic Program.

ZX-MC — **Machine Code Debug/Monitor**
4K to 64K **£7.50**

COMPLETE FREEDOM FROM BASIC for machine code programmers. ENTER, RUN, DEBUG machine code. SAVE, LOAD, VERIFY at double speed. BREAKPOINTS and REGISTERS DISPLAY. Self contained — cannot be used with Basic. Cassette plus 36 page Manual.

REMLOAD — **Machine Code Entry/Debug**
16K to 64K **£6.95**

Version of ZX-MC without the Save/Load/Verify facility. ENTER, RUN, DEBUG machine code. Instantly CREATE A REM LINE of any length. Compatible with Basic. Switch between Program & REMLOAD Screen displays. Breakpoints and Registers displays.

Picturesque

6 CORKSCREW HILL,
WEST WICKHAM, KENT
Mail order only — 14 days delivery
SAE for more details —
Cheques/POs to: **PICTURESQUE**

ZX81—Spectrum
FINANCIAL MODELLER

MODELLER X — £8

This is a very User Friendly business modeller. It does not have the flexibility or the complexity of Micromodeller, however it does provide managers with a useful business tool and an introduction to modelling.
The program gives the user prompts in order to assist him to build his model. The factors *and criteria which are considered include advertising effectiveness, salesmen effective*-ness, elasticity of demand, pricing policy, production capacity, production flexibility and stock levels.
The model may be used in the following applications: a) To assist managers to plan the strategic decisions of the business enabling them to optimise their decisions, b) For the training of managers and supervisors in giving them an appreciation of the interaction of the pertinent marketing and production factors of a business.

MANAGEMENT GAMES

These business simulations are realistic and are not only fun to play but are also educational. The user will learn to interpret Trading Profit and Loss Accounts and Balance Sheets.

AUTOCHEF — £5

As MD you must negotiate for leases, decide on menu prices, level of wages, advertising and dividends and forecast levels of inflation. If you are not successful you will be made to resign!

AIRLINE — £5

You must decide on number of aircraft to operate, loan and fuel contracts, whether to buy or charter, and levels of staffing and maintenance.

PRINT SHOP — £5

As owner of a printing company you have to decide on staffing, paper stocks, quotations, work schedule and cash requirements.

ALL PROGRAMS INCLUDE DETAILED INSTRUCTIONS AND NEED 16K.

DISCOUNT £1.50 for two, £3 for three and £5 for four.

C.C.S.

Please state computer type and send cheque to: **DEPT 13**
CASES COMPUTER SIMULATIONS
14 Langton Way
London SE3 7TL

spectrum

We won't be be beaten on price!

SPECTRUM is a rapidly expanding group of independent retailers who specialise in selling home computers. Our group policy is simple – **WE WON'T BE BEATEN ON PRICE!** – our **BULK BUYING** ensures this. We select and buy the best and pass the savings on to **YOU**, the customer. We **GUARANTEE** that if you find an item currently advertised and in stock at another dealer and at a better price than ours – **WE WILL MATCH THAT PRICE ON THE SPOT.**

Only trained personnel at Spectrum!

We believe that our product '**know-how**' is crucial to you the customer. That's why in every one of our centres you'll find **fully trained personnel**, who have been **trained by the importers or distributers themselves** – so we **know** and **understand** the products we sell and can help every customer even the complete beginner. At **SPECTRUM** we find the **RIGHT** equipment to suit your needs. Handing over sealed boxes is not our line – our service includes '**hands-on**' **experience** that we pass on to **YOU.**

After Sales care

SPECTRUM service centres will ensure that should your machine 'go-down' **we will get it running again as quickly as possible.** We also offer **extended warranties** at reasonable prices too!– ask your **SPECTRUM HOME COMPUTER CENTRE** for full details.

New Spectrum Computer Centres now at:

ASHFORD
(Middx.)
BATH
EDINBURGH
GLASGOW
HATFIELD
LEICESTER
LONDON N.1.
MANCHESTER
RUGBY
WIDNES

COMPUTER DEALERS!

(or prospective Computer Dealers!)

If you would like to know more about becoming a **SPECTRUM APPOINTED DEALER** on an **exclusive area basis,** please contact **MIKE STERN** or **ALAN WARREN** on **(0727) 66646.**

Spectrum (U.K.) Ltd., Unit 6, Marlborough Trading Estate, Lattimore Road, St. Albans, Herts.

FREE!
CASSETTE
Worth £7.95
with every **DRAGON** purchased – use your FREE OFFER COUPON!
Offer exp. 30.10.82

Fantastic Value for money!

DRAGON 32

Enter the DRAGON! – this really is **unbelievable value at only £173** from **SPECTRUM!** British built and designed, it's one of the **most impressive micros** to appear for quite some time. Featuring as standard a **32K RAM** (expandable to 64K Bytes) **plus** it offers **extensive facilities** including **highly advanced colour graphics** for **graphs, cartoon animation** etc. It's the ideal '**Family Computer**' and will provide hours of fun and education for **YOUR** family! – see it at your nearest **SPECTRUM COMPUTER CENTRE** now. But just one word of warning – at this **amazing price** they're already **selling fast** so make it soon, or **phone** before making a journey.

Just look at this top specification

- Powerful standard 32K RAM (expandable to 64K Bytes).
- 9 Colour, 5 resolution Display.
- Extended Microsoft colour BASIC (as standard).
- Advanced sound with 5 octaves – 255 tones.
- Professional style editing, e.g. extract line, auto find reinsert.
- Professional quality keyboard.
- Centronics Parallel printer interface.
- Serious programmer/user – the BASIC on this machine is similar to that found on machines costing 3 times the price!
- Uses almost any cassette recorder.
- Standard file handling ON TAPE.

Spectrum SENSATIONAL price

£173.00

PRICE INC. VAT £198-95

SOFTWARE for DRAGON 32			
CARTRIDGES	**EX. VAT**	Graphic Animator	£6.91
Beserk	£17.35	Quest	£6.91
Cosmic Invaders	£17.35	Madness and the Minotaur	£6.91
Meteroids	£17.35	Selection of Games	£6.91
Ghost Attack	£21.70	Selection of Utilities	£6.91
CASSETTES		Examples from Dragon Manual	£6.91
Computarvoice	£6.91	Personal Finance	£6.91

Above prices excluding VAT.

Great Value from Spectrum!

SEIKOSHA GP-100A

Graphic Printer

FREE!
PAPER
Worth £11.95
with every **SEIKOSHA** purchased – use your Free Offer Coupon!
Offer exp. 31.10.82

Now a top quality graphic printer **at a price you can afford.** The **SEIKOSHA GP-100A** – **Terrific value** at under **£200** from **SPECTRUM.** Standard Centronics compatable interface for easy link-up with most micros. ■ Full graphics capability. ■ Printing speed 30 chars/sec. ■ Double width character output under software control. ■ Graphics, character and double width character can be intermixed on same line ■ Paper width adjustable up to 10" – tractor feed. ■ Print position addressable by character or dot.

Spectrum LOW price £189.00 Price Inc. VAT £217.35

Also available:
SEIKOSHA GP-100VC
(Built exclusive for VIC-20)
ONLY **£209.50** Ex. VAT
(£240.93 Inc. VAT)

Interfaces for GP-100A/GP-100VC	Ex. VAT	Inc. VAT
APPLE SERIAL	£45.00	£51.75
APPLE GRAPHIC	£55.00	£63.75
VIDEO GENIE	£36.00	£41.40
Cables for BBC MICRO, ACORN, DRAGON, ATARI	£16.00	£18.40

FREE OFFER COUPON

To claim any of the **FREE OFFERS featured** in our advertisements, present this coupon **at time of purchase,** and your **SPECTRUM** dealer will give you the **FREE** goods **relating to the purchase.**

Offers expire on 31.10.82 & apply to featured free offers only.

See next page

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

spectrum

ATARI

Spectrum's prices now lower than ever – plus super FREE offers too!

From **household budgets** to **analysis of bond yields.** From **foreign languages to spelling** or **geography.** From **missile command** to **PACMAN – ATARI does it all, EXCELLENTLY!** See the top selling **ATARI** range at your nearest **SPECTRUM COMPUTER CENTRE – NOW!** and save even more!

ATARI 400 16K RAM £173.00
(excluding programmer kit) Price inc. VAT £198.95

ATARI 800 16K RAM £434.00
(includes programmer kit) Price inc. VAT £499.10

Additional Equipment	EX. VAT	INC. VAT
Program Recorder	£43.00	£49.45
Disk Drive	£260.00	£299.00
Thermal Printer	£173.00	£198.95
Interface Module	£117.39	£135.00
Accessories		
16K Ram Pack	£56.52	£65.00
Paddles (Pair)	£12.17	£13.99
Joysticks (Pair)	£12.17	£13.99
Printer Cable	£24.78	£28.50
RS232C Cable	£21.74	£25.00
Monitor Cable	£21.74	£25.00
Thermal Paper	£3.48	£4.00
Dos. 2 Master Diskettes	£19.12	£21.99
Books and Manuals		
Wiley Manual	£5.21	£5.99
Basic Reference Manual	£5.21	£5.99
Dos. 2 Manual	£5.21	£5.99
Operating System Listing	£10.43	£11.99
Dos. Utilities Listing	£3.47	£3.99
Atari Home Computer Programs—Home/Office		
Graphit	£13.03	£14.99
Statistics 1	£13.03	£14.99
Home Study (Cassette except where stated)		
Inv. to Programming 1	£17.38	£19.99
Inv. to Programming 3	£19.99	£22.99
Conversational French	£34.77	£39.99
Conversational German	£34.77	£39.99
Conversational Italian	£34.77	£39.99
Conversational Spanish	£34.77	£39.99
Hangman	£13.03	£14.99
Scram	£17.38	£19.99
Touch Typing	£17.38	£19.99
Music Composer (Cart.)	£31.30	£35.99
Home Entertainment		
Asteroids	£26.08	£29.99
Basketball	£21.73	£24.99
Blackjack (Cassette)	£13.03	£14.99
Caverns of Mars (Disk)	£26.08	£29.99
Centipede	£26.08	£29.99
Computer Chess	£21.73	£24.99
Missile Command	£26.08	£29.99
Pac Man	£26.08	£29.99
Space Invaders	£26.08	£29.99
Star Raiders	£26.08	£29.99
Super Breakout	£21.73	£24.99
Video Easel	£21.73	£24.99
Programming Languages & Aids		
Assembler Editor	£34.77	£39.99
Pilot (Consumer)	£52.17	£59.99
Pilot (Educator)	£78.25	£89.99
Entertainer kit (Star Raiders, Missile Command and Pair Joysticks)	£60.86	£69.99
Programmer Kit (Basic Cartridge and Manuals)	£43.47	£49.99

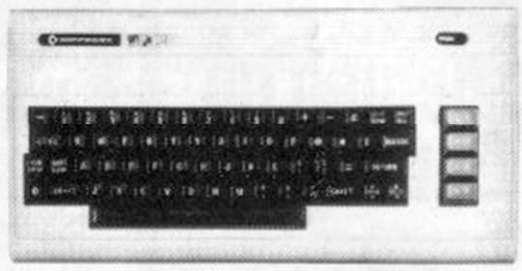
FREE! Cassette WORTH £19.95 with every **ATARI 400** purchased – Use your FREE OFFER coupon.

FREE! Cassette WORTH £19.95 with every **ATARI 800** purchased – Use your FREE OFFER COUPON.

FREE! 10 FLOPPY'S WORTH £19.50 with every **ATARI DISK DRIVE** purchased – Use your FREE OFFER COUPON.

FREE! 4 Boxes Thermal PAPER WORTH £16.00 with every **ATARI PRINTER** purchased – Use your FREE OFFER COUPON.

VIC-20



The VIC-20 represents **superb value-for-money** from **SPECTRUM.** A truly **expandable** computer system which can be as simple or as complex as your needs require. Ideal as a home micro with a **large** number of **educational & games cartridges** available. Equally, with additional memory expansion, a disc drive and printer, it becomes suitable as a **small business system,** powerful enough for stock control, book-keeping and payroll generation

■ Memory expandable to 32K ■ High resolution (full PET type) graphics ■ 16 Screen colours & 8 border colours ■ Plugs in to your T.V. or monitor ■ Add Disk Drive & Printer for impressive 170K Byte system ■ Can act as an intelligent terminal for a larger computer.

Spectrum SENSATIONAL price only **£147.50** Ex. VAT
Price inc. of VAT £169.63

	Exc. VAT	Inc. VAT
VIC C2N cassette unit	£35.00	£40.25
VIC Printer	£200.00	£230.00
VIC Single floppy disk drive (5¼")	£344.35	£396.00
3K RAM	£26.04	£29.95
8K RAM	£39.09	£44.95
16K RAM exp. cartridge	£65.17	£74.95
Super exp. Hi Res cartridge	£30.39	£34.95
Joystick	£6.52	£7.50
Games paddles	£11.74	£13.50
Programmers Aid cart	£30.39	£34.95
Machine Code Basic (1)	£30.39	£34.95
	£18.00	£14.95

	Exc. VAT	Inc. VAT
GAMES		
"Avenger"	£17.35	£19.95
"Star Battle"	£17.35	£19.95
"Jelly Monsters"	£17.35	£19.95
"Super Lander"	£17.35	£19.95
"Road Race"	£17.35	£19.95
"Rat Race"	£17.35	£19.95
"Blitz" (cass.)	£4.34	£4.99
BOOKS		
Learn Computer Programming with the Commodore VIC	£1.95	No VAT
VIC Revealed	£10.00	No VAT
VIC 20 Prog. Reference Guide	£14.95	No VAT
VIC Computing Magazine	£0.95	No VAT

Super RABBIT Software for VIC-20

Save 50p on rec. price of the following **super quality games.**

	Inc. VAT.		Inc. VAT.
Myriad	£9.49	Super Worm	£4.49
Frogger	£9.49	Rabbit Function	£4.49
Space Storm	£6.49	Charset 20	£4.49
Ski Run	£4.49	Rabbit Base	£14.49
Cosmic Battle	£4.49	Rabbit Writer	£19.49

TEXAS T199/4A

FREE! INVADER'S CARTRIDGE Worth £18.95 with every TEXAS T1/99/4 purchased – use your free Offer Coupon

A very expandable and comprehensive micro from TEXAS INSTRUMENTS – and now available at super LOW prices from SPECTRUM HOME COMPUTER CENTRES.

- 16K RAM (expandable to 48K)
- Built-in 14K Byte BASIC Interpreter
- 16 Bit Microprocessor
- 16 Colour High Resolution graphics
- Extensive range of solid state software command modules available from games to architectural aids.
- Optional programming languages – UCSD PASCAL, TI-LOGO & ASSEMBLER.

Spectrum LOW Price £173.00 Price inc VAT £198.95

TEXAS PERIPHERALS —just arriving in U.K.	EX. VAT	INC. VAT
Speech Synthesizer	£81.70	£93.95
Peripheral Exp. System	£147.78	£169.95
Disc Cont. Card	£124.30	£142.95
Disc Drive	£234.74	£269.95
RAM Exp. Card	£179.57	£206.50
Matrix printer	£347.78	£399.95
Software Entertainment		
TI Invaders	£16.48	£18.95
Tombstone City	£19.96	£22.95
Attack	£19.96	£22.95
Car Wars	£23.43	£26.95
Munchman	£23.43	£26.95
Adventure & Private	£31.26	£35.95
Education		
Number Magic	£12.13	£13.95
Addition/Subt. 1	£23.43	£26.95
Teach yourself beginners BASIC	£8.26	£9.50
Home Budget Management	£19.96	£22.95

BOOKS

We stock an extensive range of books to help you. Here are just few to whet your appetite.

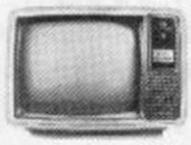
CP/M Handbook	£11.50
DON'T	£9.65
Programming the Z80	£11.95
Programming the 6502	£10.75
Your First Computer	£7.75
BASIC Handbook (2nd edition)	£14.95
A-Z of Computer Games	£5.60
Atari Basic	£5.95
Basic "BASIC"	£9.95
BASIC Computer Games	£6.95
BASIC Computer Programs for Business (VOL I)	£8.55

NO VAT ON BOOKS

ACCESSORIES

	Exc.VAT	Inc.VAT.
SANYO		
Slim 3G Cassette Recorder (for use with Nascom and Dragon)	£26.04	£29.95
CTT 3106 14" Colour TV Set	£199.96	£229.95
ACCUTRAK		
C12 Cassettes	£0.43	£0.50
Single sided, double density disks (for Commodore, Atari, Apple, Tandy etc.	£1.70	£1.95
Double sided, double density disks (for Sharp and Superbrain)	£2.87	£3.30
Single sided, double density double track disks (for Nascom and Commodore 8050)	£2.30	£2.65
Disk Bank Interlocking cases for diskettes	£3.91	£4.50
Disk head cleaner	£13.00	£14.95
Single part 11" x 9½" printer paper, box of 2200 sheets	£10.39	£11.95

Incredible Value!
BMC 12" Green Monitor

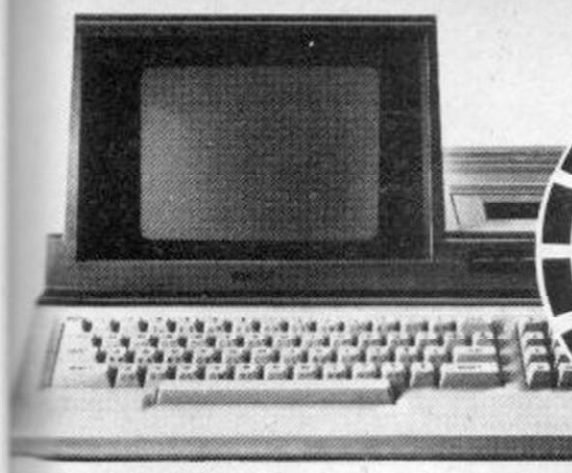


■ 18 MHz band width
■ Green and black display

Spectrum LOW price £69.00
(£79.35 inc. VAT)

	Ex VAT	Inc. VAT
Prince 12" Monitor	£86.00	£98.00
Sanyo 12" SM-12H	£84.00	£96.60
Sanyo 14" SCM-14H Colour	£350.00	£402.50

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.



FREE!
£75 WORTH of software
with every **MZ80A** purchased

SHARP MZ-80A

Desk top genius! – the all-in-one SHARP MZ-80A. A personal computer designed with the serious user in mind. **ready to run the moment you get it home.** Built-in keyboard, CRT 9" display and cassette data storage with **48K RAM**. The BASIC with extra useful additions, offers quite a powerful micro for the home or business. ■ 4K Byte ROM + 48K Byte RAM + 2K Byte Video RAM ■ ASCII profiled keyboard + numeric pad ■ 2 page Video RAM allows screen to be scrolled up or down. ■ CP/M available.

Spectrum LOW price £475.00

Price inc. V.A.T. £546.25

MZ Software from KUMA

Pakman (48K)	£8.00
Asteroids	£8.00
Frogger	£8.00
Chess	£14.00
Cribbage	£10.50
Adventure	£10.50
Tombs of Karmak	£8.00
Map of U.K.	£10.50
Music Composer	£10.50
Junior Maths	£5.50
Home Budget	£5.50
Word Pro (Cass)	£39.50
Word Pro (Disk)	£79.95
Data Base (Cass)	£29.50
Data Base (Disk)	£59.50

All KUMA prices excluding V.A.T.

SHARP PERIPHERALS FOR MZ80A

	EXC. VAT	INC VAT
Twin floppy disk unit (5¼")	£590.00	£678.50
Single floppy disk unit	£400.00	£460.00
Floppy disk interface card	£100.00	£115.00
Floppy disk cable	£24.00	£27.50
Master diskette and manual	£31.00	£35.66
Expansion unit (disk drive or printer)	£100.00	£115.00

SHARP HAND HELD COMPUTERS

Pocket-sized genius at your command – we sell the well established PC1211 & the new 1500 Models.

SHARP PC1211 £65.00 Ex. VAT (£74.75 inc. VAT)

SHARP PC1500 £147.48 Ex. VAT (£169.95 inc. VAT)

PC 1500 Printer/cassette interface	£130.39	£149.95
PC 1500 4K RAM upgrade	£43.43	£49.95

Attention real computer enthusiasts!

NASCOM Special Edition

SAVE £15 on the **PRINCE 12" Monitor** when purchased **together** with the **NASCOM Special Edition.**

Are you a real computer enthusiast? If you're looking for a machine to take you **way beyond** the sphere of a normal domestic computer you need go no further than the **NASCOM SPECIAL EDITION.** To give you some indication of it's scope its already been adopted for many commercial applications including **Hotel Booking Systems, blood grouping, weaponary & satellite tracking** etc. Now **SPECTRUM** bring you the opportunity to embark on a **remarkable sphere of computing** with the **infinitely expandable NASCOM. It's a terrific buy!** – Trade-in your **old machine & trade-up** to a **NASCOM SPECIAL EDITION – NOW!**

■ **Programmable in BASIC and machine code** ■ **8K Memory expandable easily to 56K with plug-in board** ■ **Facility for up to 206K onboard memory** ■ **Super colour graphic facilities** ■ **Full range of disk drives, printers & various input/output facilities can be added** ■ **Supplied complete with Mains Lead & Plug, TV, Monitor & Tape Recorder connections.**

Spectrum **LOW** price **£429.95** **Ex. VAT** (£494.44 inc. VAT) Prince Monitor illus. extra.

NASCOM Special Edition 48K RAM Board (ready to plug in) **£130.00 ex. VAT** (£149.50 inc. VAT).

EPSON PRINTERS

FREE! PAPER Worth £11.95 with every EPSON Printer purchased see your Free Offer Coupon

Chosen by SPECTRUM for their reliability, the superb new **top quality** graphic printers from **EPSON.** New features include **super & subscript, underlining & deletion.** If you're looking for an **up-market** printer at a **down-to-earth-price,** call in and see the **EPSON** range at **SPECTRUM.**

Model	EX. VAT	INC. VAT
MX80-T3	£299.00	£343.85
MX80 F/T Type III	£335.00	£385.25
MX100 Type III	£429.00	£493.35

Please see your SPECTRUM dealer for prices of INTERFACE/CABLE options.

There's a SPECTRUM HOME COMPUTER CENTRE near you...

ALFRETON
Gordon Harwood
69/71 High Street,
Alfreton, Derbyshire
Tel: 0773 832078

ASHFORD
Ashford Computer Centre
2 Station Parade, Clarendon Rd,
Ashford, Middlesex.
Tel: 07842 44955

BASILDON
Godfrey's
28-32 East Walk, Town Centre,
Basildon, Essex.
Tel: 0268 289379

BASINGSTOKE
Fisher's
2/3 Market Place,
Basingstoke, Hants.
Tel: 0256 22079

BATH
Software Plus
12 York Street, Bath
Tel: 0225 61676

BIRMINGHAM
Sherwoods
Great Western Arcade,
Birmingham 2.
Tel: 021 236 7211

BRADFORD
Photosave
18 Cheapside, Bradford BD1 4JA
West Yorkshire.
Tel: 0274 308598

BRIGHTON
Capricorn
1 Queens Road, Brighton, Sussex
Tel: 0273 29634

CAMBRIDGE
KP Ltd.,
12a Kings Parade, Cambridge.
Tel: 0223 68087

CARDIFF
Randall Cox
18-22 High St. Arcade, Cardiff,
Tel: 0222 31960

DERBY
C T Electronics
The Spot, Derby.
Tel: 0332 44760

EDINBURGH
The Silicon Centre
6-7 Antigua St., Edinburgh,
Scotland.
Tel: 031 557 4546

GLASGOW
Victor Morris Ltd.,
340 Argyle St., Glasgow G2.
Tel: 041 221 8958

GUILDFORD
The Model Shop
23 Swan Lane, Guildford,
Surrey GU1 4EQ
Tel: 0483 39115

HARROW
Camera Arts
(Micro Computer Division)
24 St. Ann's Road, Harrow,
Middlesex.
Tel: 01-427 5469

HATFIELD
Microworld
2 Crawford Road, Hatfield, Herts.
Tel: 82 64137 (Temporary number to be changed)

LEEDS
Bass & Bligh
4 Lower Briggate, Leeds,
W Yorkshire.
Tel: 0532 45445

LEICESTER
Youngs
40-42 Belvoir St.,
Leicester.
Tel: 0533 54774

LONDON N1
ASP Micro Systems
185 Upper Street,
Islington.
Tel: 01-226 9392

LONDON SE9
Square Deal
375 Footscray Road,
New Eltham, London SE9
Tel: 01-859 1516

LONDON W11
Electroleisure
120 Notting Hill Gate,
London W11
Tel: 01-221 7029

MACCLESFIELD
Camera & Computer Centre
118 Mill Street, Macclesfield,
Cheshire.
Tel: 0625 27468

MANCHESTER
Lomax Ltd.
8 Exchange St., St. Ann's Square,
Manchester A2 7HL
Tel: 061 832 6167

MIDDLESBROUGH
McKenna & Brown
190 Linthorpe Road,
Middlesbrough.
Tel: 0642 248345

NEWCASTLE-ON-TYNE
Turners
29-31 High Friars, Eldon Square,
Newcastle.
Tel: 0632 612901

NEWCASTLE-ON-TYNE
Newcastle Camera
& Computer Mart
16 Northumberland, Court,
Newcastle-on-Tyne.
Tel: 0632 327461

NOTTINGHAM
Cameo Computers
8/9/10 Trinity Walk, Nottingham,
Tel: 0602 42912

READING
David Saunders Computer Centre
8 Yield Hall Place, Reading,
Berks.
Tel: 0734 580719

RUGBY
The Rugby Micro Centre
9-11 Regent Street, Rugby.
Tel: 0788 70522

TEDDINGTON
"Andrews"
49 Broad Street, Teddington,
Middlesex.
Tel: 01-977 4716

WALLINGTON
Surrey Micro Systems Ltd.
53 Woodcote Road, Wallington,
Surrey.
Tel: 01-647 5636

WATFORD
SRS Microsystems Ltd.
94 The Parade, High Street,
Watford, Herts.
Tel: 0923 26602

WEST BROMWICH
Bell & Jones
39 Queens Square
West Bromwich.
Tel: 021 553 0820

WIDNES
Computer City
78 Victoria Road,
Widnes, Cheshire
Tel: 051 424 9999

WIGAN
Wilding Ltd.
11 Mesnes St., Wigan, Lancs.
Tel: 0942 44382

WORKING
Harpers
71-73 Commercial Way, Woking,
Surrey.
Tel: 04862 61061

WORCESTER
David Waring Ltd.
1 Marmion House, High Street,
Worcester.
Tel: 0905 27551

COMPUTER DEALERS!
(or prospective Computer Dealers!)
If you would like to know more about becoming a **SPECTRUM APPOINTED DEALER** on an **exclusive area basis,** please contact **MIKE STERN** or **ALAN WARREN** on **(0727) 66646**
Spectrum (U.K.) Ltd. Unit 6, Marlborough Trading Estate, Lattimore Road, St. Albans, Herts.

MAIL ORDER
When it comes to **MAIL ORDER** our **service is FAST!** with **SECURICOR DELIVERY** to **anywhere in the British Isles.** – Ask your nearest **SPECTRUM** dealer for further details at time of ordering.

Up to £1000 INSTANT CREDIT with a SPECTRUM CHARGECARD
With a **SPECTRUM CHARGECARD** you choose the credit limit to suit **YOU.** e.g. a **monthly payment of £10** gives you **£200 credit.** Ask your nearest **SPECTRUM COMPUTER CENTRE** for written details on how to apply for **your SPECTRUM CHARGECARD – NOW!**
(Typical APR 30.6%)

V.A.T.
You will see that we quote our prices both **including VAT** and **excluding VAT – no hidden 15%** to **suddenly up-lift your bill** but also making our prices **easier** to compare with our competitors.

Not all stores carry every advertised item, please phone before making a journey — Prices correct at time of going to press E. & O.E.

EVERYTHING SPECTRUM OFFER... PLUS

SHARP

We have in stock the full range listed by Spectrum.

PLUS The MZ 80B and a full range of peripherals.

APPLE

Apple II and III Computer Systems in stock and we are an authorised Service Centre for Apple.

PLUS We are an appointed dealer for Jarman Business Systems.

NASCOM

	EXC VAT	INC VAT
Nascom 2 (kit) No user RAM	£225.00	£258.75
Nascom 2 (built) No user RAM	£285.00	£327.75
Nascom Power Supply (kit)	£35.00	£40.25
Nascom Micro-ed 8K Computer	£399.00	£458.85
Nascom "Special Edition" 8K Computer	£429.95	£494.44
Nascom 3 48K Computer	£499.00	£573.85
Nascom RAM B 16K Board (kit)	£80.00	£92.00
Nascom RAM B 16K Board (built)	£100.00	£115.00
Additional 16K RAM	£15.00	£17.25
Additional 32K RAM	£30.00	£34.50
48K Add-on Memory Board for "Special Edition"	£130.00	£149.50
I/O Board (kit)	£45.00	£51.75
PIO Option	£12.00	£13.80
CTC Option	£14.00	£16.10
UART Option	£16.00	£18.40
Nascom Single Disk Drive inc FDC Card	£470.00	£540.50

STOP PRESS!

Scoop purchase of manufacturers final stock.

NASCOM IMP Printer complete with 'IMPRINT' ROM.

Previously £325 plus VAT.

Now £199.95 exc. VAT.

£229.95 inc. VAT.

THE SYMBOL OF VALUE

SRS MICROSYSTEMS

94 The Parade, High Street, Watford, Herts.
Telephone (0923) 26602.

YOU'LL VALUE OUR EXPERIENCE, YOU'LL VALUE OUR PRICES. FREE SECURICOR DELIVERY OR POST ON ORDERS OVER £50

Keen prices and knowledgeable staff have created a need for bigger and better new premises in Watford. Access & Barclaycard welcome. Hire purchase and part exchange available. E. & O.E.

NEW LARGER PREMISES

adventure

SPECTRUM ZX81 BBC nascom

Colossal Adventure . . . . . **16K/32K** . . . . . **£8/£10**
The classic mainframe game "Adventure", with all the treasures and creatures of the original. And with 70 extra rooms!

Adventure Quest . . . . . **16K/32K** . . . . . **£8/£10**
From the Great Forest, up Orc Mountain, braving fire, swamp and caverns on a quest against Tyranny. Face vampires, demons, wizards, 200-foot worms. . .

Adventure games are fascinating. You enter English phrases and the computer acts as a window to worlds of magic.

Every Level 9 adventure has over 200 individually described locations and a game may take weeks to solve! Only our combination of data *and* code compaction allows so much to be provided.

FREE P&P. NO VAT. Money back if unhappy.
Supplied on TDK cassettes. Send order, describing your computer, or a SAE for full details of all our programs to:

LEVEL 9 COMPUTING

229 Hughenden Road, High Wycombe, Bucks

AND NOW!

Spectrum workstation

Following the success of our ZX81 plinth we have introduced a workstation for the Spectrum. This stylish ABS plinth raises and tilts the TV for better viewing whilst angling the Spectrum and making typing easier. The PSU is hidden underneath, the printer and cassette may still be used, and a matching, stackable unit for Microdrives will be available.

Peter Furlong Products, Unit 5, South Coast Road Industrial Estate, Peacehaven, Sussex BN9 8NA. Tel. (07914) 81637.

Now Available

"WINGED AVENGER" and "RENUMBER" SPECTRUM VERSIONS

"WINGED AVENGER"
Fast and furious SPECTRUM version has SOUND and defined GRAPHICS. 7 LEVELS, 3 WAVES, MOTHER SHIP, HIGH SCORE. Spectrum or 16k ZX81 at £4.50.

"DO NOT PASS GO"
RENAMED under protest. A simulation of THE best selling board game. You know Park Lane and all that. Up to six players all board features handled by the ZX81. No cheating allowed. £6.95.

"TRADER JACK"
An adventure trading game. Are you an entrepreneur. Can you beat the system. All the DECISIONS are yours. Stand or Fall. Uses all but a few BYTES of 16k. Are you as good as you think! £5.95.

"GREATEST GAMES NO 1"
TEN Yes 10 good games on one tape. Intended for XMAS but ready early. Most contain MACHINE CODE, all worth playing. MacMaze, Gobler, Astro Defender, Vampires, Suicide, Minefield, Frogler, Startreker, Dictator and Bomber. Only 50p a game. A good buy at £5.00.

"MENU"
A directory program that site at the beginning of those cheaper C60/90's. When set up MENU lists program TITLES, POSITION on TAPE, and the LENGTH of all programs. Now you can put a whole LIBRARY of PROGRAMS on one tape and find them quickly. At £3.50 it will pay for itself.

"ADVENTURE IN TIME"
Not for the first timer. A 16k ZX81 to run an adventure of around 60k. The most extravagant game for the ZX81. Only £8.00.

"RENUMBER DELETE"
M/CODE, a fast and efficient program renumbers all RUN's, GOTO's, GOSUB's, LIST's, LLIST's. Renumber or Delete all or BLOCKS, Only £4.95.

"ZX81 TOOLKIT"
3 further features added to RENUMBER DELETE. Decimal M/CODE loader, handles LABELS and TEXT, with EDIT features. 1st REM Expander, instantly expand the 1st REM ready for the LOADER to fill. MEMORY LISTER instant display of 66 BYTES and LOCATIONS. Page forward or back at a single KEYSTROKE. £6.95.

N.B. These reduced prices only till XMAS. All ZX81 programs need 16k. Submissions Wanted SPECTRUM OR ZX81.

WORK FORCE
140 Wilsden Ave., Luton, Beds.

NEW ZX PRODUCTS FROM PRINT 'N' PLOTTER

Illustrated at every stage

ZX GRAPHICS PROGRAMMING MADE EASY
Professionally-produced full colour A4, 24 page Manual packed with ZX Graphics Programming techniques Information Graphics. Sketchpads. Saving your 'Art' Graphics Stringing and ZX Printer Graphics.
Only **£1.50**

ZX PRINTER PAPER £10-95!

GOOD NEWS FOR PRINTER OWNERS

ZX PRINTER PAPER
Five rolls of Printer paper — identical to Sinclair's but a quid cheaper! each roll is approximately 65 feet long — excellent printing standard . . . fast delivery
£10.95 for 5 rolls.

Also available:
Print 'n' Plotter Jotters – 100 pages of Print and Plot grids in fully-bound Pad . only £3.50.
Print 'n' Plotter Films – The re-usable transparent film version of the Jotter ideal for copying graphics from photos, illustrations, charts etc only £2.25.

Post today to: Print 'n' Plotter Products (Y7) 19 Borough High Street London SE1 9SE (or detail your requirements in a letter).
Please forward me . . . . . Manuals @ £1.50 each
. . . . . Packs of Printer Paper @ £10.95 each.
. . . . . Print 'n' Plotter Jotters @ £3.50 each.
. . . . . Print 'n' Plotter Films @ £2.25 each
All prices include U.K. VAT, postage and packing.
☐Remittance enclosed. ☐Please bill my Access/Barclaycard/Visa

No:_____

Name _____

Address: _____

_____

_____

_____

Print 'n' Plotter Products©

FOUR NEW VIC ADD-ONS FROM ADDA

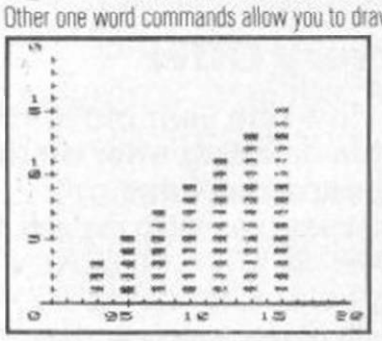
1. **Light up with VicRel.** VicRel is a control relay that plugs straight into the Vic user port to give simple, programmable switching of electrical apparatus in the home, office or factory. Its six relay outputs can control door locks, lamps, valves, tools, ventilators. And two inputs allow the Vic to read signals from external sources such as thermostats, push buttons or light activated switches. VicRel eliminates black boxes full of wires and represents one of the most exciting, value-for-money, firmware additions to any Vic computer system.

£28.95 INC VAT

2. **Plot away with VicGraf.** This cartridge allows you to explore the complicated equations and functions of graphs. The menu screen, activated by the Vic's special function keys, will automatically plot a graph, define new functions, calculate accurate values of an intersection, find the maxima and minima of a function. Simple editing allows you to check current functions and to change them. A necessary and attractive addition to any educational situation where graphs need to be explored.

£28.95 INC VAT

3. **Crunch & Display with VicStat.** A plug in cartridge that undertakes statistical calculations—such as Meanvalues, Standard deviations and Variances—and displays using single commands. Other one word commands allow you to draw vertical and horizontal bar charts, to plot graphs, and to specify the scales and the colours used by these commands. It will also sort numeric and character strings. Finally, all or part of screen displays can be copied to the Vic Printer.



VicStat comes complete with a detailed operating guide.

£28.95 INC VAT

FORTH

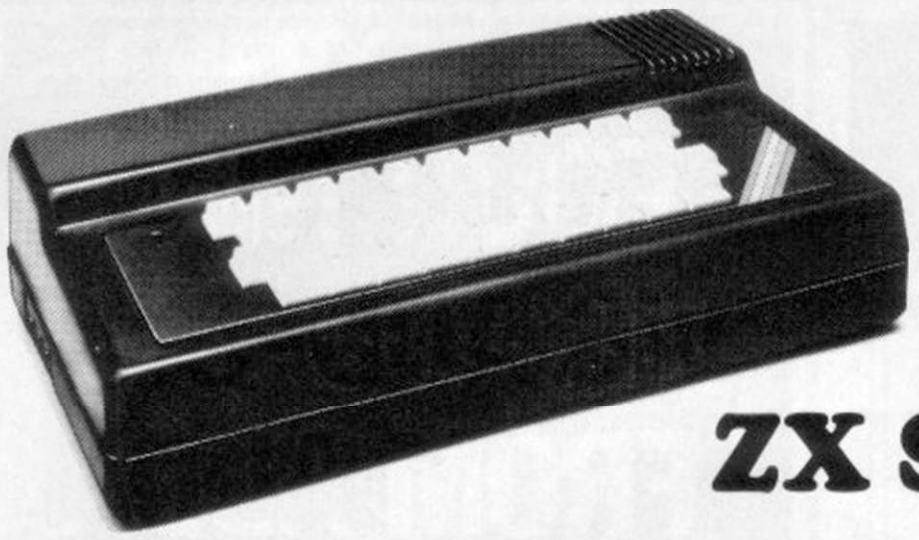
The VicForth plug-in cartridge, complete with 3K of additional memory, takes programming into new dimensions. As both an operating system and program development aid VicForth can speed up program writing and speed of operation.
VicForth is based on fig-Forth and is almost identical to Pet Forth. It does however support the Vic cassette deck—an unusual feature. For those who do much programming a Vic Disk unit is suggested. VicForth provides several hundred one-word commands—listed in the detailed user guide—that can be added to.

£38.95 INC VAT

ADDA COMPUTERS
Contact your local dealer for these VIC products from Adda.

adda

In case of difficulty—or to see demonstrations—call the VIC Centre 154 Victoria Road, London W3. 01-992 9904.



New From Fuller

FD System for the

ZX SPECTRUM

£39.95

+ £2.50 p & p.

Professional Keyboard & Case —

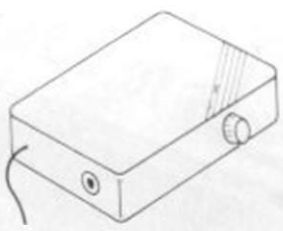
This unit has the same high standard as our ZX81 unit.
Tough A.B.S. Plastic case encloses our Keyboard, the Spectrum Printed Circuit Board and the Power Supply.
Our own Power supply is available:- 9 volts DC at 2 amps.
Mains either 110v or 240v AC at £5.95 + 80p. p & p.

The Keyboard has 42 keys with all the spectrum functions printed onto them, the full travel key switches have gold plated contacts and a guaranteed life of 10^6 operations.
INSTALLATION - Simply unscrew the ZX printed circuit board from its case and screw it into the FD case, plug in the keyboard and that's it. No technical know how or soldering required, the built unit is tested and comes with a money back guarantee.
Spectrum Keyboard and Case Kit £33.95

Our Mother Board for the spectrum has 2 slots at £15.95 or 3 slots at £19.95, this unit also fixes inside the case. p & p 80p.

SPECTRUM SOUND AMPLIFIER £5.95 + 80p p & p.

Complete with leads, volume control and loud speaker in tough ABS Plastic case measuring 5" x 3" x 1" just plugs into your spectrum MIC input.



First Anniversary Offer

The FD System is now one year old and Fuller are celebrating with this amazing offer on the FD42 Professional Keyboard and Case.
Makes an ideal Christmas present to expand the new low priced Sinclair ZX81. Or why not buy a new ZX81 based system directly from us, consisting of ZX81, FD42 keyboard and case with power supply and reset switch, leads and manual **£69.95 + £2.50 p & p**
FD42 Keyboard and Case Kit £24.95 + £2.50 p & p
FD42 Keyboard kit £14.95+80p p & p

£29.95

+ £2.50 p & p

STAR TREK FOR ZX 16K SPECTRUM

Play this popular adventure game on your Spectrum with ship display and sound
£5.00 + 50p p & p

GUARANTEED 14 DAYS DELIVERY FROM RECEIPT OF ORDER, OR CALL TO THE ZX CENTRE.

Mail to **FULLER MICRO SYSTEMS,**
The ZX Centre, Sweeting Street, Liverpool 2. England, U.K.
Please Supply:-
Name .....
Address .....

SAE for more details — Enquiries: Tel. 051-236 6109

FULLER FD SYSTEM

★★ NEW FROM CAMEL PRODUCTS ★★

AN INNOVATIVE PRODUCT
FOR YOUR ZX81

Faster than a Floppy
Easier than an EPROM

MEMIC-81

HOW IT WORKS & WHAT IT DOES

This useful accessory for ZX81 users is a 2 kilobyte (or 4KB) memory module using chips fabricated in a remarkable technology. When not actually in use, these CMOS chips can be put into standby. They then take only a minute current to reain the data securely. The Lithium battery fitted in the unit will last for 5 to 10 years. Plug it into the ZX81 and flick a switch and the data is ready for retrieval.

MEMIC-81 resides in the 8-12K area of ZX81's memory map. This area is not directly addressed by Basic, but Basic programs can easily be stored and retrieved by means of the tiny 12 byte routine provided. This can itself be stored in CMOS, so that Basic programs become available simply by entering PRINT USR . . . Machine Code routines are directly accessible.
Clear User Notes, Application Notes, Program Example and the necessary routines are provided with MEMIC-81, which comes cased and with an extender card at the back.
For a picture of MEMIC-81, see Sept Y.C. page 122.

2kB MEMIC-81 £24.95 + VAT 4kB MEMIC-81 £29.95 + VAT

OTHER CAMEL PRODUCTS

MEMIC T	2 kB Towerblock version for any System	£29.95 incl.
MEMIC L	2 kB Low Profile version with cabled connector	£29.95 incl.
PIO-81	8+8 Ch. latched Input/Output ZX81 card	£13.00 + VAT
ROM-81	2 kB-8 kB ROM/EPROM Unit for ZX81	£14.94 + VAT

CAMEL PRODUCTS

Cambridge Microelectronics Ltd, One Milton Rd, Cambridge. CB4 1UY Tel (0223) 314814

Spectrum Owners!

SOFTWARE

Runs in either a 16k or a 48k Spectrum, and is supplied on cassette with a printed inlay card and full instructions.

3D MAZE OF GOLD **£5.95**
Machine coded to provide fast, full colour 3D perspective views as you scour the labyrinth for GOLD, but you must find the exit or it could well be worthless! Great fun.

LIFE **£4.95**
Also in machine code implementing J.H. Conway's rules of life at an amazing 2 generations a second. Including an easy to use pattern editor and audible stagnation alarm.

MUNCHMAN **£3.95**
Full feature arcade game, including bonus points if you catch a ghost that's turned white and high score feature.

BEAR ISLAND **£3.50**
A new arcade style game. Trapped in the Antarctic with up to 15 angry Polar Bears, can anyone survive the 8 progressively harder frames to escape? I certainly can't.

MONGOOSE **£3.50**
Another new arcade style game. Your snake is trapped in an apple orchard. Eating a windfall will increase his length, but the mongoose is always ready to take a bite!

ZX-CESIL **£4.95**
A low cost, full implementation written specifically for those doing 'O' level computer studies. Includes full instructions. (A version for the 16k ZX81 also available)

AMPLIFIER **£9.50 + 50p P&P**
Change your Spectrum's whisper to a roar! Smart console style case, with built in speaker. Just plug into Spectrum.

GILSOFT
30 Hawthorn Road, Barry, S. Glam. CF6 8LE
Tel: (0446) 736369

THE COMMODORE 64

THE PERSONAL COMPUTER

£299
PLUS VAT

- 64k built in RAM
- 40 column colour display—tv interface
- Upper and lower case characters and graphics
- Sprite graphics on eight levels
- Music synthesiser with three voices and nine octave range

Business and home utility programs available soon. Can use VIC-20 printer and disk (with rom upgrade). Supports other languages including Comal and Pascal—has CP/M option.

From Adda Computers
Telephone: 01-992 9904
for credit card orders or call at
the VIC Centre, 154 Victoria Road,
London W3 (near Acton North tube)

adda

FOR PERSONAL AND BUSINESS COMPUTING THAT ALWAYS ADDS UP TO A GREAT DEAL MORE.

BBC SOFTWARE CASSETTES

MISSILE CONTROL the first implementation on the BBC Micro of the popular arcade game.....£9.00
MAZE MAN an authentic version of the popular arcade game.....£6.00
BALLOONS a highly original game that soon becomes compulsive playing.....£6.00
DISSASSEMBLER the memory dump routing includes a scrolling back in memory facility.....£5.00

30+ PROGRAMS FOR THE BBC, MICROCOMPUTER

This Book contains program listings with explanations & tips on using the BBC Micro

GAMES UTILITIES GRAPHICS & MUSIC

"ASTRO RUN" "FASTFINDER" "3D GRAPHICS"
Most programs will run on Models A & B
Edited by C. J. Evans, various Authors.
A pair of cassettes with all the programs is available.

BOOK £5.00
BOOK & CASSETTE SET £9.00

CASSETTE LEADS for the BBC Micro

The BBC Micrto comes with an incomplete lead cassette lead

7 Pin Din to 2x3.5mm & 1x2.5mm minijacks		£4.00
7 Pin Din to 5 Pin Din & 2.5mm minijack		£4.00
7 Pin Din to 7 Pin Din		£4.009
7 Pin Din PLUGS	Two for	£0.65
6 Pin Din PLUGS (for RGB socket)	Two for	£0.65
5 Pin Din PLUGS (360° for RS232)	Two for	£0.65

RS423 LEADS

RS423 TO RS423 (BBC Micro to BBC Micro)
Allows two BBC Micro's to 'talk' to each other
Two metre cable.....£4.00
Four metre mable.....£5.00

TELEVISION/MONITOR LEADS

Phono plug to Co-ax with high quality cable.....£3.00
BNC Plus to Phono plus
(i.e. BBC Micro to Redifussion TVRM).....£2.20

PRINTER CABLES

BBC to 36 way Centronics Type Connector.....£17.00
BBC to 25 wat D Type (for use with RS232).....£9.50
BBC to 40 way edge connector (Centronics 737/739).£20.00
TORCH to 36 way Centronics Type Connector.....£20.00

BBC UPGRADE KITS

RAM UPGRADE 8x4816 (100ns) Special offer **£29.00**
FULL UPGRADE KIT £62.00

PRINTERS

STAR DF8480 From £250.00 inclusive of VAT
80 CPS : 80/96/132 COLS
BIDIRECTIONAL LOGIC SEEKING
FRICTION & TRACTOR FEED
CENTRONICS £217.39 + £32.61 VAT = £250.00
RS232 £235.00 + £35.25 VAT = £270.25
(24 hr Securicor delivery for Printers £8.00)
VAT included where applicable
POSTAGE: Add 50p on all Orders under £10.00

C. J. E. Microcomputers

Dept (YC), 25 HENRY AVE, RUSTINGTON, W. SUSSEX, BN16 2PA (09062) 6647

SOUND with ZX-81!

MAKE AMAZING SOUND EFFECTS WITH YOUR ZX-81

£25.95 THE ZON X-81
incl p&p & V.A.T.

* The ZON X-81 SOUND UNIT is completely self-contained and especially designed for use with the ZX-81. It just plugs in – no dismantling or soldering.
* No power pack, batteries, leads or other extras.
* Manual Volume Control on panel – ample volume from built-in loudspeaker.
* Standard ZX-81 – 16K Rampack or printer can be plugged into ZON X-81 Sound Unit without affecting normal ZX-81 operation.
* Huge range of possible sounds for games or: Music, Helicopters, Sci-Fi, Space Invaders, Explosions, Gun-shots, Drums, Planes, Lasers, Organs, Bells, Tunes, Chords etc., or whatever you devise!
* Uses 3-channel sound chip giving programme control of pitch, volume of tones and noise, all with envelope control.
* Easily added to existing games or programmes using a few simple "BASIC" lines.

FULL instructions with many examples of how to obtain effects and the programmes, supplied. Fully Guaranteed.

BI-PAK Dept YC10 P.O. Box 6, 63A High Street, Ware, Herts.
BARCLAYCARD VISA
Access & VISA accepted Ring 0920 3182 for immediate despatch.

SOFTWARE

for ZX-81, ZX Spectrum, BBC Micro

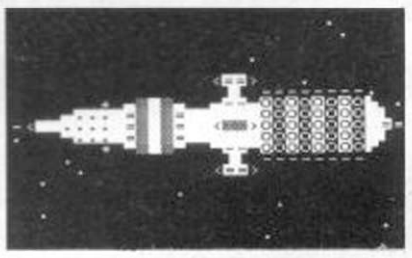
New maths programs – improve your maths and programming skills by playing Simon maths **Games**.
Choose your own level of difficulty – suit ages 10-16.
10 programs on each tape – most incorporate **Moving Graphics** and are fun to run.
Let your computer help you to pass your exams.

Maths 1	Number, Area, Fractions, Decimals, Money, Length, Number, Estimation, Test 1, Game 1.
Maths 2	Volume, Ratio, Percentages, Perimeter, Bases, Time, Number, Estimation, Test 2, Game 2.
Maths 3	Directed Number, Co-ordinates, Angles, Scale, Probability, Density, Temperature, Estimation, Test 3, Game 3.
Maths 4	Square Roots, Indices, Circles, Inequalities, Statistics, Number, Fractions, Angles, Test 4, Game 4.
Maths 5	Equations, Directed Number, Statistics, Probability, Circles, Equations, Pythagoras, Simultaneous Equations, Test 5, Game 5.

Simon Software

Quality tapes copied at normal speed for better reproduction.
Cassettes with Printed Programs £5 (inc. VAT). Please add £1 p&p.
FREE! blank tape with each **set** ordered.
Send cheque/PO to: Simon Software, Dept. E.S. Freepost, New End, Redditch, Worcestershire.
(Please state ZX-81 (1K), (16K) or BBC Micro) or **ZX Spectrum.**

VIC 20 16K ZX 81



SUBSPACE STRIKER... It comes from out of nowhere and then vanishes back into the shadows. With your deadly Antimat torpedoes, you unleash havoc in the Federation Spacelanes. VIC20 £9.50. ZX81 £5.50.

STARQUEST... A voyage of discovery and adventure in the cosmos. With the help of your onboard computer, you seek a habitable planet amidst the perils of deep space. VIC20 £9.50. ZX81 £5.50.

ENCOUNTER... Would you know what to do if you were abducted by alien beings? In this game the space invaders play YOU! VIC20 £9.50. ZX81 £5.50.

TRADER... Yor latest top selling epic. A Triology of three full 16K programmes chained together to give a fantastic 48K graphic adventure. As an intergalactic trader you seek fame and fortune and deal with some very bizarre customers indeed. VIC20 cassette or disk £18.50. ZX81 cassette £10.50.

The ultimate in graphic adventure games, Pixel now also have a range of programmes for the unexpanded VIC20 featuring hi res graphics. Send SAE for more details.

PIXEL

Pixel Productions 39 Ripley Gdns., London SW14 8HF

ZX81 Hi-Res Graphics Board

- Fully programmable 256 by 192 pixel resolution
- Powerful BASIC commands for USER DEFINABLE GRAPHICS
- 2k EPROM with graphics routines including PLOT, PRINT, PAGE, CLS, COPY
- Simple to generate your own exciting displays
- Stylish case which fits between ZX81 and RAM pack
- No additional power supply or soldering necessary
- Full instructions provided, fully guaranteed

Price breakthrough at £49.95
SAE for data sheet

★ ★ ★ NIGHT GUNNER ★ ★ ★

Enemy aircraft approaching... BATTLE STATIONS! Survival depends upon your skill to shoot down the enemy fighters as they move in for the attack. Beware, the going gets fast and furious as you survive each mission in this entertaining and challenging machine code game with excellent graphics.

Requires 16k RAM only **Highly addictive! £4.95**

★ ★ ★ FIGHTER PILOT ★ ★ ★

15 feet... 7 feet... TOUCHDOWN! Instrument landings are not always as easy as this. You are in full control from take-off to landing during this real-time flight simulation of a jet fighter. Written by pilots — tested by pilots — for you to fly like a pilot.

'An excellent program!' Capt. H, Senior British Airways pilot.

Requires 16k RAM only **Super value at £4.45**

All prices inclusive
(Overseas add £0.55 p&p per tape, £2.00 for HRG board)
All products guaranteed, refund if not satisfied.

DIGITAL INTEGRATION **MAIL ORDER ONLY**
Dept. YC
22, Ash Church Road
Ash, Aldershot,
Hants. GU12 6LX

IT'S MORE FUN LEARNING WITH VIC -at Home or School

If you are over 3 years old, and still young enough to hit the keys, then these new VIC programs are for you.

From top software publishers ASK, they let you learn—and laugh about it too.

Fabulous graphics. Demanding ideas that make learning lots more fun.

All on cassette at £8.95 inc. VAT.

TWISTER. Designed to improve concentration and logic. Rearrange a geometric puzzle—a bit Rubik cube-like—so that no row or column contains a repeated colour. There can be from 3-10 columns and if you cannot get out of it, Twister will do it for you. For really clever users you can go into the Super-Twister mode where you must arrange the squares so that no diagonal, as well as row or column, contains the same coloured square. This is so difficult that the computer does not give you the answer! Supposedly designed for age 8 upwards.

NUMBER CHASER. Designed to improve estimating and multiplication skills for 5-12 year olds. A car race where you move against the computer according to your skill at estimating the given sum. We forget that in the age of the calculator estimating is important to see if your computer, calculator etc has come up with the right answer.

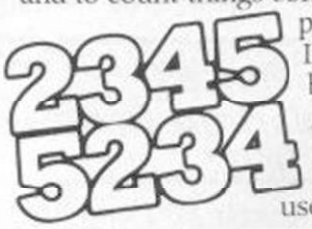
Number Chaser has superb graphics and sound—you would not want more than a few of these in a classroom at any one time since the level of excitement, as well as learning, is very high.

FACEMAKER. This is designed to improve spelling, to expand vocabulary and also sharpen observational skills. Designed for 5-12 year olds this is an interactive program where you draw people's faces.

Superb graphics that—like most of these ASK programs—fill the monitor or TV screen and are not restricted to the normal VIC format.

A beautifully crafted piece of software that will find many applications in school and at home. It will also be of special benefit to people teaching children who are slow to learn to read.

WE WANT TO COUNT. This is a program for children of three years and upwards who want to learn numbers and to count things correctly. There are four parts in the program with games-type graphics. In two of these you can select levels between one and five. This program has been designed to be extremely simple to operate so that, once loaded, children can use it entirely on their own.



ADDA COMPUTERS
Contact your local dealer for these VIC products from Adda.

adda

In case of difficulty—or to see demonstrations—call the VIC Centre 154 Victoria Road, London W3. 01-992 9904.

ARCADE QUALITY SOFTWARE FROM LLAMASOFT!!

Spectrum ATARI 400/ 800 VIC 20 by Jeff Minter ZX81

SPECTRUM

GRAPHICS/CHARACTER CREATOR
Now you can define your very own custom character sets. Or edit the existing sets. Results fully displayed on screen in mode 0, 1 and 2. Many exciting features including: Save, Screen Modes, Reflect, Invert etc.
Supplied on cassette with data £8.00.

SPECTRUM SUPERDEFLEX
The idea of this new game is to bounce 'SID' the space invader around the screen into the power pads. Keeping away, of course, from the devil which chases you around the screen. Steer with your deflex shields, but beware the mines or you may be buried alive. Superb graphics and fantastic sound on the 48K SPECTRUM only. £4.95 on cassette.

CITY BOMBER
A full feature version of the popular game 'BLITZKRIEG' supplied for the 16K or 48K SPECTRUM only. £2.95.

ROX III
Blast the falling meteors as they invade your planet. Cruise missiles are your only defence in this world of disaster. If they break through the crust of your planet then your life support systems will fail. A very addictive game with fast action and great graphics. Only £2.95.

GRAPHICS CREATOR
NOT just another character editor! This one allows you to define not only the 21 user definable characters, but also allows you to change the entire 96 character ASC11 set. Creates BYTES files ready for you to load into your own programs. Includes advanced Reflect, Invert, Field commands etc. Complete with full documentation. If you are at all serious about SPECTRUM graphics, then bin the BIN statement and use Graphics Creator with its easy on-screen cursor editing. £2.99

PLEASE ADD 50p P&P WITH ALL ORDERS

WANTED!
GOOD QUALITY SOFTWARE. SEND DEMO FOR QUICK REPLY.

TRADE ENQUIRIES WELCOME

Send Cheque/P.O. with order to:
LLAMASOFT SOFTWARE
Dept YC2, 49 Mount Pleasant, Tadley, Basingstoke, Hants. (07356) 4478.

ZX81

CENTIPEDE
The ORIGINAL game from the ORIGINAL author. This is the identical program to that being sold by other companies for three times our price. The game has received ecstatic reviews in the computing press. Program has 30 speed levels and ever increasing Centipede hordes. Tables top 10 scores and their names. Why Wait to Pay More? Only £1.99.

VIC 20

BREAKOUT/DEFLEX
Unexpanded package a full feature version of the popular arcade Breakout plus a new concept in computer games, Deflex!! Both programs on one cassette only £3.95.

BLITZKRIEG (3.5k)
Fly your Vulcan bomber over enemy territory and destroy the city. 25 levels of play. Hi-res colour graphics on the unexpanded Vic 20. Only £4.95.

DEFENDA! m/c
Full feature version of the popular arcade game including; Swarmers, Baiters, Pods, Landers and Humanoids. Controls: Up, Down, Thrust, Reverse, Fire and Smart Bomb. High resolution colour graphics. Joysticks controls. 8k or 16k expansion needed. Only £10.00.

TRAXX! m/c
Vic 20 version of the brand new arcade game "Amidar" A Packman/Quix crossbreed. All machine code, fast and fun. Joystick controls. Hi-res colour graphics. 8k or 16k expansion needed. Only £10.00.

RATMAN! m/c
Kill the squeaking rats which fall from the sky before they dig in and prey on you! Game includes rats, hammers, men, mutants and spears. M/c, hi-res colour graphics. 8k or 16k expansion needed. Fast and fun for only £5.

UTILITY PROGRAMS (for unexpanded Vic 20)
GAME GRAPHICS EDITOR. Create your very own custom characters. Full featutres include Reflect, Save on Tape etc.
SOFTKEY 24.24 key words inc. Peek, Poke, List, Save on your function keys. Both programs supplied on one cassette. Only £6.00.
Coming Soon, plug-in games cartridges at under £20 — please ring for details.

ATARI 400/ 800

TURBOFLEX
Superb ultra-fast and totally new ball game unlike any you have seen before. Uses ATARI's unique features to the full. Incorporates superb colour/sound effects and uses Player/Missile graphics. Tables top 10 scores along with Scorer's name.

FREE! TO VIC, ATARI & SPECTRUM OWNERS. SEND SAE NOW FOR FREE PROGRAM AND CATALOGUE OF SOFTWARE

NEW FOR ZX81 USERS

Even More Memory with our Byger Byte 32K + Ram Pack. Why put aside your 16K Ram Pack when you can use it together with the new Byger Byte 32K + Ram Pack to give you 48K OF MEMORY.

No trailing leads or wires — all you need do is plug the existing 16K Ram Pack into the back of the new Byger Byte 32K + Ram Pack, and bingo 48K OF MEMORY.

Uses existing power supply. The new 32K + Ram Pack is tested and guaranteed with the following 16K Ram Packs: Byg Byte, Sinclair, Downsway.

Also available:

	16K Ram Pack	— £22.00
New	32K + Ram Pack	— £39.50
Standard	32K Ram Pack	— £35.00
	64K Ram Pack	— £53.95

Tape loading Interface — for trouble free loading of Programs — £9.50
New High Quality Keyboard with bleep + reset — £49.95
All Prices are inclusives of V.A.T + Free Postage & Packing

Phoenix Marketing Services,
Oaklands House, Solartron Road,
Farnborough, GU14 9QL.

Name _____

Address _____

_____

Make cheques payable to: **Phoenix Marketing,**

I enclose my cheque for £_____

Please debit my Access/Barclaycard

Signed_____

Date_____

Please send me

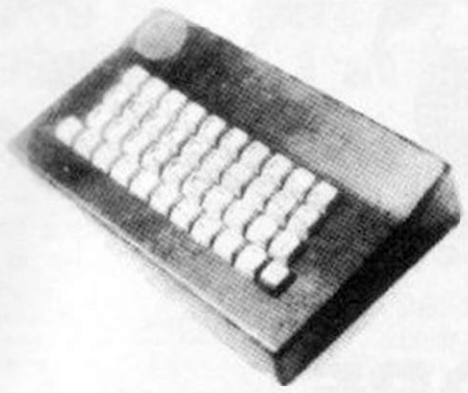
- ☐ 16K Ram Pack at £22.00
- ☐ New 32K + Ram Pack at £39.50
- ☐ 32K Ram Pack at £35.00
- ☐ 64K Ram Pack at £53.95
- ☐ Tape loading interface at £9.50
- ☐ Fully cased keyboard at £49.95

KAYDE Electronic Systems Ltd

ZX KEYBOARDS FULLY CASED

ZX81 WITH REPEAT KEY

This is a highly professional keyboard using executive buttons as found on top quality computers. It has a repeat key and comes complete in its own luxury case. This is a genuine professional keyboard and should not be confused with toy keyboards currently available on the market.
As reviewed by Tim Hartnel ZX Computing/Interface
£37.95



NEW

SPECTRUM

This is a highly professional keyboard, taken from our World Famous and well proven 81 keyboard, it has been redesigned to complement your ZX Spectrum.
BUY NOW BEFORE THE RUSH **£37.95**

FULLY CASED ZX81

RAMPACKS

NEW Spectrum

MASSIVE ADD ON MEMORY

MEMORIES YOU CAN RELY ON

64K £72.95
16K £29.95

Up grade your Spectrum now to 48K. Just add our 32K memory extension plug in board to your Spectrum which already has 16K to give you a massive 48K of memory.
£48.95

ZX81 4K GRAPHICS BOARD

The *KAYDE* Graphics Board is probably our best accessory yet. It fits neatly inside your ZX81. It comes complete with a pre-programmed 4K Graphics ROM. This will give nearly 450 extra graphics and with the inverse makes a total of nearly nine hundred.

The *KAYDE* Graphics Board has facilities for either 2K of RAM (for user definable graphics) 4K of ROM or our 4K Tool Kit Chips that will be available shortly. All the graphics are completely software controlled therefore they can be written into your programmes. Here are a few examples:
A full set of space invaders — Puckman — Bullets, Bombs — Tanks — Laser Bases and Alien Ships
NO EXTRA POWER NEEDED **£29.95**

FLEXIBLE RIBBON CONNECTOR

Stops movement of RAM PACK	**£12.95**
IN/OUT PORT	**£10.95**
MOTHER BOARD	
Complete with 5 volt regulator	**£18.95**

16K GRAPHICS BOARD SOFTWARE

PECKMAN The only true ZX version of the popular arcade game.
SPACE INVADERS The best version available anywhere.
CENTIPEDE "In all I think this is the best presented moving graphic programme I've yet seen" — Phil Garratt, INTERFACE **£5.95 EACH**
Graphic Software can only be used with a Graphics board

16K 81 SOFTWARE

CENTIPEDE "In all, I think this is the best presented moving graphic programme I've yet seen" Phil Garratt — Interface.
3D/3D LABYRINTH A cubit maze that has corridors which may go left, right, up and down. **£5.95**

4K Tool Kit full of utilities to aid the programmer in constructing and de-bugging E. PROM version for use with graphics ROM. **£9.95**

VIC-20 SOFTWARE

NEW

THE KAYDE VALLEY
The ultimate in adventure games

Othello
Plus many more.
£7.95
VIC 20 dealer

All Hardware comes fully built and tested and complete with a 14 day money back option

Qty	Item	Item price £	Total £
	ZX Spectrum Cased Keyboard s	37.95	
	ZX Spectrum 32K Rampack	48.95	
	ZX81 Cased Keyboard with repeat key	37.95	
	ZX81 64K Rampack	72.95	
	ZX81 16K Rampack	29.95	
	ZX81 4K Graphics Board	29.95	
	ZX81 Flexible Ribbon Connector	12.95	
	ZX81 Mother Board	18.95	
	ZX81 In/out port	18.95	
	ZX81 16K Graphic Software	5.95	
	ZX81 16K Software	5.95	
	Vic 20 Software	7.95	
	Name of Software	+ p&p	

*I enclose a cheque/postal order payable to *KAYDE Electronic Systems Ltd.*, for £.....
*Please charge to my Access/Barclaycard/Trustcard account no.
*Please delete/complete as applicable.
Please print.

Signature _____

Name: Mr/Mrs/Miss

Address

Please allow £1.50 P&P for all Hardware 50p for all software (Dept YC)

SEND FOR A FREE CATALOGUE STATING TYPE OF COMPUTER.

WHY WAIT TO PAY MORE
FAST IMMEDIATE DELIVERY

VISA

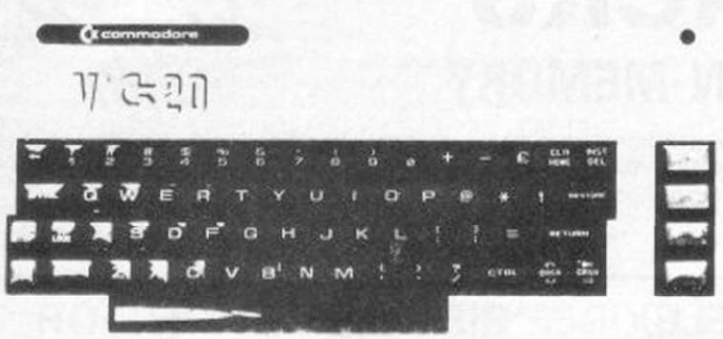
Post To **KAYDE ELECTRONIC SYSTEMS LTD**
Dept **THE CONGE, GREAT YARMOUTH**
NORFOLK NR30 1PJ
Tel: 0493 57867 (Dept YC)
Telex 957247 CHATCOM G

Don't forget you can always order on the telephone with your credit card *Dealers welcome*

South London's Largest Micro Computer Centre

VISION STORE

COMMODORE



VIC-20

5K £169	21K £199
inc. basic	inc. basic

Vic Cassette **£44.00**
Vic Printer **£229.00**
Vic Disk Drive **£395.00**

New

Commodore 64
64K Colour Computer
in stock now **£345**

Sinclair ZX81
Now available
£49.95 with free programme.

Over 900 software programmes always in stock. We carry probably the widest range with continuous demonstrations.

Top Cash Prices paid on Second Hand Equipment or Part Exchange Welcome.

ATARI

400

16K £199	32K £259
Less Basic	Less Basic

Basic Cartridge £34.90

Atari 800 16K inc. Basic	**£499.00**
Atari 800 48K	**£569.00**
Atari 410 Cassette	**£49.00**
Atari 810 Disk Drive	**£299.00**
Atari 822 Printer	**£265.00**

plus every Atari accessory.

EXCLUSIVE:
New for Atari — Percom
Double Density Disk Drive.
174K Per Diskette.
On demonstration now!

Now available*
EMI Submarine Commander.
EMI Jumbo-Jet Lander.
Incredible Games for Atari.
*from November 8

Instant Credit Available subject to status

Access/ Barclaycard

BARCLAYCARD VISA

VISION STORE
3 Eden Walk Precinct,
Kingston-on-Thames, Surrey.
Tel: 01-546 8974

TI-99/4A * VIC 16K * ATARI 400/800 * SHARP MZ-80K/A/B * BBC MICRO * SINCLAIR SPECTRUM

Functional cassette software by Dale Hubbard
Buy 2 at £19.95 — take 1 at £5.95 FREE!!!

DATABASE

The program that everyone needs. Facilities include sort, search, list, delete, change, totals, save file, one print if required, etc, etc. Can be used in place of any card index application. **£19.95**

STOCK CONTROL

All the necessary for keeping a control of stock. Routines include stock set up, user reference no., minimum stock level, financial summary, line print records, quick stock summary, add stock, delete/change record, and more. **£19.95**

MAILING LIST

A superb dedicated database to allow for manipulation of names & addresses & other data, with selective printing to line printer. Features include the facility to find a name or detail when only part of that detail is known. Will print labels in a variety of user-specified formats. **£19.95**

DECISION MAKER

A serious program that enables the computer to make a sound decision for you based on various criteria. If you want to buy a car, hi-fi, house, etc., or you don't know which woman to marry then you need this one. **£5.95**

INVOICES AND STATEMENTS

Ideal for the small business. A complete suite of programs together with generated customer file for producing crisp and efficient business invoices and monthly statements on your line printer. All calculations including VAT automatic and provision for your own messages on the form produced. *Not Spectrum **£19.95**

RUBIK SOLVER

It's not our policy to offer games but we make an exception here for a program to solve the cube from ANY position. Shorthand notation makes learning the solution by heart possible for most active brains. **£12.95**

THE CATALOGUER

This dedicated database is ideal for use in any situation where a catalogue could be utilised. E.g. stamp collection, coins, photos, slides, books, records etc. **£19.95**

COMMERCIAL ACCOUNTS

A gem of a program, all for cassette, with the following features:

Daily Journal	Sales Ledger
Credit Sales	Purchase Ledger
Cash Sales	Bank Account
Credit Purchases	Year to Date Summary
Purchases – other	

A fully interactive program suitable for all businesses. Files can be saved and loaded and totals from one file carried forward to another on cassette. Particularly useful from a cash flow point of view, with an immediate accessibility to totals for debtors and creditors. Bank totally supported with entries for cheque numbers, credits and, of course, running balance. **£19.95**

HOME ACCOUNTS **£19.95**

Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account, mortgage, H.P. etc etc etc!! You'll wonder how you ever managed without it.

CHOPIN – LES ETUDES

Six beautiful studies from Opus 10 and 25 performed for you live by Mr. Computer. Spellbinding!!!
*Not Spectrum **£5.95**

MOTOR ACCOUNTANT

Find out exactly what the car is costing you and keep a data file with all your expenses therein! **£5.95**

RECIPE FILE

Let all those computer widows have a bash! The wives will realy enjoy the fun of this program designed to keep all her recipes. Will even suggest a menu for the day/week! Excellent value. **£19.95**

All programs supplied with exhaustive documentation.
Send cheque or P.O. or Cash (registered) or Credit Card no. to:

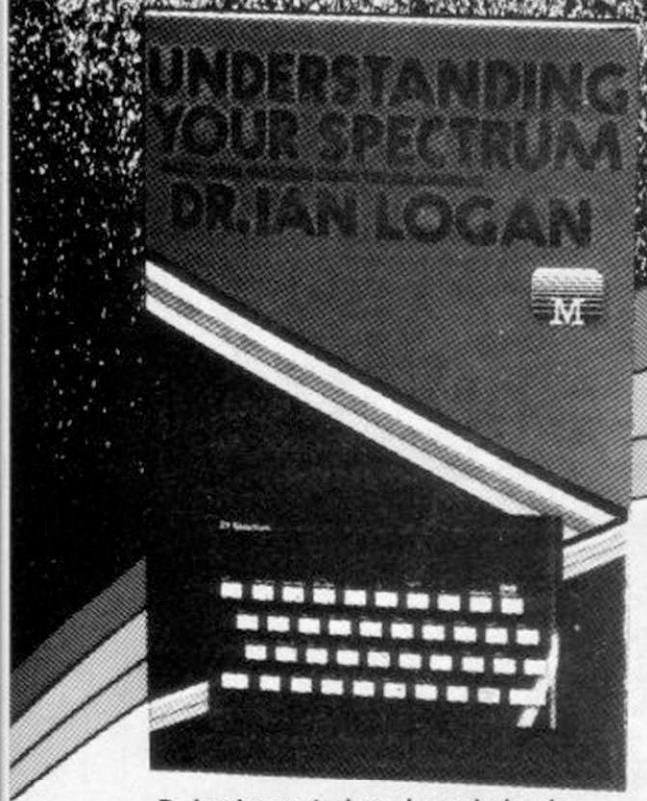
Gemini Marketing Ltd

DEPT. YC10 **9 SALTERTON ROAD, EXMOUTH, DEVON EX8 2BR.**

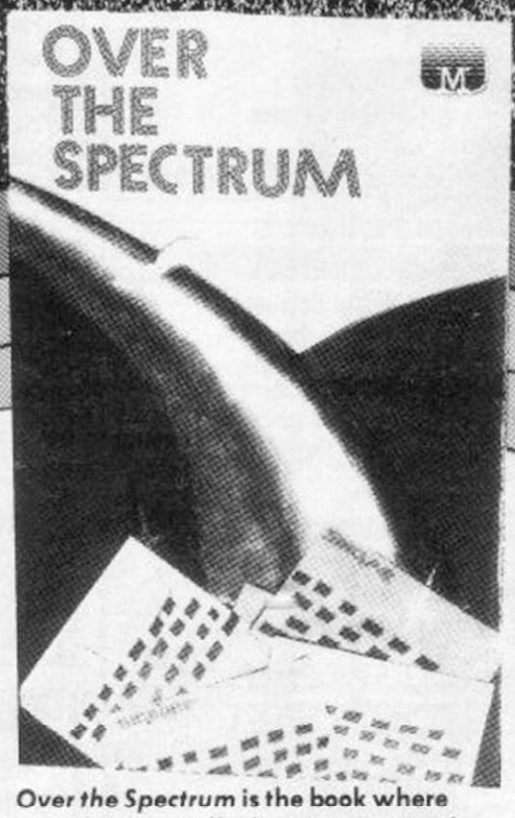
Or telephone us with your credit card order on (03952) 5832
All orders despatch by return – no waiting.
All prices include VAT and post & packing except Hardware.
Full range of Sharp peripherals available – please 'phone for quotations.
Please state machine type and memory size when ordering software.

Access Welcome

ANNOUNCING The BEST Books For Your SPECTRUM



Dr. Ian Logan is the acknowledged leading authority on Sinclair computers. In this book, he gives a complete overview of the way the Spectrum operates, both for BASIC and machine language programming. A special section on the ROM operating system will give you insight into this computer as well as provide you with information on how to use many of the routines present in the ROM. This book is a must if you are serious about programming the Spectrum. Only £7.95.



Over the Spectrum is the book where your dreams really do come true! With the full listing of over 30 programs for your Spectrum, this book will show you how to use the computer's complete facilities. Exciting games such as *Meteor Storm*, *Eliminator* and *Spectrum Invaders*, together with utilities, educational programs, programming tips and hints, make this the definitive book for every Spectrum user. Only £6.95.

This title speaks for itself, it's everything you need to understand about *Spectrum Machine Language* when you're just starting off. A must for all new Spectrum owners. Only £6.95.

After leading the way in Sinclair ZX81 software, we've produced the highest quality, most exciting Spectrum software available. From the three excellent books depicted above to fast-action games on cassette, we're providing the best choice in Sinclair Spectrum software today.

Whether it's for your new Spectrum or ZX81 Melbourne House has books and programs perfectly suited to your needs.

Send for your Spectrum or ZX81 catalogue today.

Melbourne House Publishers,
131 Trafalgar Road, Greenwich, London SE10.
Correspondence to: Glebe Cottage, Station Road, Cheddington, Leighton Buzzard, BEDS LU7 7NA.

☐ Please send me your Spectrum/ZX81 catalogue (please specify).

☐ Please send me ..... (please add 80p for post, pack & V.A.T.)

Name .....

Address .....

..... Post Code YC10

MELBOURNE HOUSE PUBLISHERS

dk'tronics

ZX80/81 SPECTRUM Hardware Software

ZX KEYBOARD

The case is large enough for both the computer (81 or Spectrum) and the power supply to fit inside. **Requires no soldering**

Fully cased with numeric pad £45
Uncased with numeric pad £30
Case £15

SPECTRUM MEMORY UPGRADE TO 48K £39.95

NEW FROM dk'tronics

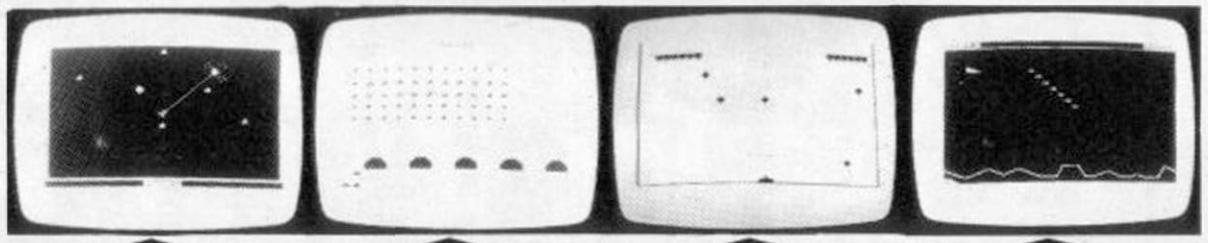
(A) 16K Ram Massive Add On Memory
Fully assembled and tested £19.95
(B) 64K Memory Expansion £49.95
(C) 4K Tool kit full of utilities to aid the programmer in constructing and de-bugging E. Prom version for use with graphics Rom £9.96
Cassette version £6.95
(D) Flexible ribbon connector (as illustrated) £10

The DK Graphic module is our latest ZX81 accessory. This module, unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you an unbelievable 448 extra pre-programmed graphics, your normal graphic set contains only 64. This means that you now have 512 graphics and with their inverse 1024. This now turns the 81 into a very powerful computer, with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there; it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

£29.95

4K Graphics rom

SOME OF THE GRAPHICS NOW POSSIBLE ON THE ZX81



★ASTEROIDS ★SPACE INVADERS ★CENTIPEDE ★DEFENDER

16K GRAPHICS ROM SOFTWARE

dk'tronics

Send off the coupon today or telephone Great Yarmouth (0493) 602453 for our answering service (available 24 hours a day, 7 days a week) quoting Barclaycard or Access number (please add on £1 for P/P)

23 Sussex Road,
Gorleston,
GREAT YARMOUTH,
Norfolk.

Access BARCLAYCARD VISA

Please state type of machine, which ROM memory size, quantity and price when ordering.

Please send me ..... @ £ .....
Please send me ..... @ £ .....
Please send me ..... @ £ .....
Please send me ..... @ £ .....
Please send me ..... @ £ .....

Please add on £1.25 for P/P. I enclose £ .....

Name .....

Address .....

Cheques/P.O. payable to D.K. Tronics.

ZX Spectrum
20 Programs £6.95

The ZX Spectrum has brought advanced computing power into your home, The Cambridge Colour Collection, a book of 20 programs, is all you need to make it come alive.

No experience required. Simply enter the programs from the book or load them from tape (£2.95 extra) and run.

Amazing effects. All programs are fully animated using hi-res graphics, colour and sound wherever possible.

Entirely original. None of these programs has ever been published before.

Proven Quality. The author already has 30,000 satisfied purchasers of his book of ZX81 programs.

Hours of entertainment

- **Lunar Landing.** Control the angle of descent and jet thrust to steer the lunar module to a safe landing on the moon's surface.
- **Maze.** Find your way out from the centre of a random maze.
- **Android Nim.** Play the Spectrum at the ancient game of Nim using creatures from outer-space.
- **Biorhythms.** Plot the cycles of your Emotional, Intellectual and Physical activity. Some would say this is not a game at all.

Improve your mind

- **Morse.** A complete morse-code training kit. This program will take a complete beginner to R.A.E. proficiency.
- **Maths.** Adjustable to various levels, this program is an invaluable aid to anyone trying to improve their arithmetic.

Run your life more efficiently

- **Home Accounts.** Keeping track of your finances with this easy-to-use program will enable you to see at a glance where the money goes and plan your spending more effectively.
- **Telephone Address Pad.** Instant access to many pages of information.
- **Calendar.** Displays a 3 month calendar past or future, ideal for planning or tracing past events.

ORDER FORM:

Send Cheque or P.O. with order to:–
Dept. C., Richard Francis Altwasser, 22 Foxhollow, Bar Hill, Cambridge CB3 8EP

Please send me

☐ Copies Cambridge Colour Collection Book only £6.95 each.
☐ Copies Cambridge Colour Collection Book & Cassette £9.90 each

Name: _____

Address: _____

_____

ZX81 — BOOKS BY ROGER VALENTINE

WHAT CAN I DO WITH 16K?

Advanced programming techniques, and Machine Code routines, fully explained, together with complete listings of 10 excellent progrmas.

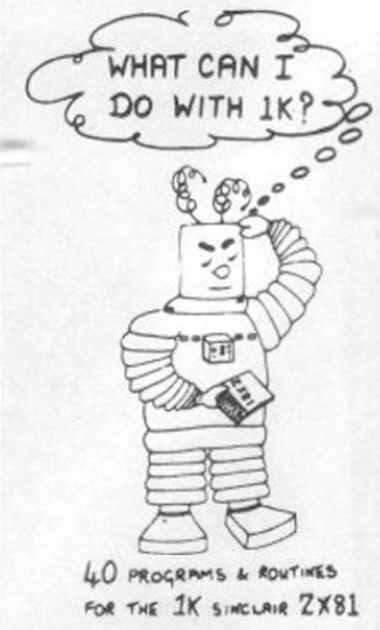
A MUST for serious users and game players alike.

BOOK £4.95
Cassettes available individually — ask for list.

PROGRAMS FOR THE SINCLAIR ZX81

WHAT CAN I DO WITH 1K?

40 programs and routines, many of which you would never heave believed could be squeezed into 1K. In Basic and Machine Code, with full explanations.



BOOK £4.95
Also available on cassette £4.95

40 PROGRAMS & ROUTINES FOR THE 1K SINCLAIR ZX81

Also by Roger Valentine
V & H PAYROLL — Available on cassette for ZX81 (16K), Spectrum (48K) and Pet (32K).
Cassette and Manual: £14.50 incl. VAT.
Manual only: £2.00.
Full maintenance contract available.

V & H COMPUTER SERVICES
182c KINGSTON ROAD
STAINES
MIDDLESEX

TEL: STAINES 58041

sinclair

ZX Spectrum

1	2	3	4	5	6	7	8	9	0
BLUE EDIT	RED CAPS LOCK	MAGENTA TRUE VIDEO	GREEN INV. VIDEO	CYAN ⇦	YELLOW ⇩	WHITE ⇧	⇨	GRAPHICS	BLACK DELETE
DEF FN	FN	LINE	OPEN #	CLOSE #	MOVE	ERASE	POINT	CAT	FORMAT

Q	W	E	R	T	Y	U	I	O	P
SIN	COS	TAN	INT	RND	STR$	CHR$	CODE	PEEK	TAB
PLOT	DRAW	REM	RUN	RAND	AND RETURN	OR IF	AT INPUT	POKE	" PRINT
ASN	ACS	ATN	VERIFY	MERGE	{	}	IN	OUT	©

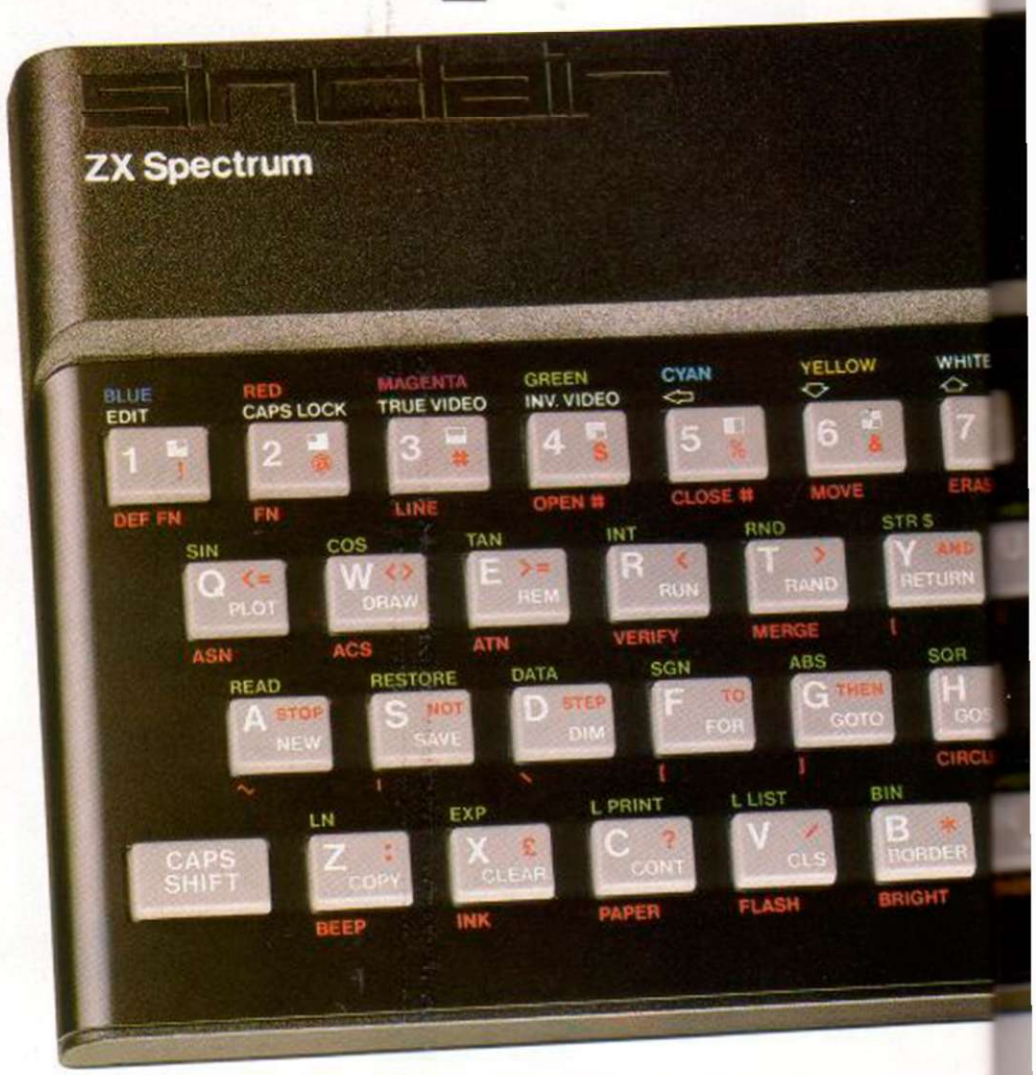
A	S	D	F	G	H	J	K	L	ENTER
READ	RESTORE	DATA	SGN	ABS	SQR	VAL	LEN	USR	
STOP NEW	NOT SAVE	STEP DIM	TO FOR	THEN GOTO	↑ GOSUB	− LOAD	+ LIST	= LET	
~	|	\	{	}	CIRCLE	VAL$	SCREEN $	ATTR	

CAPS SHIFT	Z	X	C	V	B	N	M	SYMBOL SHIFT	BREAK SPACE
	LN	EXP	LPRINT	LLIST	BIN	IN KEY$	PI		
	: COPY	£ CLEAR	? CONT	/ CLS	* BORDER	, NEXT	. PAUSE		
	BEEP	INK	PAPER	FLASH	BRIGHT	OVER	INVERSE		

Sinclair ZX Spectr

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 uprate 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).

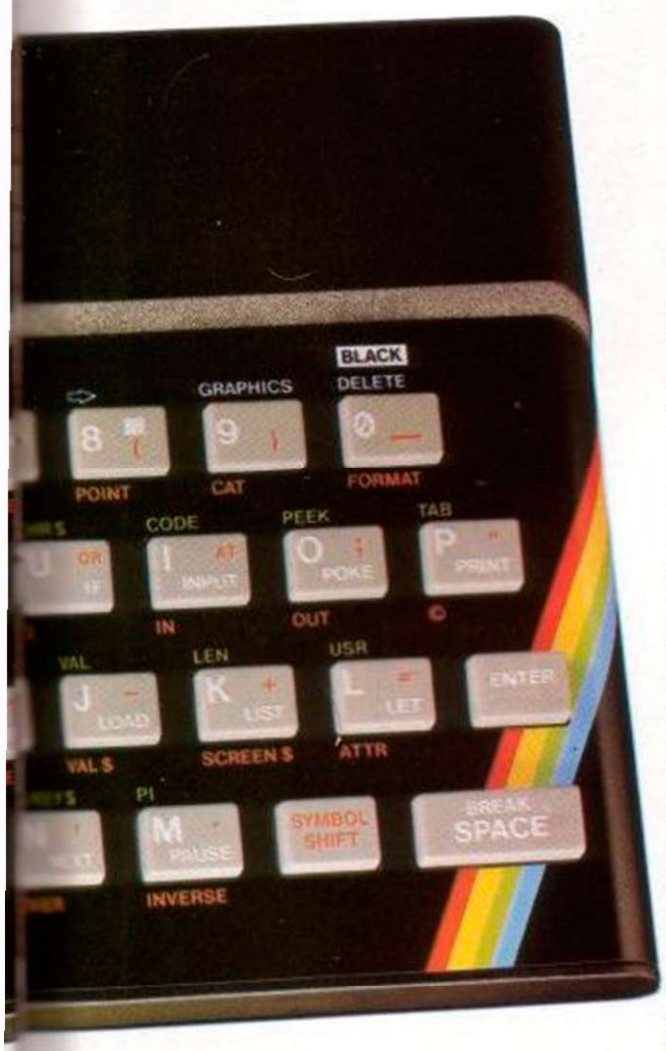
Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer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



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.

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

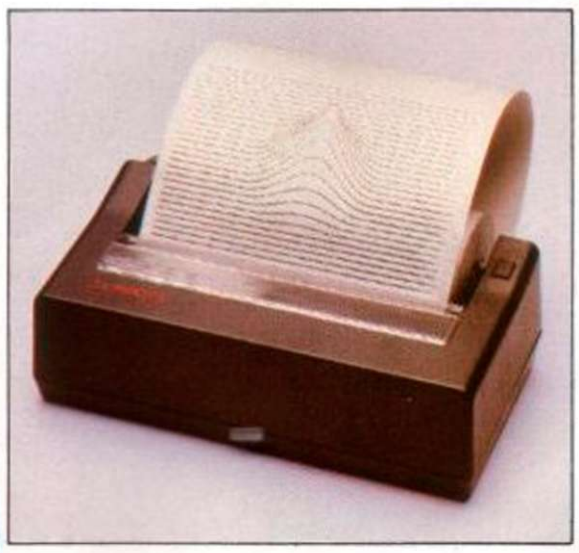
The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

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, Barclaycard, Access 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

YOC 810

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

ZX Spectrum

Available only by mail order and only from

sinclair

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

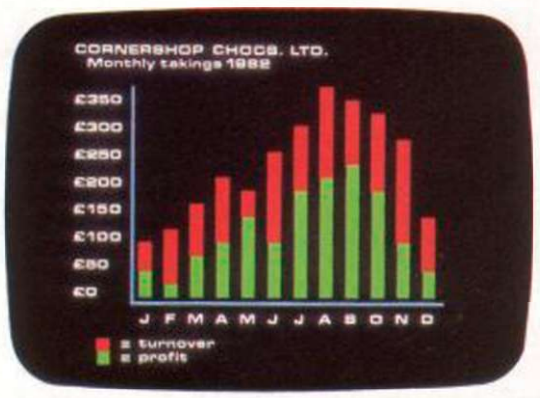
ZX Spectrum software: how good and how soon?

The ZX Spectrum uses an enhanced version of Sinclair BASIC, fast becoming a world standard, and unlikely to be superseded. Unique features, such as one-touch keyword entry and syntax check and report, are increasingly attracting software originators.

Building the software library is already far advanced, and a complete catalogue will be available in the next few months. Subjects will include sophisticated games, education, 'housekeeping', and business management. The more complex packages can, of course, be used to their best advantage with the full 48K RAM version of the ZX Spectrum.

The Sinclair ZX Spectrum can handle sophisticated games programs with high-resolution colour graphics and sound.

This major advance in computer technology maintains Britain's world-beating position in the field of personal computers.



A range of business software will soon be available, covering both specific applications (eg stock-control and payroll) and general business management systems (eg matrix models).

This second generation of Sinclair personal computers demonstrates continuing commitment. Advanced technology made the ZX80/81 family a price breakthrough: advanced technology makes the ZX Spectrum a breakthrough in price and performance.

Elegant, effective, unique—the ZX Spectrum design.

'Less than half the price of its nearest competitor – and more powerful.'

'These two pictures show how it's done. On the right is the PCB from the BBC Model A Microcomputer. On the left is the PCB from the ZX Spectrum.

'It's obvious at a glance that the design of the Spectrum is more elegant. What may not be so obvious is that it also provides more power.

'The ZX Spectrum has more usable RAM, and higher maximum RAM.

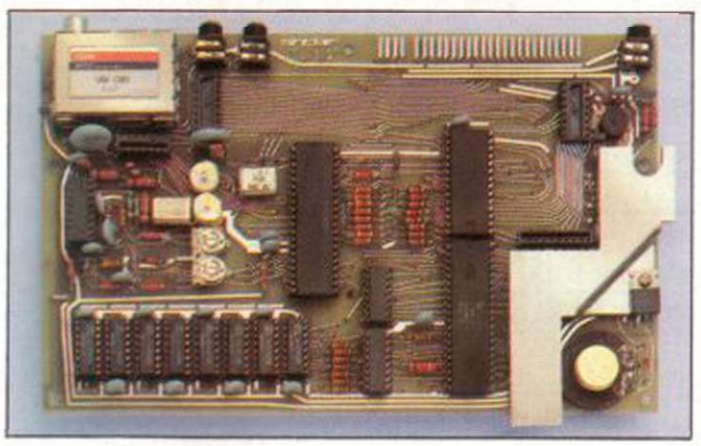
'It offers twice as many colours on the screen at any one time, plus a colour brightness control. It also offers user-definable graphics.

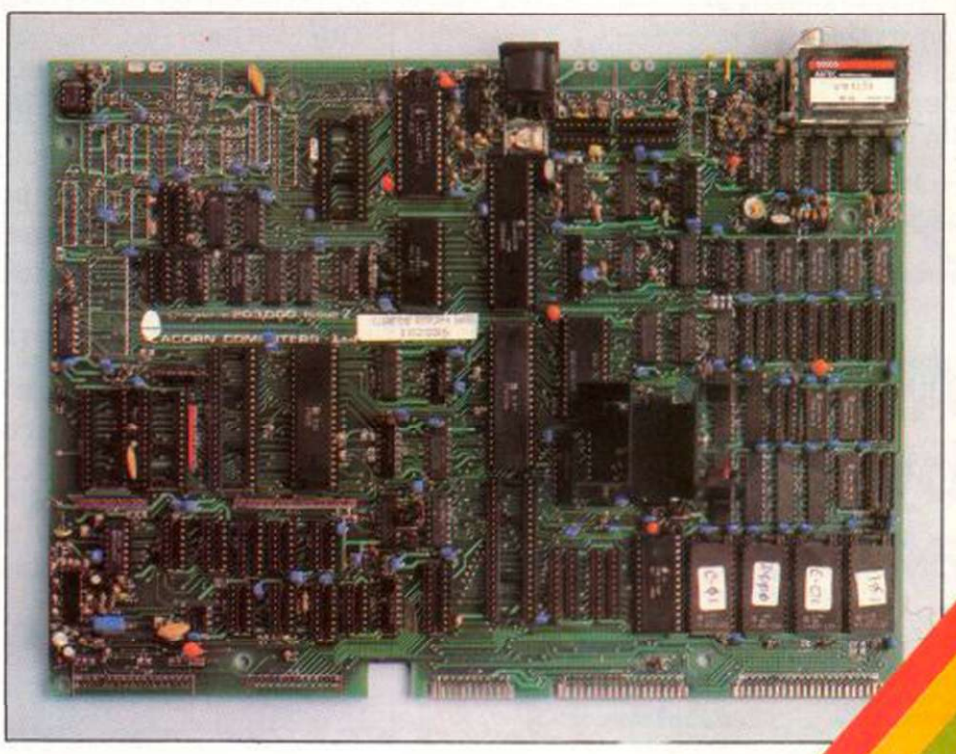
'It has data transfer rate 25% faster, supported by a VERIFY facility.

'And it employs a dialect of BASIC (Sinclair BASIC) already in use in over 500,000 computers worldwide.

'We believe the BBC make the world's best TV programmes – and that Sinclair make the world's best computers!'

– Clive Sinclair.





Above left: internal layout of Sinclair ZX Spectrum.

Right: Internal layout of BBC Micro Model A.

The illustrations are to the same scale, and demonstrate the rate of advance in microcomputer design. The ZX Spectrum uses just 14 chips to provide more power and more user-available RAM.

sinclair ZX Spectrum

© RICH SHENFIELD 82.

SPACE INTRUDERS WITH MUTANTS

- Four different types of Alien.
- Random saucer gives mystery points.
- Mutant Alien from second Attack-Wave.
- Bonus base at 50,000 points.
- Aliens explode when hit.
- Left, right and fire.
- Full sound effects and colour.

METEOR STORM WITH SPEECH

- Three different types of meteor.
- Two different saucers.
- Full screen wrap-around.
- Bonus ship every 10,000 points.
- Superb explosions.
- Left, right, thrust, fire and hyperspace.
- Sound effects and speech.

BOTH OF THESE FULL FEATURE GAMES INCLUDE:

- Personalised high score table.
- Hold feature, suspends game at any time.
- Progressive difficulty.
- Full "Attract Mode" with instructions and scores.

Supplied on Cassette. Both run in 16K

SEE US AT THE NORTHERN COMP. FAIR Microscene Brum '82 show and the P.C.W. Show

Send order to: QUICKSILVA, Dept SPC, 92 Northam Road, Southampton SO2 0PB

ORDER COUPON

Please send me:
SPACE INTRUDERS at £5.95 each
METEOR STORM(S) at £5.95 each
I enclose a cheque or P/O for

£_____
(cheques payable to QUICKSILVA)

Name:_____

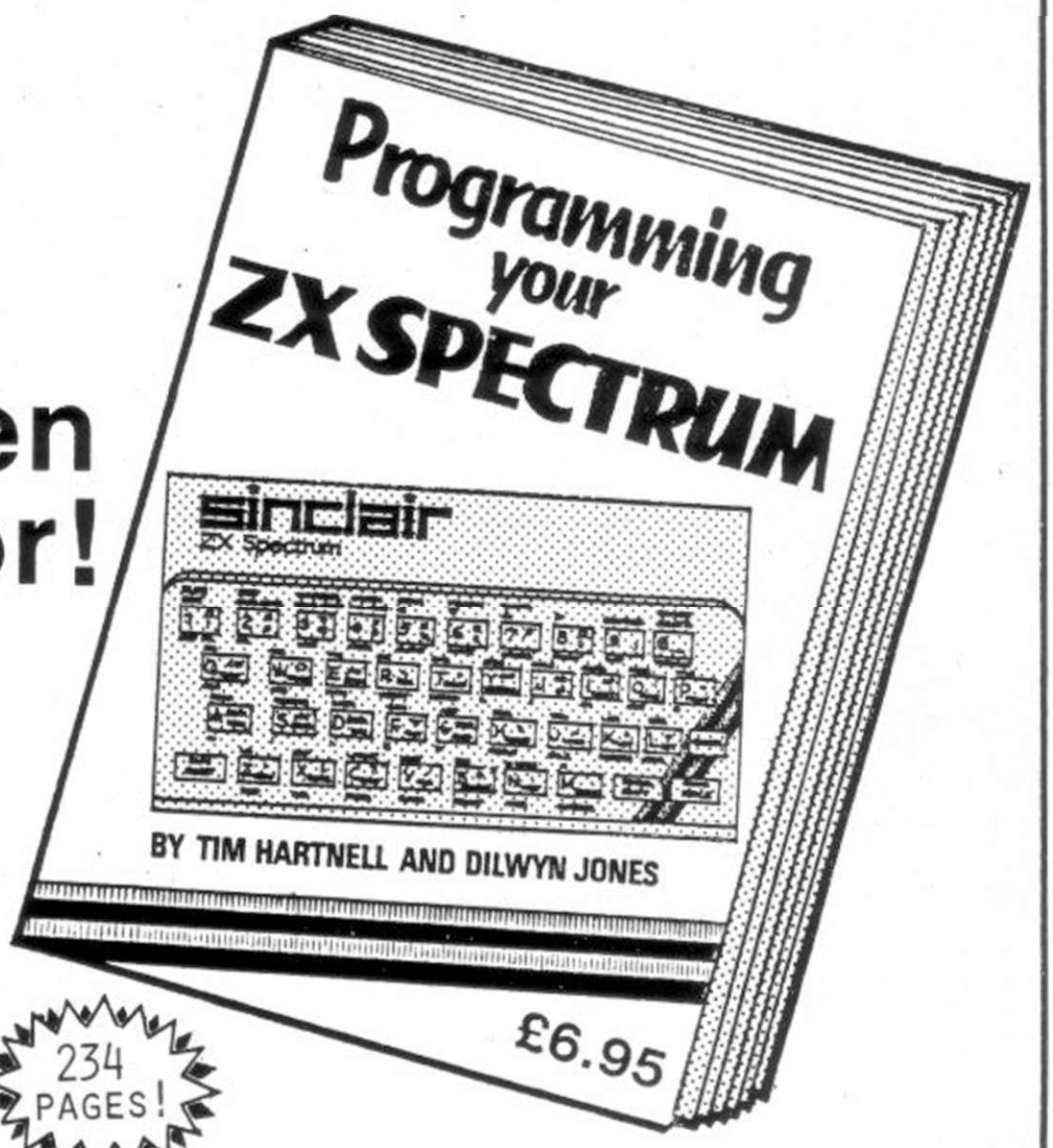
Address:_____

Tim Hartnell's previous books have been warmly welcomed by the computer press:

". . . This is undoubtedly the book to read . . ." Personal Computer World

". . . A book to be recommended . . ." Computing Today

The book you've been waiting for!



234 PAGES!

This is a book that will allow you to make the most of the ZX Spectrum — a book that will lead to you 'expert programmer' status within weeks.

There are two major sections — the first for those who have no previous experience of computer programming, and the second containing advanced material for really powerful programming. All sections of the book make good use of the full eight colours, sound generation and high-resolution graphics. You're also shown how to make the most of Sinclair BASIC features such as DEF FN, SCREEN$, MERGE and FLASH.

Key features of 'Programming Your ZX Spectrum'

- Using the colour effectively — BRIGHT, FLASH, INVERSE and more.
- Sound — there's more to the BEEP than meets the ear.
- Finding your way around the keyboard, the use of *every* keyword, command and function.
- High resolution graphics — how to use them for stunning displays, how to create your own version of the famous arcade game 'Pacman' with user-defined graphics.
- The ZX Spectrum has the full ASC11 character set and this book includes a word processor program to make best use of it.
- The Spectrum LOAD and SAVE is highly reliable, and the MERGE and VERIFY features increase its flexibility. Programming Your ZX Spectrum outlines simple ways to ensure you never lose a program.

The ZX Printer

All program listings are dumped direct from the ZX Spectrum, so all programs are guaranteed to run.

The Microdrive

An appendix to this book details the commands needed to use your ZX Spectrum with the Microdrive microfloppy so you'll be ready when it comes on the market.

Interface,
Dept. *YC*
44-46 Earls Court Road,
London, W8 6EJ

Interface Publications

The UK's leading publisher of proven microcomputer books

Interface, 44-46 Earls Court Road, London W8 6EJ
Please send me the following:

( ) Programming Your ZX Spectrum — Hartnell/Jones £6.95
( ) Getting Acquainted with your ZX81 — Hartnell £5.95
( ) Mastering Machine Code on your ZX81 — Baker £7.50
( ) 20 Simple Electronic Projects for the ZX81 — Adams £6.45
( ) 34 Amazing Games for the 1K ZX81 — Gourlay £4.95
( ) 49 Explosive Games for the ZX81 — edited Hartnell £5.95

YOUR COMPUTER

( ) Pascal for Human Beings — Ruston £4.95

BBC Micro

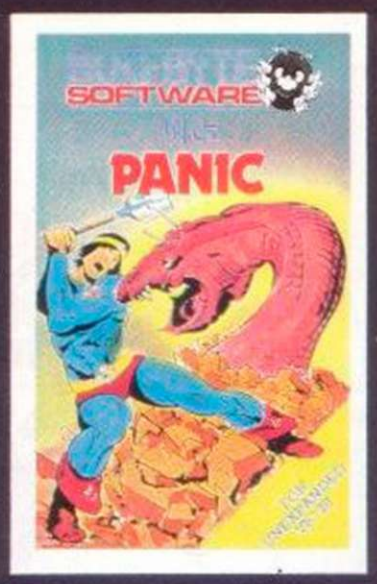
( ) Let Your BBC Micro Teach You to Program — Hartnell £6.45
( ) The BBC Micro Revealed — Ruston £7.95

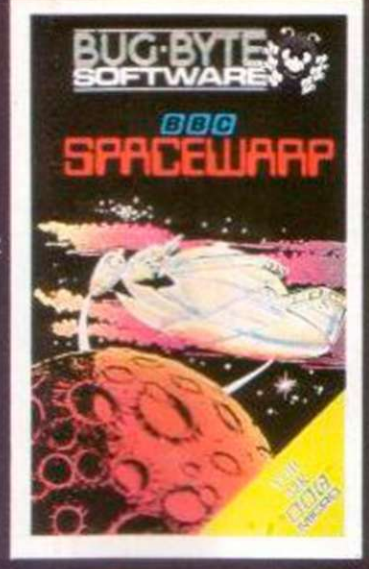
Total enclosed £ _____

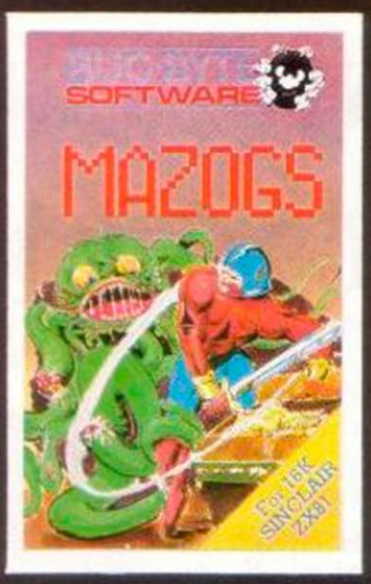
Name _____

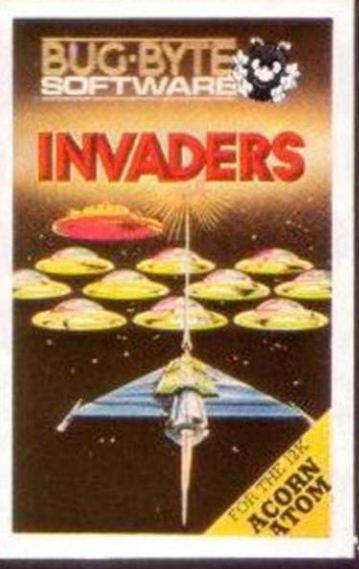
Address _____

_____

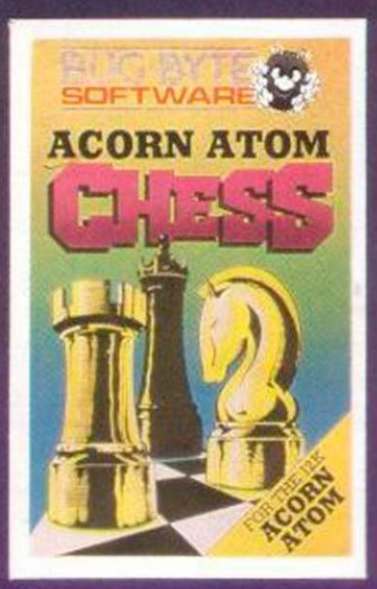


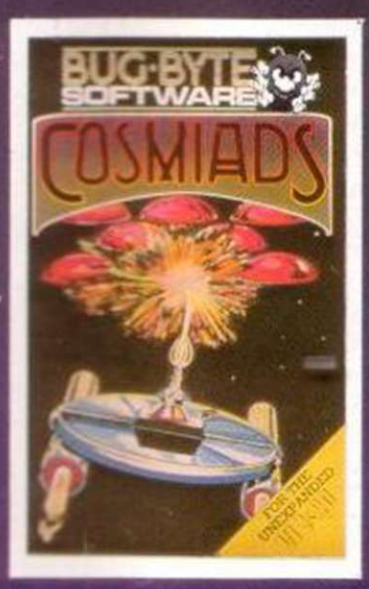


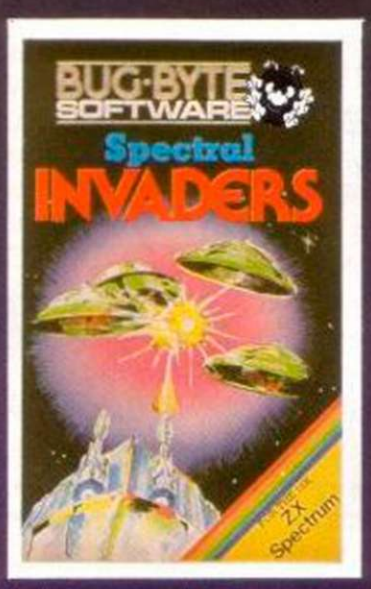


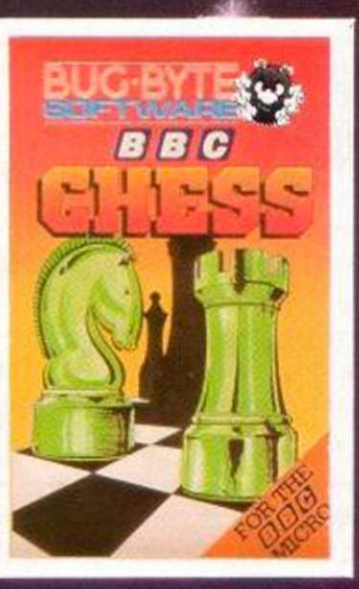


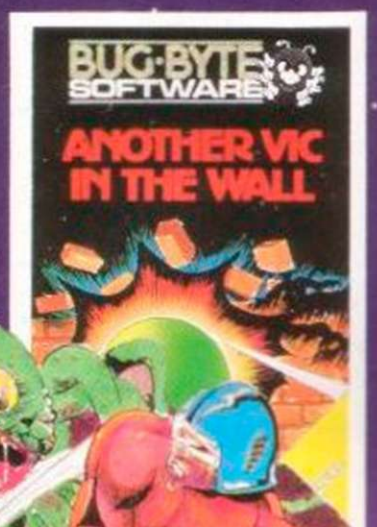
WHAT'S YOUR GAME?

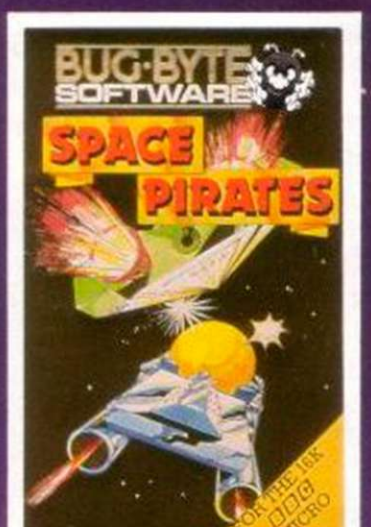


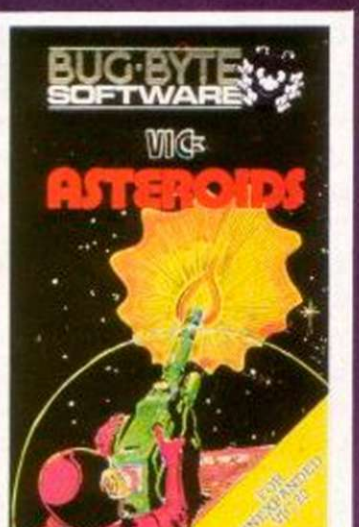


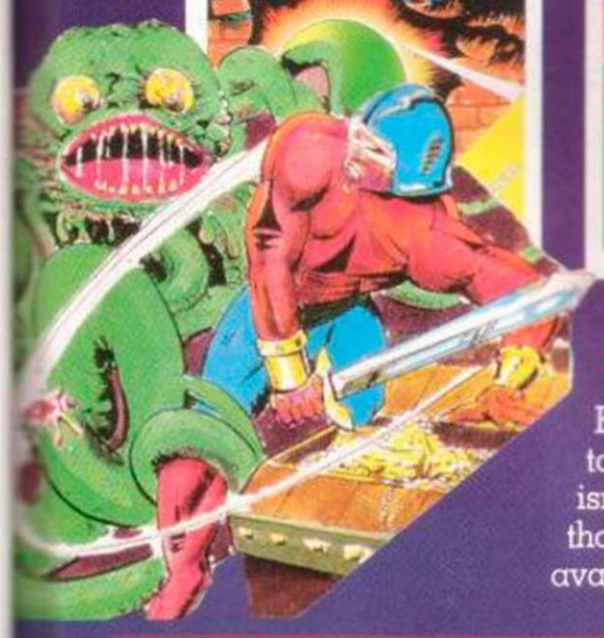












FOR OWNERS OF ZX81, SPECTRUM, BBC MICRO, ATOM, COLOUR GENIE, VIC.

Bug-Byte games are best sellers. Tens of thousands of contented customers testify to that, so do consistently hot reviews in the popular micro-press. If your game isn't shown, don't worry, we probably have more quality games for more machines than any other software house – we just couldn't fit them all in. Bug-Byte games are available at good computer shops everywhere, or direct from our Liverpool office.

BUG-BYTE SOFTWARE

FREEPOST (NO STAMP REQUIRED) LIVERPOOL L3 3AB.

PLEASE SEND ME FULL DETAILS, MY COMPUTER IS _____

NAME: _____

ADDRESS: _____

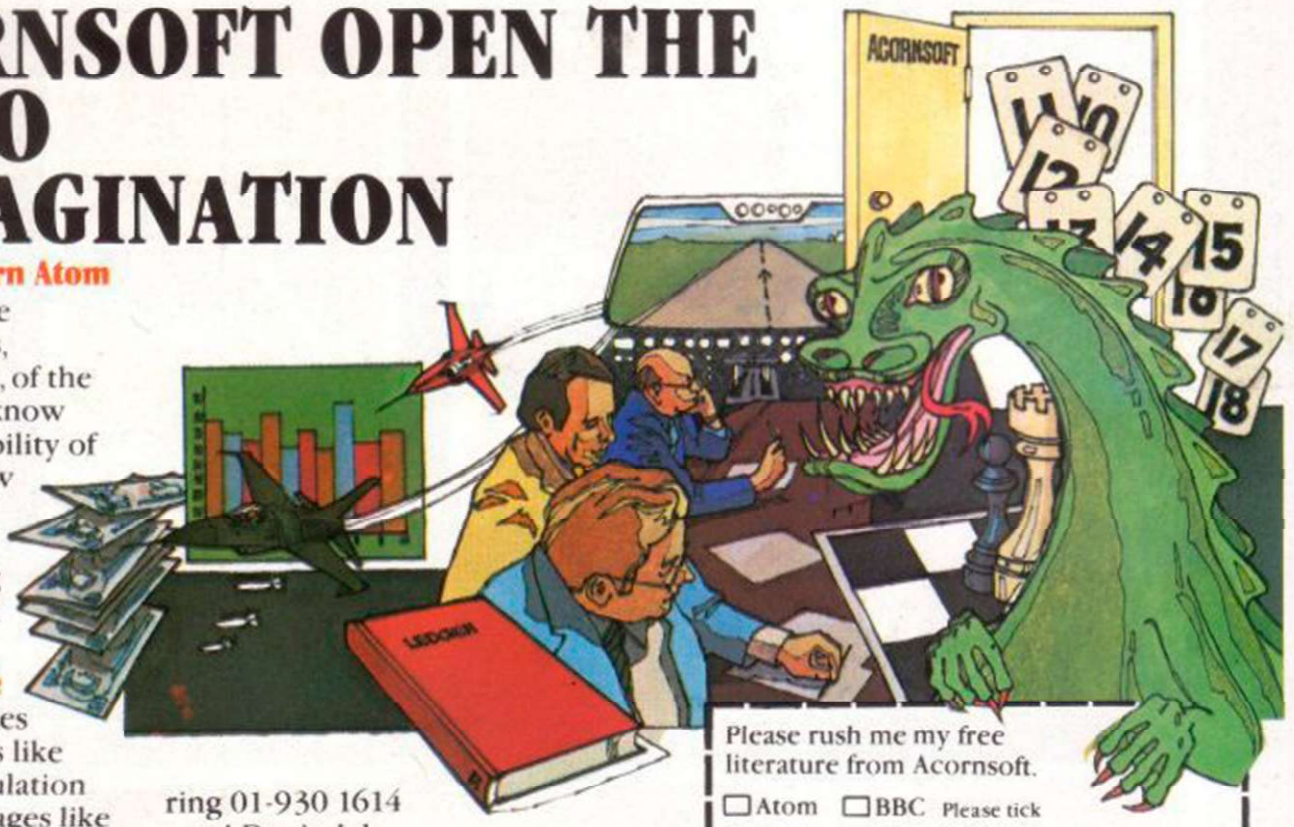
_____

_____

YC/82

ATTENTION DEALERS! For special introductory pack send coupon and business card to Mark Butler

LET ACORNSOFT OPEN THE DOORS TO YOUR IMAGINATION



BBC Microcomputer or Acorn Atom

Acornsoft is the software division of Acorn Computers, designers and manufacturers, of the BBC Micro and Atom. They know better than anyone the capability of the machines, they know how to get the very best from the hardware. And they have produced a range of exciting games, exacting business and useful household software.

The Biggest Range Available

Acornsoft software ranges from authentic arcade games like Snapper to Algebraic Manipulation to Desk Diary to other languages like FORTH and LISP. Striking colour, amazing sound effects and powerful graphics are all used to the full. And it does not stop there. There is a complete range of manuals, accessories and plug-in ROMs.

Free Brochures

Just clip the coupon or write to us and we will rush our catalogue absolutely free. Can't wait for the post ring 01-930 1614 now! Don't delay – do it today. Let Acornsoft help you get the best from our machine and open the doors to your imagination.

Acornsoft and Atom are registered trade marks of Acorn Computers Ltd.

ACORNSOFT
4A Market Hill,
CAMBRIDGE CB2 3NJ.

Please rush me my free literature from Acornsoft.

☐ Atom ☐ BBC Please tick

Name _____

Address _____

_____

_____

_____

Postcode _____

COMPUTING IS EASY
David Parker and Martin Hann

Computing is Easy has been written for first-time computer users, and younger readers in particular will find it a simple and friendly introduction. It tells you what a personal computer is, how to program it, and how to get it working for you. The easy-to-follow style and amusing cartoons will help you to learn about computer programming in BASIC. All technical terms are fully explained when they first appear, and the book contains sample programs for many popular makes of computer — ZX81, ZX Spectrum, Apple, TRS80, Pet, BBC Micro, Research Machines 380Z etc. If you are a newcomer to computing, this book will prove to you that *Computing is Easy*

0 408 01203 X 128 pages £3.95

OTHER TITLES OF INTEREST:-

LEARNING BASIC WITH YOUR SINCLAIR ZX80
Robin Norman

0 408 01101 7 160 pages £4.50

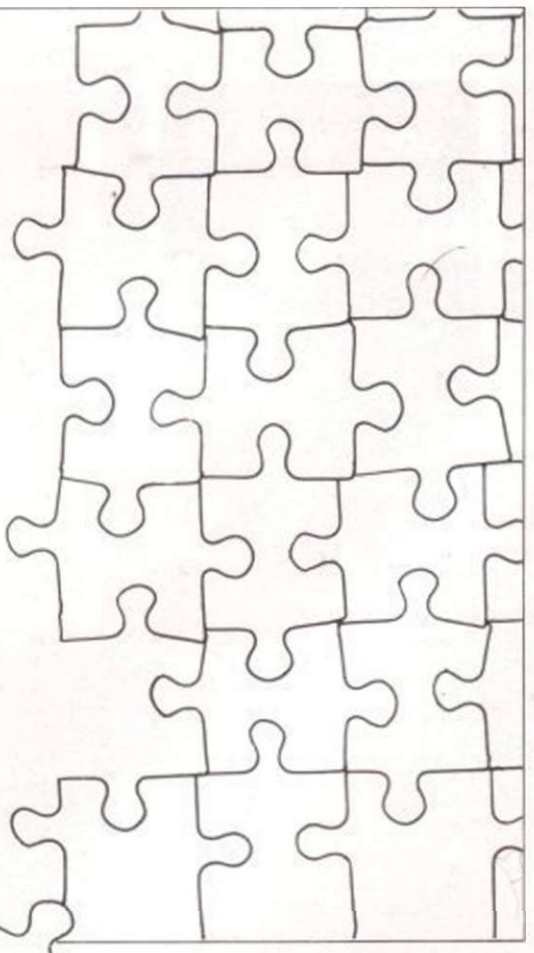
QUESTIONS AND ANSWERS ON PERSONAL COMPUTING
Peter Lafferty

0 408 00555 6 96 pages £1.95

ZX81 BASIC BOOK
Robin Norman

0 408 01178 5 176 pages £4.95

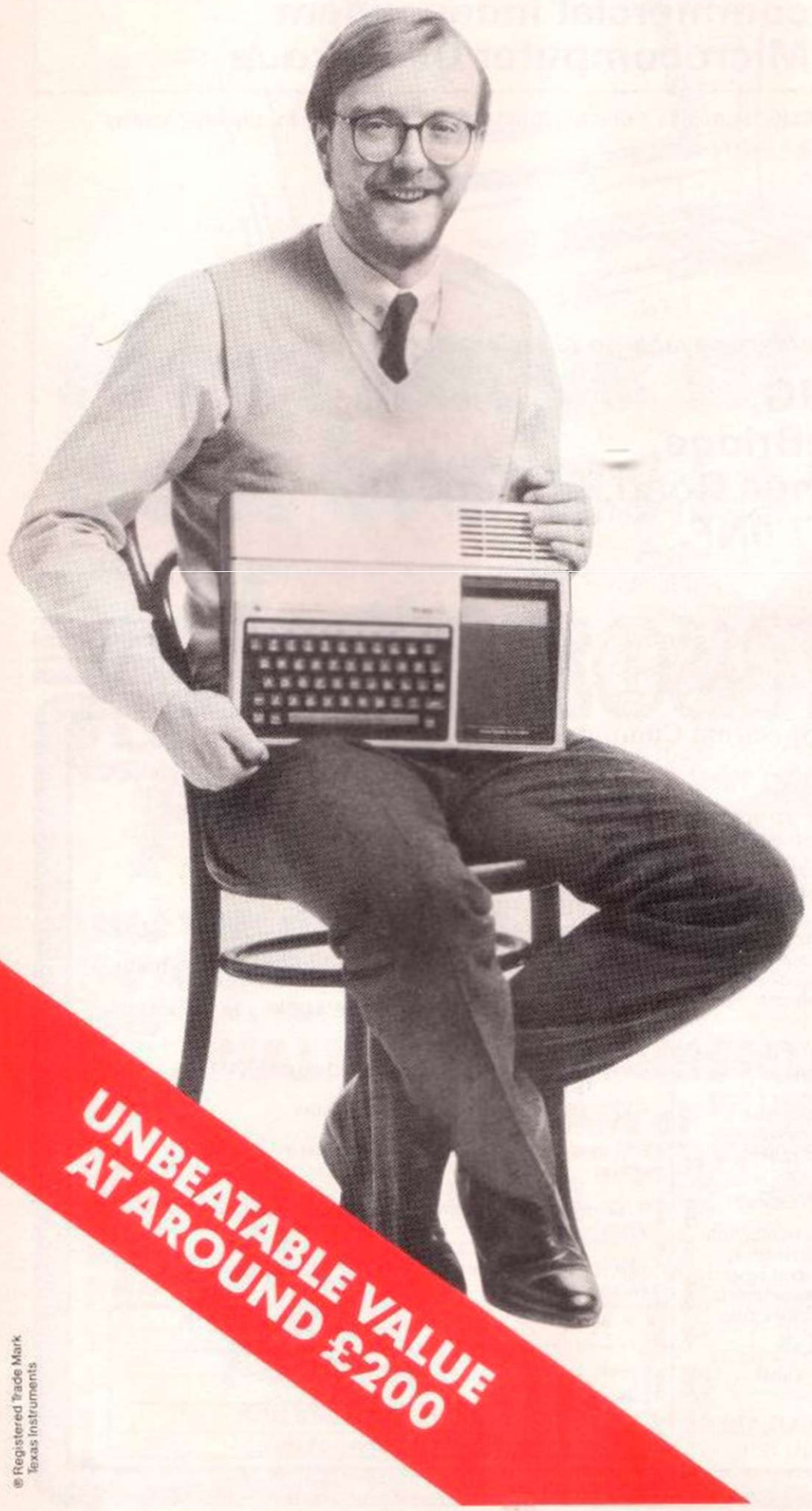
ORDER NOW from your local Bookseller
In case of difficulty send cheque/PO with order to Publicity -NTB 10 at the address below:-



Newnes Technical Books
Borough Green, Sevenoaks, Kent TN15 8PH Telephone: (0732) 884567

(YC/10.82)

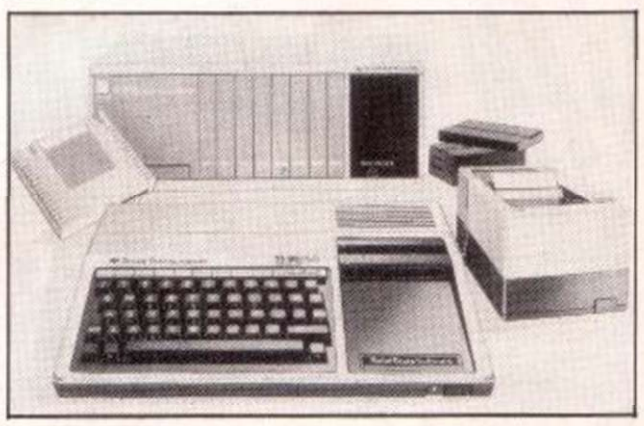
You can't get a Home Computer from Texas Instruments under 16 K RAM.



Make the right move into computing with the Home Computer from Texas Instruments. It gives you a large combined RAM/ROM capacity up to 110 K Byte and the ability to expand with a full range of peripherals and software. So as your knowledge of computers increases the TI Home Computer will grow with you.

Just compare the versatility of the TI Home Computer with its price – you'll find it real value for money that will prove to be a good long term investment.

The TI-99/4A is a sophisticated computer designed not only for the beginner with its ease of operation, but also for the professional with its vast computing power through a 16 bit microprocessor. And it simply plugs into an ordinary household TV set.



With its high resolution graphics with 32 characters over 24 lines in 16 colours (256 x 192 dots), 3 tones in five octaves plus noise, and BASIC as standard equipment and options such as other programming languages – UCSD-PASCAL, TI-LOGO and ASSEMBLER – and speech synthesis, you'll find that the TI 99/4A more than compares with the competition. Especially when the starting price is around £200. When you want to solve problems there are over 600 software programs available worldwide – including more than 40 on easy-to-use Solid State Software® Modules.

After all, from the inventors of the microprocessor, integrated circuit and microcomputer, it's only natural to expect high technology at a realistic price.

We'll help you do better.

TEXAS INSTRUMENTS
LIMITED

® Registered Trade Mark
Texas Instruments

There's only one thing that can help you get the best out of your BBC Micro . . .

Laserbug

The only non-commercial independent National BBC Microcomputer User group

Please enrol me as a member of LASERBUG. I enclose a cheque/postal order for £12.00 for twelve months subscription/£1.00 plus S.A.E. for sample copy.

Name.....

Address.....

.....

..... Tel.....

Please make all cheques/postal orders payable to Laserbug and send to:

LASERBUG,
4 Station Bridge,
Woodgrange Road, Forest Gate,
London E7 0NF.

SILVERSOFT

ZX81/Spectrum Computer Software

'ORBITER' & 'GROUND ATTACK! Simply the most amazing ZX-Spectrum arcade games available.

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

All the excitement of the arcade inhabits your micro. Aggressive aliens flash across the screen as you try to destroy them with your laser-bolts and smart bombs, while rescuing the humanoids.

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 which make it one of the best games around.

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 tortureous caverns while destroying the enemy missile launchers and fuel dumps. Endurance as well as quick thinking are needed to survive as the caves become progressively smaller and airborne aliens start to appear. No-one has yet survived!!

GROUND ATTACK is written completely in machine code. It has 26 zones, full: up, down, forward and reverse, controls. Lasers, bombs, explosions, continuous scoring and sound effects, plus rockets, fuel dumps and airborne aliens.

Both games will run in either 16K or 48K Spectrum and cost £5.95 each.

Programmers NOW you can make money from your micro. Send your programs to us today. We pay probably the best royalties around.

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. You'll never need to buy another machine code program again!! ONLY £5.95.

ZX81 ARCADE ACTION

MUNCHER
– Exciting pacman game for the ZX81 £4.95

ASTEROIDS
– "Just the thing for asteroid addicts" PCW Sept 82 £4.95

INVADERS
– "Probably the best version of INVADERS you will get for the ZX81" – PCW '82 £3.95

ALIEN-DROPOUT
– Exciting ORIGINAL arcade game for your ZX81 £3.95

STARTREK
– YES! you can be a starship commander £3.95

GRAPHIC GOLF
– 18 graphically displayed holes to test even the best golfer £3.95

SUPERWUMPUS
– An enthralling underground adventure for your ZX81 £3.95

GAMES PACK
– Fantastic value for money, nearly 50K of programs on one cassette! Only £3.95

Please send me : _____

I enclose a cheque/PO for £ _____

Name _____

Address _____

_____

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

Sponsored by Practical Computing and Your Computer

Meet some of the best brains in Britain

at THE **Northern Computer Fair**

Personal computers
Home computing
Small business systems

BELLE VUE, MANCHESTER
NOVEMBER 25-27, 1982

Opening Times 10am-6pm each day

The brains we're talking about are the printed circuit, silicon-chip variety and you'll find them (thinking hard) in the vast range of exhibits at The Northern Computer Fair. The show covers the fields of personal computing, home computing, small business systems and associated software, through computer books to video games, with a special attraction being the ZX 81 Sinclair Village. So whether you're a businessman (or woman) who needs to keep up to date with the latest developments in this fascinating field, a die-hard computer enthusiast, or simply interested in the subject, you'll find what you're looking for at the Northern Computer Fair.

Ticket prices at the door are £2.00 for adults and £1.00 for children under 16, but special party rates are available for 20 people or more with the organiser admitted free. For more information contact IPC Exhibitions, Surrey House, 1 Throwley Way, Sutton, Surrey SM1 4QQ. Tel: 01-643 8040.

HALF PRICE ADMISSION VOUCHERS

for readers of YOUR COMPUTER

THE Northern Computer Fair
Personal computers
Home computing
Small business systems

adult £1.00

Cut this coupon and exchange for half-price ticket at the door.

YC

THE Northern Computer Fair
Personal computers
Home computing
Small business systems

child 50p

Cut this coupon and exchange for half-price ticket at the door.

YC

PSS

PERSONAL SOFTWARE SERVICES, 112 OLIVER STREET, COVENTRY CV6 5FE

ZX81 OWNERS — YOU CAN NOW

LOAD/SAVE 16K IN 29 SECS

WITH THE INCREDIBLE QSAVE PACKAGE FROM PSS

★ Verify successful saving of programs
★ Compatible with your existing recorder
★ No hardware modifications needed
★ No extra power supply necessary
★ No more wasted time waiting for programs to load or save

QSAVE comes in two parts:—

A HARDWARE — Simply plug the QSAVE amplifier/filter between your existing tape recorder and the ZX81 (all leads supplied)

B SOFTWARE — Load the QSAVE cassette before you load a tape or key in a program. You can then save + reload a full 16K (including ramtop) in only 26 seconds. IE. A data transfer rate of 4000+ BAUD compared with only 250 on the standard ZX81.

QSAVE also gives your ZX81 a verify function just like the Spectrum which allows you to check that your programs have saved properly.

Recolutionise your programming now for the all inclusive price of £15.95

Make Cheques P/Os payable to PSS. Full money back guarantee. Normal delivery within 7-14 days.

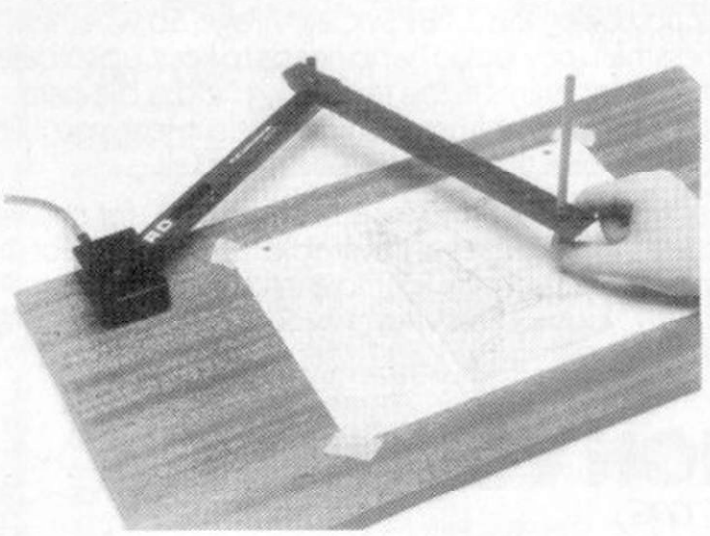
ZX SOFTWARE FROM PSS

We also have the widest range of high quality software for the ZX81 available anywhere. Whatever your needs we have the program for you. From a superb version of Puckman to a compiler or a complete word processor package — you need look no further than PSS. In addition — all of our software is available through the ZX Software Library. For a once only payment of £5.50 you can have any five of our packages (£10 for ten). You take one tape at a time and make your own copies — save yourself £'s on list prices. Send 2 first class stamps for a fully detailed catalogue of all our products.

NEW

INSTANT IMAGE TRANSFER TO ZX SPECTRUM

RD DIGITAL TRACER £49.95



(unretouched originals)

The high resolution colour graphics of The ZX Spectrum permit accurate presentation of complex or irregular images – maps, technical drawings, even personalities. But entering individual co-ordinates for unusual shapes can be tedious and time-consuming.

The new RD DIGITAL TRACER cuts out much tedious plotting. It provides instant transfer from original to display file – for screen display in colour, ZX printer printout, or retention on cassette.

The RD DIGITAL TRACER is of immense benefit in many fields – for geographers and weathermen, for engineers, architects and technicians, even for budding Leonardos! Designed for use with the ZX Spectrum, the RD DIGITAL TRACER as supplied is compatible with ZX 81, although high-resolution colour graphics cannot be obtained on this machine.

The RD DIGITAL TRACER is available only from RD Laboratories. The price of £49.95 includes P & P and VAT. Send your cheque now for delivery in 28 days. (Cheques payable to "RD Laboratories".) The RD DIGITAL TRACER is supplied with tracing sheet, software cassette, and full instructions on use.

Please send me ..... RD DIGITAL TRACER(S) at £49.95 each. I enclose payment of £ _____ . _____

Name: .....

Address: .....

.....

Send to: RD Laboratories, Dept. YCO, 5 Kennedy Road, Dane End, Ware, Herts. SG12 OLU

RD Laboratories' policy is to bring sophisticated computer techniques to low-cost computing. RD Laboratories therefore maintain the right to amend specifications at short notice. Please send for further details of the RD DIGITAL TRACER, and the RD 8100 SYSTEM for automatic monitoring, test and control.

R D Laboratories

5 Kennedy Road, Dane End, Ware, Herts. SG12 OLU
(0920) 84380

ZX81 MACHINE CODE?

NEW
Send for details of under-the-keyboard board for ASZMIC & BASIC.

ZX.ASZMIC rom transforms ZX81 into an

Assembly Language programming unit

£ **39**.95 total

ø FULL~SCREEN EDITOR

Sixteen shift keys take you into a world with a word processor feel. A blink cursor moves at your command to control insertion, rubout, line or string deletion, auto-scroll & page flip up or down. Text block operations. Ultra-fast editing.

ø MULTI~FILE SYSTEM

Declare as many files as you like, with any names you like, & they are automatically handled by the Operating System. Merge them, delete them, print, save & load them, & edit them by name. Superb flexibility with a simple but powerful system.

ø TOTAL ASSEMBLER

Full Z80 mnemonics, unlimited length labels, ORG & EQU directives, proper assembly listings with errors flagged on screen or printer. Relocatable object code & options to facilitate cross-assembly. Interpretive immediate execution available.

ø POWERFUL DEBUG

All the usual dump, modify, fill & copy commands; plus breakpoints, single stepping, context control, the convenience of interpretive execution mode, full use of the names in your program, Command Macros, autodump, and full operating system interface.

ø HI~RES GRAPHICS

255 x 144 resolution under program control to give you truly convincing graphics. With the power & flexibility of assembler you can really use this high definition.

ø MUCH, MUCH MORE

Repeat function on all keys. Double height titling on printer. Lots of extras. But more important than all these features, attractive though they are, is the fact that ZX.ASZMIC is an integrated development system in which everything fits together to give you a tool which can satisfy the professional programmer by simplifying all stages of the program development process. It is excellent for those who are taking the first steps into real programming but the more expert you become the better you realise just what ASZMIC can do for you. If you are at all interested in machine code it will be worth your while to find out more.

Comprocsys limited

I enclose £39.95. Please rush me ZX.ASZMIC + manual

NAME .....

Address .....

.....

.....

Sole UK agents:- CAPITAL COMPUTERS LTD.
1 Branch Rd, Park St, St Albans AL1-4RJ.
Phone 0727 72917. Cheques payable to ASZMIC a/c.

THE

BUFFER
MICRO SHOP

(NEXT TO STREATHAM STATION)

NEW SOFTWARE SHOP EXCLUSIVELY FOR

ZX81

PROGRAMS, GAMES, "ADD-ONS"

MOST OF THE MAIL ORDER ITEMS ADVERTISED IN THIS MAGAZINE AVAILABLE OVER THE COUNTER

LOADING PROBLEMS? TRY OUR INTERFACE
BUSINESS & TECHNICAL DATA HANDLING PROGS;
PROPER KEYBOARDS; CONSOLES; VDUs

The BUFFER Micro Shop,
374a Streatham High Road,
London SW16
Tel: 01-769 2887

P·E·P

THE PROGRAM ENHANCEMENT PACKAGE FOR THE ZX81 (16K)

A suite of easy to use machine code routines designed to transform your Basic programs.

■ **DEFINED SCROLL REGION** 1 line to whole screen
■ **SCROLL** up or down ■ **FILL SCREEN** any character
■ **CHANGE BACKGROUND** ■ **CHANGE FOREGROUND**
■ **INVERSE VIDEO** ■ **FLASH SCREEN**
■ **CLEAR SCREEN** without changing print position

Supplied on tape with a **6K DEMO PROGRAM** and a FULL instruction booklet

ONLY £5.95 Incl. p & p

SEND TO

R & R SOFTWARE

34 BOURTON ROAD
GLOUCESTER GL4 OLE

GOLF (9K)
A full feature game for 1 or 2 players. 9 or 18 hole course to test your skill. Fantastic full screen graphics with rough, bunkers, trees, water hazards, fairway and the green

BOMBER (5K)
Destroy the enemy city in this all action machine code game. Beware the cities defenders fight back. Complete with high score feature

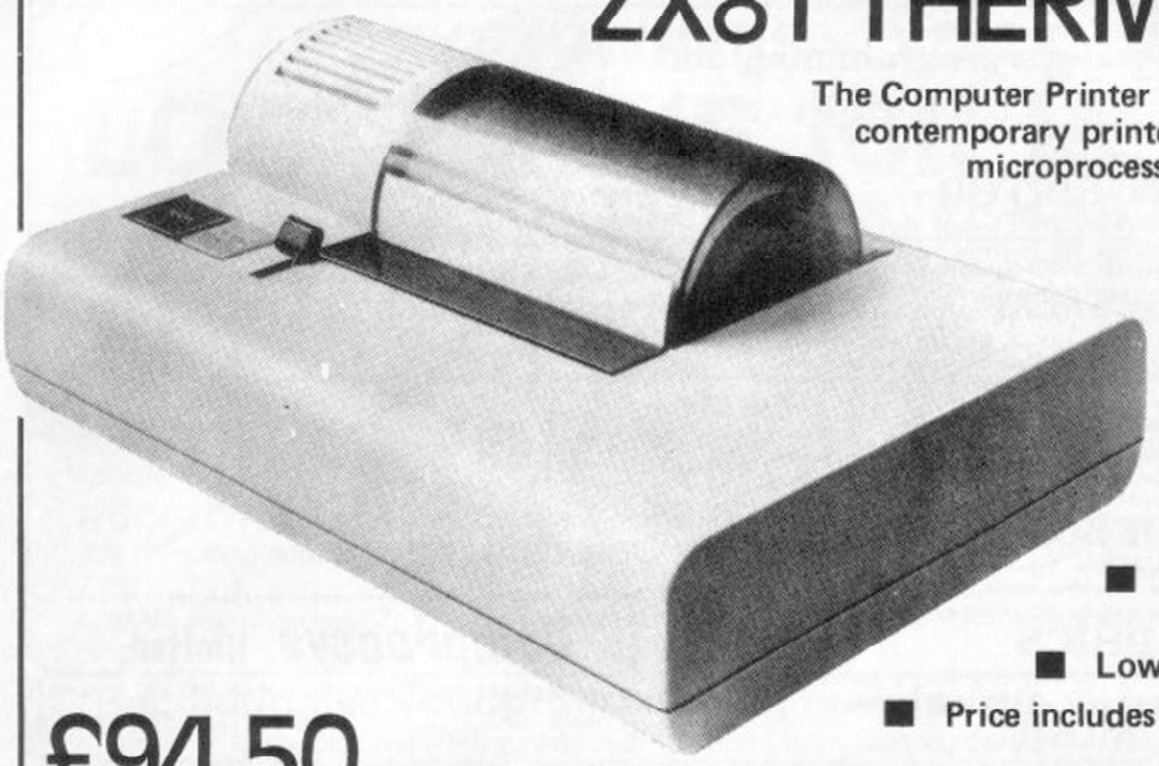
NEW
16K Spectrum
GOLF
Only £3.75

NEW
48K Spectrum
STAR TREK
Only £4.95

16K GAMES

THE PROFESSIONAL ONE

ZX81 THERMAL PRINTER



The Computer Printer high speed matrix printer combines contemporary printer mechanism design with advanced microprocessor based VLS I control electronics and distinctive functional styling.

- Professional high performance 40 column line printer.
- Attractively styled durable housing.
- Total interfacing.
- Quiet operation.
- Graphics capability standard.
- Uses Olivetti dot matrix thermal print mechanism.
- Low cost thermal paper supply.
- Price includes ZX interface and one roll of paper.

£94.50

inclusive of ZX interface and one roll of paper.
Please add £16.47 to cover postage, packing and VAT (total £110.97).
Please allow maximum of 28 days for delivery.

COMPUTER PRINTER DIVISION
DEAN ELECTRONICS LIMITED
Glendale Park Fernbank Road Ascot Berkshire England
Telephone 0344 885661 Telex 849242

MICHAEL ORWIN'S ZX81 CASSETTES

The best software (by various authors) at low prices.

QUOTES

"Michael Orwin's £5 Cassette Two is very good value. It contains 10 stolid well designed games which work, offer plenty of variety and choice, and are fun."
from the ZX Software review in *Your Computer, May '82 issue.*

"I had your Invaders/React cassette ... I was delighted with this first cassette."
P. Rubython, London NW10

"I have been intending to write to you for some days to say how much I enjoy the games on 'Cassette One' which you supplied me with earlier this month."
E. H., London SW4

"I previously bought your Cassette One and consider it to be good value for money!"
Richard Ross-Langley
Managing Director
Mine of Information Ltd.

CASSETTE 1
(eleven 1K programs)

machine code:
React, Invaders, Phantom aliens, Maze of death, Planet lander, Bouncing letters, Bug splat.

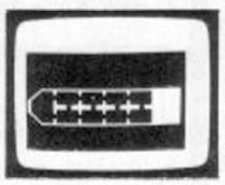
Basic:
I Ching, Mastermind, Robots, Basic Hangman. PLUS Large screen versions of Invaders and Maze of Death, ready for when you get 16K.
Cassette One costs £3.80.

CASSETTE 2
Ten games in Basic for 16K ZX81

Cassette Two contains Reversi, Awari, Laser Bases, Word Mastermind, Rectangles, Crash, Roulette, Pontoon, Penny Shoot and Gun Command.
Cassette Two costs £5.

CASSETTE 3
8 programs for 16K ZX81

STARSHIP TROJAN



Repair your Starship before disaster strikes. Hazards include asphyxiation, radiation, escaped biological specimens and plunging into a Supernova.

STARTREK This version of the well known space adventure game features variable Klingon mobility, and graphic photon torpedo tracking.
PRINCESS OF KRAAL An adventure game.
BATTLE Strategy game for 1 to 4 players.
KALABRIASZ World's silliest card game, full of pointless complicated rules.
CUBE Rubik Cube simulator, with lots of functions including 'Backstep'
SECRET MESSAGES This message coding program is very txlp qexi jf.
MARTIAN CRICKET A simple but addictive game (totally unlike Earth cricket) in machine code. The speed is variable, and its top speed is very fast.
Cassette 3 costs £5.

CASSETTE 4
8 games for 16K ZX81

ZX-SCRAMBLE (machine code)

Bomb and shoot your way through the fortified caves.

GUNFIGHT (machine code)

INVADERS (machine code)

GALAXY INVADERS (machine code)
Fleets of swooping and diving alien craft to fight.

SNAKEBITE (machine code)
Eat the snake before it eats you. Variable speed (very fast at top speed)

LIFE (machine code)
A ZX81 version of the well known game.

3D TIC-TAC-ONE (Basic)
Played on a 4×4×4 board, this is a game for the brain. It is very hard to beat the computer at it.

7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available from J. Steadman).

Cassette 4 costs £5.

Recorded on quality cassettes, sent by first class post, from:
Michael Orwin, 26 Brownlow Rd. Willesden, London NW10 9QL *(mail order only please)*

ADD ON, PLUG IN, PRINT OUT

AMBER 2400 MATRIX PRINTER

the flexible print out facility for home computers.

At long last it's possible for every home computer user to have a hard copy of program listings. The AMBER 2400 Matrix Printer is the first low-cost complete printer with the flexibility of parallel or serial inputs to make it compatible with most home computers.

Priced at just £69.99 plus VAT, the AMBER 2400 is available for the first time this August and has a most impressive specification.

● 24 characters per line standard text ● Full graphics capability – each dot is individually programmable ● Conventional 25 pin 'D' type plug ● Serial and parallel input ● CTS/Busy output ● Serial baud rate selectable from 75 to 9600 baud ● Mains Powered ● Injection moulded case for strength ● Size of just 80mm x 160mm x 160mm (H x W x D) ● Uses low-cost plain paper rolls (90ft for 45p) ● This is not a thermal or spark discharge type printer

This is the printer you need, write now telling us what computer you use, including a SAE, and we'll send you the AMBER 2400 Matrix Printer leaflet. We're also accepting advance orders for the AMBER 2400.

AMBER CONTROLS LTD.
Central Way, Walworth Industrial Estate,
Andover, Hampshire.

CALCULEX IV
DIFFERENTIAL AND INTEGRAL CALCULUS

This new program from CALCULEX puts the whole of Differential and Integral Calculus on to a single tape for the ZX81 (16k RAM). The program has in its memory, accessed by machine-code, more than 50 pairs of Differentiation/Integration formulae which can be looked up and used directly (they are indexed as algebraic, trigonometric, exponential and logarithmic). When you have chosen the general formula matching the equation you want to integrate or differentiate, the process is completely straightforward: input and values for the coefficients and the program will immediately tell you the *indefinite* integral or derivative and allow you to find the value of the definite integral or differential coefficient for any values of the equation.

For the differential calculus, the program automatically performs the often complicated operations involved in finding the *sum*, the *product*, the *quotient* or the *function of a function* for any number of expressions. For the integral calculus, besides finding the sum of any number of expressions, there is provision for finding the definite integral of equations which cannot otherwise be integrated, by an accurate numerical method. You can also input equations direct to find where the roots lie so that these can be used as the range for the definite integral.

The system can be operated immediately without difficulty by anyone. It teaches you as you use it and will allow you to become expert in Calculus in weeks rather than years.

Cassette with full instructions and guidance on the mathematics £12 cheque/PO from:

CALCULEX
21 Headland Avenue, Seaford, Sussex.

EDUCATIONAL COMPUTING
on the
ZX81

Suit children ages 5-11

No comparable collection offers so much for so little

THE LITTLE PROGRAMMES WHICH ARE BIG EDUCATORS

Here at last. A set of programmes to turn your Sinclair ZX81 into a powerful educational tool. And you don't even need to know programming. There are clear instructions and plenty of tips & advice. Designed to go beyond drill & practice the promote learning through interaction & discovery.

All programmes fit 1K

Creative use of graphics

Many innovative ideas

Fully documented

Includes many games

Educare's **50** 1K PROGRAMMES for PRIMARY EDUCATION

Includes:-

TORTOISE
A simplified version of the famous Turtle programme

CODED MISSILE
Combines the fun of arcade games with learning

£4.95 only
incl. p & p

Graph-plotter ● Histogram ● Simon-spell ● Sketchboard ● Times-table ● Sets Series-quiz ● XY-coordinates ● Count ● Equations ● Areas ● Guess-a-Volume Angles ● Upstairs-Downstairs ● Music-notes ● See-saw ● Wipe-out ● Spell Temperature ● Clock ● Money ● Snake Mastermind ● Number-shoot ● + 26 more

EDUCARE

To:
EDUCARE
103 College Road
Margate
Kent CT9 4AA

Please send me .....copies Educare's 50.
I enclose cheque/postal order for £ .....
Name .....
Address .....
.....

Let your child benefit early. Send now.

The SPECTRUM Games Companion

ISBN: 0 907211 02X PRICE: £5.95

by Bob Maunder

Available NOW!

LINSAC (YC)

68 Barker Road, Middlesbrough TS5 5ES

ARE YOU A ZX81 USER WHO'S NOT PLAYING GAMES?

£47.50
Including VAT.
complete

ECR 81 DATA RECORDER SAVES AND LOADS YOUR PROGRAMS EVERY TIME!

The ECR81 Enhanced Certified Recorder from MONOLITH is a major advancement in cassette recorder technology which minimises the problems associated with standard audio recorders. The unit is a high reliability program store for ZX computers based on a modified, proven cassette mechanism. The two sections of data recording circuitry automatically ensure precise levels are written onto the tape and that optimised signals are received by the computer.

THE ECR81 IS NOT SUITABLE FOR AUDIO REPRODUCTION
NO MANUAL VOLUME OR TONE CONTROL ADJUSTMENT PROVIDED

- Each ECR81 comes complete with its own individual certification tape, tested and serial numbered to prove your machine reliability.
- Mains Operation only.
- Mains & DIN connector leads provided.
- Certification of tape head alignment - height and azimuth.
- Certified tape tension, torque and speed.
- Fast forward and rewind tape search controls.

The ECR81 is also suitable for Sinclair ZX80

● Please allow up to 28 days delivery. ● The ECR81 is backed by our 14 day money-back option.

To: MONOLITH ELECTRONICS CO. LTD., 5/7 CHURCH STREET, CREWKERNE, SOMERSET

Please supply me with:	Price	Total
..... (Qty.) **Monolith ECR 81 Enhanced Certified Recorder(s)** to be used with my **ZX81**	£47.50 (Each)	
I also enclose postage & packing per recorder	£2.50	

Prices include VAT £ ☐

Please print

Name: Mr/Mrs/Miss. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Address ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

MONOLITH
electronic products
Telephone: Crewkerne 0460 74321 Telex: 46306

The country's biggest think-tank

Compec '82 is about ideas, decisions, short and long-term planning. It's the largest computer exhibition in Britain and it's designed specifically for the people who use computers; D.P. professionals and general management alike.
Compec '82 is the one place you'll find the whole range of products and services available in today's professional computer market. Complete systems, processors, components and subsystems, peripherals, terminals, communications equipment, ancillaries, consumables and services of every kind.
Plus a special emphasis on software in Compec's Software Village.

COMPEC'82

The Computer Exhibition, Olympia, London
November 16-19, 10.00-18.00
10.00-16.30 (final day)

Think now- order your tickets in advance

Entrance to Compec '82 is by registration at the door and costs £3. But you may obtain tickets in advance for the privilege price of £1.50 by ordering them on this coupon. The form and your remittance in UK £ sterling must reach us not later than October 29.

To: Compec '82 Tickets, IPC Exhibitions Ltd., Surrey House, 1 Throwley Way, Sutton, Surrey SM1 4QQ.

Please send me ..... advance tickets for Compec '82 at the privilege price of £1.50 each.

I enclose my remittance of £ sterling payable to IPC Exhibitions Ltd.

Name _____

Job Title _____

Company _____

Address _____

_____

Compec '82 is a Computer Weekly exhibition and is organised by IPC Exhibitions Ltd.

As seen on BBC TV "Computer Programme"

BIG EARS

STOP! GO! LEFT! RIGHT!

SPEECH
INPUT
FOR ANY
COMPUTER

Hugely successful Speech Recognition System, complete with microphone, software and full instructions.
BUILT TESTED & GUARANTEED ONLY £49
PLEASE STATE COMPUTER: UK101, SUPERBOARD, NASCOM2, Vic 20, Micron, ZX80/81, PET, TRS80, MZ80K, APPLE II, BBC MICRO

ZX80 ZX81

MUSIC SYNTHESISER
+ 16 LINE CONTROL PORT

Play 3-part music, sound effects, drums etc. Full control of attack, decay and frequency. Input/Output lines provide control and monitor facility for Home Security, Robot Control, Model Railway, etc. etc. Works with or without 16K RAM.

Add keyboard to make a live performance polyphonic synthesiser! Full instructions/software included.
AMAZING VALUE AT ONLY £19.50 (KIT)
Extra 23 way connectors at £2.60
The "Composer" Music Program (16K) £7.40
£25.50 (BUILT)

COLOUR MODULATOR — KIT £12 / BUILT £18
RGB in, PAL/UHF out (not for ZX)

UK101/NASCOM COLOUR GRAPHICS — KIT £45 / BUILT £60
Inc. Modulator. Still the best selling system!

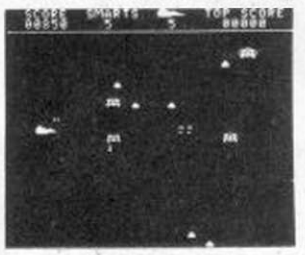
Please add VAT at 15% to all prices.
Barclay/Access orders accepted by telephone
All enquiries S.A.E. please

WILLIAM STUART SYSTEMS Ltd
Dower House, Billericay Road, Herongate, Brentwood, Essex CM13 3SD
Telephone: Brentwood (0277) 810244

BARCLAYCARD VISA

NEW! ATOM NEW!

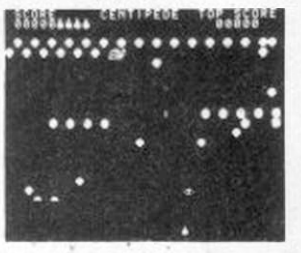
ALL ACTION PACKED M/CODE ARCADE GAMES



DEFENDER £7

The most realistic version of this amazing Arcade game available for the Atom. Defend your humanoids from mutation and destroy the Aliens in this hyper fast, action packed game. Moving planetary surface, repeating lasers and smart bombs, thrust, space, increasing Attack Waves, 6 types of Aliens, Sound Effects, Top score and excellent mode 4 graphics are some of the features in this exciting game.

CENTIPEDE £6

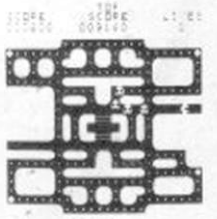


The first and only version of this popular Arcade game for the Atom. Shoot down the splitting centipede as it swirls through the mushroom field. Also inhabiting the game are Spiders, Bugs and Snails. The action increases until only skill and quick thinking can save you. Excellent high speed mode 4 graphics, Sound Effects and Top score.

OMEGA MISSION £7

The first and only version of the superb Scramble Arcade game. Moving landscape! fly over mountains, through caves and tunnels. 5 different stages, Ground to Air Missiles, Fire Balls, Space Craft, Mutants and the narrow twisting Tunnel. Movement in 8 directions, laser cannon, Excellent COLOUR graphics (give Black & White on monochrome T.V.) mode 3a, Sound Effects, Top score.

PUCKMAN £5



One of the best versions of this popular Arcade maze chaser game. Eat all the dots in the maze but watch out for the hungry ghosts! Eat an Energy Blob and the chase reverses. Each maze cleared brings a new one with faster ghosts. Excellent high speed mode 4 graphics, Sound Effects and Top score.

ALL 12K RAM
PRICES INCLUDE P&P. FAST 2 DAY DESPATCH!
micromania
14 LOWER HILL RD. EPSOM. SURREY.

BRITAIN'S LARGEST SINGLE MICRO USER GROUP

BEEBUG FOR THE BBC MICRO

INDEPENDENT NATIONAL USER GROUP FOR THE BBC MICRO

IF YOU OWN A BBC MACHINE, OR HAVE ORDERED ONE, OR ARE JUST THINKING ABOUT GETTING ONE, THEN YOU NEED BEEBUG. BEEBUG runs a regular magazine devoted exclusively to the BBC Micro (10 issues per year). Now 36 pages.

Latest news on the BBC project.
What you should know before you order a machine.
Members' discount scheme on books and hardware.
New program listings, regular advice clinic, and hints and tips pages in each issue.
April Issue: 3D Noughts and Crosses, Moon Lander, Ellipse and 3D Surface. Plus articles on Upgrading to Model B, Making Sounds, and Operating System Calls.
May Issue: Careers, Bomber, Chords, Spiral and more.
Plus articles on Graphics, Writing Games Programs, and Using the Assembler.
June Issue: Mazetrap, Mini Word Processor, Polygon; plus articles on Upgrading, The User Port, TV set and Monitor Review, Graphics Part II, More Assembler Hints, Structuring in BBC Basic, plus BBC Bugs.
July issue (36 pages) Invaders and patchwork programs. Fix for BBC cassette Bugs, Mode 7 explored, User define Keys, Software reviews, High res graphics printout, RS423 receive fix.

Membership
6 months £4.90
1 year £8.90
Send £1.00 and A4 SAE for sample
(Overseas add £1.00 for 6 mths, £1.50 for 1 year)

Make cheques to BEEBUG and send to BEEBUG, Dept 4, 374 Wandsworth Rd., London, SW8 4TE.

16K ZX SPECTRUM GRAPHICS SUPERDRAW16 16K ZX SPECTRUM GRAPHICS

- 16K Spectrum graphics pack.
- Full screen high resolution colour.
- Moving cursor control.
- Large alphabet facility.
- Pictures saved on cassette.
- Automatic "slide show" option.
- Menu driven, easy to operate, crash proofed.
- Documented to usual high Video Software standard.
- Demonstration slide show.
- Audio commentary on reverse of cassette.

If you've now got your Spectrum you will be wanting to explore its graphics potential. SUPERDRAW16 will help you get the best from it.
Price: £5.00 inc. VAT, P. & P. Immediate delivery.

STONE LANE
KINVER
STOURBRIDGE
WEST MIDLANDS
DY7 6EQ
ENGLAND
TEL: KINVER 2462

VIDEO SOFTWARE LIMITED

Machinecraft Software

FOR THE 16k ZX81

737 Cockpit.....£5.75
Amazon Adventure..£4.50
Fruit Machine.....£4.50
Life.....£4.50
Wordsquare £4.00
Orbiter/Hangman ...£4.00
ZXHEX M/C entry and manipulation.....£4.00
ZX CESIL Computer language for schools.....£5.75
DNA Educational 7 program set.....£11.50

FOR THE ACORN ATOM

Theseus 3D Adventure in 12k No F.P. needed.....£11.50
DEATH TEMPLE Adventure in 3k.....£5.75
SPACE ALIENS Requires only 3k.....£5.75
DEATH PARK/HIGH-LOW/SNIPER 12k No F.P..£5.75
ATOM CESIL 12+12.....£5.75

SPECTRUM Software available soon.
All prices inclusive.
Send S.A.E. for further details or payment to:

MACHINECRAFT LTD.,
P.O. Box 2, Coggeshall, Colchester, CO6 1TJ

MACHINECRAFT LTD.
The Bazaar, Market Hill,
Coggesall, Colchester, Essex.

MIDWICH MICROCOMPUTERS CO. LTD.

MAIL ORDER SPECIALISTS
Lowest Prices — Fastest Delivery

MEMORIES **NEW LOWER PRICES**

2114 Low Power 200ns	0.80	4116 200ns	0.70
2708 450ns	2.79	4116 150ns	1.10
2716 450ns (5V)	2.10	4118 150ns	3.38
2716 350ns (5V)	3.59	4164 200ns (TI)	4.65
2716 450ns (3 rail)	5.95	4816/4516 100ns	3.25
2732 450ns	3.90	5516 200ns	9.38
2732 350ns	4.40	6116P3 150ns	4.30
2532 450ns	3.60	6116LP3 150ns	5.75

BBC MICRO UPGRADE KITS
NEW LOWER PRICES

As some parts are still in short supply please check availability before ordering.

BBC1	4516/4816 × 8 100ns	25.50
BBC2	Printer/User I/O kit (IC69,70 + PL9,10)	8.00
BBC4	Analogue input kit (IC73,77 + SK6)	6.70
BBC5	Serial I/O and RGB kit (IC74,75 + SK3,4)	11.45
BBC6	Expansion bus and tube kit (IC71,72,76 + PL11,12)	6.25
BBC21	Printer cable complete	13.00
BBC22	Connector for user port with 36" cable	2.00
BBC44	Analogue input plug with Cover	2.25
BBC55	5 and 6 pin DIN plugs for Serial I/O and RGB input	0.99
BBC66	Connector for Bus port with cable	3.50

VISA
24 HOUR TELEPHONE SERVICE FOR CREDIT CARD USERS

★ All prices exclude VAT and Carriage (0.75 + VAT) on orders under £10 ★
★ All orders despatched on day of receipt with full refund on O/S items if requested ★
★ Order receipted & returned with goods. If full VAT invoice required please add 0.50 + VAT ★

MIDWICH MICROCOMPUTERS CO. LTD.
DEPT YC, HEWITT HOUSE, NORTHGATE STREET,
BURY ST. EDMUNDS, SUFFOLK IP33 1HQ
TELEPHONE: (0284) 701321 TELEX: 817670

GRAPHICS AT TWICE THE SPEED OF TAN!

THE TUG INTELLIGENT VIDEO BOARD 80/82

6502A Processor

8/16K Bit mapped screen. 131,072 pixels!

VBUG Eprom controller

512×256/256×256 USER SELECTABLE SCREEN

Phantom displayed with Microtan video, and full handshaking facilities

80 Chars and 25 lines ... or 40 x 25

TANGERINE USERS GROUP
0202/294393

16 Iddesleigh Road Charminster Bournemouth BH3 7JR

access and barclaycard THINK TUG!

ZX81 ADVENTURE SPECIALISTS

C2: VOLCANIC DUNGEON/HANGMAN £4.50

A) VOLCANIC DUNGEON: Rescue if you can, the Elfin Princess. Mythical monsters, pits, firey caverns, diminishing strength and water make your quest anything but easy.
FULL 16K PROGRAM** SAVE GAME ROUTINE** SINGLE KEY ENTRY**
"Volcanic Dungeon is terrific value and I would recommend it to anyone." *Mrs. Thomas, Cornwall.*

B) HANGMAN: Deluxe version of the classic game. Play against an opponent, or the computers 400 word vocabulary. Good graphics.

C3: ALIEN INTRUDER/HIEROGLYPHICS £5.00

A) ALIEN INTRUDER: You awaken to find you are the only survivor on the Explorer Class 3 Starship. Can you escape before you also fall victim to the Alien monstrosity that devoured the crew? There are many ways to end this adventure but only one way to survive!
FULL 16K PROGRAM** INTERACTIVE GRAPHICS**
SAVE GAME ROUTINE**

B) HIEROGLYPHICS: Decode the ancient 39 symbol alphabet in time to save the famous explorer, "Wullie Makeit" from a sandy grave.
FULL 16K PROGRAM** ANIMATED GRAPHIC DISPLAY**
RANDOM CODE**

C4: WUMPUS ADVENTURE/MOVIE MOGUL £5.00

A) WUMPUS ADVENTURE: **FOR 1 TO 4 PLAYERS!** Seek the famous creature in the most dangerous Wumpus hunt ever. All the usual features are there SUPERBATS* PITS* TREMORS* SWAMPS* MAGIC ARROWS**
PLUS Exciting new features: EVIL GOBLINS that will try to sacrifice you to the Wumpus. GIANT SERPENTS* WUMPUS MUCK* MAGIC SPRINGS**
FULL 16 PROGRAM** RANDOM & PRESET CAVE PATTERNS**
YOU CONTROL THE LEVEL OF DIFFICULTY** GREAT FUN FOR YOU AND YOUR FRIENDS**

B) MOVIE MOGUL: Guide your film through the often hilarious traumas of production. Use your budget wisely and you may make a fortune. Success depends on many factors and not just luck.
FULL 16K PROGRAM***

ORDERS: Plus 50p P&P or large S.A.E. for list to:

CARNELL SOFTWARE,
4 STAUNTON ROAD, SLOUGH, BERKS. SL2 1NT.
The above are also available from:
BUFFER MICROSHOP, STREATHAM, LONDON.

ZX SPECTRUM SOFTWARE

SUPERDRAW £5.00

List of Features

- 16K Spectrum graphics pack.
- Full screen high resolution colour.
- Moving cursor control.
- Large alphabet facility.
- Pictures saved on cassette.
- Automatic "slide show" option.
- Menu driven, easy to operate, crash proofed.
- Documented to usual high Video Software standard.
- Demonstration slide show.
- Audio commentary on reverse of cassette.

SUPERVIEW 48 £5.00

List of Features

- 48K Spectrum personal viewdata.
- Page creation with moving cursor.
- Large alphabet option.
- 48 full screen two colour pages OR
- 24 full screen full colour pages.
- Random page recall.
- Continuous page rotate.
- Print option.
- Full operating manual to our usual standard.
- Audio commentary on reverse of cassette.

Prices include VAT, P. & P. Immediate delivery.
Full range of ZX81 software still available.

STONE LANE
KINVER
STOURBRIDGE
WEST MIDLANDS
DY7 6EQ
ENGLAND

TEL KINVER 2462
STD 038 483 2462

VIDEO SOFTWARE LIMITED

Spectrum

Fast Action Games in Machine Code

ZX81

TREASURE HUNT (Spectrum) Explore one of the 29 mazes in search of treasure and grab as much as you can before the time limit. This game can be played with or without moving obstacles; with one player, two players in opposition, or two players in partnership; and with part or all of the maze visible. There are 144 variations of this fascinating game and even the game selector is fun to use.

HUNT (16K ZX81) A ZX81 version of Treasure Hunt with 48 variations.

X-MEN (16K ZX81) The only Puckman type game with all these features: true gobbling action, bonuses, arcade type maze, 3 lives, graphic display of lives left, 4 monsters, a den, booster buns, high score, continuous on-screen scoring.

UFO (16K ZX81) A fast moving space game in which you must defend and Earth by destroying all the UFOs and spy satellites while your moving force field gradually gets worn away by the alien bombs.

TRAP (16K ZX81) You control a moving wall and try to surround your opponent (computer or human) before he surrounds you. There are 3 speeds and games can be played with a border or wrap around screen.

£4.95 PER GAME ON CASSETTE

AMBA SOFTWARE
13 CHERRY BOUNDS RD
GIRTON
CAMBRIDGE CB3 0JT

Tick games required
☐ TREASURE HUNT ☐ X-MEN
☐ HUNT ☐ UFO
☐ TRAP

NAME .....
ADDRESS .....
.....
.....
.....

A GOLDEN OPPORTUNITY FROM COMPUTER RENTALS LIMITED

Here at Computer Rentals, we want to see your ZX81 programs. If you have written some software, don't waste it on a small audience of family and friends. Send it to us and we will take a good look at it. If we like it, we'll publish it, leaving you nothing more to do than cash your royalty cheques. Your program can be on any subject: Games, Education, Business, Home Finance. . . . if you can think it up we are interested. What's more *we don't pay meanly*. We want the best and we are willing to pay accordingly. A royalty of £1.50 for each cassette sold is our offer and when you think of the size of the market, you can see how generous we are. Don't be put off before you get your work in the post, just send your cassette away with some instructions and a stamped addressed envelope. After all, you have nothing to lose but the postage, and all to gain from our marketing.

Send to:

Computer Rentals Limited
140 Whitechapel Road
London E1.

WHAT PEOPLE ARE SAYING ABOUT OUR . . .

BBC MICRO GAMES

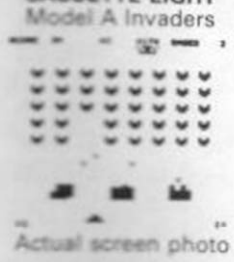
". . . I bought all your tapes to date for the BBC Micro and I think they are just super, especially STAR TREK, and the sound effects in CANDY FLOSS really made me sit up! Well done and keep them coming".
J. S., Paisley

". . . I was very impressed, not only with the cassette, but also at the speed at which it came!"
— R.L., Cheshire

". . . I must congratulate you on your MUTANT INVASION cassette. I have had it for two weeks now and it is really superb. Incidentally, I have beaten your high score of 4,500 — mine is 7,580!"
— S.L., Berks

AND NOW LOOK AT OUR LATEST CASSETTES!

CASSETTE EIGHT
Model A Invaders



Actual screen photo

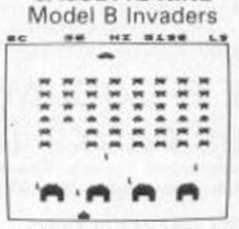
Cassette Eight contains Model A Invaders. A superb full feature machine code teletext colour graphics version of the popular 'Space Invaders' arcade game for the Model A BBC Micro. Choice of Invader and Missile speeds. FAST, SMOOTH AND GREAT FUN!

Only £4.95 inc.

Cassette Nine contains Model B Invaders. A superb full feature adaptation of the arcade 'Space Invaders' game in machine code and high resolution colour graphics, for the Model B BBC Micro. Choice of Invader and Missile speeds. QUITE SIMPLY THE BEST.

Only £6.95 inc.

CASSETTE NINE
Model B Invaders



Actual screen photo

NOT FORGETTING THE REST OF OUR FANTASTIC RANGE

FOR MODELS A AND B

Cassette One: STAR TREK (8x8 Galaxy, Klingons, Phasers etc) and CANDY FLOSS, the tremendous new game everyone is talking about! **Only £5.95 inc.**

Cassette Two: HANGMAN, KRYPTOGRAM, DICE, BEETLE, GRAND NATIONAL and MUSIC. **Only £3.95 inc.**

Cassette Three: MUTANT INVADERS (arcade game). Can you destroy the Mutants before they destroy you with their radioactivity. **Only £5.95 inc.**

Cassette Four: BREAKOUT (arcade game). Superb version, 6 skill levels, 1 or 2 players. **Only £3.95 inc.**

FOR MODEL B ONLY

Cassette Five: BEEBMUNCH (arcade game). Our version of the 'Pacman' game. Tremendous version containing multi-ghosts, tempting fruits, superpoints, screams etc. **Only £5.95 inc.**

Cassette Six: SUPER HANGMAN. The special feature is the high-resolution animated man. Marvel at the detail of his clothing and witness his impatience! Contains many categories. **Only £3.95 incl.**

Cassette Seven: 3D MAZE. Battle against the clock to escape from the maze, with the computer showing your view in 3-D each step you take! **Only £3.95 inc.**

ALL CASSETTES AVAILABLE *NOW* FROM:

(All our software is available before we advertise)

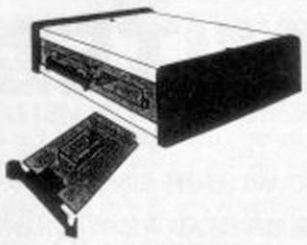
I. J. K. Software

55 Fitzroy Road, Bispham, Blackpool, Lancs

ATOM USERS!

WIN AN ADPROM 4000

IN OUR "ONE LINE" PROGRAMME COMPETITION. DETAILS IN OUR BROCHURE. DON'T FORGET S.A.E.



ADPROM 4000 WITH 2 CARDS

Problem! Two or more Eproms and only one socket on your Atom. SOLUTION! is an ELINCA ADPROM unit and use any as required for only £39.10 incl. VAT etc.

ATOM CASE CONSOLE

Type AC155 £31.63 incl. VAT etc. can be supplied with single Adprom as in photograph.

FULL DETAILS OF ALL OUR PRODUCTS WILL BE SENT ON RECEIPT OF AN A5 S.A.E.

ELINCA PRODUCTS LTD (Dept. C)
LYON WORKS, CHAPEL STREET
SHEFFIELD S6 2HL

SATURN SOFT

SPECTRUM ZX81
NEW — NEW — NEW

MAD MARTHA — Dedicated to the little woman! Adventure with a difference! Can you have Henry, Littlefellow, go out on the town without being caught by your crazy, axe wheeling wife. Lots of fun for the broadminded.
Spectrum **£5.95** inc. ZX81 **£4.95** inc.

GOBBLER An exciting version of **PAC MAN** for the Sinclair machines. M/code fast action. Spectrum version features full arcade Graphic and sound!
Spectrum **£5.95** inc. ZX81 **£4.95** inc.

MINES OF SATURN The first of a whole series of new adventure programs. Be warned, this is not easy!
Spectrum **£5.95** inc. ZX81 **£4.95** inc.

RETURN TO EARTH The sequel to **MINES OF SATURN** Where will it end!
Spectrum **£5.95** inc. ZX81 **£4.95** inc.

£1.00 off two or more programs ordered together. Please send SAE for full lists of many programs available for Spectrum and ZX81. Programs for dragon ready soon.

ALL PROGRAMS DOUBLE SAVED
on computer quality cassettes to avoid loading problems.

SATURNSOFT
37 Heol Dulais, Birchgrove, Swansea,
West Glamorgan SA7 9LT.
TELEPHONE: (0792) 816579

ZX-FORTH!

***FULL FIG-79 STANDARD (NON-DISK)**
***FASTER THAN BASIC**
***EASIER THAN MACHINE CODE**
***SUPPORTS ZX-PRINTER**

Forth, for those who are not already converts, is perhaps the closest yet to the ultimate all-purpose computer language. It is designed to be fast, portable and *extremely* flexible. A FORTH program consists, largely, of definitions of new FORTH words, enabling a user to develop a unique, application oriented, vocabulary. It is even possible to alter the syntax to suit your application (or just your style of program!).

***TAPE & DOCUMENTATION . . . £10**

GAMES PACKS 1&2
Pack 1 includes: Space Torpedo, Reverse, M/C Life and more.
Pack 2 includes: Robot chase, Nim, Music, Mini Adventure etc.

UTILITIES PACK
Enhance your BASIC Programs with this set of useful machine code routines.

GAMES PACKS . . . £6 each

UTILITY PACK . . . £5

*****COMING SOON*****

PILOT: the educational language

ALL PRICES INCLUDE VAT & P&P
QUALITY STACKABLE CASSETTES

Quasar Computational Paraphernalia SOFTWARE

11c HERCIES ROAD · UXBRIDGE · MIDDLESEX

MEMORY DEVICES FROM:

GCC ELECTRONICS

Tel: 0223 21044 **Telex: 817672**

EPROMS		6500 Family		MEMORIES	
2708	200p	6502	375p	2114LP-2	90p
2716+5V	200p	6520	285p	2114-450	85p
2732	385p	6522	375p	4116-150	90p
2532	365p	6532	520p	4116-200	88p
2764	1200p	6545-1	900p	4816-2+5V	250p
				4164-200	410p
6800 Family		Z80 Family		6116-150	350p
6800	270p	CPU	315p	5516-250	635p
6802	325p	ACPU	350p		
6810	110p	CTC	270p		
6809	850p	ACTC	290p		
6850	135p	PIO	340p		
6821	110p	APIO	350p		

We supply 74LS TTLs, CMOS 4000 Diodes. Transistors, etc., etc. All components are guaranteed prime parts, from leading manufacturers.

Orders from Government, Educational and Overseas buyers welcome. Special prices for volume enquiries. Please add £1 post and packing plus VAT at 15%. Minimum order £15.00.

GCC ELECTRONICS
18 CLAYGATE ROAD, CHERRY HINTON
CAMBRIDGE CB1 4JZ
TEL: 0223 210444 **TELEX: 817672**

BBC SPECTRUM VIC

You don't need to be one to use our

Magnetic Character Plotter

— it's simply the best thing since sliced bacon!

The MCP is designed for use with personal computers having a user definable character facility — SPECTRUM, BBC, VIC and many others.

A quality product having two 8×8 plotting grids on which the black magnetic markers are arranged to create or amend your "Space Invader", Russian script, electronic symbols etc. Your only limit is your imagination! Use both grids to plot larger characters.

The MCP is manufactured in durable p.v.c. as a pocket wallet so that you can quickly and easily "plot" anywhere — on the bus, lunchbreak, in the bath! Plotting on paper is just plain tedious and old fashioned.

MCP CO
34, WOODSIDE,
HARROGATE,
NORTH YORKSHIRE
HG1 5NG.

£2.95
(Post and packing free)

WRITE EFFICIENT ZX81 BASIC

- Improve your ZX BASIC Programming skills with this new book
- Assumes knowledge of the Sinclair ZX81 BASIC manual only
- Illustrated by over 25 useful and enjoyable programs, demonstrating the rules described, while making the most effective use of 1K
- Many of the principles listed are of more general application, most particularly to ZX SPECTRUM Basic
- Send £5 to:

Ivor Killerbite,
10, Elson Road,
Formby,
Liverpool L37 2EG.

ANIROG Computers

"**VIC 20 - AUDIO CASSETTE INTERFACE**" uses earphone and microphone sockets of the recorder - built and tested - £10.50.
Motor control via mic switch £2 extra.
3K RAM + 2 ROM SOCKETS
+ PROGRAMMER'S AID + HI - RES GRAPHICS - £49.95.

SPECIAL VIC 20 OFFERS

BEGINNER'S BAG — VIC 20 + Cassette Drive + introduction to basic (part 1) + 3 cassette games + 10 blank cassette — £225.
ECONOMY BAG — VIC 20 + cassette interface + 3 cassette games + 2 blank cassettes — £198.
GAMES BAG — VIC 20 + Joystick + Cartridge game £205.

VIC 20 SOFTWARE WITH A DIFFERENCE

ALL ANIROG SOFTWARE IS IN HIGH RES. GRAPHICS AND HAS FAST M/C DISPLAY.

LOST IN THE DARK - Occassional flashes of lightning would show you the way to the sacred chalice in the pitch dark maze. The maze is fraught with dangers and hides an unseen beast which is cunning enough to work out your moves almost before you make them. The game stretches your powers of memory and concentration to the limit. A unique maze adventure game - £6.

SPACE RESCUE - Rescue the survivors stranded on a devastated star base. You have to thread your way through fast moving debris to land, rescue and then return to dock with the mother ship - £6.

SLALOM - SKI - The giant slalom on the scenic mountain slopes. You need nerves of steel and split second reactions - £6.

GOBLINS GOLD — The gold is well guarded by the goblins and their henchmen. Have you the cunning and agility of mind to outwit them.
A high pressure adventure game - £6.

HUGE SELECTION OF **VIC 20 - SPECTRUM - ZX81 BBC MICRO SOFTWARE - COMPUTER BOOKS - ADD ON HARDWARE**
Authorised dealer for **COMMODORE - ARFON - STACK - BUG BYTE - AUDIOGENIC - LLAMA - DK'TRONICS AND MANY OTHERS**
ORDER 2 OR MORE BOOKS OR SOFTWARE FOR 7.5% DISCOUNT
SEND S.A.E. FOR CATALOGUE.PLEASE STATE THE COMPUTER TYPE.

Mail Order -
Payment by cheque, P.O., VISA or ACCESS.

Counter service,
CO-OP CRAWLEY

AR

26 Balcombe Gardens,
Horley, Surrey.
Phone order:
Horley (02934) 2007/6083

SOFTEK

SPECTRUM METEOROIDS £4.95

By far the fastest, smoothest version of this arcade game; full colour, three meteoroid sizes, hyperspace, shield, thrust, freezeframe, etc, etc. With ultra-smooth graphics and machine code synthesised sound effects that have left other software houses wondering how we did it. Simply the best, for only £4.95 (16K or 48K Spectrums).

The ZOLAN ADVENTURE: A full adventure in 16K; probably the best presently available! Only £4.50.
Coming soon: The Quest, various toolkits, screen kits; send for details.
Send your cheques and postal orders to: SOFTEK, 329 Croxted Road, London SE24.

WRITERS: Why not let us market your software for *any* microcomputer. We pay the highest royalties and market both from London and from our office in Los Angeles.

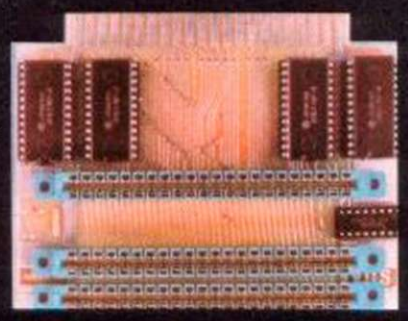
ADVERTISEMENT INDEX

MORE MEMORY FOR MICROS !

look at what we can offer :

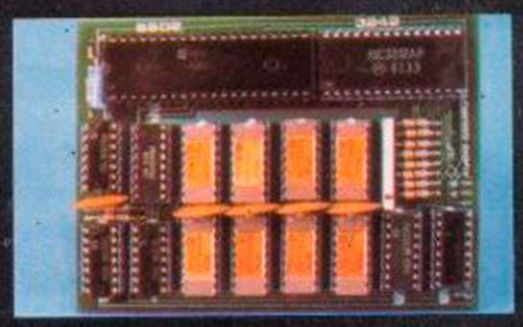
RAMPACKS

for SINCLAIR ZX81



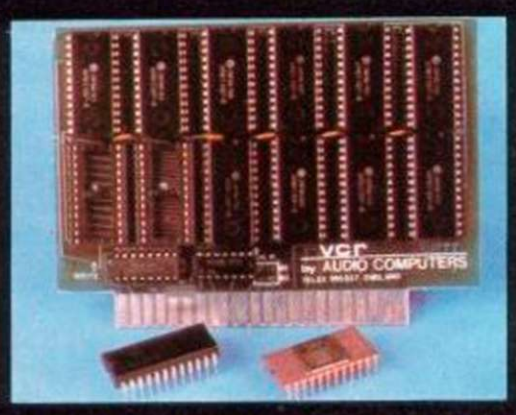
VCS 8K for VIC

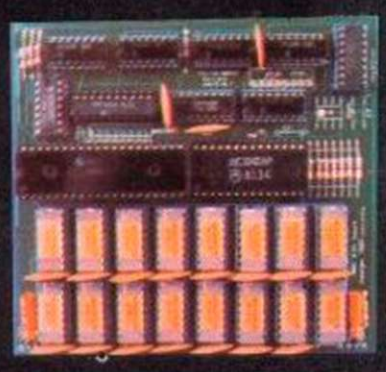
8k RAM + 3 slots **£44**



DUO1 for ATOM

64k RAM only **£70**





add up to 20k RAM + 16k ROM

VCR 20 for VIC

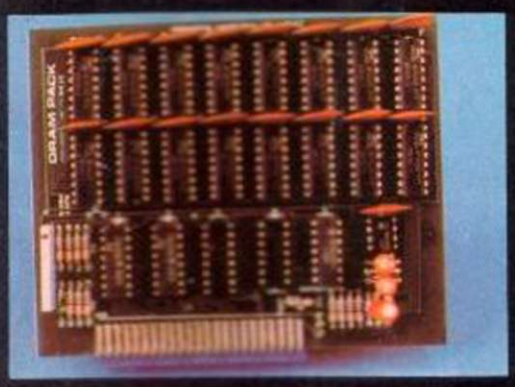
4K-£24, 2k increment - £5

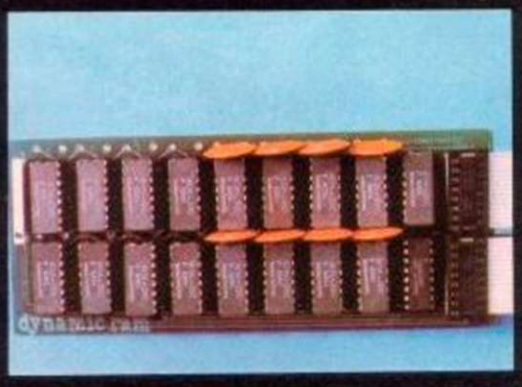
DRC for PET

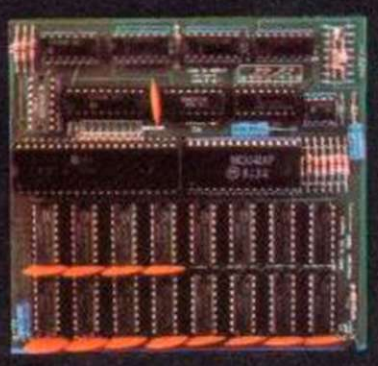
64K-£80 128K-£130

OUT OF STOCK

16K - the only upgradable to 56k on the market - £36







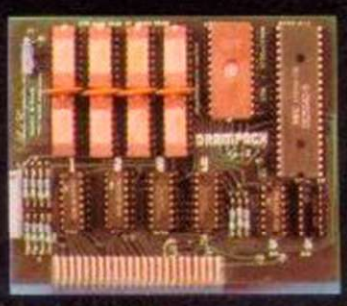
TRS80-V.GENIE

32K bytes — £29

32K add on RAM £46

UK101:

32K add on RAM **£69**



56K — exceptional low power consumption — £44.90

64K + Eprom programmer & user port — only £79

We can adopt the above products for ZX81 to fit your new Spectrum for just £5 Extra.

FOR A FREE BROCHURE, RING LINDA OR SUE ON SOUTHEND (0702) 613081
FOR CREDIT CARD ORDERS, RING JACKIE OR PAM ON SOUTHEND (0702) 618144

CHEQUES AND P.O.'s TO :

AUDIO-COMPUTERS

87 BOURNEMOUTH PARK ROAD,
SOUTHEND ON SEA — ESSEX SS5 2JJ

ALL PRICES INCLUDE V.A.T. AND POSTAGE

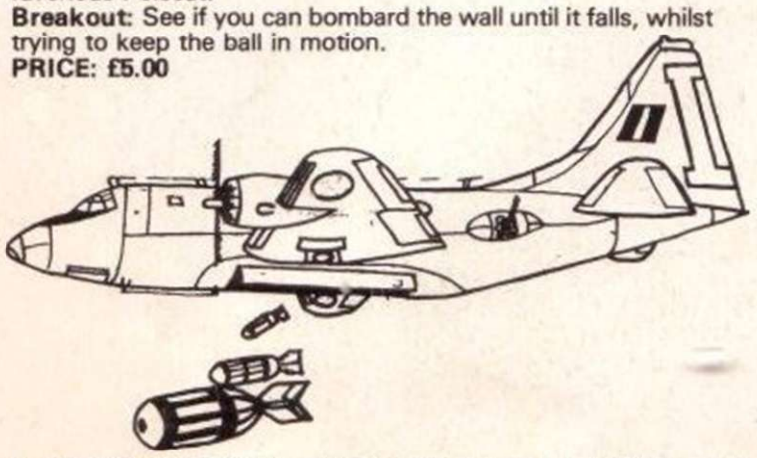
TELEX 995337 G AUDCOM

A TRADEMARK OF SOLIDISK LTD.

Spectrum & Dragon Software

MISSILE COMMANDER AND LUNAR LANDER
Missle Commander: defend your city against ICBM's streaming from the heavens, causing a series of mutlicoloured, noisey explosions. You must also deal with marauding enemy bombers. There are 10 skill levels, and/or on screen score.
Lunar Lander: falling towards the lunar surface your lander must be brought to a safe halt on the green moon. A new surface is generated on each run.
PRICE: £5.00

POLECAT AND BREAKOUT
Polecat: A completely original and ingenious maze program in which you are a rabbit and the computer is a Polecat. The action takes place in one of over a million underground mazes. The plot involves the rabbit collecting carrots and bringing them back to his burrow whilst avoiding the attention of the ravenous Polecat.
Breakout: See if you can bombard the wall until it falls, whilst trying to keep the ball in motion.
PRICE: £5.00



We guarantee DISPATCH WITHIN 48hrs

WE WOULD LIKE TO SEE YOUR SOFTWARE **NOW**

BOMBER AND FRUIT MACHINE
Bomber: This fast-action game involves the destruction of cities quickly before you crash into the buildings.
Fruit Machine: Similar to the familiar one-armed bandit, with very realist graphics.
PRICE: £5.00

CRAZY RACE AND SUBHUNT
Crazy Race: You are driving around a racing track. How many obstacles can you run over before you crash?
Subhunt: You are a helicopter pilot firing down at submarines, destroying them before they destroy you.
PRICE: £5.00

ALL PROGRAMS SUITABLE FOR EACH MACHINE USING MACHINE CODE

ZX81 — Software

4 MAGNIFICENT MACHINE CODE PROGRAMS	**£5**
SCRAMBLE **GALAXIONS** **INVADERS** **GUNFIGHT**	"UNDOUBTEDLY THE FINEST SOFTWARE AROUND" — quote from many such letters we receive each week! See for yourself the world's best programs. All for £5.00 inc. VAT.
+ 2 STRATEGY GAMES	
The 16K ZX81 Games Pack — £5	

MAIN DEALERS:
LEICESTER — MICROWARE
HYDE, MANCHESTER — PASE
BRISTOL — GEORGES
BRIGHTON — GAMER
CO. ANTRIM — OHMEGA

ZX BUSINESS SYSTEM

Now installed in many businesses, comes with PURCHASE; SALES LEDGER for 100+ entries per week, does daybook analysis, VAT incl. and excl., totals, password protection plus many more excellent features. You also get a STOCK CONTROL. MAIL LIST and PHONEBOOK. Easy to use, designed for everyday small businesses. Includes instruction book and tape. **£17.00 incl. VAT**
And does the job of systems costing hundreds of pounds.

16K PACK 123

Pack 1, 2 & 3 include all of:
AIR TRAFFIC CONTROL: Animated radar screen of busy airport shown. You must bring planes into land; INVADERS SELFPLAY; PHONEBOOK — keep friends' and relatives numbers on cassette. COMPUTER DATING, who will it pick for you and those around you for a laugh. ADVENTURE ATLANTIC: you may become very rich or marooned forever. BREAKOUT: SQUASH: LANGUAGE TRANSLATOR: translates any European language to any other. COMPUTAPUNT: predict horse races and football pools with you ZX. INDISCO, video roadracer. DRAUGHTS computer chequers, with kings. BATTLESHIPS, nautical naval battle at home. MASTERMIND: brain teaser, see if you can beat a microelectroic mind.
THIS MASSIVE PACK OF SOFTWARE IS ONLY **£5.00**

CONTROL TECHNOLOGY
184 MARKET STREET
HYDE, CHESHIRE SR14

Please send me as soon as possible the following:
☐ _____ £_____
☐ _____ £_____
I enclose a Cheque/P.O. for the total £_____
NAME _____
ADDRESS _____
_____ POSTCODE _____