Personal Computing Today

AUGUST 1982
65p

NEW

BUYING A MICRO?
Details On The 12 Top Machines

OVER 20 PAGES OF PROGRAMS FOR TANDY, ZX81, ATOM, VIC-20, BBC, SPECTRUM, ETC

COMPUTER FACT-FILE
All You Need To Know About The Machines That Matter

MAKING SENSE OF COLOUR ON THE VIC-20

SOFTWARE CHECKLIST
Thousands Of Facts On Hundreds Of Programs



ZX99 AUTOMATIC TAPE CONTROL

The logical extension for the Sinclair ZX81 giving data retrieval & word processing

£59·95
plus P & P

The ZX99 Tape Control system is a sophisticated extension to the Sinclair ZX81 Microcomputer, providing remarkable additional capabilities, which allow both the beginner and expert access to a professional computing system without the expected expense.



✸ DATA PROCESSING

The ZX99 gives you full software control of up to four tape decks (two for reading and two for writing) allowing merging of data files to update and modify them. This is achieved by using the remote sockets of the tape decks to control their motors as commanded by a program.

✸ PRINTER INTERFACE

The ZX99 has a RS232C interface allowing you direct connection with any such serial printer using the industry standard ASCII character code (you can now print on plain paper in upper and lower case and up to 132 characters per line.)

✸ MANY SPECIAL FEATURES

There are so many different features that it is difficult to list them all:
For example:

AUTOMATIC TAPE TO TAPE COPY: You can copy any data file regardless of your memory capacity (a C90 has approx 200K bytes on it) as it is loaded through the Sinclair block by block.
TAPE BLOCK SKIP without destroying the contents of memory.
DIAGNOSTIC INFORMATION to assist in achieving the best recording settings.

✸ TAPE DRIVES

We supply (and guarantee its compatability) a Tape Drive that works with your computer.

✸ COMPUTER CASSETTES

We supply quality (screw assembled) computer cassettes.
Please enquire for any not shown:

The ZX99 contains its own 2K ROM which acts as an extension to the firmware already resident in your ZX81'S own ROM. The ZX99's ROM contains the tape operating system, whose functions are accessed via Basic USR function calls. Each function has an entry address which must be quoted after the USR keyword. All of the functions can be used in program statements, or in immediate commands (i.e. both statements with line numbers and commands without them).

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 cassette lead, more are available at £1 each (see below).

COMPREHENSIVE USER MANUAL INCLUDED IN PRICE

✸ 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 will be:

* Stock Control
* Sales Ledger
* Business Accounts
* Order Processing
* Debtors Ledger
* Tax Accounting

COMPUTER CASSETTES	QTY	PRICE	TOTAL
C5		35p	
C10		37p	
C12		38p	
C15		39p	
C20		41p	
C25		43p	
C30		44p	
Add min £1·50 or 10% P & P			

ITEM	QTY	PRICE	P&P	TOTAL
CASSETTES	See left			
ZX99		59·95	2·95	
E312 Tape Drive		24·00	1·00	
EDITOR – 99		9·95	·50	
CASSETTE LEAD		1·00	·20	

Cheque/PO payable to Storkrose Ltd.
or
Charge my Access/Visa card no:

ORDER FORM TO:
data-assette
Dept: PC1
44 Shroton Street,
London NW1 6UG Tel: 01-258 0409
Telephone enquiries welcome

NAME _____
ADDRESS _____

Personal Computing Today

Volume 1 Number 1 August 1982

Editor:
Ron Harris
Art Director:
Diego Rincon

Editorial Assistants:
Kathryn McFarland
Roger Munford
Catherine Howes

Origination and Layout:
Kieran Wade
Alison Lilley
Enzo Grando

Advertisement Managers:
Beverly McNeill
Colleen Pimm

Managing Director:
T. J. Connell

Published by:
Argus Specialist Publications,
145 Charing Cross Road
London, WC2H 0EE

Printed by:
Alabaster Passmore & Sons Ltd,
London and Maidstone

Distributed by:
Argus Press Sales & Distribution
Limited, 12-18 Paul Street,
London EC2A 4JS

Personal Computing Monthly is normally published on the first Friday in the month preceding cover date. ☐ The contents of this publication including all articles, designs, plans, drawings and programs and all copyright and other intellectual property rights therein belong to Argus Specialist Publications Limited. All rights conferred by the Law of Copyright and other intellectual property rights and by virtue of international copyright conventions are specifically reserved to Argus Specialist Publications Limited and any reproduction requires the prior written consent of the Company. ©1982 Argus Specialist Publications Ltd ☐ All reasonable care is taken in the preparation of the magazine contents, but the publishers cannot be held legally responsible for errors. Where mistakes do occur, a correction will normally be published as soon as possible afterwards. All prices and data contained in advertisements are accepted by us in good faith as correct at time of going to press. Neither the advertisers nor the publishers can be held responsible, however, for any variations affecting price or availability which may occur after the a publication has closed for press.

☐ Subscription Rates. UK £11.65 including postage. Airmail and other rates upon application to Personal Computing Monthly, Subscriptions Department, 513 London Road, Thornton Heath, Surrey CR4 6AR.

Welcome to Personal Computing, a magazine designed not just for the computer experts, but for anyone with an interest in the subject of microcomputing. Even if you don't yet own a system of your own, but are still wondering which one is right for you, we think you'll find something of interest in Personal Computing.

Each month we plan to carry comprehensive information on all the personal computers on sale in the U.K. at less than £1,000 basic price. Check our FACTFILE before you buy. There you will find the machines described in a way designed to allow easy comparison between systems.

In addition we have the only real SOFTWARE CHECKLIST in print. This is our own comprehensive listing of the programs available for a wide range of machines. It will be continually up-dated and expanded, as will FACTFILE.

Software will feature strongly in our editorial in another way, with a large number of programs for you to run at home contained in each issue. These will be presented in an entirely new manner.

As well as the actual listing, there will be included within the article "How It Runs" and "Hints On Conversion" sections. These are written to help you understand how the program functions, virtually line by line, (so that you can improve your own programming techniques!) and how to convert the listing to one that will function on a different microcomputer.

Converting programs from magazines is a constant headache for the non-technical user, as there are so many machines around now, only a few printed each month will be for the particular system you happen to own. Our presentation is designed to overcome that, by outlining any special difficulties and how to overcome them.

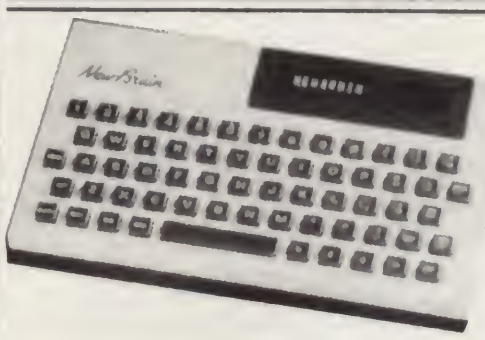
We will be looking at commercial software, too, and plan to carry around three pages a month of software reviews in which we will be telling you the tapes to buy — and those to avoid! With literally thousands of programs on sale nowadays, there is really no way of telling the good from the bad just by reading advertisements. SOFTWARE REVIEW will help.

On the hardware side, we will be bringing you regular machine reviews, many of which will be comparative tests of similarly priced microcomputers, and will be pointing out the strengths (or otherwise) of each.

One feature we have planned that we were unable to include in the first issue is a READERS LETTERS Page!
We hope that you will be letting us know what you think of Personal Computing, be it good or bad — so long as it's printable! The greater the feedback we get from our readers, the closer we will be able to tailor the magazine to your requirements.

Turn over the page for a full contents list of this issue.

CONTENTS



NEWS

Newstalk **7**
Our regular news round-up has details of the happenings that matter in the world of microcomputing.

VIC20 SOFTWARE

Breakout **12**
A challenging game to try which makes great use of the VIC's colour capabilities. Easy to convert to other machines.

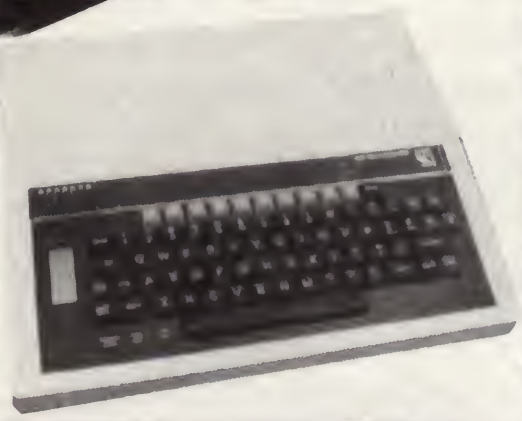


TRS 80 SOFTWARE

Microspot **15**
Tandy users will appreciate this method of inputting data and strings on a tape-based Model I System.

BBC MICRO TECHNIQUE

Sounding off **16**
An exclusive excerpt from an exciting new book which shows how to get the best from the versatile SOUND command on the BBC Micro.



REFERENCE

Micro Factfile **19**
Buying a micro? Interested in computers? Either way our easy-to-compare reference section has all the facts on twenty-six micro systems under £1000.



REVIEW

Software Reviews **35**
Some pages of tapes to try . . . and avoid. We review some commercial releases for ZX81, VIC and Sharp MZ-80K and report our findings.

ZX-81 SOFTWARE

Programmer's Toolkit **40**
Add some big machine power and versatility to your ZX81 with this versatile software package. Makes programming easier and more fun.

LETTERS



Micro Answers **46**
The first of our regular replies to readers enquiries. This month our experts look at questions on the ZX81 and VIC-20.

COMPUTER CLUBS



Clubhouse **48**
The Computer Users Club is the first to have their say in PC's monthly spot. Some useful tips for BBC owners, too!

ZX-81 SOFTWARE

Oxon **51**
A new version of a popular game which not only teaches you how to handle data, but is guaranteed to get you cross!









If you would like to see your programs reach the masses through Personal Computing's pages don't hesitate to send them in.
We are interested in publishing program listings and articles for any microcomputer. If you want to submit your work, please send it to us in type-written form and include the listing, breakdown of how the program runs, the variables used, any conversion tips, and any other useful information. All listings and articles published in Personal Computing will be paid for.

CONTENTS

ZX SPECTRUM — REVIEW

Over the Rainbow? 54
Not only the best in-depth of Sinclair's new machine in print, but also a great game to run which demonstrates the Spectrum's capabilities.

ZX-81 — SOFTWARE

Microspot 58
Put some life and action into your games and graphics listings, with this routine which can literally explode with excitement!

ATOM — SOFTWARE

Microspot 61
Of all the monsters that inhabit micro-games, this one must be about the nastiest! Escape if you can . . . re-RUN if you can't!

REVIEW

12 of the Best 62
Our lead feature takes you on a guided tour through the maze of machines and details twelve best sellers. Which is right for you?

VIC20 — TECHNIQUE

Making use of colour 69
Commodore's VIC may be full colour, but making full use of its commands hasn't been fully explained . . . Until now.

VIC20 — SOFTWARE

Solitaire Maze 73
Fiendish and deceptive, this task will have you confounded for hours. Think it looks easy? Just try it and discover the truth.

ATOM — SOFTWARE

Up and Down Lister 74
A very useful routine which will allow your Atom to display your programs in a much more useful fashion.

REFERENCE

Software Checklist 79
Want to know what programs there are for your micro? Fed-up looking through hundreds of ads? We have the facts on what to buy.

REFERENCE

Microterms 95
Your guarantee that computer jargon is easy to understand. We explain the facts behind the words from each issue.

Work which you would like us to consider for publication should be sent to the Editor,

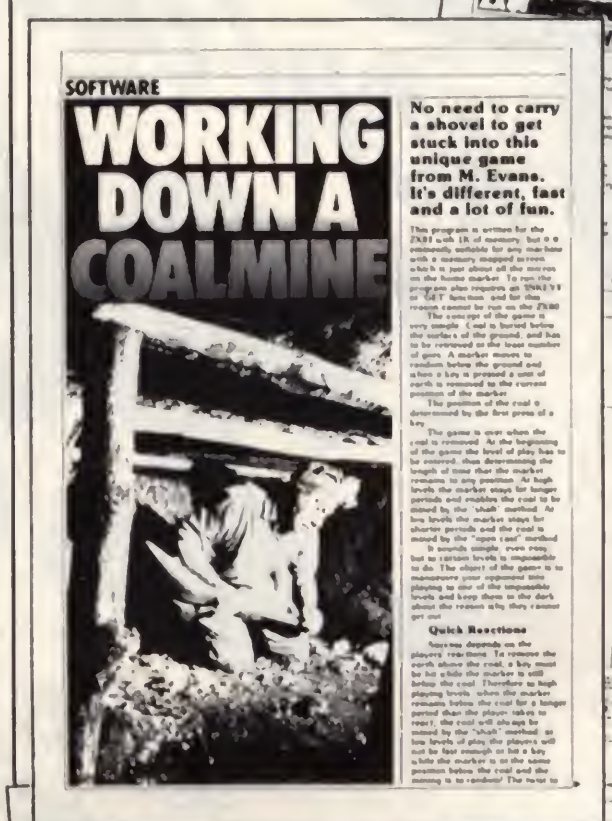
Personal Computing,
145 Charing Cross Road,
London WC2H 0EE.

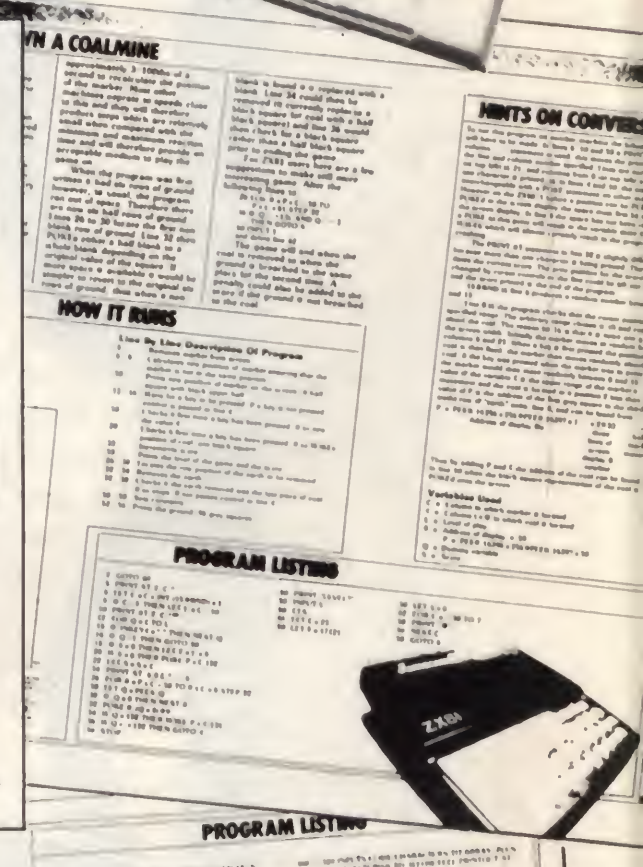
NEXT MONTH

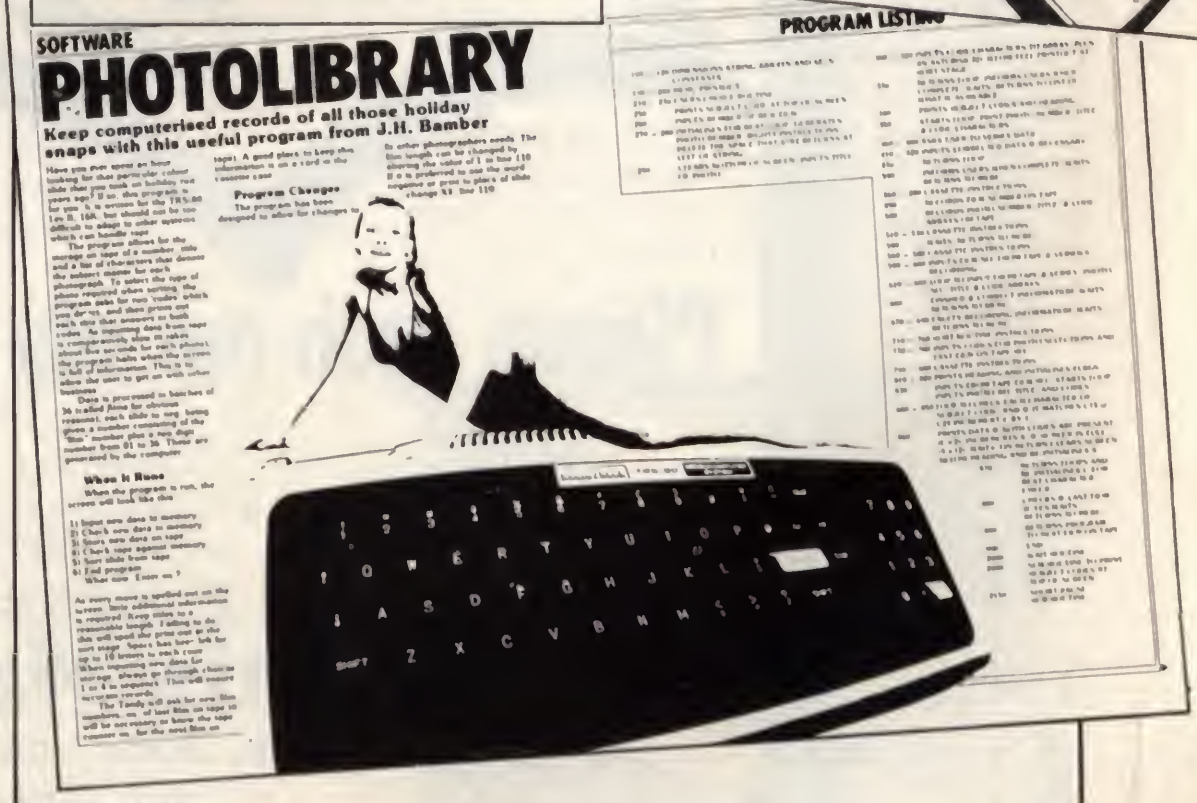


Shoot out at around £200? ATARI 400 does battle in our comparative review.

PLUS
Special reports on the new Commodore machines and a programmable Dragon!







PLUS
New feature! Games theory on computers explained in our new regular series for up and coming programmers.


A
BYG BYTE
FROM THE PRICE OF A
16 K RAM PACK
NOW ONLY
£29.50
inc. V.A.T., Postage and Packing
Dispatch guaranteed within 24 hrs
Please rush me my BYG BYTE 16k Ram Pack
NAME _____
ADDRESS _____
PLEASE MAKE ALL CHEQUES PAYABLE TO
Phoenix Marketing Services
Oaklands House, Solartron Road, Farnborough, Hants. GU14 9QL.
Tel: (0252) 514990.



Sinclair Spectrum set to climb all over Commodore?

Must be the time of year. A young man's mind turns to thoughts of love, and computer companies launch new models. . .

In the wake of 'Uncle Clive' Sinclair's Spectrum, ***Acorn*** *and* ***Commodore*** *are muttering things about machines meant to compete with the multi-coloured menace. Acorn have not long since produced a BBC BASIC for their Atom, making it a powerful little machine in its own right. The set of memories costs £45 and is plugged into the PCB, whereupon theAtom can be switched between its own, slightly odd language, and the new BASIC.*

Make sure you have plenty of memory, though. We heard recently of the apparent confusion over ***BBC machines*** *and their memory. Although the BBC Micro has marvellous graphics capabilities, the most usable of them takes 10K of the user's program memory! Since the operating system of the machine itself takes another 3K, on the model A you get left with about 2.7K to put programs into! -16K become less than 3K.*

Nice graphics, shame about the space?

Electron

Acorn's new machine will be termed the ***'Electron'*** *(someone down there has a thing about small particles, obviously), and is designed to compete directly with the Spectrum.*

It will be equipped with BBC BASIC, 32K RAM and a high definition screen. This needs 8K to run, so drop that 32K to 24K. We can get no work as to the size of the operating system, or whether it too will be nibbling away at the users program space. If so we hope they tell us about it this time!

The Electron will also be possessed of a dual-speed cassette and a programmable sound generator. Acorn themselves, curiously, will neither confirm or deny details of the Electron, but sources very close to the company put the launch date semewhere in August and the price around £130. Perhaps they're just trying to worry Clive a little. After all, he's worried everyone else long enough!

Not-So-New Brain

Another launch is that of the ***Newbrain*** *portable computer. Re-launch would be more appropriate as those of you with long memories will remember that it was launched once before, two years ago.* ***Grundy Business Systems*** *have 'acquired' the project from Newbury and are giving it another try.*

There are many improvements on the 'new' Newbrain — memory is expanded to 32K from 2K, for example. Up to Four 512K RAM packs can be connected to the Newbrain, giving a phenominal 2 MB capability! (Perfect for big program nuts!). As well as the memory packs, the Newbrain will take cassettes, drive a TV or monitor and expand to handle discs and printer.

Because of its small size the Newbrain would appear ideal for educational, office or laboratory use, as well as in the living room. It will be sold in two models, the 'A' and 'AD', without and with built-in flourescent display at £199 nd £299 respectively. We hope to get hold of a Model A for review in PC very soon but if you can't wait, ***Grundy*** *reside at* ***Cabridge Science Park, Milton Road, Cabridge. Tel: 0223 350355.***

PET Panic

We hear (ever-so-quietly) that there was indignation and panic in the halls at Commodore, following Uncle Clive's launch recently. Much gnashing of teeth and growling at press officers, apparently.

Seems the great home of the PET was caught a little napping by the Spectrum and woke up with a start. They had planned to produce a baby VIC, ***the VIC-10,*** *sometime this autumn, but rumour has it that they may well knock that on the head now that they are faced by the Spectrum. Early specifications would suggest that, as a computer, Clive's machine would slaughter it!*

Commodore *do have the* ***64*** *up their sleeves, however, and if rumours from the States are correct, then this could be a major release. It has a built-in BASIC and 38K of RAM available to the user. The interesting things is, though, that the BASIC is switchable, supposedly to a socket on the machine. Commodore's idea would be that 'modules' could then be marked which plug into the 64 and allow it to behave, for all intents and purposes, like another micro! Thus anybody else's software could be used! True independence at last! Hardware, at that point, becomes totally irrelevant and you can take your pick of any programs on the market!*

With true big-company power, Commodore can't even decide what to call it. . . it might yet appear as the Vic-40! Whatever name actually gets put on the box, the 64 sounds an amazing machine. It is due to be launched in September at the moment, but you never can tell — anything might yet happen! Price around £400.



Dixons and VIC

Whilst on the subject of ***Commodore, Dixons,*** *that well known cross between a chemist and a hi-fi shop, are now marketing the* ***VIC-20*** *through their 250 high street outlets. Some £150,000 is being spread across an advertising campaign.*

People who begin marketing computers always seem compelled to predict how many units will be in how many homes, and by what year.

Dixons estimate is a little on the conservative side at one million by end of 1985, (UK).

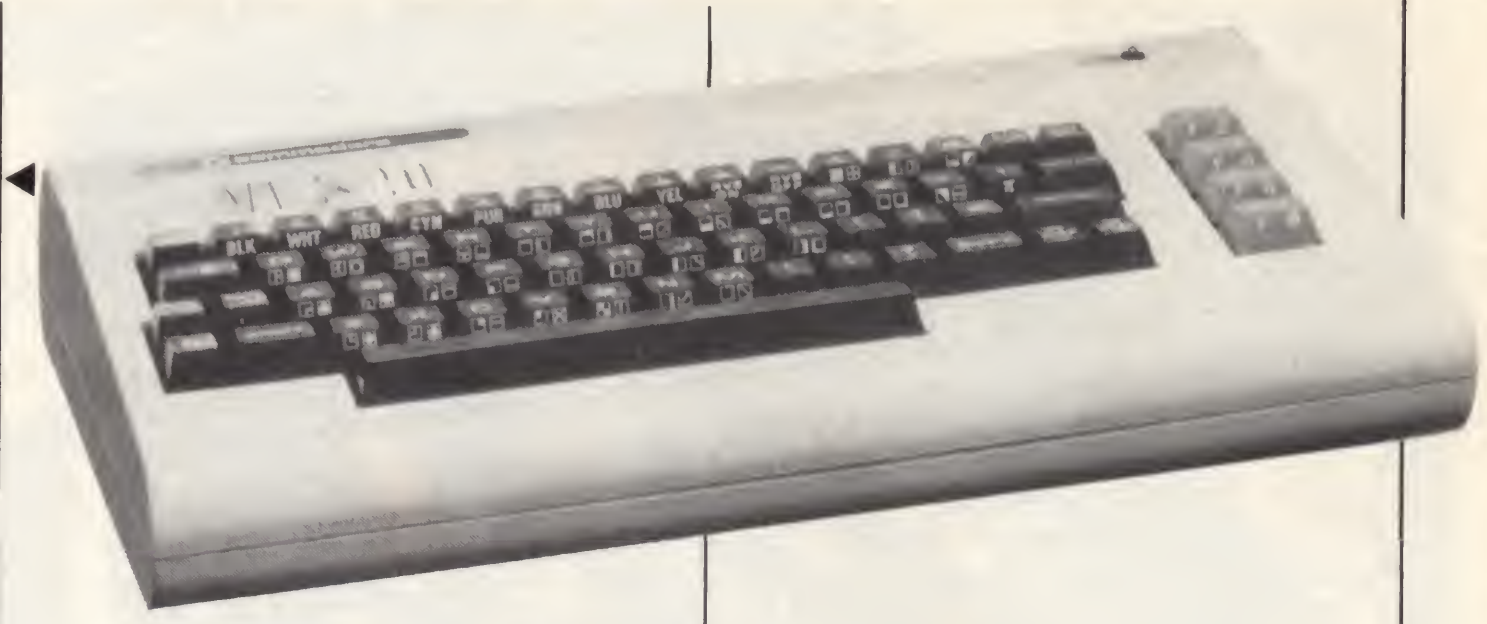
What with Electrons, Spectrums, BBC boxes et al, we could be well past that — and an awful lot sooner. But as we're not marketing computers, we're ***not*** *going to make a prediction.*

Acorn Adds And 81 Keys

Since the ***Atom*** *is such a versatile little beast, it has a wide range of improvements available for it on ROM (Read Only Memory). The snag is, or used to be, that there aren't enough holes in the PCB to plug them all into.*

A clever little adaptor has been released by ***CMT Computer Technology, 6 Turf Park Road, Royton, Oldham Lancs.*** *It costs £22 and will allow up to four ROM packages to connect to one socket. A simple POKE command will tell the machine which of the four you want. Neat, that.*

Also, recently out is yet another keyboard for the ZX81. This one is easier to fit than most, and somewhat tidier. You just peel off the existing keyboard (!??!) and drop this one in its place. A short piece of ribbon cable completes the connections.



The kit is marketed by ***Kempston Electronics, 60 Adamson Court, Hillgrounds Road, Kempson, Bedford.*** *It will cost you £22.50 complete.*

Some Softspots

News of some recent program releases. For the ZX81 there is a handsome Chess game from ***Artic, 396 James Reckitt Avenue, Hull, North Humberside.*** *It is claimed to offer a good game and costs £45. Graphics are described as 'excellent'. Artic are also producing a FORTH ROM, which enables the ZX81 to run that somewhat up-market language. FORTH is a strange thing to use — you create you own instructions as you go. (There are no rules, really!)*

FORTH programs written by anyone other than you are well-nigh impossible to comprehend. If you fancy solitaire computing, FORTH costs £60.

Aslso, for ***Sinclairs*** *is a series of tapes entitled 'Bargain Bytes' each costing around a fiver. Each will carry eight programs and run on a 16K machine. Number One contains a couple of Adventure games and a Bank Accountant, amongst others. The company is called* ***Shepard Software, 22 Green Leys, Maidenhead, Berks,*** *and price includes p&p.*

The ***VIC-20*** *gets some serious intentions with a database management program from a company called* ***Stage One.*** *If you need to ask what a database manager is, you don't need one. To run it, you* ***do*** *need 16K, discs and printer. Stage One can be conversed with on* ***Poole 735656.***

Talking of serious matters, there is now a company marketing a device called Safeware. *This will allow you to protect your programs from being copied or used without your permission.*

The idea is that somewhere in the program being guarded there is a little routine which looks at the user port socket (on a PET at present) to see if a particular piece of hardware is hanging there. The hardware comes with the package and is individually coded for each user. No package, no run program.

Safeware costs £19.95 from ***Mektronic Consultants, Linden House, 116 Rectory Lane, Prestwich, Manchester.***



Clubbed on the End

To round off this month, news of a new computer club springing up . . . ***The Norwich and District BBC User Group*** *is based at* ***Room B12a, Norwich City College of Further Education, Ipswich Road, Norwich*** *(where else?)* ***Norfolk.*** *Knock twice and ask for Paul Beverly. Membership costs £2, discounted to £1 for students and OAPs.*

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. We know better than anyone the capability of the machines, we know how to get the very best from the hardware. And we 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 _____

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 English 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

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.

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-TOE (Basic)
Played on a 4x4x4 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

FUNGALOIDS (Machine code)

Recorded on quality cassettes, sent by first class post, from:
Michael Orwin, 26 Brownlow Road, Willesden, London NW10 9QL (mail order only please)

Don't let its size fool you.

If anything NewBrain is like the Tardis.

It may look small on the outside, but inside there's an awful lot going on.

It's got the kind of features you'd expect from one of the really big business micros, but at a price of under £200 excluding VAT it won't give you any sleepless nights.

However, let the facts speak for themselves.

You get what you don't pay for.

NewBrain comes with 24K ROM and 32K RAM, most competitors expect you to make do with 16K RAM.

What's more you can expand all the way up to 2 Mbytes, a figure that wouldn't look out of place on a machine costing ten times as much.

We've also given you the choice of 256, 320, 512 and 640 x 250 screen resolution, whereas most only offer a maximum of 256 x 192.

Big enough for your business.

Although NewBrain is as easy as ABC to use (and child's-play to learn to use) this doesn't mean it's a toy.

Far from it.

It comes with ENHANCED ANSI BASIC, which should give you plenty to get your teeth into.

And it'll also take CP/M® so it speaks the same language as all the big business micros, and feels perfectly at home with their software.

NO OTHER MICRO HAS THIS MUCH POWER IN THIS MUCH SIZE FOR THIS MUCH MONEY.



So as a business machine it really comes into its own.

The video allows 40 or 80 characters per line with 25 or 30 lines per page, giving a very professional 2000 or 2400 characters display in all on TV and/or monitor. And the keyboard is full-sized so even if you're all fingers and thumbs you'll still be able to get to grips with NewBrain's excellent editing capabilities.

When it comes to business graphics, things couldn't be easier. With software capabilities that can handle graphs, charts and computer drawings you'll soon be up to things that used to be strictly for the big league.

Answers a growing need.

Although NewBrain, with its optional onboard display, is a truly portable micro, that doesn't stop it becoming the basis of a very powerful system.

The Store Expansion Modules come in packages containing 64K, 128K, 256K or 512K of RAM. So, hook up four of the 512K modules to your machine and you've got 2 Mbytes to play with. Another feature that'll come as a surprise are the two onboard V24 interfaces.

With the aid of the multiple V24 module this allows you to run up to 32 machines at once, all on the same peripherals, saving you a fortune on extras.

The range of peripherals on offer include dot matrix and daisy wheel printers, 9," 12" and 24" monitors plus 5¼" floppy disk drives (100 Kbytes and 1 Mbyte) and 5¼" Winchester drive (6-18 Mbytes).

As we said, this isn't a toy.

It doesn't stop here.

Here are a couple of extras that deserve a special mention.

The first, the Battery Module, means you won't be tied to a 13 amp socket. And, even more importantly, it means you don't have to worry about mains fluctuations wreaking havoc with your programs.

The ROM buffer module gives you a freedom of another sort.

Freedom to expand in a big way. It gives you additional ROM slots, for system software upgrades such as the Z80 Assembler and COMAL, 2 additional V24 ports, analogue ports and parallel ports.

From now on the sky's the limit.

Software that's hard to beat.

A lot of features you'd expect to find on software are actually built into NewBrain so you don't need to worry about screen editing, maths, BASIC and graphics.

However, if you're feeling practical you can always tackle household management, statistics and educational packages. And because NewBrain isn't all work and no play, there's the usual range of mind-bending games to while away spare time.

Waste no more time.

To get hold of NewBrain you need go no further than the coupon at the bottom of the page.

With your order we'll include a hefty instruction manual so you'll know where to start, and a list of peripherals, expansion modules, and software so you'll know where to go next.

® CP/M is the registered trade mark of Digital Research Inc.



NewBrain, Grundy Business Systems Ltd., Grundy House, Somerset Road, Teddington TW11 8TD.

Each NewBrain order will include a FREE comprehensive user manual, a catalogue of expansion modules and peripherals, and a detailed list of available software.

PEC8

Please send me the following:–

Quantity	Item	Price per item (Inc. VAT & p&p)	Total
	NewBrain A	£233.00	
	NewBrain AD with onboard single line display	£267.50	
	Printer	£466.00	
	Monitor 12"	£142.50	
		Total £	

I enclose a cheque/Postal Order for £_____ payable to Grundy Business Systems Reader Account. NewBrain, Grundy Business Systems Ltd., Grundy House, Somerset Road, Teddington TW11 8TD.

Please debit my Access Card No:_____ my Barclaycard No:_____

Signature_____

Name_____

Address_____

_____

_____ Postcode_____

Registered Number 1522978
VAT Number 358661618
Please allow up to 28 days for delivery.

NEWBRAIN

SOFTWARE

A good demonstration of your VIC-20's power in this exciting and skilful version of the ever popular arcade game. Lots of room for adding your own ideas too!

This version of one of the original computer games makes good use of the colour and music capabilities of the VIC. It is very simple to play. You have nine balls at the start of the game and as long as you manage to bounce the ball off the slide at the bottom of the screen, the ball will stay in play. If you find this easy, try it with two balls (or two slides) at once, or vary the number of bricks. Each time you miss the ball, your ball count (top left hand corner of the screen) is reduced by one. Each time the ball count changes, your score changes too.

Scoring Hints

You score every time you destroy one of the coloured bricks at the top of the screen. One other suggestion to improve the game is to get rid of the 'white' bricks (which can't be seen) at the start of the game. Again you can improve the scoring system by relating the score to the colour of the brick, or make the sound of hitting a brick change according to its colour. Alternatively, you can get the ball to change colour at random.

HOW IT RUNS

Structure Of The Program

Line 5:	Sets volume at maximum.
Lines 20 to 29:	One bounce.
Lines 30 to 39:	The other bounce.
Line 50:	Sets score to zero, ball number (Z) to nine.
Lines 60 to 80:	Place the bricks at the top of the screen.
Line 110:	X and Y control the direction of the ball.
Lines 120 and 130:	Place the ball (A and B) and set indicators (M and N) to POKE the ball out of its old position.
Line 160:	Goes to bounce routine.
Line 162:	Goes to 'new ball' routine.
Line 180:	Bounce routine.
Line 200:	A brick has been struck.
Lines 300 to 330:	POKEs and unPOKEs to move the slide.
Lines 340 to 360:	Get player commands to move the slide.
Lines 400 to 505:	Move the ball.
Subroutine from 2000:	Changes direction of ball (2000), checks if ball has hit bat (2005) and if it has, sends action back to main body of program, changes (rather noisily) the ball count (2010 to 2023) and checks that ball count is not zero (2025).
Subroutine from 5000:	Makes the brick disappear, produces some appropriate sound effects (5002 to 5004), updates the score (5005).

```
1 REM BREAKOUT
5 POKE36878,15
10 GOTO40
20 X=-X
22 POKE36876,200
29 RETURN
30 Y=-Y
32 POKE36876,220
39 RETURN
40 PRINT"□"
50 SC=0:Z=9
60 FORJ=23TO108STEP 3
70 POKE 7680+J,102
75 POKE38400+J,(INT(RND(1)*8))
80 NEXT
90 F=10
110 X=-3:Y=1
120 A=20:M=A
130 B=1:N=B
160 IFA<0 THEN GOSUB 20
```



HINTS ON CONVERSION

The VIC is named after the special chip it contains (the Video Interface Chip). As this is unique to the VIC (and its other Commodore relatives) there are several commands in this program which will have to be altered or removed to make Breakout function on other systems. All POKE commands which are between 36874 and 36878 control the sound generating section of the VIC computer.

For example, Line 5 sets the volume to its maximum value, Lines 22, 32 and 2022 generate a sound — the number after the comma determines whether high note or low.

The command in Line 5003 works in much the same way, except that it generates a noise rather than a musical note. If the value after any of these POKE commands is 0 it simply turns the sound off.

The VIC has a memory mapped screen for graphics, like many other common systems, but its organisation is somewhat unusual. There are two sets of screen addresses to be handled, the first (from 7680 to 8185) is the 'character' screen and the second (38400 to 38905) is the 'colour' screen. This means that any value POKEd to the character screen can be made to appear in any colour by POKEing the appropriate colour value to the corresponding 'colour' screen location. Program lines 300 to 330 and 400 to 505 show this.

The POKE codes used correspond to;

32	Space
42	Asterisk
102	Cross hatched square

PROGRAM LISTING

```
162 IF A>20 THEN GOSUB2000
165 A=A+X
180 IFB<1 OR B>20 THEN GOSUB 30
185 B=B+Y
200 IF PEEK(7680+22*A+B)=102 THEN GOSUB 5000
300 POKE8163+F,32
310 POKE 8165+F,32
320 POKE 8164+F,102
330 POKE38884+F,0
340 GETA$
350 IF A$="Z" THEN F=F-1
360 IF A$="M" THEN F=F+1
400 POKE 7680+22*M+N,32
500 POKE 7680+22*A+B,42
505 POKE38400+22*A+B,0
510 POKE36876,0
910 M=A:N=B
920 GOTO160
2000 GOSUB20
2005 IF ABS(F-B)<2 THEN RETURN
2010 Z=Z-1
2015 PRINT"■BALL"Z
2020 FORT=1TO20
2022 POKE36876,128+ 4*T:POKE36876,0
2023 NEXT
2025 IFZ=0 THEN 6000
2030 RETURN
5000 POKE 7680+22*A+B,32
5001 POKE36876,0
5002 FORK=1TO10
5003 POKE36877,255-10*K:POKE36877,0
5004 NEXT
5005 SC=SC+367
5010 PRINT"■BALL"Z"■ SCORE"SC
5020 GOSUB20
5500 RETURN
6000 POKE36876,0
6005 PRINT"■■■ END  "
6010 GOTO6010
```

From the Publishers of:



SHIVA's friendly micro series

Easy Programming for the BBC Micro
Eric Deeson

£4.95 (approx) ISBN 0 906812 21 6 *September*

Further Programming for the BBC Micro
Alan Thomas

£7.50 (approx) ISBN 0 906812 20 8 *September*

Machine code and better Basic
Ian Stewart & Robin Jones
with an educational program by
Eric Deeson

£7.50 ISBN 0 906812 18 6 *July*

The ZX81 Add-On Book
Martin Wren-Hilton

£6.50 ISBN 0 906812 19 4 *July*

Easy Programming for the ZX Spectrum
Ian Stewart & Robin Jones

£4.95 (approx) ISBN 0 906812 23 2 *August*

Further Programming for the ZX Spectrum
Ian Stewart & Robin Jones

£7.50 (approx) ISBN 0 906812 24 0 *September*

Shiva Publishing Limited
4 Church Lane, Nantwich, Cheshire CW5 5RQ
Telephone: (0270) 628272

Please supply me with _____
Cheques should be made payable to Shiva Publishing Ltd
NAME (Capitals please) _____
Full postal address _____

For payment by Access/American Express:
Card No. _____
Signature _____

30+ PROGRAMS FOR THE BBC MICROCOMPUTER

This Book contains program listings, with explanations and tips on using the BBC Micro

GAMES UTILITIES GRAPHICS & MUSIC

'ASTRO RUN' 'SCREEN PLAY' '3D GRAPHICS' .....
Most programs will run on Model's A & B. Edited by C. J. Evans, various Authors.

£5.00 inclusive of p&p

Cassette leads for the BBC Micro

The BBC Micro comes with an incomplete lead

7 Pin Din to 2 × 3.5mm & 1 × 2.5mm minijackets	**£4.65 (a)**
7 Pin Din to 5 Pin Din & 2.5mm minijack	**£4.65 (a)**
7 Pin Din to 7 Pin Din	**£4.65 (a)**
7 Pin Din PLUGS	**Two for £0.65 (a)**

MONITOR/VIDEO LEADS

BNC Plus (twist type) to Phono Plus (BBC Micro to Rediffusion TVRM)	**£2.20 (b)**

Full range of leads available

PRINTERS

STAR DP8480 — (Roxburgh RX 8000)
80 CPS 80/96/132 cols Bidirectional Logic Seeking

	Centronics	RS232
Friction Feed	£199.00 + £29.85 VAT = £228.85	£213.00 + £31.96 VAT = £245.00
Tractor with Friction Feed	£217.39 + £32.61 VAT = £250.00	£246.09 + £36.91 VAT = £283.00

(24 hr Securicor delivery for printers £6.00)
Printer Cable BBC to 36 way Centronics Type Connector £17.00 (b)

RAM CHIPS

4816 As used in the BBC Micro 8 Chips gives 16k **£4.00 each (b)**
2114 As used in the Acorn Atom 20 Chips gives 10k **£1.20 each (b)**

Programs & Hardware designs for the BBC Micro wanted.

A RANGE OF SOFTWARE CASSETTES AVAILABLE SHORTLY

VAT included where applicable
POSTAGE Book Free (a) 35p (b) 50p
Orders over £10.00 post free (NOT applicable to printers & cases)

C. J. E. MICROCOMPUTERS
25 Henry Ave, Rustington, West Sussex BN16 2PA
Telephone (09062) 74998

SIR Computers
Cardiff

Official agents for ACORN COMPUTERS and COLNE ROBOTICS

BBC MICRO COMPUTERS MODELS A & B
Available from stock.

Conversion of your Model A to Model B.....£80
All Atoms available with accessories and software.

ADD ON'S FOR ZX SPECTRUM

8 Byte input output port £9.50
8 Byte input output port with status monitor.....£13.50
One Channel Analogue input port.....£15.50
4 Channel Analogue input port for use with joy sticks p.o.a.
All Add On's are ZX81 compatible. Please add £1 p.p. and 15% VAT.

SIR COMPUTERS
38 DANYCOED ROAD, CYNCOED, CARDIFF CF2 6NB, WALES.
Tel: 0222 — 759015

EASY LINE INPUTS

At last! An easy way for TRS-80 owners to input data and word processing! A little routine from S.A. Barnett which is worth its weight in keyboards!

As all TRS-80 users know, unless you have disk BASIC, you cannot input a line containing a comma. Any program using large amounts of data input usually requires such a routine, and it is essential to any form of word processing in BASIC. To this end, this short routine only uses about 180 bytes with all of the spaces removed. It supports backspace and line delete. Any other control key will end the routine.

On exit 'B$' contains the input string.



```
 5  PRINT CHR$(24)
10  A$ = INKEY$: IF A$ = " " GOTO 10
20  A = ASC(A$):IF A < 31 GOTO 40
30  PRINT A$; :B$ = B$ + A$:GOTO 10
40  IF A = 8 THEN PRINT A$; :A$ = LEFT$(B$,LEN(B$ – 1): B$ =
    A$:GOTO 10
50  IF A = 24 THEN B$ = " ":PRINT CHR$(29);CHR$(30); :GOTO
    10
60  RETURN
```

Program Notes

Line

5 PRINTCHR$(24) TURNS ON THE CURSOR
10 INKEY$ CAN BE REPLACED BY 'GET' ON THE PET.
20 ALL ASCII CODES BELOW 31 ARE CONTROL CODES ON THE TRS-80.
30 PRINT THE CHARACTER AND ADD IT TO THE STRING.
40 ASCII CONTROL CODE '8' IS A BACKSPACE.
50 ASCII CONTROL CODE '24' IS A (SHIFT) BACKSPACE, WHICH MEANS 'DELETE THIS LINE' ON THE TRS-80.
50 PRINT CHR$(29) PLACES THE CURSOR AT THE BEGINNING OF THE CURRENT LINE.
CHR$(30) DELETES TO THE END OF THE LINE.

Microspots are our regular "quick-action" program hints. They are designed to be short, useful and adaptable. However, they are not necessarily aimed at the complete beginner and therefore we advise readers to read through each very thoroughly before attempting to enter and use the program.
We will pay £20 for each Microspot submitted by readers that makes it into print! Address your envelope to "Microspot, Personal Computing, 145 Charing Cross Road, London WC2H 0EE".
Keep 'em short and keep 'em coming!

TECHNIQUE

SOUNDING OFF ON THE BBC MICRO



In this exclusive excerpt from his forthcoming book "Let Your BBC Micro Teach You To Program" Tim Hartnell not only gives us an insight into making music with micros, but also provides programs for BBC men to run

The SOUND statement on the BBC Microcomputer is very versatile. It is easy to use, and if you avoid the use of ENVELOPE the first few times you use the SOUND command, you should find it very easy to master. Even without ENVELOPE, you'll find there is a wide variety of sounds you can make to incorporate into your programs.

The word SOUND is followed by four parameters. The first one (0 to 3), chooses the sound channel, the second (0 to −15) sets the volume, with −15 being the loudest, the third chooses the pitch of the note (0 to 255) and the fourth controls its duration (1 to 254). A simple, one-line program which puts the sound output through its paces indefinitely, producing a sort of electronic music, is:

```
10 SOUND RND(4)-1,-RND(15),RND(255),RND(20):GOTO 10
```

We can demonstrate the statement in action more precisely with the following routine, which sets the volume at maximum (−15) and the duration at one. Enter and run this program to hear it in action. You can read the channel number (the left hand column) and the

pitch value (the right hand column of figures) as the program runs.

```
10  REM Sound Demo 1
20  VOLUME = -15
30  DURATION = 1
40  FOR CHANNEL = 0 TO 3
50  FOR PITCH = 1 TO 255 STEP 3
60  SOUND CHANNEL,VOLUME,PITCH,DURATION
70  PRINT CHR$(128 + RND(6));CHANNEL,PITCH
80  NEXT PITCH
90  NEXT CHANNEL
```

You'll see (or hear) that the first run, when CHANNEL is set to zero, produces a strange sound, quite unlike the music produced when the CHANNEL is one, two or three. This is because the channel zero is for noise, and the other three allegedly for music. The rising tone produced on channels one, two and three is, I'm sure you'll agree, quite effective.

Using A Loop

You can change this by putting the volume in a loop to produce a totally different sound. Try to predict what this routine will produce before you run it. You're almost certain to be wrong. Modify the first program given, by adding lines 55 and 75, and changing lines 50 and 70 as indicated.

```
20  REM Sound Demo 2
30  DURATION = 1
40  FOR CHANNEL = 0 TO 3
50  FOR PITCH = 1 TO 100 STEP 3
55  FOR VOLUME = -15 TO -1
60  SOUND CHANNEL,VOLUME,PITCH,DURATION
70  PRINT CHR$(128 + RND(6));CHANNEL,VOLUME,PITCH
75  NEXT VOLUME
80  NEXT PITCH
90  NEXT CHANNEL
```

If all went well, you should have heard a strange series of cymbal-like sounds, followed by notes played on a rather flat piano.

There is, of course, no reason why even random noise should not be musical. The following routine, Storm Boy, produces music which, although somewhat atonal, is certainly better than the mishmash of noise produced by the one-line routine at the start of this article.

```
10  REM *Storm Boy *
20  REPEAT
30  VOLUME = -10 - RND(5)
40  CHANNEL = RND(3)
50  PITCH = RND(8) *30
60  DURATION = 2 *RND(10)
70  SOUND CHANNEL,VOLUME,PITCH,DURATION
80  PRINT CHR$(128 + RND(6));CHANNEL,PITCH
90  UNTIL FALSE
```

The SOUND statement can also produce quite creditable sound effects, such as the following:

```
10  REM *Steam Train *
20  K = -15
30  REPEAT
40  SOUND 0,K,100,6
50  SOUND 1,K,120,5
60  SOUND 2,K,140,4
70  SOUND 3,K,160,3
80  T = TIME
90  REPEAT UNTIL TIME - T > 30
100 K = K + 0.5
110 UNTIL K = 0
```

Experimentation is the only way to discover how wide the range of this command can be!

Stacking Notes

You will find, from time to time, that sounds tend to continue after the line which generated them has long been passed. The computer, when necessary, stacks up notes and waits for the sound channel to clear so it can play them. If you want a note to be played immediately, in effect to dismiss the notes stacked up waiting for their turn, you can use a slightly more elaborate form of the SOUND statement.

The computer can stack up to four notes at a time, and the full SOUND statement can tell it how many notes you wish to play. The statement, in its full version, is as follows: SOUND &HSFC, volume, pitch, duration.

The first parameter after the ampersand, H, can have a value of 0 or 1. In general use, it is set to 0. It has a specific task when used in conjunction with the ENVELOPE statement. For your use in the early stages, you should assume it is set to 0. The second parameter, S, dictates the number of notes which are to be sounded at once S can equal 0, 1, 2 or 3, and when set to zero, allows the notes to be played one at a time, in turn. This is the way the SOUND statement operates in its simpler form.

The third parameter, F, can be set to equal 0, when the SOUND statement operates as normal, accepting the notes in the order in which they are stacked. If F is set to 1, all the waiting notes are suppressed, the note which is sounding is cut off, and the newest note is sounded. C stands for channel, the voice we used in the earlier section of this article. It is set to 0, 1, 2 or 3.

The SOUND statement, then, is fairly easy to use, although it can, as you have seen (and heard), produce quite exotic effects. Finally, the following program is a great demonstration of how effective the SOUND statement can be.

```
10  REM *Piano dementia *
20  MODE7
30  FOR J = 255 TO 0 STEP -1
40  SOUND 17, -15,J,1
50  PRINT CHR$(128 + RND(6));CHR$(157);
60  NEXT J
70  FOR J = 0 TO 255
80  SOUND 17, -15,J,1
90  NEXT J
100 REPEAT
110 A = RND(47) + 43
120 M = -53 *(A = 90) - 61 *(A = 88) - 69 *(A = 67) - 73 *
    (A = 86) - 81 *(A = 66) - 89 *(A = 78) - 97 *(A = 77) - 101 *
    (A = 44)
130 IF M = 0 THEN 110
140 PRINT CHR$(128 + RND(6));CHR$(157);CHR$(128 + RND(6));
    M,M,M
150 FOR J = -15 TO -1 STEP RND(3)
160 SOUND 1,J,M,RND(3)
170 SOUND 2,J,M,RND(5)
180 NEXT J
190 UNTIL RND(10) = 1
200 PRINT CHR$(128 + RND(6));" # # # # #"
210 FOR J = -15 TO -1
220 SOUND 1,J,53,5
230 NEXT J
240 FOR J = 1 TO 255 STEP RND(10)
250 SOUND 17, -15,J,2
260 SOUND 18, -15,255 - J,2
270 SOUND 19, -15,J/2,2
280 PRINT CHR$(128 + RND(6));CHR$(157);
290 NEXT J
300 GOTO 30
```



© RICH SHENFIELD 82

ONE COMPANY IS READY

for the

SPECTRUM

REFERENCE

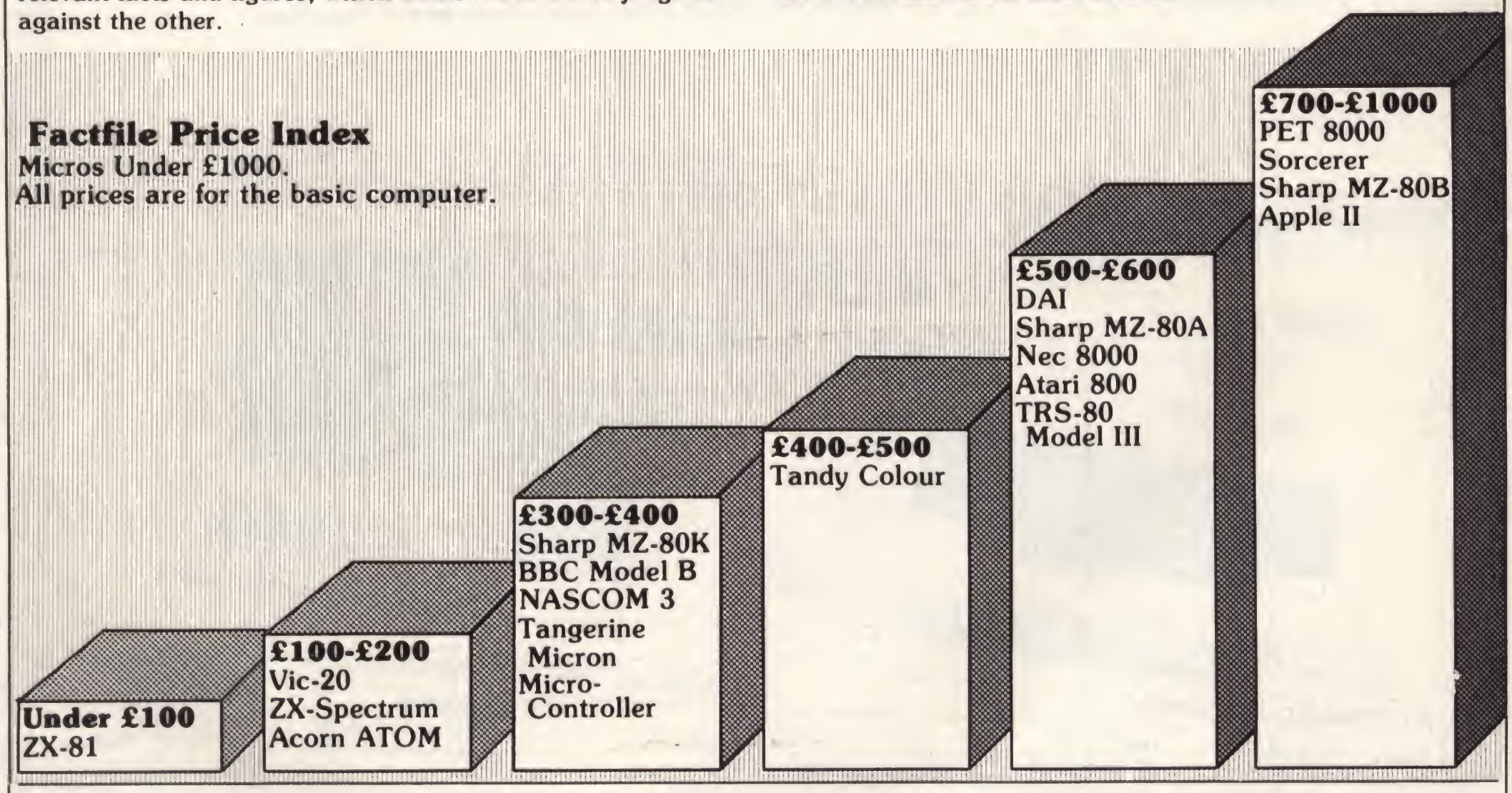
MICRO FACTFILE

Factfile is our regular buyer's guide to microcomputers. Herein you will find all the important facts and figures on 26 of the most important micros on the market under £1000. The idea is that you are able to directly compare what different manufacturers are offering you and how much they are charging you for it. Many brochures and adverts bury the reader in a mass of irrelevant facts and figures, which make it difficult to judge one against the other.

Factfile sorts it all out for you!

Just look down the price index to discover which machines are in your price-range and then consult the 'cards' on each. All the information is in a standard form and has all been checked by our technical staff. The section is presented alphabetically.

As new machines become available, we will add them into the FACTFILE as soon as we can.



Factfile Glossary

RAM: Stands for Random Access Memory and it is in there to accept the user's programs. Amount of memory is measured in "thousands of bytes" or "K" ie, 8K. A byte is a computer 'word' or single piece of information, made up of eight 'bits' which are just 1 or 0. Hence you need thousands of bytes to store a reasonable size program, since each letter, number, full stop, comma, line number, etc, uses up computer 'words' quite rapidly.

As a guideline – you can get about 50 program lines into 1K and 250 into 8K. This is a rough estimate – don't take it literally! The figures are not straight multiples, because you need to allow the machine space to work on your listing, once you've typed it in.

ROM: Read Only Memory. The machine can look see what is stored in the memory, but it cannot alter the contents, nor store anything new. Generally used for control programs, where the micro consults the memory to see what to do next at various points in the program. Languages, such as BASIC, are stored in ROM and allow the machine to interpret what you type in, in terms of its own 'machine code'.

SIZE OF BASIC: The number of bytes occupied by the BASIC language is important, as it is an approx. guide to the BASICs versatility. The more powerful is the language, the easier it should be to use.

BUS CONNECTION: A socket on the micro which allows it to be linked up to various add-on etc. This can take the form of many various items, ie, expansion box, printer, disc drives, plotting device. In short a BUS is an information 'window' through which the micro communicates with the outside world.

SERIAL/PARALLEL OUTPUT: This refers to the manner in which the micro transmits data to other units. If it puts out information in a long string, one bit after another, down a single wire or connector, it is a serial output. Parallel output is where pins or wires carry information simultaneously and are 'read' together as a block by whatever it is the micro is communicating with.

VIDEO OUTPUT: an output which will drive a monitor, as opposed to a TV set, allowing it's use as a screen for the computer.

REFERENCE



ATARI 400

Atari UK Ltd, PO Box 59, Alperton Lane, Wembley, Middx.

STANDARD PACKAGE

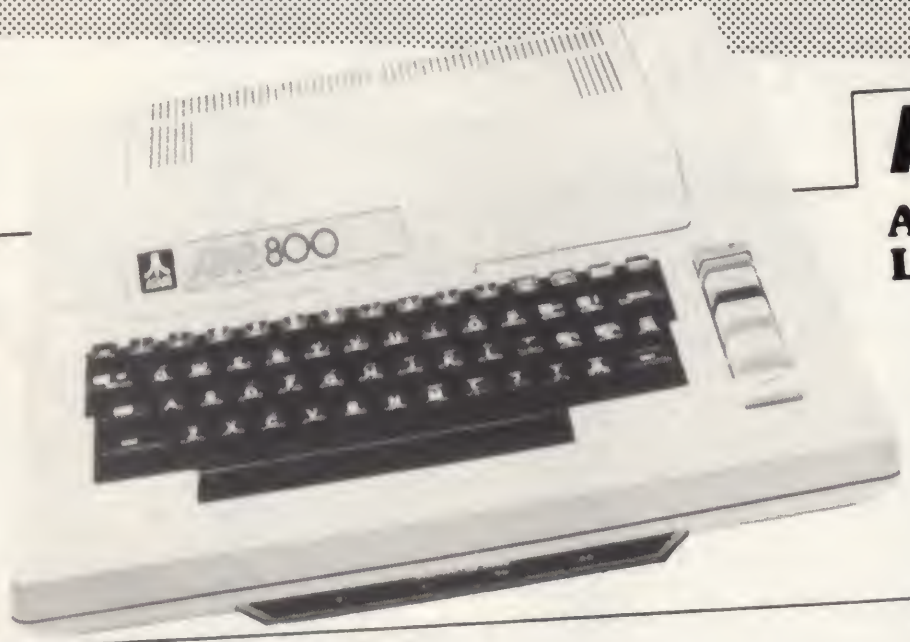
Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£299.95**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£265
Monitor	No	—
Disc Drives	Yes	£345
Other Languages	Yes	
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	TBA

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microctonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95 .



ATARI 800

Atari UK Ltd, PO Box, 59 Alperton Lane, Webley, Middx

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£599.95**

MANUFACTURER'S EXPANSIONS

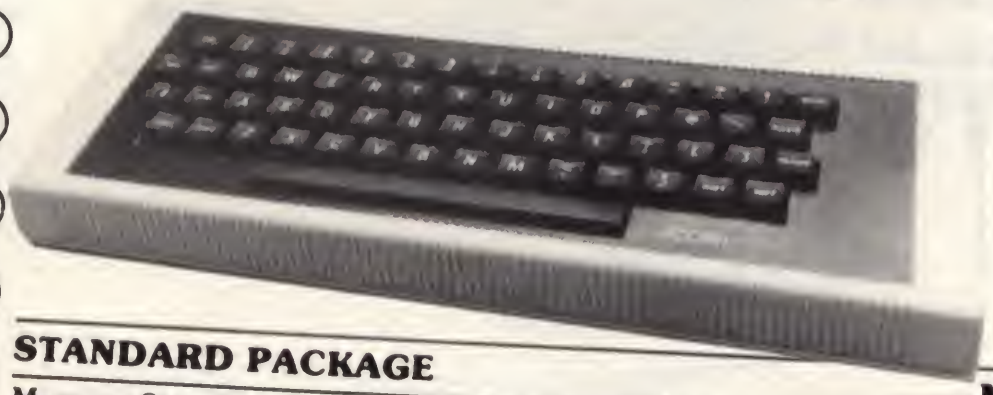
	DETAILS	PRICE
RAM	optional 16K RAM packs (to 48K Max)	£65
Printer	Yes	£265
Monitor	No	—
Disc Drives	Yes	£345
Other Languages	Yes	£345
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	TBA

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microtonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **Carrying case,** CJE Microcomputer, 25 Henry Avenue, Rustington, W. Sussex, BN16 2PA, £18.50

ACORN ATOM

Acorn Computers, 4A Market Hill, Cambridge.
Tel: 0223-245200.



STANDARD PACKAGE

Memory Size (RAM)	2K
Screen Size	16 lines of 32 characters
Expansion Sockets	BUS connector, Printer, Video output
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£140 kit, £174.50 built**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	12K internal, 32K external options	£45-149
Printer	Yes	
Monitor	No	£232
Disc Drives	Yes	—
Other Languages	Yes	£299
Multi-user Capabilities	Yes	£11.50
BASIC extensions (Toolkits)	Yes, BBC BASIC	— £50

OTHER ADD-ONS:

Centronics-type connector, Technomatic Ltd, 17 Burnley Road, London NW10, £8.50; **TMS 5100 Talking Board,** GM Microtronics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **DUO-1 64K add-on,** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea, SS5 2JJ, £64 kit, £70 built; **MZ163 RAM expansion boards,** Timedata Ltd, 57 Swallowdale, Basildon, Essex SS15 5BZ, £59.50-76.

APPLE II

Apple Computer (UK) Ltd, Finway Road, Hemel Hempstead, Herts, HP2 7PS



STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	24 lines of 40 characters
Expansion Sockets	BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8 or 12K
Average Price	**£812**

MANUFACTURER'S EXPANSIONS

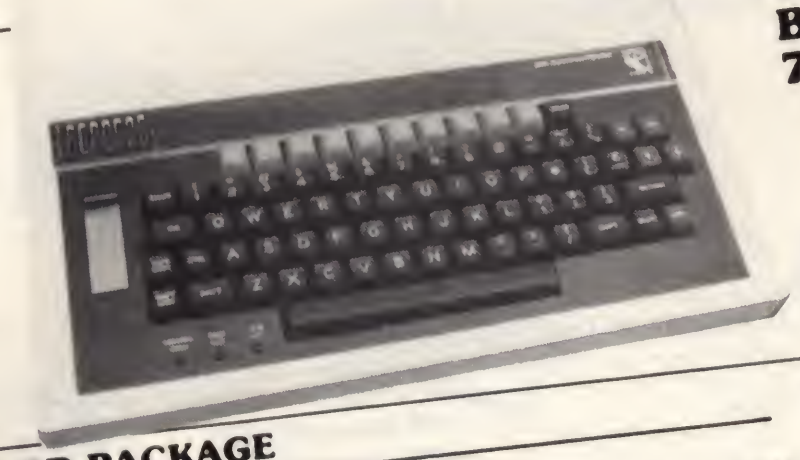
	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£200-1700
Monitor	Yes	£134
Disc Drives	Yes	£379
Other Languages	Yes	£84-500
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£26

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microctonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **Multifunction Card,** Datex Micros, 193 Touring Road, Worthing, W. Sussex, £85; **5¼" Winchester disc drive,** Independent Computer Engineering Ltd 16/18, Littleton Road, Ashford, Middlesex, TW15 1UQ; **16K RAM Board,** DDP Research & Marketing, 17 Novel Square, Basildon, Essex, SS13 1LP, £75; **U-port, 8 serial interfaces,** U-Microcomputers, Ltd, Winstanely Industrial estate, Long Lane, Warrington, Chesire, WA2 8PR, £195.

BBC MICROCOMPUTER

Model A,
BBC Microcomputer Systems, PO Box 7, London W3 6JX.



STANDARD PACKAGE

Memory Size (RAM)	16
Screen Size	32 lines of 40 characters (max)
Expansion Sockets	Parallel serial output, analogue output, Bus connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£299**

MANUFACTURER'S EXPANSIONS

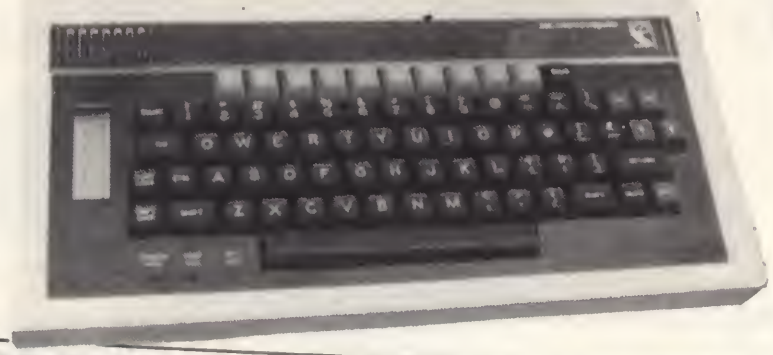
	DETAILS	PRICE
RAM	up to 32K	£100
Printer	TBA	–
Monitor	No	–
Disc Drives	TBA	–
Other Languages	TBA	–
Multi-user		–
Capabilities	Yes	
BASIC extensions (Toolkits)	TBA	

OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35 Walnut Street Close, Guildford, Surrey GU1 4UN, Tel: 0483 50321, £199-799; **BBC Cassette Recorder,** Microage Electronics, 135 Hale Lane, Edgeware, Middx, £28; **Colour Monitor,** PortaTel Conversions Ltd, 25 Sunbury Cross Centre, Staines Roach West, Sunbury-on-Thames, Middx, TW16 7BB, £299; **Floppy Disc Controller Kit,** Midwich Computer Co Ltd, Newitt House, Northgate Street, Bury St. Edmunds, Suffolk IP33 1HQ, £42.50.

BBC MICROCOMPUTER

Model B
BBC Microcomputer Systems, PO Box 7, London W3 6JX



STANDARD PACKAGE

Memory Size (RAM)	32
Screen Size	30 lines of 80 characters
Expansion Sockets	Serial and parallel output, analogue output, printer BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£399**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	–
Printer	TBA	TBA
Monitor	No	–
Disc Drives	TBA	TBA
Other Languages	TBA	TBA
Multi-user	Yes	–
Capabilities		
BASIC extensions (Toolkits)	TBA	TBA

OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35, Walnut Tree Close, Guildford, Surrey GU1 4UN, Tel: 0483 503121, £199-799; **BBC Cassette recorder,** Microage Electronics, 135 Hale lane, Edgware, Middx, HA8 9QP, £28; **Colour Monitor,** Portatel Conversions Ltd, 25 Sunbury Cross Centre, Saires Road West, Sunbury-on-Thames, Middx, TW16 7BB, £299; **Floppy Disc Controller Kit,** Midwich Computer Co Ltd, Hewitt House, Northgate Street, Bury St. Edmunds, Suffolk, IP33 1HQ, £42.50; **Carrying Case,** CJE Microcomputers, 25 Henry Avenue, Rustington, W. Sussex, BN16 2PA, £18.50.



COMMODORE PET 4000

Commodore, 675 Ajax Avenue, Slough, Bucks

STANDARD PACKAGE

Memory Size (RAM)	16 or 32K
Screen Size	25 lines of 40 characters
Expansion Sockets	IEEE 488 standard, parallel output
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£632.50, £799.25**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes several	£454-1604
Monitor	N/A	—
Disc Drives	Yes	£396
Other Languages	Yes, single or dual	£454-1029
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Universal Interface, Technomatic Ltd, 17 Burnley Road, London NW10, £149; **TMS 5100 Talking Board,** GM Microtronics Ltd, Unit 14, Godinton Way industrial Estate, Ashford, Kent, £82.95; **64K DRC Module,** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea SS5 2JJ, £70 kit, £80 built.



COMMODORE PET 8000

Commodore, 675 Ajax Avenue, Slough, Bucks

STANDARD PACKAGE

Memory Size (RAM)	32K or 96K
Screen Size	25 lines of 80 characters
Expansion Sockets	IEEE 488 standard, parallel output
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£980, £1374**

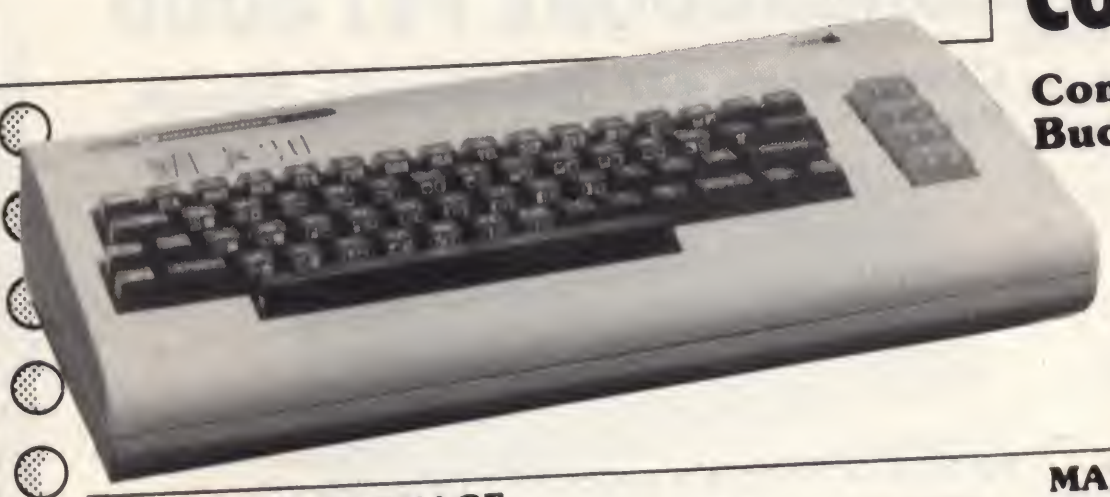
MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£454-1604
Monitor	N/A	—
Disc Drives	Yes single or dual	£454-1029
Other Languages	Yes	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Universal Interface, Technomatic Ltd, 17 Bunley Road, London NW10, £149; **TMS 5100 Talking Board,** GM Microtronics Ltd, Unit 14, Godinton Way industrial Easte, Godinton Road, Ashford, Kent, £82.95; **64K DRC Module** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea SS5 2JJ, £70 kit, £80 built.

COMMODORE VIC20



Commodore, 675 Ajax Avenue, Slough, Bucks

STANDARD PACKAGE

Memory Size (RAM)	5K
Screen Size	23 lines of 22 characters
Expansion Sockets	BUS connection, Disc, Printer, Serial output, joystick
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£199.99**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	3K,8K,16K expansion options	£30,£45,£75
Printer	Yes	£270
Monitor	No	—
Disc Drives	Yes	£396
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microtonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **Cassette Conversion Kit,** Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £6; **VCR-20, 20K RAM cartridge,** Audio Computers, 87 Bournemouth Park Road, Southend on Sea SS5 2JJ, £39 kit, £45 built; **Expansion Board,** 3K-16K, Arfon Microelectronics Ltd, Gibyn Industrial Estate, Caernafon, Gwynedd, Wales LL55 2BD, £220.

DAI



Data Applications UK Ltd, 16B Dyer Street, Grencester, Gloucestershire, GL7 2PF

STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	24 lines of 60 characters
Expansion Sockets	BUS connection, Serial output, joystick socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£575**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	No	—
Monitor	No	—
Disc Drives	Yes	TBA
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes, maths pack	£149

OTHER ADD-ONS:

None Reported



VIDEO GENIE I

Lowe Electronics, Bentley Bridge, Chesterfield Road, Matlock, Derbyshire, DE4 5LE

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	16 lines of 64 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	12K
Average Price	**£279**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user Capabilities	No	
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35 Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17 Highcross St, Leicester LE1 4PF, £179-349; **EG3014 Expansion box with 16K/32K RAM,** Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £199-213 **48K Internal RAM,** General Northern Microcomputers, GNOMIC, 46 Middle Street, Blackhall, Martlepool, Cleveland, £70 + VAT: **32K RAM Card** Audio Computer, 87 Bournmouth Park Road, Southend-on-sea, SS5 2JJ, £40 kit, £46 built.



VIDEO GENIE II

Lowe Electronics, Bentley Bridge, Chesterfield Road, Matlock, Derbyshire DE4 5LE

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	13K
Average Price	**£299**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Disc drives, single and dual, Cumana Ltd, 35, Walnut Tree Close, Guildford, Surrey, Gul 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17 Highcross St, Leicester LE1 4PF, £179-349; **EG3014 Expansion box with 16K/32K RAM,** Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £199-213; **48K internal RAM,** General Northern Microcomputers, GNOMIC, 46 Middle Street, Blackhall, Hartlepool, Cleveland, £70 +VAT; **32K RAM Card** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea, SS5 2JJ, £40 kit, £46 built.

REFERENCE



MICROCONTROLLER

Midwich Computer Company, Ltd, Hewitt House, Northgate Street, Bury St. Edmunds, Suffolk IP33 1HQ.

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K (control BASIC)
Average Price	**£375**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	–
Printer	Yes	POA
Monitor	Yes, 9" or 12" screen	£135-149
Disc Drives	No	–
Other Languages	No	–
Multi-user Capabilities	No	–
BASIC extensions (Toolkits)	No	–

OTHER ADD-ONS:

None Reported



NASCOM 3

Lucas Logic, NASCOM Microcomputers Division, Welton Road, Wedgenuck Industrial Estate, Warwick, CV34 5PZ.

STANDARD PACKAGE

Memory Size (RAM)	0-48K
Screen Size	25 lines of 40 or 80 character
Expansion Sockets	Parallel & serial outputs, BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	10K
Average Price	**£376-500**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	up to 48K (max)	£130
Printer	No	–
Monitor	No	–
Disc Drives	Yes, single or dual	£470-700
Other Languages	No	–
Multi-user Capabilities	No	–
BASIC extensions (Toolkits)	Yes	£15-50

OTHER ADD-ONS:

Olivetti disc drives, single and dual, Kram Electronics, Victoria House, 17, Highcross St., Leicester, LE1 4PF, £179-349; **A/D Board,** 10, Research Ltd, 6, Laleham Avenue, Mill Hill, London NW7 3HL, £120 + VAT; **Hobbit – mini-cassette system,** Ikon Computer Products, Kiln Lane, Laugharne, Covnathen, Dyfed, £99 + VAT; **Disc drives, single and dual,** Micro-Spares, 19, Roseburn Terrace, Edinburgh, EH12 5N9, £199-279.



NEC PC8000

IBR, Unit 57, Sutton Industrial Park, London Road, Earley, Reading, Bucks.

STANDARD PACKAGE

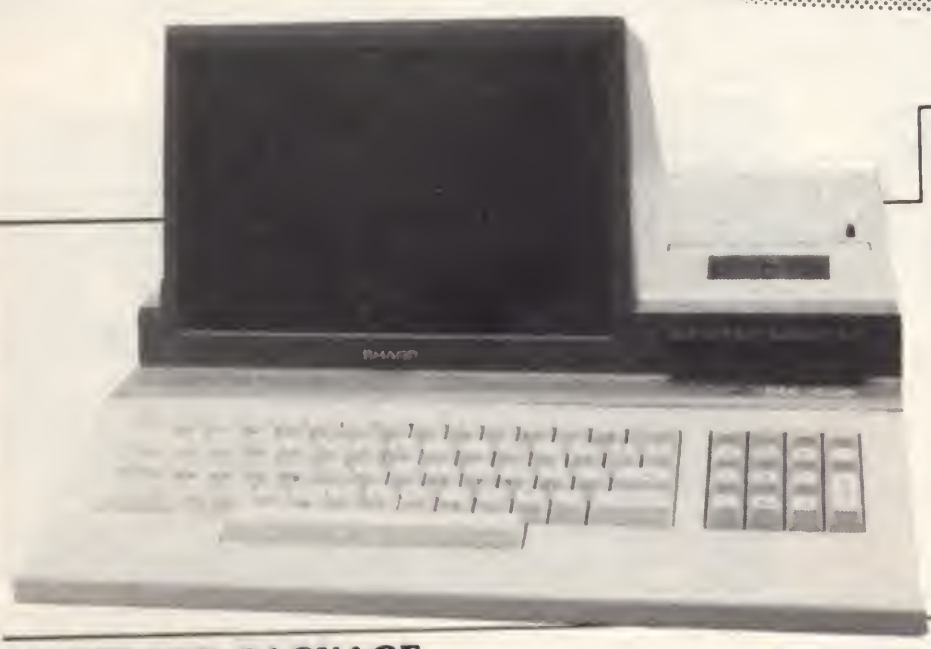
Memory Size (RAM)	32K
Screen Size	25 lines of 80 characters
Expansion Sockets	Parallel output Bus Connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	24K
Average Price	**£599**

OTHER ADD-ONS:

None Reported

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	optional 32K RAM packs (up to 128K)	£109
Printer	Yes	£375-1450
Monitor	Yes	£149-£549
Disc Drives	Yes, dual	£625
Other Languages	Yes	£200-£500
Multi-user Capabilities	Yes	P.O.A.
BASIC extensions (Toolkits)	No	—



SHARP MZ-80A

Sharp UK Ltd, Thorn Road, Newton Heath, Manchester M10 9BE
Tel: 061-205 2333.

STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£549**

OTHER ADD-ONS:

None Reported

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

REFERENCE



SHARP MZ-80B

Sharp UK Ltd, Thorn Road, Newton Heath, Manchester M10 9BE

STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 40 or 80 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	16K
Average Price	**£990**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	Yes	£120
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Multi-vision and triple-vision, Datron Micro Centre, 2 Abbeydale Road, Sheffield S7 1FD, £35-79



SHARP MZ-80K

Sharp UK Ltd, Thorn Road, Newton Heath, Manchester M10 9BE

STANDARD PACKAGE

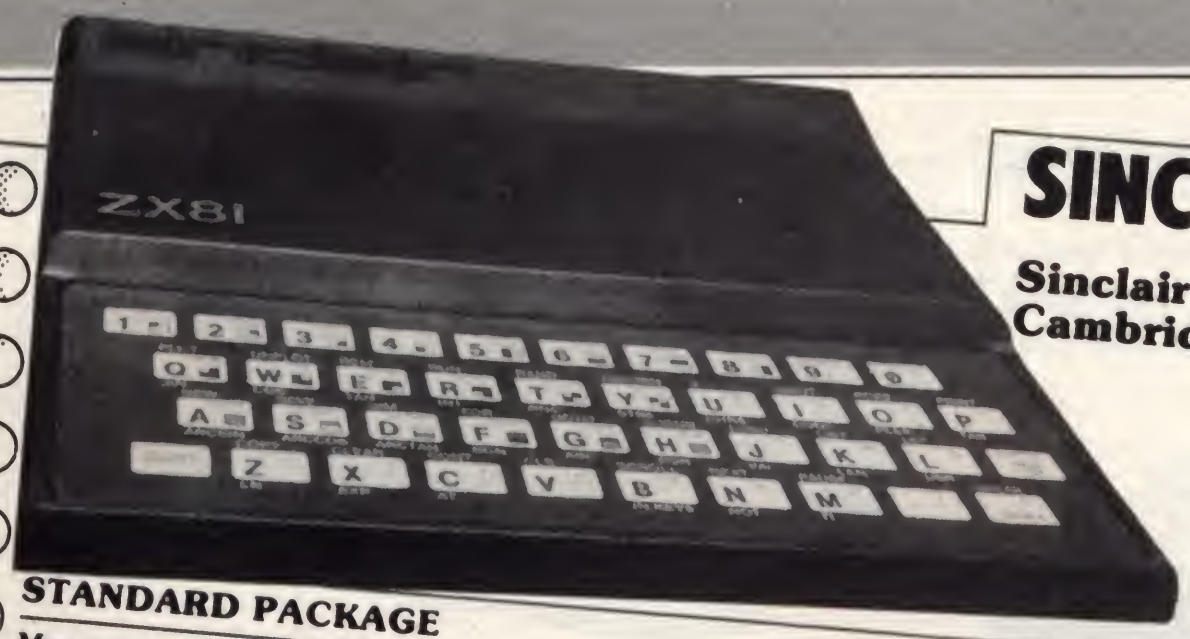
Memory Size (RAM)	48K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£549**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45 upwards
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None Reported



SINCLAIR ZX-81

Sinclair Research, 6 Kings Parade, Cambridge, CB2 1SN

STANDARD PACKAGE

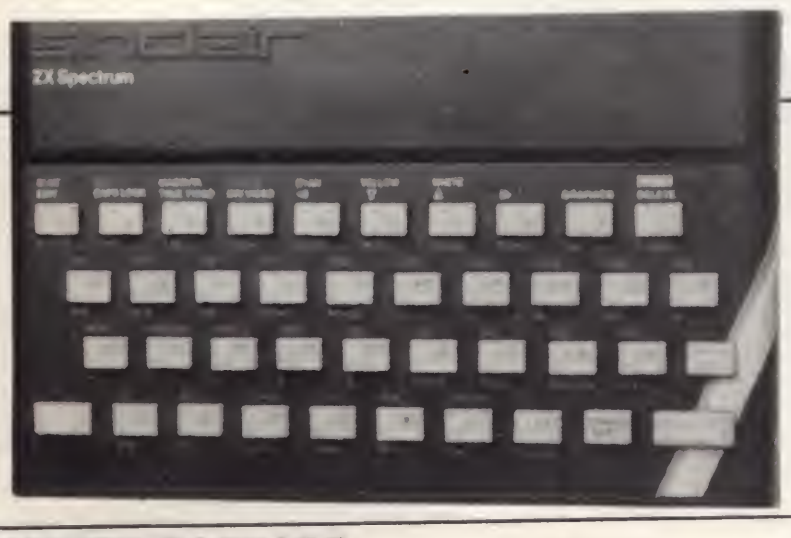
Memory Size (RAM)	1K
Screen Size	24 lines of 32 characters
Expansion Sockets	BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£49.95 kit, £69.95 built**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	16K RAM pack	£29.95
Printer	ZX Printer	£59.95
Monitor	No	—
Disc Drives	No	—
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Memory expansion unit 16K or 64K, Memotech Ltd, 3 Collins St, Oxford OX4 1XL, £39.95-79; **Key Bleep Unit,** Microtronix, 3 Buxton Avenue, Coulton, Nottingham, N94 3RR, £8.85 kit, £9.95 built; **Maximem 1.1,** East London Robotics, Finlandia House, 14 Darwell Close, East Ham, London, EB4 BT, £93.50; **Music Synthesiser + 16 line control port,** William Stuart Systems Ltd, Dower House, Billicicay Road, Herongate, Brentwood, Essex CM13 3SD, £19.50; **Full-size keyboard,** Protos Computer Systems, Frome Computing, 20 Ashtree Road, Frome, Somerset, BA11 2SF, £64.95; **ZX99 Automatic tape control,** Data-cassette, 44, Shroton Street, London NW1 6UG, £59.95.



SINCLAIR ZX-SPECTRUM

Sinclair Research, 6 Kings Parade, Cambridge CB2 1SN

STANDARD PACKAGE

Memory Size (RAM)	16-48K
Screen Size	24 lines of 32 characters
Expansion Sockets	BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	10K
Average Price	**£125 or £175**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	48K RAM for 16K version	£60
Printer	ZX Printer	£59.95
Monitor	No	—
Disc Drives	ZX Microdrive	TBA
Other Languages	No	—
Multi-user Capabilities	No	TBA
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None Reported

REFERENCE



SORCERER

EMG, Microcentre, 47 Lower Belgrave Street, London, SW1

STANDARD PACKAGE

Memory Size (RAM)	56K
Screen Size	30 lines of 64 characters
Expansion Sockets	BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£790**

OTHER ADD-ONS:

None Reported

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£395-1935
Monitor	Yes	£160-330
Disc Drives	Yes single and dual	£420-599
Other Languages	Yes	£99-420
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—



TANDY TRS 80 I

Tandy Corporation, 12th Floor, Tameway Tower, Walsall, West Midlands WS1 1LA. Tel: 0922-648181

STANDARD PACKAGE

Memory Size (RAM)	4 or 16K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8 or 12K
Average Price	**£229 or £339**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	32K extra in expansion unit	£349
Printer	Yes	£239-1200
Monitor	Yes	£100
Disc Drives	Yes	£369
Other Languages	Yes	£100
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

Disc drives, single and dual, Cumana Ltd, 35 Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kran Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349; **48K internal RAM,** General Northern Microcomputers, (GNOMIC) 46 Middle Street, Blackhall, Marlepool, Cleveland, £70 + VAT; **32K RAM card,** Audio Computers, 87 Bournemouth Park Road, Southend on Sea, SS5 2JJ, £40 kit, £46 built.



TANDY TRS 80 III

Tandy Corporation, 12th Floor, Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA

STANDARD PACKAGE

Memory Size (RAM)	4-48K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connection, parallel & serial output
Tape Included?	No
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	16K
Average Price	**£599-1799**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	16K modules	£70
Printer	Yes various	£239-1200
Monitor	N/A	—
Disc Drives	Yes	£600
Other Languages	Yes	£100
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

Disc drives, Cumara Ltd, 35, Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17, Highcross St, Leicester LE1 4PF, £179-349; **48K internal RAM,** General Northern Microcomputers, (GNOMIC), 46 Middle Street, Blackhall, Hartlepool, Cleveland, £70 + VAT; **32K RAM card,** Audio Computers, 87 Bournemouth Park Road, Southend on Sea, SS5 2JJ, £40 kit, £46 built.



TANDY COLOUR

Tandy Corporation, 12th Floor, Tameway Tower, Bridge Street, Walsall, West Midlands, WS1 1LA
Tel: 0922-648181

STANDARD PACKAGE

Memory Size (RAM)	16-32K
Screen Size	16 lines of 32 characters
Expansion Sockets	Serial output, ROM pack, joystick socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8-16K
Average Price	**£499**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£239-1200
Monitor	No	—
Disc Drives	Yes	£439
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Olivetti disc drives single and dual, Kram Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349.

REFERENCE



TANGERINE MICRON

Tangerine Computer Systems Ltd, The Science Park, Milton Road, Cambridge CB4 4BH

STANDARD PACKAGE

Memory Size (RAM)	8K
Screen Size	16 lines of 32 characters
Expansion Sockets	Parallel & serial output, BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	10K
Average Price	**£395**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	48K in system rack	£144
Printer	No	—
Monitor	No	—
Disc Drives	Yes	TBA
Other Languages	Yes	£40
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Sound Board and Graphics Board, Bulldog Video Ltd, 52, Nash Square, Birmingham, B42 2EX, £49-£179; **Toolkit,** Microtanic Software, 235, Friern Road, Dulwich, London, OBD, £22.50.



TEXAS TI 99/4A

Texas Instruments, European Consumer Division, Manton Lane, Bedford MK41 7PA

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 32 characters
Expansion Sockets	ROM pack, Bus connector, joystick, socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	14K
Average Price	**£299**

MANUFACTURER'S EXPANSIONS

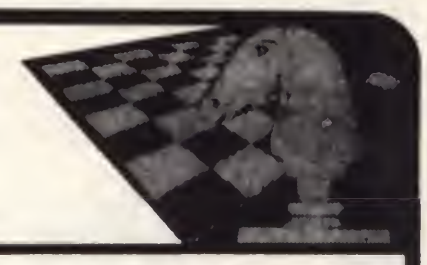
	DETAILS	PRICE
RAM	up to 48K (max)	£300
Printer	Yes	£275
Monitor	No	—
Disc Drives	Yes	£300
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100
	£100	

OTHER ADD-ONS:

None Reported

ARTIC moving ahead with ZX software

ZXCHESS



ZX CHESS & ADVENTURES

PROGRAMS FOR THE ZX81/80 INCLUDING –

ZX-FORTH — **Full implementation of forth on the ZX. forth runs 10 to 26 times faster than BASIC "Simplicity of BASIC with the speed of machine code" No wobble problems 1 Year Guarantee on each Ram Pack. Simply the best you can buy. Immediate delivery.**

BUG–BYTE RAM PACK
16K– £29.50
32K– £42.95
64K– £65.95

1K ZXCHESS! £2.95 — **We didn't think it was possible but this actually plays against you. Two opening moves.**

Exciting machine code games with instant response, choose from the range below. You find yourself stranded on an alien planet.

ADVENTURES

ADVENTURE 'A' £6.00

Can you reach your ship and escape?

ADVENTURE 'B' £7.00

In a jungle clearing you come across an Inca temple. You must break in, collect treasure and escape alive. Beware. Includes a cassette save routine.

ADVENTURE 'C' £8.00

You are unfortunate enough to be 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.

GALAXIANS £3.95

All the features of the arcade game in a fast machine code program. Swooping attackers, explosions and personalised scoring.

ZXBUG £7.00

A 30 in 1 machine code tool and disassembler, allows access to registers and search through and modify memory; with cassette routines.

Tool Kit (Programmers) £5.95

at 9 New Functions to the ZX81 Commands making programming easier.

TWO GREAT ZX81 16K CHESS GAMES

ZXCHESS (ENHANCED)

- Written totally in machine code.
- Full graphic display of Chess board.
- Six levels of play: Two play within competition time limits.
- Option to play Black or White.
- Plays all legal moves including castling and en-passant.
- Cassette routines for saving unfinished game and returning to later.
- Displays moves of game on screen or printer for analysis.
- Print a copy of the Chess board onto the printer.
- Board can be set up in any position, you can even swap sides midgame.
- Clear whole board with one command: for end game analysis.

£6.50

ZXCHESS II We believe the strongest ZX81 Chess game as no other has beaten it!!

- All the features of ZXCHESS plus:
- 32 opening moves.
- Seven levels of difficulty: FOUR play within competition time limits.
- A move is suggested by the ZX81 if wanted.
- Optional Full Graphic version using the QS CHRS Board.

£9.95

2 copies supplied on cassette with full instructions.
Cheques and postal orders payable to:

ARTIC COMPUTING LTD Dept AS1
396 JAMES RECKITT AVENUE,
HULL HU8 0JA

VIC 20 SOFTWARE

CSOFT

PLEASE NOTE ALL PRICES ARE INCLUSIVE

HI-RES GRAPHICS AND COLOR

"NEW"
HI-RES GRAPHICS TUTORIAL
At last a simple and demostrative package that lets you learn at an easy pace how to use the remarkable graphic features of the VIC 20. They said it couldn't be done. **£11.95**

"NEW"
VIC 20 SOUND TUTORIAL
You have to hear to believe with this package. Three voices all at one time. Everything explained from Jazz to Pop **£11.95**

SOUND

SIMON SAYS
An addictive game of follow the leader can you remember the sequence of notes and colors and repeat them in the correct order? A GREAT GAME FOR ALL THE FAMILY...
£7.50

Move Memory
Execute code
Dump memory
Un assembler
Save code
Assembler
MEDUSA is a machine code monitor for people who have extra money but no expensive mother-board and can't have the cartridge monitor MEDUSA will run any memory configuration of 6k or more

RENUMBER UTILITY
Renumber a program to save precious bytes and speed up the run time of the program. WILL RUN IN ANY MEMORY CONFIGURATION
£5.50

GOLF
Play the game of kings in your own home. Come rain or shine this realistic game will have you glued to the screen for hours. Beware of bunkers trees the rough to get on the green. 18 hole course with complete set of clubs (sorry no caddy)
ONLY **£10.95**

PATIENCE
Play this game for hours on end for complete enjoyment. This old card game put on to the vic is a proven winner with young and old alike. THIS GAME IS NOT FOR CHEATS CARD SHARPS OR FROGS.. ?
ONLY **£9.95**

PELMANISM
Can you recall where you last saw something this program will stretch your brain to its limits. hi-res graphics and color to enhance this all ready brilliant game
ONLY **£9.95**

TEMPEST
SHOOT DOWN THE ALIENS BEFORE THEY GET YOU. FAST AND FURIOUS IS THIS GAME SO BEWARE
ONLY **£6.95**

WHY BUY THE REST CHOOSE THE BEST ONLY FROM CSOFT..

COMPETITION
£500.00
TO BE WON FOR THE BEST MACHINE CODE PROGRAM + ROYALTIES ON EACH PROGRAM SOLD
£500.00

OFFICES AT... 38 HIGH STREET, SUTTON COLDFIELD, WEST MIDLANDS
905 WALSALL ROAD, GREAT BARR, BIRMINGHAM, WEST MIDLANDS

LOW PRICE HIGH QUALITY SOFTWARE FOR 32K COMMODORE PET

DATABASE £120 + VAT
(For 4032, 8032 or 8096 only)
A complete information retrieval system for office or school administration. Lay out files for dates, numbers, money or other data. Display, update or amend as required.

PURCHASE AND SALES CONTROL £80 + VAT
Runs both purchase and sales ledgers with optional calculation of VAT from the gross or net amount analysis for any period, "due for payment' report, totals for net VAT and gross, etc.

INVOICE PRINT £80 + VAT
Prints invoices on your own stationary laid out according to your own instructions. This programme is an optional add-on to be used in conjunction with "purchase and sales control".

STOCK CONTROL £60 + VAT
Keeps detailed stock records including stock location, re-order level, quantity on order, cost and selling prices and stock valuation.

NOMINAL LEDGER £60 + VAT
Produces trial balance and up to 20 reports in addition to profit and loss and balance sheet from up to 1,000 nominal accounts. This programme is intended for use on its own, but it can read files set-up by our purchase and sales control and stock control programmes.

Electronic Aids (Tewkesbury) Ltd., Mythe Crest, The Mythe, Tewkesbury, Glos GL20 6EB

Telephone (0386) 831020 or (0684) 294003

ZX Users' Club

JOIN YOUR USERS' GROUP — AND MAKE THE MOST OF YOUR MICROCOMPUTER

Join the National ZX80 and ZX81 Users' Club, by subscribing to the official monthly club magazine INTERFACE.

( ) Please send me the next 12 issues of INTERFACE, containing many programs for each machine in each issue, plus hints, tips, software, hardware and book reviews, plus special offers for members. I understand you will be able to help me with problems regarding my computer, and let me know of any local branches of the club in my area. I enclose **£9.50** (UK), **£12.50** (Europe) or **£16.00** (elsewhere).

Please send me the following books:

( ) GETTING ACQUAINTED WITH YOUR ZX81 — by Tim Hartnell — **£5.95**. This great ZX81 book contains over 80 programs in its 128 pages. Takes you from the first steps of programming your ZX81 to quite complex programs such as WORD PROCESSOR, DRAUGHTS and LIFE. You'll find a host of programs to get your ZX81 up and running with worthwhile programs, right from day one. Other programs include SPACE BOY, ROLLER-BALL, CHEMIN DE FER, GRAFFITI, MICRO-MOUSE, POGO, TOWERS OF HANOI, BLOCKOUT, SALVADOR, BANDIT and DODGE CITY.

As well as programs, there are sections to explain the use of PLOT, UNPLOT, PRINT AT, MAKING THE MOST OF 1K, ARRAYS, WRITING PROGRAMS, BIO-RHYTHMS, ARCADE GAMES, RANDOM NUMBERS, PEEK AND POKE, HOW TO CONVERT PROGRAMS, USEFUL ADDRESSES, SPECIFICATIONS, THE NEW ROM.

( ) THE GATEWAY GUIDE TO THE ZX81 AND ZX80 — by Mark Charlton — **£6.45**. Explains ZX BASIC from first principles. 180 pages, more than 70 programs. Recommended by Creative Computing.

( ) MASTERING MACHINE CODE ON YOUR ZX81 OR ZX80 — by Tony Baker — **£7.50**. Warmly welcomed by the computer press, this book has continued to attract praise, because it does exactly what it claims to do in the title.

( ) 49 EXPLOSIVE GAMES FOR THE ZX81 (and 29 for the ZX80) — edited by Tim Hartnell — **£5.95**. Every game you need: DRAUGHTS, GALACTIC INTRUDERS, STAR TREK, DEATH MAZE, 4-IN-A-ROW and an 8K ADVENTURE-type program SMUGGLERS BOLD.

( ) 34 AMAZING GAMES FOR THE 1K ZX81 — by Alastair Gourlay — **£4.95**. All programs dumped from the printer and guaranteed to run. This book is the key to making the most of 1K.

( ) GETTING ACQUAINTED WITH YOUR VIC20 — by Tim Hartnell — **£6.95**. This book is the ideal one for first-time users of the VIC 20, with over 60 programs.

( ) SYMPHONY FOR A MELANCHOLY COMPUTER and other programs for the VIC20 — **£6.95**. A great collection of 24 great games — all dumped direct from the printer — for the VIC20.

( ) GETTING ACQUAINTED WITH YOUR ACORN ATOM — by Trevor Sharples and Tim Hartnell — **£7.95**.

( ) 39 TESTED PROGRAMS FOR THE ACORN ATOM (the best of INTERFACE) — **£6.45**.

( ) PASCAL FOR HUMAN BEINGS — Jeremy Ruston — **£6.45**.

INTERFACE,
44-46, Earls Court Road, Department RH, London W8 6EJ.

Please send me the indicated items. I enclose £----------.

Name ----------

Address ----------

SOFTWARE REVIEW

This is the place to find out more about the software for your micro. Each month we review a hat-full of tapes and bring you the results.

Each month PC will be presenting pages of reviews of the computer programs currently available. We have engaged a team of reviewers, each of whom is a seasoned user of his/her particular machine — and has the crazy streak that means they enjoy playing computer games!

All types of software will, however, be reviewed in these pages; but with around 85% of all home-computer software being of the playful variety, you will be seeing more games than anything else!

Each program is examined for ease of use, interest level, graphics, etc, and the reviews will be presented in a uniform manner to allow you to compare directly between alternatives.

Our 'Ratings Table' headings are:

Program Quality

Here we're looking to see how well written the program is, and how well it exploits the computer's capabilities. Also, how logical is the structure of the program? Does it require the user to make guesses to use it?

Crashproofing

We all hit the wrong key sometimes, do we not? Go on, admit it. If the program has been well written, all should not be lost. If, for example, the machine is asking you to enter "Yes" or "No", then any other key except Y or N should illicit no response whatsoever. In other words, how tolerant is the program of us humans?

Value For Money

Quite frankly, some software on sale today is vastly overpriced. With the low cost of cassette tapes, why *should* simple games cost up to £12 per tape? We judge this one on an overall basis — how much work have the suppliers put into the program and is the price reasonable?

Presentation On-screen

How good are the graphics used in the program? If the instructions are provided on screen, are they both readable and easy to understand? This section examines the visual aspects of the package — vital for games!

Ease Of Use

If the program is for, say, an 'action' game, then the author's choice of keys is very important. Try playing "Invaders" with the movement keys reversed, and the "Fire" button right next to 'Reset'! There are many, many ways in which life can be made easy for the program user. We want to see them *all* used!

Supplied Instructions

Regardless of whether the instructions come on sheets of paper, or are presented as text on-screen, they should be as clear and as concise as possible. One of our pet hates is when you have to LOAD twice; once just to read screens full of words and again to use the software. Pointless! Far better to supply a few Xerox sheets!

Ratings are done on a "Five stars is excellent, one is hopeless" basis, with the reviewer then scoring the supplied package as a whole on a percentage scale.

We would very much like to hear from you, our readers, as to your comments (printable ones only please) on our methods of reviewing software. Any ideas on how we can improve it?

Title: **Cosmic Aliens**
Type: **Tape**
Supplier: **Supersoft**
Machine: **PET**
Price: **£8**

A real demonstration of what is possible with the PET! Very cunning usage of the available graphics produces a different and exciting space game. Cosmic Aliens begins as a "Space Invaders" type game then becomes an "Asteroids" battle and ends up as a sharp shooting session to earn fuel and ammo!

You start by having to clear a screenful of Invaders, which are superbly drawn (for a change), using up your limited supply of fuel in the process. Hitting the "Mother Ship" earns you points — but beware. This Mother Ship can fight back! It drops bombs which move very fast, and go *straight through* defences! Hiding will avail you nothing!

After clearing the little bugs away, the screen wipes into a 'meteorite storm' in which — if you're good enough — you can re-charge your tanks by shooting out the correct asteroids and avoiding the rest!

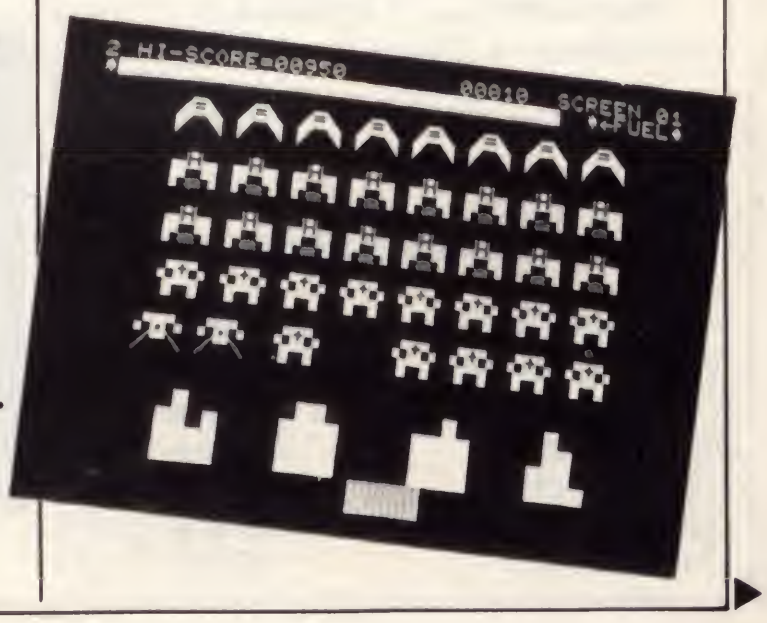
After *that*, assuming you're still alive comes 'Phase Three', in which you have to shoot through a maze type display to hit PART of a moving alien ship. Only part, mind, and it *is* moving!

More than that I refuse to reveal — life must hold some surprises after all. Suffice to say that "Cosmic Aliens" gets my vote for 'Game of the Month'!

R.H.

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * * * *
Ease of Use	* * * *
Crashproofing	* * * *
Supplied Instructions	*
Overall	80%



SOFTWARE REVIEW

Title: Jelly Monsters
Type: Cartridge
Supplier: Commodore Dealers
Machine: VIC-20
Price: £19.95 inc. VAT

At last it's here, after being around for nearly a year in prototype form, Commodore have finally released 'Jelly Monsters' — their cartridge version of the game 'Packman'. The verdict: very good indeed.

It is a faithful reproduction of the pub game which captured the hearts and wallets of countless thousands across the country. For those of you that have been on other planets for the past year or so I will explain.

The idea behind Jelly Monsters is that you are a large yellow blob with a huge mouth (!) and a voracious appetite, whose one aim in life is to travel round a maze eating the dots that are scattered on the floor. The only thing preventing you from indulging in your passion is the fact that also inhabiting the maze are four pretty nasty 'Jelly Monsters'. They spend their time chasing you round the maze with the unfortunate habit of killing you if they catch you.

All is not lost though, because situated in the four corners of the maze are power pills which, when eaten, allow you to chase and devour the Jelly Monsters. The scoring for this game is fairly simple, 10 points per dot and 200 points for the first Jelly Monster, 400 for the second, etc.

It is refreshing to see a program which makes such good use of the VIC's facilities, the graphics are superb, the colour and sound are well implemented and the action is fast and smooth. My only criticism is that as the Jelly Monsters move around they do flicker slightly. Otherwise — superb graphics.

In conclusion, Jelly Monsters is a highly addictive game (as can be seen from the USA, where everyone above the age of 10 seems to be expert at it) and it will keep you in front of the VIC for hours on end.

Be warned . . . I speak from experience.

C.P.

Ratings Table

Program Quality	* * * *
Value for Money	* * *
Presentation On-screen	* * * *
Ease of Use	* * * *
Crashproofing	* * *
Supplied Instructions	* * *
Overall	75%

Title: Super Glooper
Type: Tape
Supplier: Supersoft
Machine: PET
Price: £8

The inevitable PET "Packman" is here to amaze and amuse you — and drive the family mad with the weird sound effects.

By now the entire Universe must know how these games are played. If you don't then read the review of "Jelly Monsters" in this article and lose 100 points for being anti-social and no fun anymore.

In this version, the monsters are rather boring little squares which move relentlessly toward you once freed from their central reservation by you eating too many dots.

Overall the game is probably as faithful a rendition of the arcade game as is possible on the PET. Unfortunately, this inevitably means that the graphics are limited and by comparison with other machine versions, this one is somewhat dull.

I found the control keys awkward to use and remember and this made high scores difficult to achieve, at least at first. (I will *not* be beaten . . .)

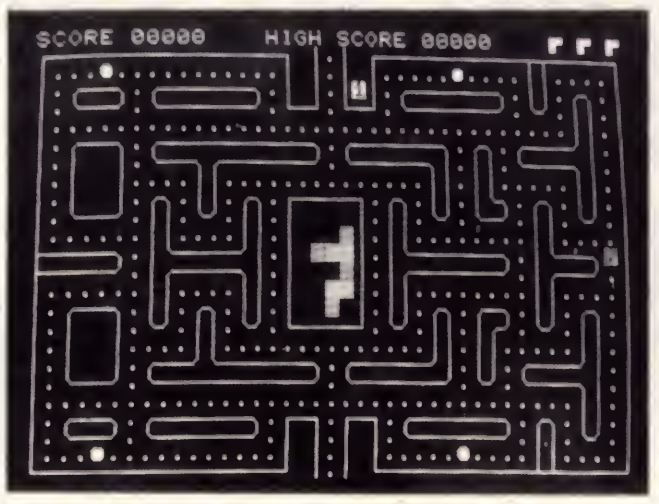
One gripe. It's boring having to go back through the long and tedious instructions when you want to play again. Pointless in a program this well written.

I think this will prove a popular PET program, if only because any serious software collector *has* to have a version of the world's most popular arcade game!

R.H.

Ratings Table

Program Quality	* * *
Value for Money	* * *
Presentation On-screen	* * *
Ease of Use	* * *
Crashproofing	* * * *
Supplied Instructions	*
Overall	60%



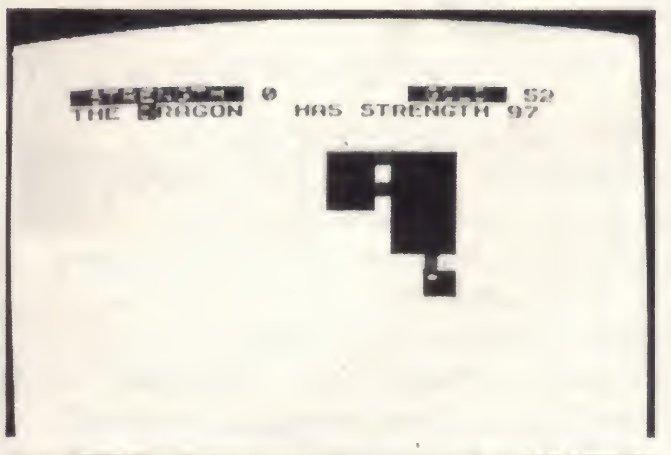
Title: Catacombs
Type: Tape
Supplier: J.K. Greye Software
Machine: Sinclair ZX81
Price: £5.95

"You are alone and lost in the catacombs, how much gold can you find, and how long can you survive?" This game doesn't come up to some of the other adventure games now available. Keys 1-8 move you in the direction indicated on the keys (1-4 diagonally as shown by the graphics character on the keys). The rooms and passages only appear as you move into them and you may find food, gold or monsters. If you beat the monsters or find food, your strength is incremented. You may try to run away from the monsters but they will follow you. Try tunnelling to escape them by shifting keys 5-8. Although acquired skill will help you, the result of a battle with a monster seems a little too random, and the novice gets killed a little too quickly to gain much skill at each attempt. This brings us to the major disturbing factor of this program; once LOADed, the game will automatically RUN and will then take roughly two minutes in FAST mode (with the screen a complete blank) to set up each level. Unfortunately, to the novice it appears that the computer is spending more time setting the stage than the player is playing! We are told that there are an infinite number of levels but also that there is an exit on each level!

P.F.

Ratings Table

Program Quality	* *
Value for Money	* *
Presentation On-screen	* * *
Ease of Use	* *
Crashproofing	* * * *
Supplied Instructions	* * *
Overall	53%



Title: UFO
Type: Tape
Supplier: Knights Computers
Machine: Sharp MZ-80K
Price: £8

Just about the most difficult computer game we've come across! This is so

fast — it's maddening. The supplier, Knights, realise the difficulty but refuse to slow down the thing on the grounds that it's more fun this way!

As you can see from the photo, UFO is *not* a 'Space Invaders' by some other name. A matrix of corridors is produced on the screen at the top of which ten UFOs appear, one by one — accompanied by worrying sound effects.

You control a little man, stuck at the bottom right. Once all ten baddies are present, they come after you — very, very fast. Your only defence is to missile them out before they get to you. Missiles can only be fired in the direction you're moving and you HAVE to keep moving.

It's fast; it's well-night impossible to beat; it's never boring — there isn't *time* to get bored — and it's compulsive. UFO is written in machine code for speed and is loaded from the monitor, rather than BASIC.

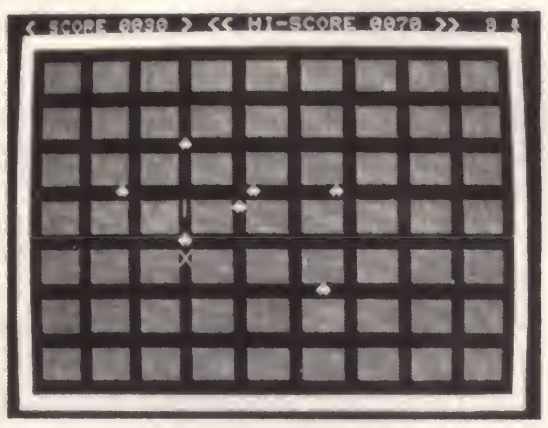
The program is so simple to use and so hard to beat it'll probably become a classic of its kind.

I hate it!

R.H.

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * * *
Ease of Use	* * * *
Crashproofing	* * * *
Supplied Instructions	* *
Overall	75%



Title: **Centipede**
Type: **Tape**
Supplier: **OD'Tronics**
Machine: **Sinclair ZX81**
Price: **£4.95**

Yet another twist to shooting down the attacking aliens. These particular creatures take the form of a segmented attack craft that moves from side to side on the screen, descending each time it hits either the frame at the sides or one of the randomly placed obstructions. You have a number of 'bases' (1-5. . . your choice) and you lose a base if you are hit by one of the alien's bombs or if they descend to 'ground level'. You may fire your laser cannon at the attackers, and if you hit a segment it will be destroyed, but if your hit is in the middle then the alien will split into two and both halves will continue independently. As the attackers are destroyed — or destroy your bases, they will be replaced. As the game proceeds the attackers will become more numerous and will also start to drop bombs on you! You may choose the breakdown — 20 for a novice! Instructions appear on-screen at the start of the game. The top 10 scores may be recorded by name, and remain in memory until you either switch off or alter the speed or number of bases. An innovative game with enough preset variation to appeal to all. Fast and entertaining.

P.F.

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * *
Ease of Use	* * *
Crashproofing	* * * *
Supplied Instructions	* * *
Overall	70%

Title: **ZX Galaxians**
Type: **Tape**
Supplier: **Artic Computing**
Machine: **Sinclair ZX81**
Price: **£6.50**

A good version for the Sinclair of the well known arcade game. You have three spacecraft equipped with the now mandatory laser guns! In front of you are the formations of the hostile Galaxians; shoot down one fleet and another will take its place. Meanwhile some of the enemy craft will peel off from their close formation and swoop down upon you dropping bombs as they go.

You have control of your position — left and right movement — and an inexhaustible supply of laser bolts! The number of attack craft aiming for you increases but the overall speed of the game is well balanced. Slow enough for the novice to get the feel of the game, but fast enough for the experienced tactician to travel some way and score a satisfying number of hits before he gets beaten to death!

P.F.

Ratings Table

Program Quality	* * *
Value for Money	* * * *
Presentation On-screen	* * * *
Ease of Use	* * *
Crashproofing	* *
Supplied Instructions	* * *
Overall	63%

Title: **The Alien**
Type: **Tape**
Supplier: **Audiogenic**
Machine: **VIC-20**
Price: **£9.95**

It is always a dangerous move giving a piece of software a grandiose title, but luckily The Alien, from Audiogenic, doesn't come off too badly. It is based, as with a lot of other programs, on a maze, except that in this variation your task is not to escape, but to survive. The program is written in machine-code and requires an extra 3K of memory over and above the standard machine.

When the game starts you are placed in control of a man stranded in the middle of the maze. For company he has 5 or 6 aliens who behave in a very unfriendly manner and try to eat him. You move about the maze avoiding the aliens, by using either the keyboard or a joystick. When you are safe from immediate danger you can set about inflicting your revenge on the aliens by digging pits for them to blunder into. Once you have snared an unsuspecting alien you must then rush to the side of the pit and fill it in, but be warned, if you do not reach the pit in time, then the alien will escape, usually straight towards you.

This is not your only problem, because if one of his companions comes by he will rescue him and both will set off with a justifiable blood-lust in their eyes.

As the game progresses and you manage to clear all of the aliens you are placed in another maze with even more homicidal extraterrestrials. The game finally ends when you have lost your three lives.

This is a well written game that is a lot of fun to play but the thing which makes it an above average buy is the inclusion of a few humerous extras, such as the sight of a very rotund, grinning alien with your feet sticking out of its mouth and the transformation of yourself into an angel which wafts serenely to the top of the screen on your demise. Once again good use of the VIC's definable characters and its colour and sound should make this a welcome addition to anyone's collection.

C.P.

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * * *
Ease of Use	* * *
Crashproofing	* * * *
Supplied Instructions	* * *
Overall	80%

New ZX81 Software from Sinclair.



A whole new range of software for the Sinclair ZX81 Personal Computer is now available – direct from Sinclair. Produced by ICL and Psion, these really excellent cassettes cover games, education, and business/household management.

Some of the more elaborate programs can only be run on a ZX81 augmented by the ZX 16K RAM pack. (The description of each cassette makes it clear what hardware is required.) The RAM pack provides 16-times more memory in one complete module, and simply plugs into the rear of a ZX81. And the price has just been dramatically reduced to only £29.95.

The Sinclair ZX Printer offer full alphanumerics and highly-sophisticated graphics. A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. So now you can print out your results for a permanent record. The ZX Printer plugs into the rear of your ZX81, and you can connect a RAM pack as well.

Games

Cassette G1: Super Programs 1 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Invasion from Jupiter. Skittles. Magic Square. Doodle. Kim. Liquid Capacity.
Description – Five games programs plus easy conversion between pints/gallons and litres.

Cassette G2: Super Programs 2 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Rings around Saturn. Secret Code. Mindboggling. Silhouette. Memory Test. Metric conversion.
Description – Five games plus easy conversion between inches/feet/yards and centimetres/metres.

Cassette G3: Super Programs 3 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Train Race. Challenge. Secret Message. Mind that Meteor. Character Doodle. Currency Conversion.
Description – Fives games plus currency conversion at will – for example, dollars to pounds.

Cassette G4: Super Programs 4 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Down Under. Submarines. Doodling with Graphics. The Invisible Invader. Reaction. Petrol.
Description – Five games plus easy conversion between miles per gallon and European fuel consumption figures.

Cassette G5: Super Programs 5 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Martian Knock Out. Graffiti. Find the Mate. Labyrinth. Drop a Brick. Continental.
Description – Five games plus easy conversion between English and continental dress sizes.

Cassette G6: Super Programs 6 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Galactic Invasion, Journey into Danger. Create. Nine Hole Golf. Solitaire. Daylight Robbery.
Description – Six games making full use of the ZX81's moving graphics capability.

Cassette G7: Super Programs 7 (ICL)
Hardware required – ZX81.
Price: – £4.95.
Programs – Racetrack. Chase. NIM. Tower of Hanoi. Docking the Spaceship. Golf.
Description – Six games including the fascinating Tower of Hanoi problem.

Cassette G8: Super Programs 8 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Star Trail (plus blank tape on side 2).
Description – Can you, as Captain Church of the UK spaceship Endeavour, rid the galaxy of the Klingon menace?

Cassette G9: Biorhythms (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – What are Biorhythms? Your Biohythms.
Description – When will you be at your peak (and trough) physically, emotionally, and intellectually?

Cassette G10: Backgammon (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £5.95.
Programs – Backgammon. Dice.
Description – A great program, using fast and efficient machine code, with graphics board, rolling dice, and doubling dice. The dice program can be used for any dice game.

Cassette G11: Chess (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Chess, Chess Clock.
Description – Fast, efficient machine code, a graphic display of the board and pieces, plus six levels of ability, combine to make this one of the best chess programs available. The Chess Clock program can be used at any time.

Cassette G12: Fantasy Games (Psion)
Hardware required – ZX81 (or ZX80 with 8K BASIC ROM) + 16K RAM.
Price – £4.75.
Programs – Perilous Swamp. Sorcerer's Island.
Description – Perilous Swamp: rescue a beautiful princess from the evil wizard. Sorcerer's Island: you're marooned. To escape, you'll probably need the help of the Grand Sorcerer.

Cassette G13: Space Raiders and Bomber (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £3.95.
Programs – Space Raiders. Bomber.
Description – Space Raiders is the ZX81 version of the popular pub game. Bomber: destroy a city before you hit a sky-scraper.

Cassette G14: Flight Simulation (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £5.95.
Program – Flight Simulation (plus blank tape on side 2).
Description – Simulates a highly manoeuvrable light aircraft with full controls, instrumentation, a view through the cockpit window, and navigational aids. Happy landings!

Education

Cassette E1: Fun to Learn series – English Literature 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Novelists. Authors.
Description – Who wrote 'Robinson Crusoe'? Which novelist do you associate with Father Brown?

Cassette E2: Fun to Learn series – English Literature 2 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Poets, Playwrights. Modern Authors.
Description – Who wrote 'Song of the Shirt'? Which playwright also played cricket for England?



Cassette E3: Fun to Learn series – Geography 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Towns in England and Wales. Countries and Capitals of Europe.
Description – The computer shows you a map and a list of towns. You locate the towns correctly. Or the computer challenges you to name a pinpointed location.

Cassette E4: Fun to Learn series – History 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Events in British History. British Monarchs.
Description – From 1066 to 1981, find out when important events occurred. Recognise monarchs in an identity parade.

Cassette E5: Fun to Learn series – Mathematics 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Addition/Subtraction. Multiplication/Division.
Description – Questions and answers on basic mathematics at different levels of difficulty.

Cassette E6: Fun to Learn series – Music 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Composers. Musicians.
Description – Which instrument does James Galway play? Who composed 'Peter Grimes'?

Cassette E7: Fun to Learn series – Inventions 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Inventions before 1850. Inventions since 1850.
Description – Who invented television? What was the 'dangerous Lucifer'?

Cassette E8: Fun to Learn series – Spelling 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Series A1-A15. Series B1-B15.
Description – Listen to the word spoken on your tape recorder, then spell it out on your ZX81. 300 words in total suitable for 6-11 year olds.

Business/household

Cassette B1: The Collector's Pack (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £9.95.
Program – Collector's Pack, plus blank tape or side 2 for program/data storage.
Description – This comprehensive program should allow collectors (of stamps, coins etc.) to hold up to 400 records of up to 6 different items on one cassette. Keep your records up to date and sorted into order.

Cassette B2: The Club Record Controller (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £9.95.
Program – Club Record Controller plus blank tape on side 2 for program/data storage.
Description – Enables clubs to hold records of up to 100 members on one cassette. Allows for names, addresses, 'phone numbers plus five lots of additional information – eg type of membership.

Cassette B3: VU-CALC (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £7.95.
Program – VU-CALC.
Description – Turns your ZX81 into an immensely powerful analysis chart. VU-CALC constructs, generates and calculates large tables for applications such as financial analysis, budget sheets, and projections. Complete with full instructions.

Cassette B4: VU-FILE (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £7.95.
Programs – VU-FILE. Examples.
Description – A general-purpose information storage and retrieval program with emphasis on user-friendliness and visual display. Use it to catalogue your collection, maintain records or club memberships, keep track of your accounts, or as a telephone directory.

How to order

Simply use the FREEPOST order form below and either enclose a cheque or give us your credit card number. Credit card holders can order by phone – simply call Camberley (0276) 66104 or 21282 during office hours. Either way, please allow up to 28 days for delivery, and there's a 14-day money-back option, of course.

sinclair
ZX81
SOFTWARE

Sinclair Research Ltd,
Stanhope Road, Camberley, Surrey, GU15 3PS.
Tel: Camberley (0276) 66104 & 21282.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR.
Please send me the items I have indicated below.

Qty	Cassette	Code	Item price	Total
	G1 Super Programs 1	30	£4.95	
	G2 Super Programs 2	31	£4.95	
	G3 Super Programs 3	32	£4.95	
	G4 Super Programs 4	33	£4.95	
	G5 Super Programs 5	34	£4.95	
	G6 Super Programs 6	35	£4.95	
	G7 Super Programs 7	36	£4.95	
	G8 Super Programs 8	37	£4.95	
	G9 Biorhythms	38	£6.95	
	G10 Backgammon	39	£5.95	
	G11 Chess	40	£6.95	
	G12 Fantasy Games	41	£4.75	
	G13 Space Raiders & Bomber	42	£3.95	
	G14 Flight Simulation	43	£5.95	
	E1 English Literature 1	44	£6.95	

Qty	Cassette	Code	Item price	Total
	E2 English Literature 2	45	£6.95	
	E3 Geography 1	46	£6.95	
	E4 History 1	47	£6.95	
	E5 Mathematics 1	48	£6.95	
	E6 Music 1	49	£6.95	
	E7 Inventions 1	50	£6.95	
	E8 Spelling 1	51	£6.95	
	B1 Collector's Pack	52	£9.95	
	B2 Club Record Controller	53	£9.95	
	B3 VU-CALC	54	£7.95	
	B4 VU-FILE	55	£7.95	
	ZX 16K RAM pack	18	£29.95	
	ZX Printer	27	£59.95	
	Post & packing – *only* if ordering hardware		£2.95	

TOTAL £ ____

I enclose a cheque/postal order to Sinclair Research Ltd for £ _____
Please charge my *Access/Barclaycard/Trustcard no.
**Please delete as applicable.*

Mr/Mrs/Miss

Address

NSA16

SOFTWARE

PROGRAMMER'S TOOLKIT



Add some big machine programming power to the ZX81 with this invaluable "Toolkit" from V.B. Rumsey

The Programmer's Aid provides the expanded ZX81 with a number of additional functions for you to use as an aid while writing and testing your own programs. These include showing the free memory available, renumbering programs, displaying the variables used in the program and a convenient format.

A number of limitations of the ZX81 are overcome for only a small cost in memory, 13K remains free and, to provide additional space, the Programmer's Aid can be deleted after completing your "masterpiece"!

When running, the Programmer's Aid displays a "Menu" telling you what is available, but the following describes in detail the action of each option:

Edit Command (E)

The program chooses FAST mode, which is more convenient to use than SLOW while editing. The program LISTs beginning with the current line. This often saves having to search through the list to find your current problem.

Lines 1000 to 6999 are free for your own program. When you have finished entering, or you wish to SAVE what has been created to date, enter RETURN (on the Y key) as a direct instruction, when the Programmer's Aid will choose SLOW mode and return to the Menu.

"Memory Left" Routine (M)

This displays the number of bytes free for programs, variables, and machine stack. It is written in machine code. An assembly language listing is shown as Diagram 1 — consult your Sinclair manuals if you are unsure how to enter this program into your ZX81.

Diagram 1

Memory Left Routine

```
HEX
21  00  00      LD HL,0
39              ADD HL,SP
ED 4B  1C  40   LD BC,(STKEND)
A7              AND A
ED 42           SBC HL,BC
44              LD B,H
4D              LD C,L
C9              RET
```

Renumber Your Programs (R)

Choosing R will instantly renumber the appropriate sections of your program, and then LIST from the current line. Unlike other renumbering routines, however, a line number is left unchanged unless it is closer to the previous line number than 5 lines.

Correctly used, this enables you to insert new lines where required without altering GOSUB and GOTO numbers!

All that is required, is that you begin these sections of the program with line numbers that are sufficiently far away from the previous ones to allow for additions. Usually multiples of 50 or 100 are convenient.

If you wish to alter the interval between lines, then POKE 16563 with the new number. This section is written in machine code too, and an assembly listing is given in Diagram 2. Again be careful with entry! Take your time and check everything.

Diagram 2

Renumber Routine

```
HEX
      21  7D  40   LD HL,407D      Address of first line no.
      11  00  00   LD DE,00
:L1   7E           LD A,(HL)
      E6  C0       AND CO         Test for end of program
      C0           RET NZ
      E5           PUSH HL
      46           LD B,(HL)
      23           INC HL         Load BC with line no.
      4E           LD C,(HL)
      23           INC HL
      EB           EX DE, HL
      E5           PUSH HL
      ED  42       SBC HL,BC      Test for highest line no.
      E1           POP HL
      38  12       JR C,L3
      C1           POP BC
      7C           LD A,H
      02           LD (BC),A      Old no. higher — POKE
      03           INC BC
      7D           LD A,L
      02           LD (BC),A
      01  05  00   LD BC,05       Add 5 to new line no.
:L2   EB           EX DE,HL
      09           ADD HL,BV
:L2   EB           EX DE,HL
      23           INC HL         Find no. bytes to next line
      46           LD B,(HL)      number
      23           INC HL
      09           ADD HL,BC      Calc. address of next line no.
      18  DE       JR L1
:L3   60           LD H,B
      69           LD L,C         New no. higher — no action
      C1           POP BC
      18  EF       JR L2
```

SAVing Problems (S)

Under this option, the program is SAVEd on tape under the first four characters of its title. When reloaded, it starts automatically.

Print Title (T)

Enables you to alter the title as printed out at the beginning of each screen.

What Variables? (U)

All variables so far created are printed out, together with their length. The order in which they are listed is that in which they are held by the computer. The Dimensioned variables are separately identified, as are Strings and 'For' Loops. This will enable you to avoid using the same letter twice in the same program.

Menu For a Meal Of Programs

The line numbers chosen for use by the menu have been carefully picked to allow you to use this feature in your own programs. For example, to insert an option beginning with A (eg Adventure) line 7040 should read 7040 PRINT "A-ADVENTURE". For an item starting with B use line 7050,C 7060 etc.

When A is selected from the menu, the computer assigns control to line 7400; when B is selected, control is transferred to line 7500,C 7600 and so on. There are, therefore, 100 line numbers for you to use for each letter (more if the following letter is unused). If this is insufficient, then control should be transferred to the main program between lines 1000 and 7000.

Keep a chart of these numbers handy for ease of reference.

When any option is chosen, FAST mode is brought into operation. If SLOW is required, then make this the first line of your section of program.

All the variables used in this Programmer's Aid, with the exception of T$, ER and OP may be used in your own program as temporary data stores.

Other Useful Subroutines

Three other useful subroutines are included.

GOSUB 100 will print the title, T$.

GOSUB 200 produces an indefinite pause, very useful when in FAST mode. When any key is depressed, the screen is cleared, FAST mode chosen, and control returned to the main program. Variable V will contain the code of the key selected.

If key C is chosen, a copy of the screen is sent to the printer, if attached.

As a slight variation, when GOSUB 190 is used instead, "PRESS ANY KEY FOR MORE" is also printed. This can be useful when the screen is full.

If GOTO is used instead of GOSUB, then, on pressing any key, control is returned to the menu. This will prevent program crashes.

The subroutine at line 900 prints variable L right-aligned provided it is no longer than five characters. This can be useful when you produce lists. To increase the length acceptable, add spaces to I$ in line 900.

PROGRAMMER'S TOOLKIT

Entering The Program

The listing is in two sections. The preliminary part sets up the machine code routines. All lines after line 20 should be deleted after running the program. For safety, it should be SAVEd at this stage.

Diagram 3

Preliminary Program

```
10  REM [14 Characters]
20  REM [45 Characters]
30  FOR I = 16514 TO 16578
40  PRINT I - 16513
50  INPUT J
60  PRINT J
70  POKE I,J
80  IF PEEK 16442<4 THEN CLS
90  NEXT I
```

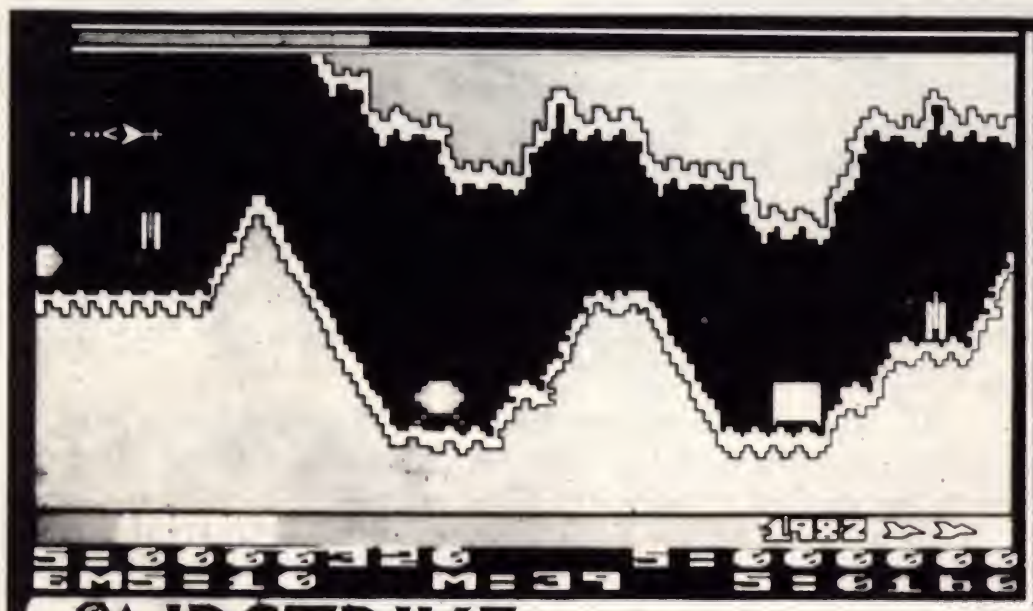
RUN the program, then enter the following numbers in sequence:-
33 0 0 57 237 75 28 64 167 237 66 68 77 201 118 0 20 47 0 234 33 125 64 17 0 0 126 230 192 192 229 70 35 78 35 235 229 237 66 225 56 18 193 124 2 3 125 2 1 5 0 9 235 78 35 70 35 9 24 222 96 105 193 24 239

Now delete lines 30 to 90 inclusive.

In the main program, please note the following points:—
line 190 inludes graphics shift H
lines 800 and 850 have 3 spaces then 5 times graphic shift 7
line 810 has three spaces
line 900 is I$ = five spaces.

After entering the main program, RUN, then enter GOTO OP. The menu should now be displayed. SAVE the program, and it is ready for use.





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 £15.95 / 32K DISK £18.95) Plus 50p P & P

NEW TITLES: ●CRYPTS OF TERROR–16K ADVENTURE ●K-RAZY SHOOT OUT CARTRIDGE ●AMERICAN FOOTBALL–16K ● CAVERNS OF MARS–16K ●COMPUTE BOOK OF ATARI ●SANTA CRUZ TRICKY TUTORIALS

NOW IN STOCK : ATARI TV GAMES PLUS ACTIVISION CARTRIDGES AT DISCOUNT PRICES ! WATCH OUT FOR PACMAN AND DEFENDER !

NATIONWIDE MAIL ORDER SERVICE ON ALL PRODUCTS – SEND STAMP OR CALL NOW FOR DETAILS

NOW IN STOCK ON 16K CASSETTE:
FROGGER @ £22.95
CROSSFIRE @ £19.95
SHOOTING GALLERY @ £15.95
*PROTECTOR (32K Cassette/Disk)
Plus: on 32K DISK:
MOUSKATTACK @ £22.95
*THRESHOLD (40K) (unbelievable graphics!)
*RASTER BLASTER (real pinball!)
*ALI BABA & 40 THIEVES
*APPLE PANIC
*Call for Prices
Add 50p P&P
MORE ATARI SOFTWARE DUE SHORTLY ! !

ACTION QUEST™
16K Assembly Language Real-Time Adventure Game For ATARI® 400/800 Computer



16K CASSETTE/DISK £19.95 Plus 50p p&p

Action Quest is a real time adventure game played with your joystick controller. You, represented as a ghost, move from room to room in an attempt to capture valuable prizes while eluding monsters and solving puzzles. Score is computed based both on prizes captured and elapsed time. Action Quest is entirely played as an action game, no keyboard input is required.

A complete game encompasses 30 rooms and 20 prizes, and prize capture is not always an easy task; a different technique or twist is involved in obtaining each one. Some require physical dexterity to reach while others can be acquired only through an intellectual problem solving path. Even some rooms are initially hidden from the player and must first be found before their prizes can be captured. Action Quest provides challenges both for fast action players as well as for those motivated by intrigue.

GEMINI ELECTRONICS

(Dept.P.C.) 50 Newton St., Off Piccadilly, Manchester M1 2EA. Tel: 061-236 3083.

ATARI MICROCOMPUTERS



Buy it with Access BARCLAYCARD VISA

✸ COMPUTER CHESS GAMES

Commodore VIC-20
PLUS GAMES NOW IN STOCK!

ATARI PERSONAL COMPUTER SYSTEMS ATARI
400 & 800

Diagram 4

```
PROGRAMMER/S AID
MAIN PROGRAM
   60 LET OP=7360
   70 LET T$="PROGRAMMER/S AID"
   80 LET ER=7850
   90 GOTO 1000
  100 CLS
  110 PRINT T$
  120 PRINT
  130 RETURN
  190 PRINT "▒▒▒▒ [illegible]
[illegible]"
  200 SLOW
  205 IF INKEY$<>"" THEN GOTO 205
  210 LET V=CODE INKEY$
  220 IF V<>40 THEN GOTO 250
  230 COPY
  240 GOTO 210
  250 IF V=0 THEN GOTO 210
  260 FAST
  270 CLS
  280 RETURN
  290 LET K=0
  300 LET X=PEEK 16400+256*PEEK 1
6401
  310 LET V=PEEK X
  320 IF V=128 THEN GOTO 800
  330 LET L=PEEK (X+1)+256*PEEK (
X+2)+3
  340 IF V>224 THEN GOTO 410
  350 IF V>192 THEN GOTO 440
  360 IF V>160 THEN GOTO 470
  370 IF V>128 THEN GOTO 570
  380 IF V>96 THEN GOTO 600
  390 PRINT CHR$ (V-32);"$",
  400 GOTO 620
  410 PRINT CHR$ (V-192);"(FOR LO
OP)",
  420 LET L=18
  430 GOTO 620
  440 PRINT CHR$ (V-160);"$";
  450 GOSUB 700
  460 GOTO 620
  470 PRINT CHR$ (V-128);
  480 LET Y=X
  490 LET Y=Y+1
  500 LET V=PEEK Y
  510 IF V>128 THEN GOTO 540
  520 PRINT CHR$ V;
  530 GOTO 490
  540 PRINT CHR$ (V-128),
  550 LET L=Y-X+6
  560 GOTO 620
  570 PRINT CHR$ (V-96);
  580 GOSUB 700
  590 GOTO 620
  600 PRINT CHR$ (V-64),
  610 LET L=6
  620 PRINT " = ";
  630 GOSUB 900
  640 PRINT
  650 IF PEEK 16442<6 THEN GOSUB
190
  660 LET X=X+L
  670 LET K=K+L
  680 GOTO 310
  700 PRINT "(";
  710 LET J=PEEK (X+3)
  720 FOR I=1 TO J
  730 LET Y=X+2+I*2
  740 PRINT PEEK Y+256*PEEK (Y+1)
  750 IF I<J THEN PRINT ",";
  760 NEXT I
  770 PRINT ")",
  780 RETURN
  800 PRINT ,"    ▒▒▒▒▒▒▒▒"
  810 PRINT ,"    ";
  820 LET L=K
  830 GOSUB 900
  840 PRINT " BYTES"
  850 PRINT ,"    ▒▒▒▒▒▒▒▒"
  890 GOTO 200
  900 LET I$="          "
  910 LET I$(6-LEN STR$ L TO )=ST
R$ L
  920 PRINT I$;
  990 RETURN
 7000 STOP
 7010 PRINT TAB 12;"▒▒▒▒▒▒▒▒"
 7020 PRINT
 7080 PRINT "E-EDIT"
 7160 PRINT "M-MEMORY LEFT"
 7210 PRINT "R-RENUMBER"
 7220 PRINT "S-SAVE"
 7230 PRINT "T-TITLE"
 7250 PRINT "V-VARIABLES"
 7300 INPUT I$
 7310 LET X=CODE I$-37
 7320 IF X<1 OR X>26 THEN GOTO 73
00
 7330 FAST
 7340 GOSUB 100
 7350 GOSUB 7300+X*100
 7360 CLS
 7370 SLOW
 7380 GOSUB 100
 7390 GOTO 7010
 7800 LIST PEEK 16394+256*PEEK 16
395
 7830 STOP
 7850 LET L=PEEK 16443
 7860 FAST
 7865 LET X=7885
 7870 LET K=PEEK 16427+256*PEEK 1
6428
 7875 LIST K
 7880 STOP
 7885 IF L THEN SLOW
 7890 GOTO K
 8600 PRINT "MEMORY LEFT = ";USR
16514;" BYTES"
 8610 GOTO 200
 9100 RAND USR 16534
 9110 GOTO 7800
 9200 LET I$=T$(1 TO 4)
 9210 SAVE I$
 9220 GOTO 7370
 9300 PRINT "TITLE?"
 9310 INPUT T$
 9320 RETURN
 9500 GOTO 290
 9999 RETURN
```

Running Your Own Programs

You are now in a position to enter your own program and RUN it. During this stage, the program may stop, display an error code. If this happens, then enter GOTO ER.FAST mode will be selected, and a listing produced beginning with the line containing the erroor. When you have corrected it, enter GOTO X and the run will continue.

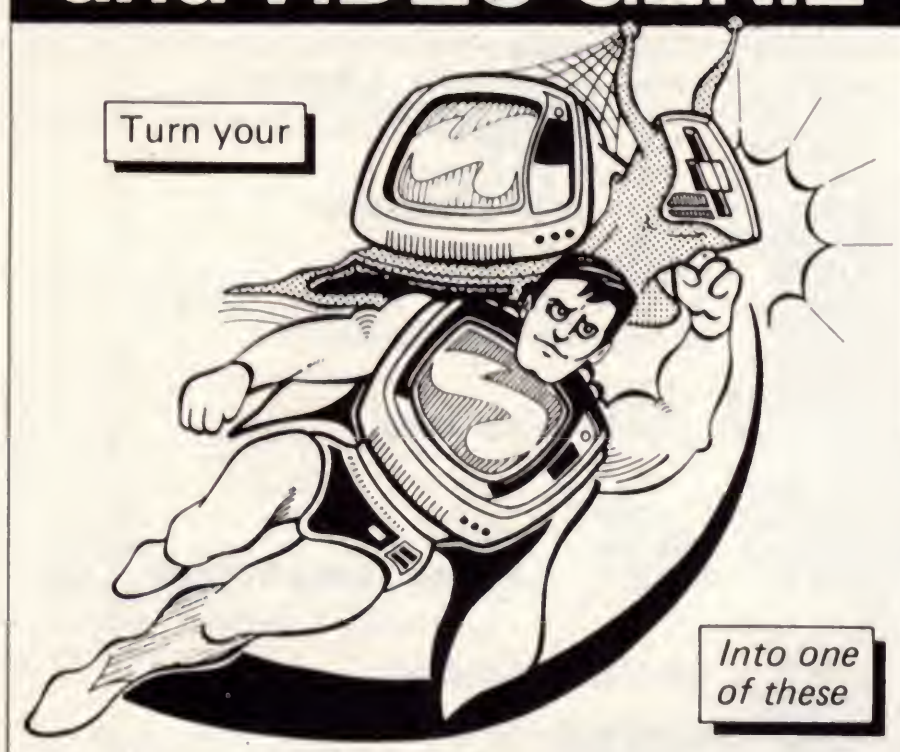
If, instead of correcting the error, you wish to return to the list of options, enter GOTO OP, and the menu will be displayed. RETURN will also work.

Diagram 5

```
                SAMPLE RUN
PROGRAMMER/S AID
MEMORY LEFT = 13311 BYTES
PROGRAMMER/S AID

OP                      =       7
T$                      =      19
ER                      =       7
X                       =       6
V                       =       6
K                       =       6
Y                       =       6
TEMPO                   =      10
D(5,17,2)               =     856
G$(5,3)                 =      23
J                       =       6
I(FOR LOOP)             =      10
I$                      =       9
                          ▒▒▒▒▒▒▒▒
                          938 BYTES
```

TRS80 Models I+III and VIDEO GENIE



Announcing ACCEL3 — the practical BASIC compiler for home, education, or business.

Are you troubled by gradual graphics, languid loops, tedious table searches, or capricious keyboard response? ACCEL3 is the cure. Highly compatible with interpreted BASIC — correct programs compile without modification.

On Tape or Disk £49.95

Southern software

PO Box 39, Eastleigh, Hants, SO5 5WQ

AB & C Computers

AFTER SALES PRODUCT MAINTENANCE AND CUSTOMER SUPPORT

GENIE I or II

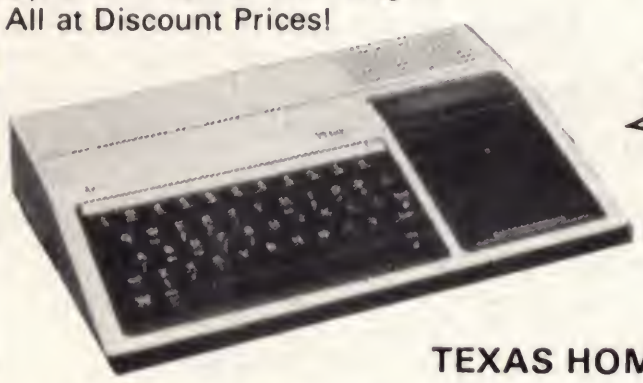
£279.99 + VAT

GENIE SYSTEMS



Powerful Basic — 16K Memory — Z80 CPU — Machine Code Monitor — 16 x 32 (or 64) Characters — Expandable to a full Business System — Full Genie Range — All at Discount Prices!

SOUND UNIT FITTED GENIE I



TI-99/4A COLOUR

£259.99 + VAT

TEXAS HOME COMPUTER

T1 Basic — 16K Memory — Sound — 16 Colour Display — 24 x 32 Characters — Resolution 192 x 256 — Command Modules available offering instant games — Education — Home Planning etc. System fully expandable. All at Discount Prices.

SEIKOSHA GP100A PRINTER £206.00 (+ VAT)

A. B. & C. COMPUTERS,
11 BROCKSTONE ROAD,
ST AUSTELL, CORNWALL.
Tel: St Austell (0726) 64463
Tel: Newquay (06373) 6886

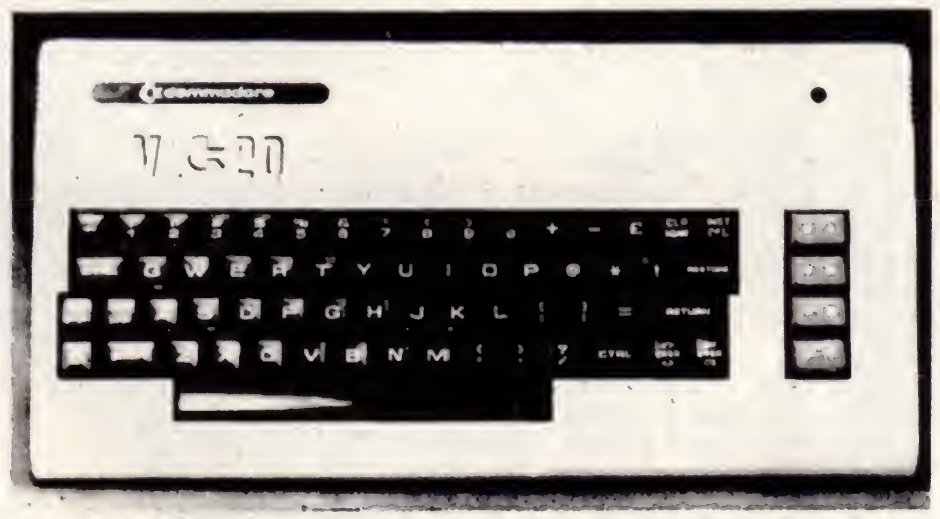
Please send SAE for Price Lists. Terms: Cheque/P.O. with order. Carriage: Computers/Printers £4.50. Post & Packing other items 50p. All hardware checked by Service Engineer. Orders promptly despatched. Access credit for personal customers.

Personal callers welcome · Demonstrations · Advice · Technical Support

SPECIAL FREE OFFER READ ON!

VIC 20

THE FIRST FULL FEATURED COLOUR COMPUTER AT **UNDER £200!!**



FEATURES

*Sound *Colour *5K Memory Expandable to 27K *Standard PET Basic *Full size typewriter Keyboard *Graphics *Plug-in memory expansion *Low-priced peripherals.

SPECIAL OFFERS AVAILABLE WHEN ORDERING YOUR VIC 20 COMPUTER

3K RAM CARTRIDGE FREE
or 8K RAM CARTRIDGE £32.95 inc. VAT
or 16K RAM CARTRIDGE £54.95 incl. VAT

PLUS FREE GAMES TAPE WITH EVERY CASSETTE DECK ORDERED

THE FOLLOWING ITEMS NOW AVAILABLE

VIC 20 Colour/Sound Computer	☐ £189.95 incl. VAT*
VIC Data Cassette Deck	☐ £44.95 incl. VAT
VIC 3K RAM Cartridge	☐ £29.95 incl. VAT
VIC 8 K RAM Cartridge	☐ £44.95 incl. VAT
VIC 16K RAM Cartridge	☐ £74.95 incl. VAT
VIC Joystick Control	☐ £7.50 incl. VAT
Arfon VIC Expansion Unit	☐ £97.75 incl. VAT*
Machine Code Monitor Cartridge	☐ £34.95 incl. VAT
Programmers Aid Cartridge	☐ £34.95 incl. VAT
"Avenger" ROM Games Cartridge	☐ £19.95 incl. VAT
"Super Slot" ROM Games Cartridge	☐ £19.95 incl. VAT
"Alien" ROM Games Cartridge	☐ £19.95 incl. VAT
"Super Lander" ROM Games Cartridge	☐ £19.95 incl. VAT
"Road Race" ROM Games Cartridge	☐ £19.95 incl. VAT
Introduction to Basic (Part I)	☐ £14.95 incl. VAT
Carriage & Ins. on items marked*	☐ £3.45 incl. VAT

TOTAL .....

All prices Subject to Manufacturers Price Changes

437 Stoney Stanton Road,
Coventry, CV6 5EA
West Midlands
Tel: (0203) 661162

IBEK SYSTEMS

Name: .....

Address: .....

.....

Please charge my Barclaycard/Access No.

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Signed: .....

Or telephone order. PC/7/82

A & F SOFTWARE

FOR
ATOM & BBC
USERS

ADVENTURE
First £50 Prize

COMPETITION
PLUS 10 RUNNER UP PRIZES

By following the clues and overcoming the obstacles can you solve the mystery of the "DEATH SATELLITE" and unlock its secrets???

Your ATOM will require 12K RAM. (F.Point NOT Required)

Full competition details supplied with all orders ——

PRICE ——————————————— 6.00

CYLON ATTACK

In this 3D all action game, hi-resolution graphics are used to simulate the pilots view of space from the cockpit of his Starfighter.
Your instruments are constantly displayed and include - Long range scanner - Laser energy status - and fuel status. Score and Hi-score also displayed

Written in m/c for the ATOM using 5K text 6K graphic

PRICE ——————————————— 4.95

OTHER ATOM TITLES

POLECAT ——— •	4.95	EARLY WARNING ——— •	4.95
MINEFIELD ——— ••	4.95	ROBOT NIM ——— ••	3.95
ATOMIC CUBE ——— • x	4.95	POLARIS ——— •	3.95
MISSILE COMMAND ——— •	4.95	PONTOON ——— •	3.95

• = 5K text 6K graphics •• = 5K text 1/2 graphics
x = Floating Point Required

ATOM SUPERCOS

Tired of waiting for your programs to load?
SUPERCOS is a low cost HIGH SPEED (1200 baud) COS you will be able to save/load 5 times faster than normal. In addition SUPERCOS provides visible load, program test verifying, plus 8 other commands. Req's 1·25RAM only 5·95

BBC MICRO

Two popular games from our Atom range converted and enhanced to run on BOTH MODEL A & B MICRO's

EARLY WARNING Destroy the attacking waves of ICBMs using a radar tracking system and intercept missiles. 48 Levels - Each one harder than the last ——— 6.00

POLECAT Find your way through the warren onto the surface and return to your burrow with winter supplies. Easy!!! —— BEWARE THE POLECATS —— ——— 6.00

SPECIAL OFFER Deduct 1.00 per additional cassette when you order 2 or more programs

WE PAY 25% ROYALTIES ON YOUR PROGRAMS

ORDERS TO A&F SOFTWARE 10,WILPSHIRE AVE, LONGSIGHT, MANCHESTER, M12 5TL [Access/Barclay card on (061) 320 5482]

SPECTRUM SOFTWARE NOW AVAILABLE

PLEASE SEND FOR DETAILS

COULD YOU PLEASE FORWARD DETAILS OF YOUR SPECTRUM SOFTWARE TO:

NAME .....

ADDRESS .....

.....

CONTROL TECHNOLOGY
39, GLOUCESTER ROAD
GEE CROSS, HYDE
CHESHIRE. 061-368-7558

PC7

TECHNICAL ENQUIRIES

MICRO-ANSWERS is Personal Computing's Technical Enquiries Service. Each month we will endeavor to answer your questions on the subject of micro-computing. We would love to hear of your problems (honest!) as it is certain that if *you* are having trouble then other users of your machine will also be suffering.

So here's your chance to lighten your burden by sharing your troubles with Personal Computing's panel of experts.

Address your letters to:
"Micro Answers"
Personal Computing
ASP Ltd
145 Charing Cross Road
London WC2H 0EE

If you wish a personal reply, please enclose a stamped addressed envelope *and the reply coupon from this page*. This is to enable us to give priority to regular readers of PC.

We start this month with a collection of correspondence from the files of our technical consultants, which deal with the VIC-20, ZX-81 and how to get together with other enthusiasts. Remember that if you find any of the terminology in Personal Computing difficult, you can look up our explanations in Micro-Terms at the back of the issue. This feature will appear each month and cover the issue it appears in.

Dear PC,
I have a VIC-20, which is unexpanded, and which I use mainly for writing my own games programs.

I have seen ads in the computer magazines for toolkits and things, but all I want is key repeat! It gets boring having to move the cursor around one key-push at a time.

Is there a program which will give me a key repeat, without having to buy one of these expensive add-on toolkits?
A.Walters
Bath

Yes! The VIC-20 already has the facility built in, but somehow people don't get told it very often!

If you type in
POKE 650, 255
you will find that all ***your keys now possess a repeat function and will continue to do so until you type in***
POKE 650, 67

On the other hand if you just want to have the repeat function on the cursor control keys and the space bar, type in
POKE 650, 0

It can be switched off with the same command as before, ie
POKE 650, 67

All you have done here is to place a particular number into a particular spot in the VIC's memory. In this case, it is the location which controls the facility for key repeat.

Dear PC,
I have owned a ZX81 for over six months now and have not long ago bought a 16K memory pack and the Sinclair printer. I saw the new Sinclair ZX Spectrum at the Microfair recently and ordered one!

What I want to know is can I use my add-on memory and printer with the new Sinclair? I cannot find anything in the Sinclair literature which would tell me. I have ordered a 16K Spectrum and if I can fit the pack for the ZX81 I can get 32K of memory.

If I have to modify my Spectrum to fit the RAM pack, please supply details of the modifications required.
C. Martin
London

Some good news and some band news.

Yes, you can use your newly acquired printer with the Spectrum. The two are highly compatible and no problems should be encountered. That's the good news.

PRIORITY REPLY

August 1982 Issue

Personal Computing Reader Enquiry Service

Name .....

Address .....

.....

.....

.....

.....



Now the bad . . . no way will your ZX81 RAM add-on fit your Spectrum! The idea of modifying the brand-new machine is also a non-starter I'm afraid. Better by far to leave it where it belongs and get the proper Spectrum expansion if you begin to feel cramped by the 16K of memory on offer.

A lot of letters have been received by all of our correspondents over the last year, asking for addresses of computer clubs in and around London. So for those who sought and have not yet found:-

North London Hobby Computing Club
Polytechnic of North London
Holloway Road
London N7 8DB
01-607 2789

West London Personal Computer Club
81 Rydal Crescent
Perivale
Middx. UB6 8DZ
01-997 8986

South East London Computer Club
61 Craigerne Road
London SE13 7PG
01-853 5829

London School Computer Club
Burlington Danes School
Dane Building
Ducane Road
Hammersmith
London W12 UTY

East London Amateur Computer Club
82, The Drive
Ilford
Essex
191 3JA
01-554 3288

Croydon Microcomputer Club
142 Windermere Road
Norbury
London SW16 5HE
01-764 4043

Harrow Computer Club
16 St. Peter's Close
Bushey Heath
Watford
Herts WD2 3

Richmond Computer Club
18A The Barons
St. Margarets
Twickenham
Middx.
01-892 1873

A reminder that all clubs should be sending us articles for 'Clubhouse' by now! Lose out on free publicity if you really want to, we can't stop you . . .

THE VALLEY

© Computing Today 1982

What are you.. Barbarian or Wizard?

Choose your character type carefully . . . Barbarians recover quickly but their magic doesn't come easily. A Wizard? Slow on the draw and slow to mature . . . but live long enough and grow wise enough and your lightning bolts are almost unstoppable . . .

The Valley is a real-time game of adventure and survival. You may choose one of five character types to be your personal 'extension of self' to battle and pit your wits against a number of monsters. Find treasure, fight a Thunder-Lizard in the arid deserts of the Valley, conquer a Kraken in the lakes surrounding the dread Temples of Y'Nagioth or cauterise a Wraith in the Black Tower. In fact live out the fantasies you've only dared dream about. BUT BEWARE . . . more die than live to tell the tale!

You've read the program (Computing Today — April '82) . . . Now buy the tape. PET and TRS-80, BBC and Sharp tapes are available at £9.95 per tape plus 50p postage and packing. 16K minimum . . . Commodore PET (New ROMs), TRS-80 Model 1, Level 2, BBC Model B and Sharp MZ-80K.

Fill in the coupon and return it to CT Software, *ASP Ltd., 15 Charing Cross Road, London WC2H 0EE* and become one of the many to play . . . The Valley . . .

Computing Today Software

82/6

Please send me . . . tape(s) of The Valley ☐ PET ☐ TRS-80 ☐ Sharp ☐ BBC at £9.95 per tape plus 50p postage and packing.

I enclose my Cheque/Postal Order/International Money Order for: (delete as necessary)
£. . . . . (Made payable to ASP Ltd)
OR Debit my Access/Barclaycard (delete as necessary)

Please use BLOCK CAPITALS
Name (Mr/Mrs/Miss) . . . . . .
Address . . . . . .
. . . . . Postcode . . . . . .
Signature . . . . . Date . . . . . .

COMPUTER USERS CLUB

In this the first of our regular club features, Tony Latham introduces the Computers Users Club and presents some hints for BBC and Genie owners.

What a good idea it is to have a magazine of this nature where Users Groups and Clubs are given the opportunity to express their views and outline their intentions. Our Computer Users Club was formed mainly to serve the interests of the BBC Micro users and since the predominant quest is computer literacy this has become one of the main objectives of the monthly journal received by members. The programs are arranged to show as many different techniques as are possible, so that when the software is entered into the machine the user quickly and efficiently becomes familiar with routines.

In most cases the programs are capable of being easily translated to other makes of computer and we have many members who do not use the BBC machine. Where any ambiguity arises suggestions and very often alternative routines are offered. Recent program issues for BBC users are "Intelligent Typewriter", capable of being run on 16K machines with cassette recorder. This of course can be expanded enormously for the "B" model with discs, but the idea was that people, even without printers, could save pages of text notes on a filing system basis.

The second program "Hangman" is an animated version of the old classic. He blinks, taps his feet and finger impatiently whilst whistling "Why are We Waiting" during delays. If a wrong letter is entered — instant sadness; the right letter bringing immediate happiness. The game ends with the appropriate music written in 3-part harmony. The Hangman program can be looked upon as high resolution graphics, but has in fact been constructed in the worst graphic mode the BBC machine offers, outside the Teletext mode.

Both these programs are available to members either as free software listing or tape copies £4.50. Non-members will have to pay £5 per tape.

Worth The Wait?

Many users are only just now receiving their machines, together with a provisional user manual which lacks a certain amount of information and does not give any guidelines to programming. The long delay between ordering and receiving the BBC Micro has been discussed with the powers that be. They were not optimistic of immediately solving the problem but in our opinion the long wait will prove worthwhile once the machine finally arrives.

The Club has assisted many people by telephone and letter to correct faults where these have occurred due to transit, and to guide them regarding programming approach. What a good idea it would be if the "Welcome" tape supplied could be arranged to list the programs given on to printer or screen. It must come as a shock to people completely unused to micros, particularly in view of the massive publicity stating how wonderful these devices are, when the new owner, having finished the Welcome tape, thinks 'What's next?' and it begins to dawn on him that the machine will not dance upon his verbal command!

One of the original ambitions was for the Club to become a nucleus for the exchange of ideas and co-ordinate the efforts of individuals. This is indeed becoming a reality. Membership of the Club ranges from the Outer Hebrides to France and Germany so we cannot claim to be "national" any more we can claim to be "international" since we have no members at this time outside the EEC. The Club issues a journal every month and supplies a professional binder for the pages. This builds up over the years into a reference manual of program routines and hardware tips. As an example of our work, I present below some extracts from our April 82 newsletter. This deals with the BBC and Video Genie characters and has something to say about the envelope command on the BBC micro. Membership costs 25p per week, payable as a 6-monthly or yearly amount (£12). The journal contains pages of equipment and consumable items plus software tapes, all at discount prices. Our own software generated within the club, regardless of complexity, is offered to members at a fixed price – £4.50. £1.50 of this price is given to the originator of the programme as a token royalty which shows our appreciation of his efforts, and helps to inspire the generation of new material for the club library.

BBC & Video Genie Graphic Characters

The letters appearing on your screen are seen by the computer as numbers arranged as an 8 by 8 matrix. These numbers are decoded by the hardware to appear as dots, in the right combination and on the right line of the VDU.

VDU 23 on the BBC machine is used to design your own characters, or if you like, pieces of a large character. To do this, VDU 23 is followed by character number. Although any of the ASCII character codes can be used it is

best to employ numbers 244 to 255, since these leave your keyboard keys delivering the characters engraved on the key tops. So we have VDU 23, 244, we now add eight other values, these being the totals of the 'powers' for each of the eight rows, eg. Row 1 =
128 + 64 + 32 + 4 + 2 + 1 = 231

Note that the shaded blocks are not used.

The design shown in Fig. 1 would be made by VDU 23, 244, 231, 219, 189, 189, 12, 9, 189, 189,

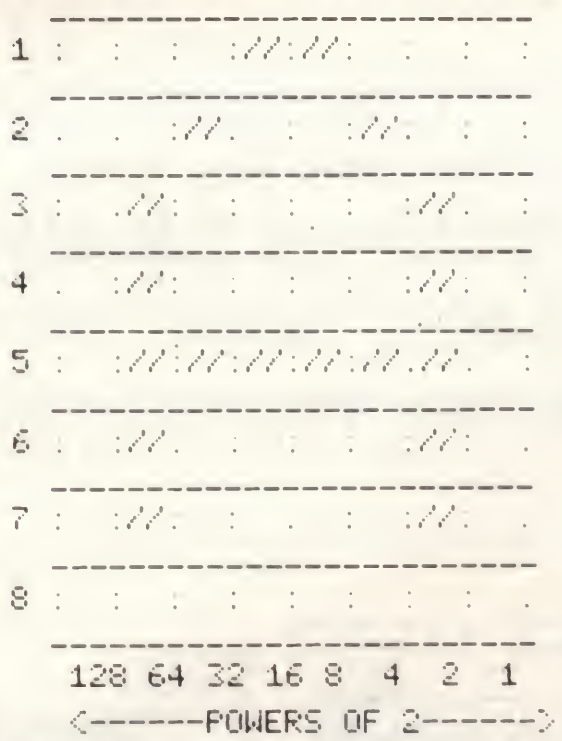


Figure 1.

255. The design can then be printed by PRINT CHR$(144) or drawn in a row within a for/next loop.

From this you can see that you are able to design as many space invaders as you like. You can (add) blocks together by A$ = CHR$(144) + CHR$(145) etc. This form of addition being known by the posh word 'concatenation'.

To enable you to add up the rows, the simple program given below may be of help.

```
10 T = 0 : REM TOTAL
20 PRINT TAB(1,5);"
   ENTER NUMBER ";X
30 T = T+X :REM TOTAL=
   PREVIOUS TOTAL
   PLUS NEW NUMBER
40 IF X = 0 THEN 50 ELSE 20
   REM ENTER 0 TO START
   NEXT ROW
50 PRINT "TOTAL = ";T
60 GOTO 10
```

We will leave it to one of you to write a program to draw a matrix, allow the user to colour squares, print the totals, then show the finished block!

Video Genie owners will have to improvise a little. Your graphics blocks can be handled the same way, except in a 2 by 6 matrix and that 128 will need to be added to the total.

The symbol shown in Fig. 2 is 128 (blank all blocks) + 2 + 4 + 32 (ON) = 166.

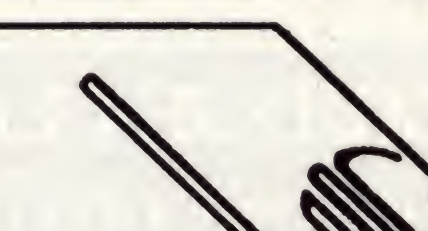


Figure 2.

The numbers that call the characters are known as ASCII codes where ASCII = American Standard Code for Information Interchange. This is the number that VAL(X$) would print. If 'A' = X$ then VAL (X$) or VAL('A') will print 65.

On BBC machines the 'white' blocks will be in the current foreground colour and the shaded portion will be in the current background colour.

For further details of membership write to:—
Tony Latham,
Computer Users Club,
72 Sidmouth Road,
Welling, Kent.
Telephone: 01-304-3910

Two way REMOTE CONTROL Without the need for wiring

The IPTC range

The Stripeland IPTC system has been developed to provide an extremely flexible remotely located control and logging system capable of full two-way communication over existing A.C. mains lines; twisted pair or balanced feeder; or any other inplant wiring where, for reasons of cost or inconvenience, a dedicated multiple wiring system would be unsuitable.

The IPTC equipment comprises two models of Remote Location Units (TC 105 and TC 115 Super) and a computer communications interface for central control.

The IPTC equipment, when interfaced with a computer/micro processor, has a very large range of applications. If one considers that they can control and switch any electrical appliance, as well as collecting and storing data, you can get some idea of its range. The IPTC remote units will not only act as interpreters of the central control computer's programmes, but will also act as a stand alone device in control and logging applications.

TC 105 Basic Remote Controller

Description: The TC 105 basic remote controller is a processor based transceiver unit developed to receive and transmit data over A.C. mains cables or balanced line feeder.

The basic principle of the transceiver is a frequency modulated carrier. This carrier is passed onto the mains as a low level signal and received at either the remote location or the central controller. The information is removed from the carrier by the receiver, the dedicated processor enables the transceiver to make intelligent decisions on the received signal at a high speed and low error rate.

Features: • Two analogue inputs • Two analogue outputs • Two on/off high priority inputs • Total 44 input/output lines • Microprocessor control with watchdog timer for software protection • 4K Eprom operating firmware • 1 or 2K Ram for onboard data storage (expandable) • Functions as stand alone controller and data logger or slave in multiple system with central control • Two-way communication with central control via existing A.C. lines without the need for dedicated cabling • Alternative communication via balanced line feeder (Bus) • Ideally suited to installations in control and data logging where, for reasons of expense or inconvenience, dedicated multiple cabling is unsuitable.

TC 115 Super

The TC 115 remote controller has all the features of the 105 with the following additions: • Processor has additional Ram for data storage • Real time clock facility.

PLEASE SEND ME DETAILS OF THE IPTC & R.M.C. SYSTEMS

NAME .....

ADDRESS .....

Stripeland Ltd., 111 Liverpool Road, Formby, Merseyside L37 6BR Tel: (07048) 78062

THE

BUFFER

MICRO SHOP

(NEXT TO STREATHAM STATION)

★★★

NEW SOFTWARE SHOP EXCLUSIVELY FOR

SINCLAIR COMPUTERS

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: VDU's

★★★

374A SREATHAM HIGH ROAD,
LONDON SW16
Tel: 01-769 2887

S.A.E. APPRECIATED FOR CATALOGUE

B B C SOFTWARE

MEMORY UPGRADE KITS **Now only £26.00 + VAT**
Model A — Upgrade the Model A to 32k RAM. Simple to fit – no soldering. Supplied with step by step instructions.

SNAKE — Model B **£7.80 + VAT**
This colourful arcade type game makes full use of the amazing graphics (Mode 2) and sound facilities of the BBC Micro. A highly adictive game that will give hours of fun.

CHARACTERS — Model A/B **£5.80 + VAT**
Forget about clumsy binary or Hex notation when re-defining character shapes. This utility program could not make it any simpler.

CUBE — Model B **£7.80 + VAT**
A simulation of the famous Rubik Cube. Full colour 3 dimensional view of all sides of the cube. Choose how jumbled you want the cube and then try to solve it.

FRUIT MACHINE — Model A/B **£5.80 + VAT**
Another game that shows off the superb graphics and sound effects possible on the BBC Micro. Features Nudges, holds, gamble etc.

CASH OR ROYALTIES waiting for any interesting software (not just games) for the BBC Micro. The better the program the more we will pay.

Send an SAE to get the latest details of our software.

COMPUTER CONCEPTS

Dept PE1
16 Wayside
Chipperfield
Herts WD4 9JJ
Tel. (09277) 62955

CAMBRIDGE LEARNING

SELF-INSTRUCTION COURSES



COMPUTER PROGRAMMING IN BASIC £11.50 (CPB)
Microcomputers are here – teach yourself to program! Learn BASIC, the easiest and most widespread language for the small computer. 60 illustrated lessons teach the essentials of good programming: problem definition, coding, flow-charting, debugging and clear documentation. And you don't even need a computer!

ZX81 SUPPLEMENT
£1.10 alone, £0.65p with CPB
When used in conjunction with the above course, it enables you to apply your knowledge to the Sinclair ZX81 microcomputer. It includes some amusing programs to help get you started.

THE ALGORITHM WRITER'S GUIDE £4.40
explains how to define questions, put them in the best order and draw the flow chart, with numerous examples. A must for programmers.

Cheque/PO with order to: **Cambridge Learning Ltd.,** Unit number 137, Rivermill Site, FREEPOST, St. Ives, Cambs, PE17 4BR.
Or phone your credit card details to 0480 67446 (24-hour service).

COLOUR ON A ZX!

From Ellanbee (Graphics)

Now you can add a coloured background to your displays with high quality P.V.C. in either blue or green.

ONLY £2-95 + p.p. per pack*

* No loss of clarity
* Cuts eye strain considerably
* Easily removed
* Strong flexible P.V.C.
* Each sheet measures 15" x 12" (Larger sizes available on request)
* Fits most b/w TV's up to 19" screen
* Full instructions provided

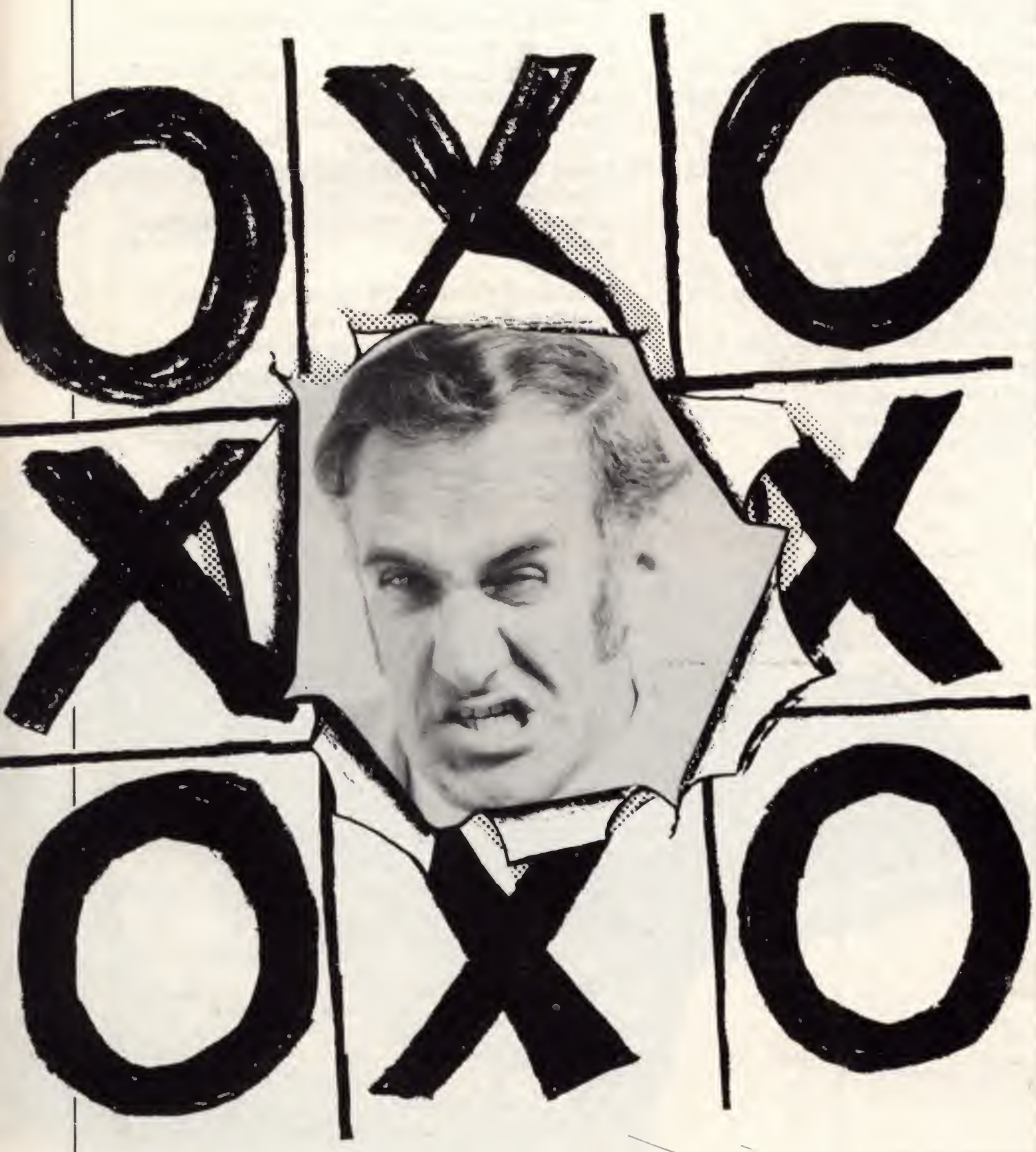
Send cheque/P.O. to:—
Ellanbee (Graphics)
11 Lichfield Close,
Gt. Lumley
Chester-Le-Street
Co. Durham
Tel: (0385) 886967

* Pack contains 1 Blue & 1 Green
Please allow 28 days for delivery
Postage & Packing 0.55p *

SOFTWARE

OXON

A game to get you cross — and all for nought! Michael Evans' version of the game also shows you how to increase the amount you can store in your ZX81.



The following program for the ZX81 is a new version of OXON, more commonly known as noughts and crosses, with the program emphasis on saving memory space! The program manages to hold a great deal of data in the ZX81's memory, due to the method used to store it within the program.

The data in the program holds the screen (not board) position of lines and the machine's playing strategy when it has the opening move. Note that you can only win when *you* have the opening. The machine never loses if it moves first . . . or does it?

The first 24 items of data are in blocks of three representing the eight lines, three horizontal and vertical, and two diagonals. The values of each item of data represent the screen position of the board. Each board position on the screen is separated by a space or a new line, thus the board position in the screen memory is at locations 2, 4, 6 etc. Using the screen in this way, to record the moves already made, uses approximately 50 bytes less than holding the board positions in an array.

Game Strategy

The last 16 items of data represent the machine's game strategy if it has the opening move. The machine always opens with an X in the top left corner, thus leaving you with one of eight moves.

The first eight items hold the machine's response to the opponent's first move.

Usually the machine's second move will result in the opponent having to block a winning line. If the opponent does not block the winning line the machine will then complete the winning line on its third move. If the opponent blocks the winning line the machine reverts to its game strategy for its third move, this is contained in the last eight items of data, and this move is also dependent on the

OXON

opponent's first move. Of the eight replies that the opponent can make only one does not definitely result in a win for the machine; none result in the opponent winning!

How To Move

When the program is run the machine asks for an input. The opponent has the first move. After entering a move it is checked then an O is entered onto the screen in the required position. The machine then has its move entering its X onto the screen and then prompts for another move from the opponent. At the end of the game the machine sets up a new board, this time the loser goes first, or in the case of a drawn game the first move is alternated.

By removing lines 54 to 75 and inserting the following lines:

```
51  PRINT CHR$(M);"  TO
    MOVE"
61  IF M = 61 THEN INPUT C
```

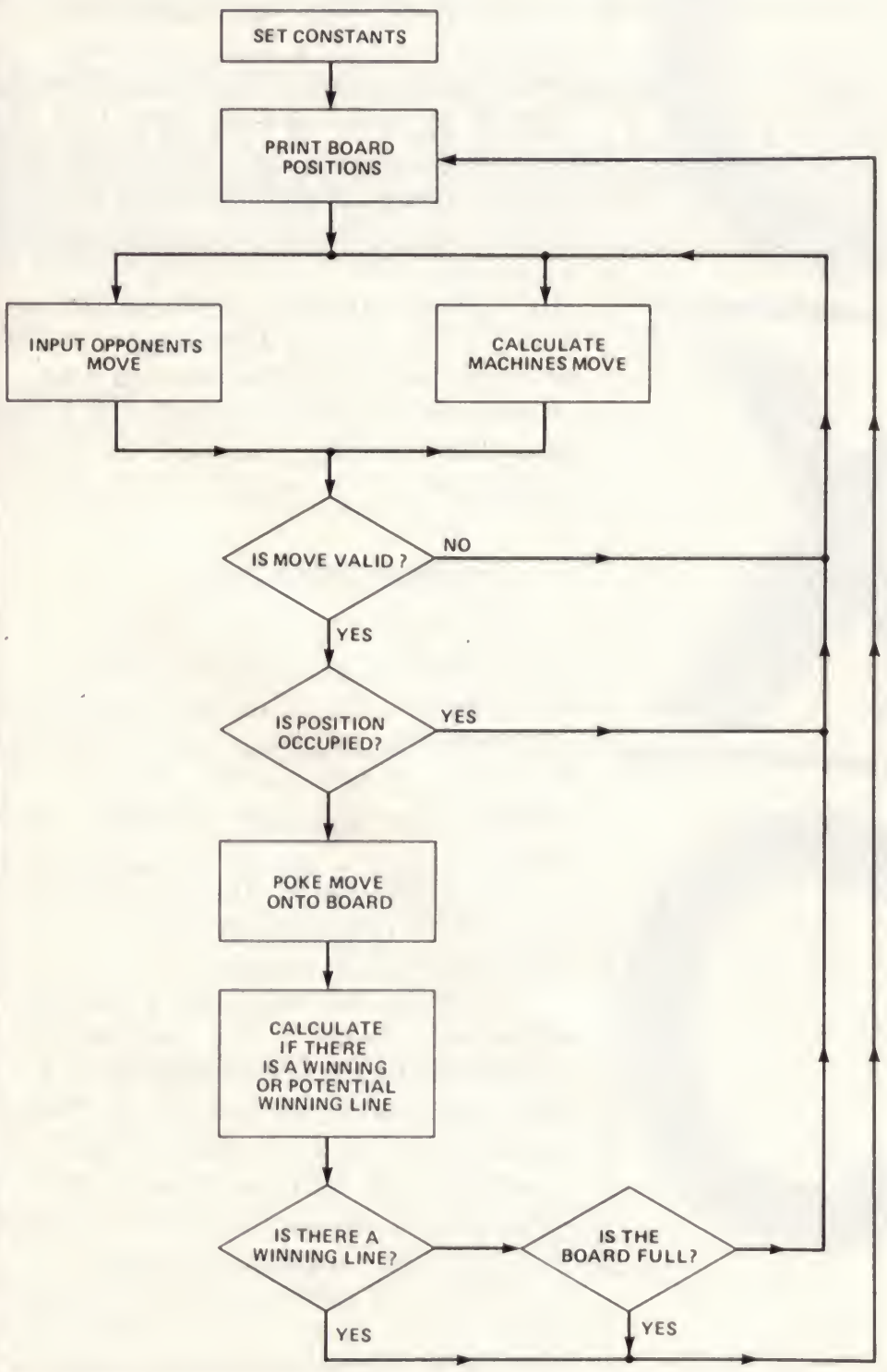
two opponents may play each other using the machine as a scratch pad.

One final suggestion is that the LET statement in line 61 is replaced by a REMark statement, so the machine never uses its predetermined game strategy. The reason for this is that when anyone has played the game as it stands they have quickly rejected it because it always wins and therefore it is no longer a game. Also for novices the machine without the game strategy will then provide a patient opponent that is capable of beating the unwary and enable the novice to work out for himself how to win consistently at the game without mechanically copying the machine's game strategy.

HOW IT RUNS

Description Of Program

Line 1	REMark statement holding data
Lines 5 - 15	Sets constants
Line 20	Clears screen
Line 25	Clears winning position string
Lines 30 - 40	Prints board
Line 45	Start of loop to count moves
Line 50	Reversible line to alternate players
Line 52	If opponents move, input move
Line 54	If second move, store value
Line 56	Jump to check for valid move (if it is the machine's move the value held in C will never be valid)
Line 61	Machine's strategy if it has the opening move
Line 65	If it is not the machine's opening move then the machine's move is random
Line 70	Check for potential winning line (machine first, then opponent) and try
Line 75	Remove tried potential winning position from W$
Line 80	Check for valid move
Line 85	Check if board position occupied
Line 90	POKE valid move to board
Lines 95 - 140	Check for winning or potential winning lines and if the board is full
Line 95	A takes the value of each location of a line from the REMark statement
Line 100	Clears S
Line 105	C takes the value of each location of a line from the REMark statement
Line 110	In each line, if the board position does not contain the players' symbol (X or O), the code value of the board position is added to S
Line 120	If S is less than 38 (code equivalent of character 9, or less) then S is the position of a potential winning line and is added to the end of W$
Line 125	If S equals zero then the player has completed a line.



PROGRAM LISTING

```
 1  REM 2,4,6,8,10,12,14,16,18,2,8,14,4,10,16,6,12,18,2,10,
    18,6,10,14,5,7,5,9,3,3,5,3,7,9,2,7,7,9,7,7, (USE THE
    CHARACTER REPRESENTATION OF THE GIVEN
    CODES)
 5  LET P = 17159
10  LET Q = 16514
15  LET M = 61
20  CLS
25  LET W$ = " "
30  PRINT "1 2 3"
35  PRINT "4 5 6"
40  PRINT "7 8 9"
45  FOR K = 1 TO 9
50  LET M = 113 - M
52  IF M = 52 THEN INPUT C
54  IF K = 2 THEN LET R = C
56  GOTO 80
61  LET C = (K = 5 OR K = 3) *PEEK (Q + 10 + 4 *K + R) OR
    K = 1
65  IF C = 0 THEN LET C = INT (RND *10)
70  IF W$ < > " " THEN LET C = CODE W$ - 28
75  LET W$ = W$(2 TO )
80  IF C < 1 OR C > 9 THEN GOTO M
85  IF PEEK (P + 2 *C) > 37 THEN GOTO M
90  POKE P + 2 *C,M
95  FOR A = Q TO Q + 21 STEP 3
100 LET S = 0
105 FOR C = A TO A + 2
110 IF PEEK (P + PEEK C) < > M THEN LET S = S + PEEK
    (P + PEEK C)
115 NEXT C
120 IF S < 38 THEN LET W$ = W$ + CHR$ S
125 IF S = 0 THEN GOTO 20
130 NEXT A
135 NEXT K
140 GOTO 20
```



HINTS ON CONVERSION

A difference between ZX80 and ZX81 is the way they do Boolean algebra. Line 50 is a reversible line and alternates the players, its equivalent on the ZX80 is:

LET M = M = X AND O OR M = O AND X

where X and O represent their code values, 61 and 52 respectively. This statement simply does not work here. On the ZX81 if the argument (M = X or M = O) is true then the function (LET M =) is set to one, if the argument is false the function is set to zero. There *are* ways round this problem, so that values other than one or zero can be assigned to the function.

In line 61, by enclosing the argument in brackets and then multiplying it, the function can be assigned a value not equal to one if the argument is true. For some reason this process only works if the argument(s) enclosed in brackets includes the *first* argument. In line 61 the argument K = 1 can only assign the value one or zero to the function. Again this problem can be overcome by replacing the OR prior to K = 1 by +, enclosing the argument in brackets and multiplying by the desired value and enclosing the whole line in brackets. Thus if K = 1 is true and the value 10 is to be assigned to the function, line 61 would become:

```
61 LET C = (K = 5 OR K = 3) *PEEK (Q + 10 + 4 *
   K + R) + (K = 1) *10
```

This type of statement need not be limited to LET statements; they also work in PRINT and POKE statements. The above line could of course be written as three IF THEN statements.

In line 5, P is the address of the display file less one. It is calculated from:

P = PEEK 16396 + 256 *PEEK 16397 - 1

Once the program has been keyed in, the value of P should be checked. If it is not equal to 17159 a mistake has probably been made in keying the program in. No harm will be done by running the program with the wrong value of P, but moves will not be entered onto the screen.

For non ZX81 users the RND *10 in line 65 generates a random number between 0 and 10. In line 75 W$ = W$(2 TO) strips the first character from the string and could be replaced either by TL$(W$) or MID$(W$,2).

List Of Variables

A = Dummy variable
C = Current move
K = Count for number of moves made
M = Indicates player
  M = 52 = Opponent's move (O)
  M = 61 = Machine's move (X)
P = Address of display file less one
P = PEEK 16396 + 256 *PEEK 16397 - 1
Q = Address of first character of data in the REMark statement in line 1
R = Opponent's reply to machine's opening move
S = Indicates winning or potential winning lines
W$ = Hold board position of potential winning lines.

REVIEW

OVER THE RAINBOW?

The end of the ZX81 is drawing near. That's the opinion of Mark Charlton who has been looking at the new ZX Spectrum in some detail for readers of Personal Computing

Clive Sinclair announced at the launch of his new 48K colour computer, the ZX Spectrum, that his company would continue to manufacture the ZX81. He said he had no plans to withdraw the ZX81, and felt it still represented the ideal introduction to computing.

This may be his belief, or wish, but I think he is wrong. Like it or not, the ZX81 is on the way out, unless Sinclair Research drop the price to £49.95, around the price the Sinclair Timex 1000 is selling in America. Why should anyone spend £69.95 on a 1K ZX81, then pay an extra £29.95 for a 16K pack, to end up with a limited, silent, black and white computer with questionable reliability, LOAD and SAVE, when for £125 he can get a computer with 16K built in, with colour and sound, and a greatly enhanced load/save capability? I suggest that very few people will bother with the ZX81, now that a computer of the quality of the ZX Spectrum is available.

Value For Money

Is it a good computer? Is it worth the money? There is no doubt that it *is* worth the money, whether you pay £125 for the 16K version (which gives 7K of user RAM) or the 48K version (with 39K of user RAM) for £170. The question of whether it is a 'good computer' is not so easy to answer. Apparently designed to knock the BBC Microcomputer on the head, the ZX Spectrum is certainly remarkable for the price, but you do not spend your whole time working with a computer saying 'It's great for the price' if, in fact, it is not a particularly easy computer to use.

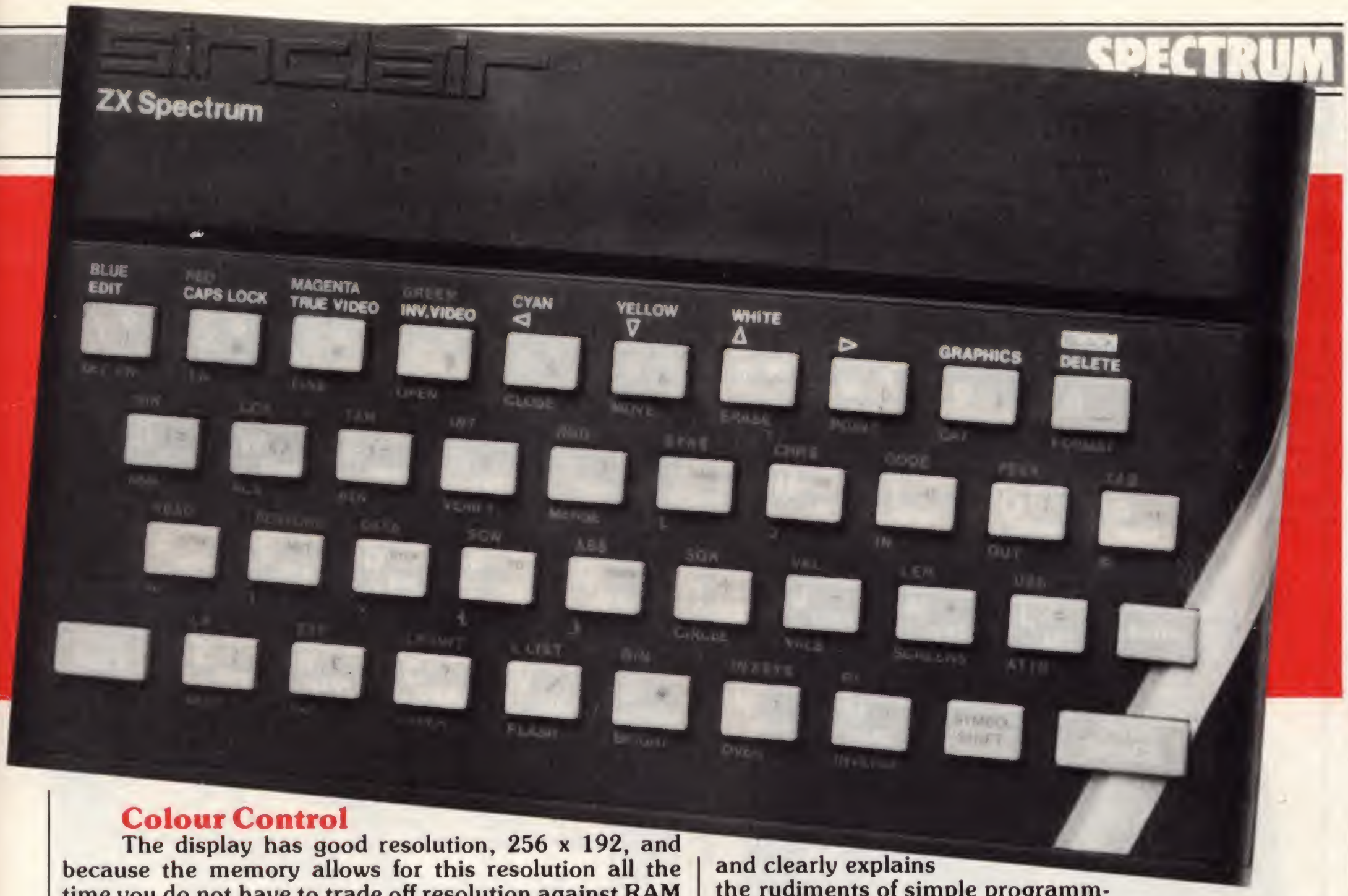
Keying In

The keyboard on the Spectrum has rubber keys which depress onto a touch-sensitive keyboard. The keys are far more satisfactory to use than the ones on the ZX80 or ZX81, but they are not as good as a proper keyboard. The lack of a space bar and a shift lock would certainly make it difficult for a touch typist to master, and the fiddly 'one key entry' system means that a lot of time is spent trying to get the function you want. To get INK, for example, which controls the colour the computer PRINTs in, you need to press the white and the red shift keys at once (yes, there are two quite different shift keys), then — while holding down the red shift key — press the X key. Three apparently unconnected actions to get a word which could be spelt out in full with three key strokes. However, I do not think this will prove a major stumbling block to most people, who will quickly become familiar with the sequence of events required to get such things as INK, PAPER (which controls the background colour) and BEEP (which produces the music from a tiny, in-built loudspeaker).

There is no doubt that most purchasers will be more than happy to live with the limitations of the keyboard and the complexities of the 'one touch entry' which puts as many as six functions on a single key, in order to take advantage of the enormous range of features Clive has packed into his new computer. Let's have a look at some of them now.

The computer runs as fast as the ZX81 did in FAST, but without losing the display as you did on the ZX81. The screen controlled by the Spectrum is memory-mapped, so much more sophisticated and satisfactory moving-graphics programs are possible in BASIC on the Spectrum than you could ever achieve on the ZX81. However, even this speed is not very fast and, coupled with the fact that everything stops if you use the BEEP command, you do not have access to the kind of speed you can get, for example, on the BBC Microcomoputer or the VIC 20.

The Spectrum uses the ASCII code, a welcome decision for those of us who have had experience working with non-Sinclair micros, and for whom the Sinclair character set was a source of frustration. There is the full upper and lower case character set, and the Spectrum does not differentiate between the two, so a variable called BEH7 is the same as beh7 or BEh7.



Colour Control

The display has good resolution, 256 x 192, and because the memory allows for this resolution all the time you do not have to trade off resolution against RAM as you do on most other microcomputers. Although you can PLOT on this resolution, you can only use the colour on the same resolution as the letters, ie 32 x 22. However, this does not appear to be a problem. The colour control is better than the control of colour on the BBC Microcomputer in the teletext mode, where every colour control character uses up a space on the screen, so you cannot (on the BBC machine) have a word with every letter a different colour. This is very easy to achieve on the Spectrum. To change the colour of a word from the normal black, you just preface it — after the word PRINT — with the command INK then a number corresponding to the colour. For example PRINT INK 2; "Spectrum" will print the word in red. You can couple colour commands together (along with PRINT AT or TAB) to get, for example, PRINT AT 3,2; INK 6; PAPER 1; "Spectrum" to print the word Spectrum in yellow on a little blue strip, starting three lines down the screen, and two spaces across. You can also use INK and PAPER to change everything on the screen rather than just the line you are currently PRINTing.

Sound Command

The internal loudspeaker is triggered by the BEEP command, which is followed by two parameters — pitch and duration. The pitch 0 is middle C, and the duration 1 is one second, so BEEP 0,1 will play middle C for one second. BEEP 0,2 will play C sharp, and BEEP -1, 0 will play the B below middle C for a second. The sound command is, as you can see, very easy to use, but suffers as I mentioned earlier because it stops all other processing (including the internal clock) while it is making a noise. The output from the EAR socket is loud enough to drive a small external speaker.

There are point (PLOT X,Y), circle (CIRCLE X,Y, radius), line (DRAW x,y) and arc (DRAW x,y,z) commands to make maximum use of the resolution on the screen. These operate quickly and are very simple to use. Their easy use is enhanced by the provision with the computer of two manuals. The first, a slim volume of 30 pages, is a first-time users' introduction which simply and clearly explains the rudiments of simple programming. The second, meatier manual is about the size of the one which came with the ZX81, and this covers the subject in much greater depth. It is obvious that Sinclair's documentation is getting better, as is his load and save.

Loading

The most-criticised feature of the ZX81 is its unreliability when loading programs, and this is one area where a great deal of thought went into the design of the Spectrum. There is a completely different type of cassette interface, designed (so Sinclair's engineers tell me) to work with any crummy cassette recorder. 'We had a bench covered with all the cheap recorders we could get, and it worked with all of them', I was told. Certainly when I tested it, the LOAD/SAVE worked first time, a result I have never experienced with a ZX81. As well as this, the computer has a 'VERIFY' command, which means you can SAVE a program and before wiping it from the computer, play it back from tape using the VERIFY command to allow the computer to compare the program on tape with the one in its memory. You are given a clear message if the program has been saved correctly.

The greater reliability in loading is achieved in part by the fact that the program is saved in blocks. A tone leader is recorded before the actual program, and the computer uses this to set its own internal volume control to accept the program. Programs and arrays can be merged from tape (the command MERGE is available from the T key) to combine them with existing contents of the onboard RAM. This feature alone extends the computer's capabilities a great deal.

Another feature which will extend the computer is the soon-to-be-released RS232 network interface board, which is expected to cost around £20. This will enable the Spectrum to be linked with other Spectra, other computers, and other peripherals including 'foreign' printers. The ZX printer works with the Spectrum, but the 16K pack does not. In fact, Sinclair issues a warning that connecting the 16K pack to the Spectrum will damage both the computer and the RAM pack.

OVER THE RAINBOW?

Special Features

Finally, let's have a look at a Spectrum program written by Tim Hartnell to demonstrate a number of the new computer's features. Examining the listing, and then trying out the program when you get your computer will explain much of the computer's new features to you.

I believe that Uncle Clive has done it again. He has produced a splendid mass-market computer which a sizeable percentage of the population will want to buy. Apart from the 'fiddly' keyboad, it is very easy and user-friendly. My only wariness comes from the delivery times. Sinclair Research have never managed to keep to delivery schedules, and the extreme shortage of review machines suggests it will be some weeks before any become available for buyers.



How It Runs

The program, Conway's Colony, is a version of LIFE, the program first developed by John Conway who was at that time attending Cambridge University. You can see that the computer allows variable names to have spaces in them, as is shown by line 30 (where the variable is called 'print colony') and by line 40 ('generation update'). The whole program cycles from line 50 to 70, over and over again. The routine from lines 90 to 180 sets up the starting conditions. Line 135 changes the BORDER (the 'frame' around the main display area) at random, producing a quite dramatic display as the initial colony is set up. The BEEP command in line 140 shows the parameters of a BEEP can be fractions of numbers or results of a loop. This produces a splendid, constantly changing effect, as the x and y loops are executed. Note that multi-statement lines (see line 160 and line 140, for example) are possible for the first time on a Sinclair computer. They are linked by a colon, available from the Z key.

Line 250 shows a number of PRINT statements linked and the word 'Generation' in inverse letters. Inverse letters are available directly from the keyboard by holding down the white shift key, then pressing the key. Everything from then on will appear white on black. Holding down the white shift key again, and pressing the key, will return you to normal video.

Line 345 changes the border colour at random, producing a very interesting effect which does not slow down the processing at all. The cells are printed by line 285 as an inverse little square. The colour of the square is chosen at random (INK RND*6) and this produces a very attractive display. Examing this listing should tell you quite a bit about the Spectrum.

PROGRAM LISTING

```
 10 REM Conway's Colony
 15 REM © Hartnell, 1982
 20 GO SUB 90
 30 LET print colony=200
 40 LET generation update=320
 45 REM ******************
 50 GO SUB print colony
 60 GO SUB generation update
 70 GO TO 50
 80 REM ********************
 90 REM initialise
100 CLS
110 LET cells=0
120 DIM a(11,11): DIM b(11,11)
130 FOR x=2 TO 10: FOR y=2 TO 1
0
135 BORDER RND*7
140 IF RND>.35 THEN LET a(x,y)=
1: BEEP .02,x*y/2: LET cells=cel
ls+1
150 LET b(x,y)=a(x,y)
160 NEXT y: NEXT x
170 LET year=0
175 BORDER 7: CLS
180 RETURN
190 REM ******************
200 REM Print colony
210 LET year=year+1
220 BEEP .02,RND*20
250 PRINT AT 1,0; INK RND*6;"Ge
neration ";year;AT 3,8;
255 LET cells=0
260 FOR x=2 TO 10: FOR y=2 TO 1
0
270 LET a(x,y)=b(x,y)
280 IF a(x,y)=0 THEN PRINT "  "
;
285 IF a(x,y)=1 THEN PRINT INK
RND*6;"■ ";: LET cells=cells+1
290 NEXT y: PRINT : PRINT : PRI
NT TAB 8;: NEXT x
292 PRINT AT 21,0; INK RND*6;"C
ells ";cells;"  "
293 IF cells<6 THEN RUN
295 RETURN
300 REM ******************
310 REM Update
340 FOR x=2 TO 10: FOR y=2 TO 1
0
345 BORDER RND*6
350 LET c=0
360 IF a(x-1,y-1)=1 THEN LET c=
c+1
370 IF a(x-1,y)=1 THEN LET c=c+
1
380 IF a(x-1,y+1)=1 THEN LET c=
c+1
390 IF a(x,y-1)=1 THEN LET c=c+
1
400 IF a(x,y+1)=1 THEN LET c=c+
1
410 IF a(x+1,y-1)=1 THEN LET c=
c+1
420 IF a(x+1,y)=1 THEN LET c=c+
1
430 IF a(x+1,y+1)=1 THEN LET c=
c+1
440 IF a(x,y)=1 AND c<>2 AND c<
>3 THEN LET b(x,y)=0
450 IF a(x,y)=0 AND c=3 THEN LE
T b(x,y)=1
460 NEXT y: NEXT x
470 RETURN
```

NEW

ZX 81 16K SOFTWARE

DIGGLES KITCHEN



SIMPLE SUPPERS TO CELEBRATION DINNERS

VOLUME 1

50 PAGES OF WORLDWIDE RECIPES

£4.99 (inc. P&P and VAT)

VOLUME 2

50 PAGES EUROPEAN RECIPES

£4.99 (inc. P&P and VAT)

Special price for two volumes

£9 (inc. P&P and VAT)

More volumes to follow

Please specify which volume(s) – Mail order only

Send remittance to:-

NOW AVAILABLE FOR VIC 20 WITH 16K EXTENSION

MICRO COMPUTER SOFTWARE
Unit D6, Pear Industrial Estate, Stockport Road, Lower Bredbury, Stockport SK6 2BP. Tel: 061-494 2441

Kempston (Micro) electronics introduce the

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 2 x 81
- 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.

Your Name and Address_____

Proprietor:
A. Pandaal
B.Sc., P.G.C.E.

Date

Quantity	Description	Unit Price	Amount	
	2 x 81 Keyboard Kit	£22.50		
	2 x 81 Keyboard Assembled	£26.00		
		Sub total		
		Carriage		70
		Total due		

Cheques/P.O. made payable to:
KEMPSTON ELECTRONICS
60 Adamson Court, Hillgrounds Road, Kempston, Beds MK42 8QZ
Please allow 14 days for delivery

PC1

ZX81 16K RAMCassettes

Games to Test your Skills & Tactics

''VERY NASTY MOUNTAIN and NASTY INVADERS...are both very well written''; ''I am thoroughly pleased with the goods'' : Client, London
''Thanks for your very good VERY NASTY MOUNTAIN'': M.F. Harold, Guildford, Sy.
''NASTY INVADERS...VERY NASTY MOUNTAIN : with no loading problems at all and the literature you included, will certainly purchase from you again'': N.D.H., Huddersfield
''I am writing to congratulate you on the excellent VERY NASTY MOUNTAIN. I am also pleased with the quick delivery'': R.Massingham, Batley, W. Yorks.
''I like NASTY INVADERS...the graphics are excellent; VERY NASTY MOUNTAIN is also an excellent game. These are two of the best games I have for my ZX81.'': Michael B. McAllister, Lakenheath, Suffolk

NASTY INVADERS: Get them before your Bosses get you! £4.95
A 20 minute plus Action-Packed Game. You are on duty in the Defence Radar Centre. An invasion starts. Your task is to prevent the Enemy from landing. But you have problems: not only do you have to stop the Invaders making repairs to their craft, but there could be personnel trouble too! Good control is rewarded, but errors are penalised.
Don't despair — Rank Has Its Privileges!!

NASTY MOUNTAIN: Solve the Clues if you want to Escape! £4.95
You are leading an expedition and come to an impassable mountain range. It looks like a long detour until an old goat-herd announces that there is an opening in the rocks into which the occasional animal wanders, but they never re-appear..... See if you can solve the mysteries of Nasty Mountain and continue on your travels. Whether you succeed or fail, you can always try again — but somehow its not quite the same as before!

VERY NASTY MOUNTAIN: But don't CHEAT or you will pay for it! £6.95

An advanced version of the Nasty Mountain Game with 16 Levels of Play. Practice Makes Perfect — but the more clues you solve, the more your tactics are tested!

Justify Your ZX 81 As A Business Expense

PETTY CASH/VAT: Know where your Money went! £10.00
Enter Date, Narrative and Gross Expenditure for each Cash Purchase. Analyses into 20 Sub-Headings and 13 Main-Headings and gives Gross, VAT, Net and Exempt Subtotals and Totals. Its so good, we use it ourselves.

VAT BOOK INPUTS: Written for the Small Business & Sole Trader £12.00
As the Petty Cash/VAT Program, but with the facility to add in your Cheque and Standing Order Items to give Inputs Bottom Line Totals.

CHEQUES/P.O.s TO:— GILTROLE LTD., DEP. ZXC, P.O. BOX 50, RUGBY, WARKS. CV21 4DH

ZX81 QUALITY SOFTWARE FOR THE SERIOUS USER

VIDEO — INDEX

BUILD YOUR OWN INDEX OF UP TO 1000 ENTRIES ON YOUR 16K ZX81

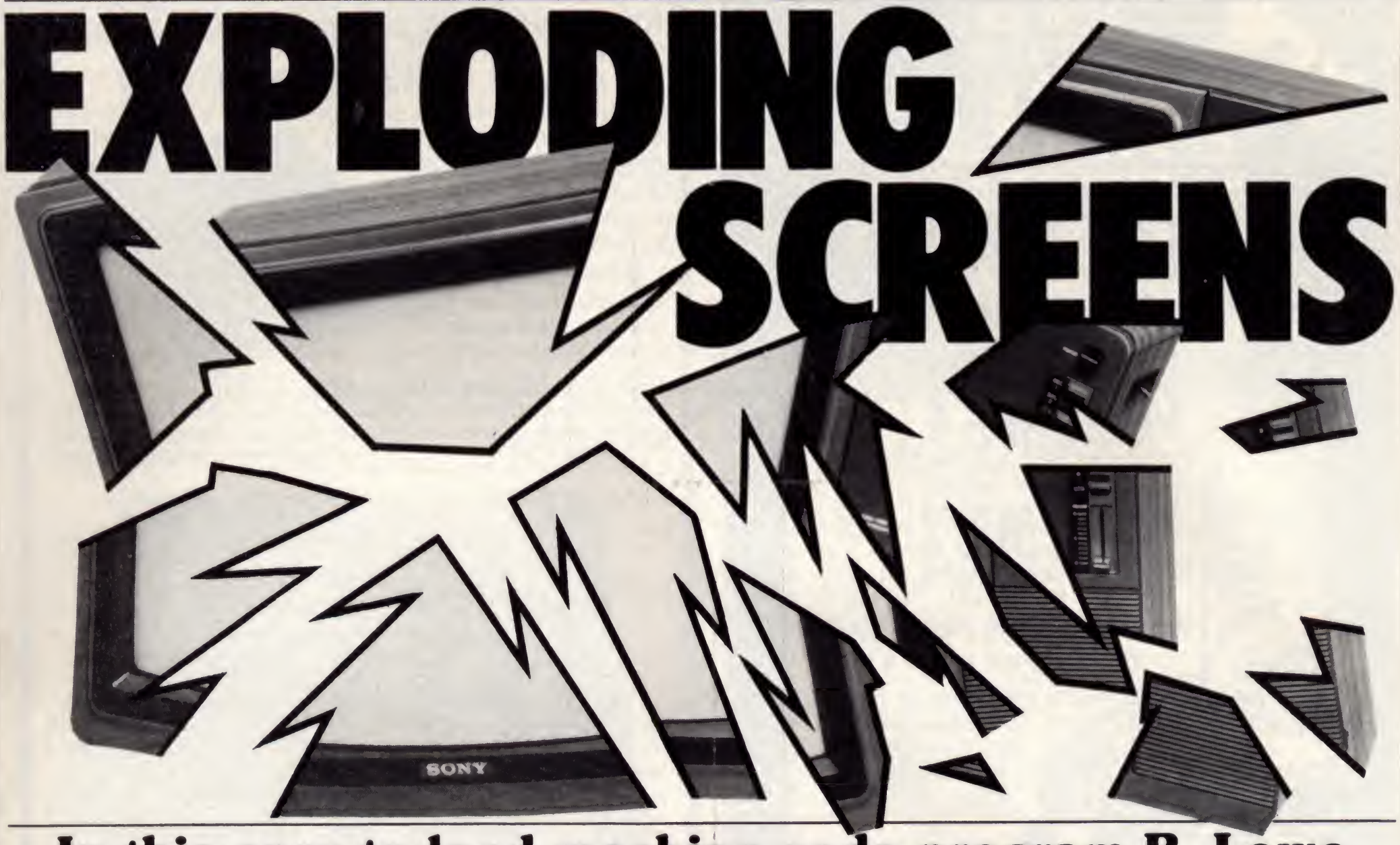
- Designed specifically for the ZX81.
- Over 1000 references possible in 16K RAM.
- Up to 57 characters of text generated for each reference.
- Ingenious machine coded eucryption technique.
- Fast and powerful machine coded search procedure.
- Minimum keystroke data entry procedure.
- Menu driven, easy to operate and crash proofed.
- Documented to the usual high Video Software standard.
- Includes demonstration index of ZX81 magazine references.

This is probably the best serious program yet written for the ZX81 and is available from good software retailers or by mail order direct from ourselves.

VIDEO SOFTWARE
Stone Lane, Kniver,
Stourbridge.
West Midlands.

Price £9.95 incl. VAT
Plus £1 00 p. & p.
Send large SAE for our full catalogue of software products.
Credit card phone orders for immediate despatch
Telephone. 01-839 3603

EXPLODING SCREENS



In this easy-to-load machine code program R. Lowe shows how to make your ZX81 explode with action!

The following machine code routine will perform an almost instantaneous reversal of the screen memory which is held in the display file of your ZX81 or ZX80.

Machine Code Routine

```
0000  06 16              LD B,16H        ; Value loaded into
                                          ; B is the number of
                                          ; lines to be
                                          ; reversed
0002  ED 5B 0C 40        LD DE,(400CH)   ; Location of display
                                          ; file
0006  13          LOC     INC DE          ;
0007  1A                  LD A,(DE)       ; Get character
                                          ; from display
                                          ; location
0008  FE 76               CP 76H          ; Is character a
                                          ; newline character
000A  28 05               JR Z, NEWLNE    ; If it is, leave it
                                          ; alone
000C  C6 80               ADD A, 80H      ; Reverse character
000E  12                  LD (DE),A       ; Return character
                                          ; to display location
000F  18 F5               JR LOC          ; Go to next
                                          ; character
0011  10 F3       NEWLNE  DJNZ LOC        ; Check for end of
                                          ; display
0013  C9                  RET             ;
```

The value put into the B register (the first instruction) can be altered to reverse only parts of the screen. If B is loaded with $0B_H$, then only the top half of the screen will be reversed, for example.

Those of you with a ZX80 can change the value to 18H to reverse all 24 lines on the display.

This effect has many uses, the most obvious of which is a 'flashing' action if called at least twice in rapid succession. The sudden change from a black on white display to a white on black display, and back again, is ideal for producing explosion effects during your favourite 'Star Trek' game!

If the routine is called on a 1K ZX81 or on a ZX80 (with or without memory expansion) the only sections of the display which will reverse are those actually written to. However, on a ZX81 fitted with the 16K RAM pack, the display file is 'padded out' to its full size, and calling the routine will now produce a reversal of the whole display area, whether anything has been written to it or not.

In the ZX81, machine code routines can be easily loaded into a protected area at the top of memory. Below is a method of loading in the routine. Those of you with a ZX80 will have to POKE the routine into an area of memory (such as a REM statement or an array) which you must make available for the purpose (and arrange to be protected).

The following shows how to load the routine into a 1K ZX81. Commands needed to implement it on an expanded machine are shown in brackets.

First, get into command mode and type:-

```
POKE 16388, 236    (POKE 16388,236)
POKE 16389, 67     (POKE 16389, 127)
NEW
```

Each line should be executed individually using the NEWLINE key. RAMTOP has now been changed to 17388 or 32748. Now type in the following program.

```
10  DIM Y(20)
20  FOR N = 1 TO 20
30  PRINT N; " [2SPC ]";
40  INPUT J
50  LET Y(N) = J
60  PRINT Y(N)
70  NEXT N
```

RUN the program, and input the following values, one value each time the prompt cursor appears
6, 22, 237, 91, 12, 64, 19, 26, 254, 118,
40, 5, 198, 128, 18, 24, 245, 16, 243, 201

Now type the following lines (*do not* type NEW):-

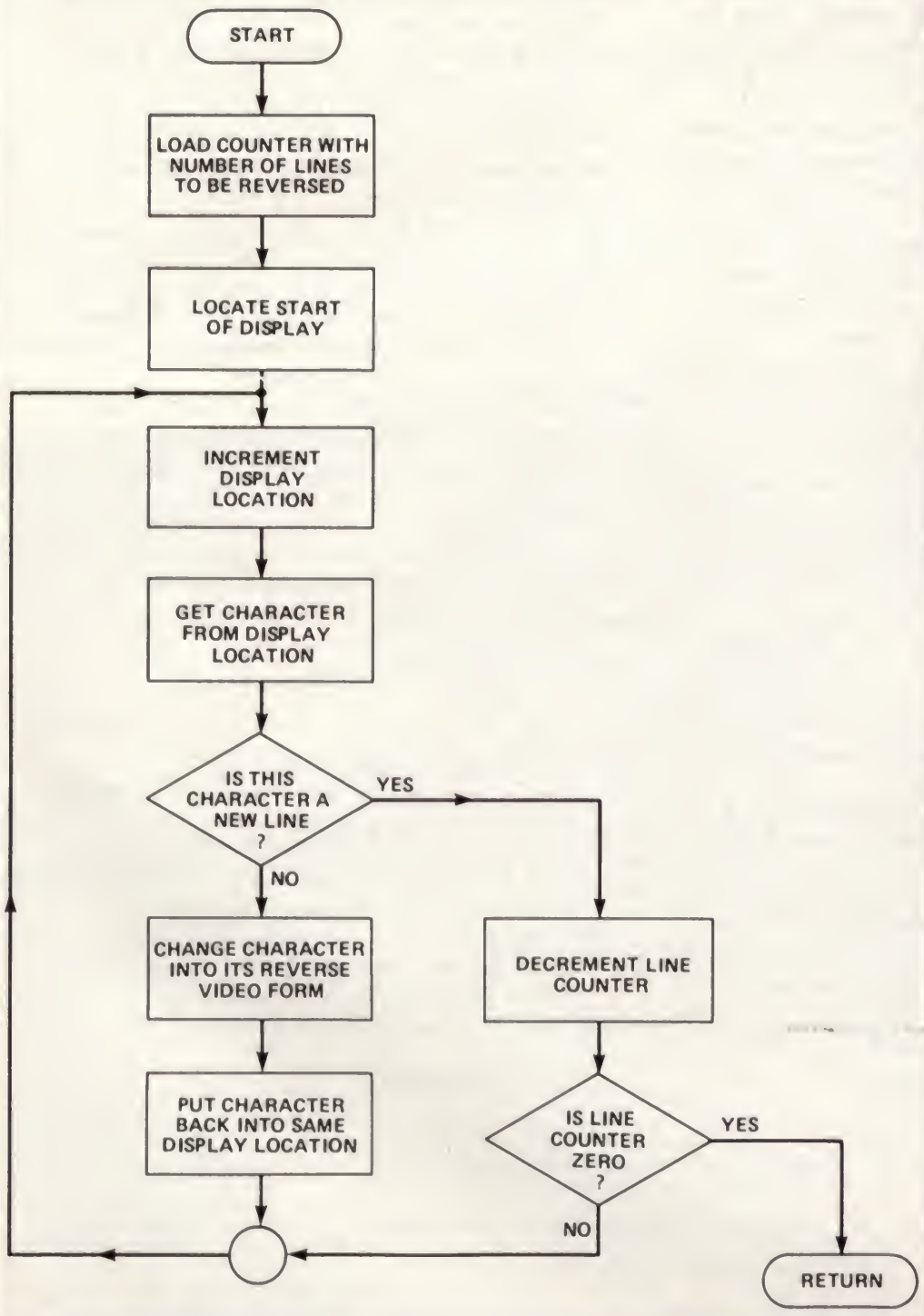
```
10  LET N = 1
20  FOR X = 17388 TO 17407 (20 FOR X  =  32748 TO 32767)
30  POKE X, Y(N)
40  LET N = N + 1
50  NEXT X
60  NEW
70  SAVE "REVERSE SCREEN"
80  GOTO 10
```

Now, set your tape recorder up and start running in Record mode.

Type GOTO 70 and press NEWLINE.

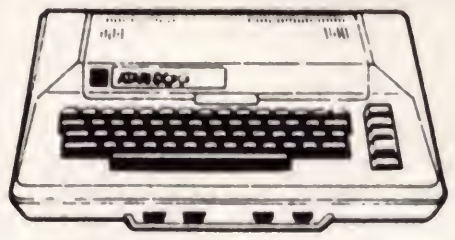
The program will save itself on tape. When it has done so it will execute itself and then 'self destruct'. You now have the machine code routine held in protected RAM. The program can be called at any time by using (for example) LET A = USR 17388 (or USR 32748 on a 16K ZX81). Only switching off the ZX81 will wipe it out (NEW does not affect it). Whenever you load the program off tape for future use, it will automatically run and 'self destruct' on completion.

Before you load the program, change RAMTOP with the two POKE commands and the NEW command as shown before the start of the BASIC program.



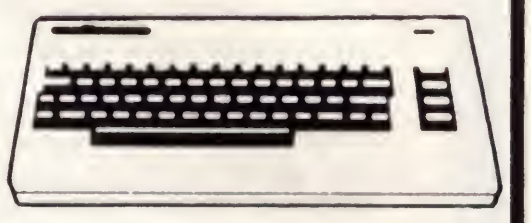
Microspots are our regular "quick-action" program hints. They are designed to be short, useful and adaptable. However, they are not necessarily aimed at the complete beginner and therefore we advise readers to read through each very thoroughly before attempting to enter and use the program.
We will pay £20 for each Microspot submitted by readers that makes it into print! Address your envelope to "Microspot, Personal Computing, 145 Charing Cross Road, London WC2H 0EE".
Keep 'em short and keep 'em coming!

GAMER
24 Gloucester Rd
Tel. 698424
BRIGHTON



ATARI 400 £260
ATARI 800 £499

VIC 20 £152





SHARP MZ-80A £434
MZ-80B £950
MZ-80K £327

ATOM - From £150
GENIE I & II £299
TEXAS TI99 P.O.A.

+ PERIPHERALS + SOFTWARE + BOOKS
+ MAGAZINES + CHESS COMPUTERS
+ GAMES FOR ZX81 AND APPLE



FOOTBALL MANAGER

Addictive Games

for
ZX81
ZX80
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!

FOOTBALL MANAGER - *IS SUPPLIED WITH INSTRUCTIONS*
- OCCUPIES THE ENTIRE 16K RAM

HARDWARE REQUIRED	
ZX81/ ZX80	*TRS80/ Video Genie*
8K ROM 16K RAM	*LEVEL II 16K RAM*

To Order send Cheque/P.O. for £7.95 *made payable to: ADDICTIVE GAMES at: Dept. P.C. P.O. Box 278 CONNIBURROW MILTON KEYNES MK14 7NE PLEASE STATE COMPUTER*

ANGLO AMERICAN SOFTWARE CO

BBC — TRS-80 — ATARI — PET — APPLE — VIC — ZX81

We know what it is like out there, because that's where we came from. Before we decided to become software entrepreneurs, we were just like you enthusiasts searching through magazines for the ideal mail order software source. What we hoped to find was a single entity that offered an ultra-wide selection for our micro-computer. That pre-selected only the best of many similar sounding programs that reached the market every month. That could give us personal assistance with the purchase-decision process, and that stood behind its products. When we couldn't find it we decided to become it. So ANGLO-AMERICAN SOFTWARE CO WAS BORN.

COSMIC PATROL

Skilled players soon master many difficult computer games, but COSMIC PATROL is in a world all its own. The challenge intensifical Supporting graphics and sound (optional) make each encounter an exciting new experience. It all adds up to a Super 3-S package ... Skill, sight and Sound.

The Cosmic Patrol program is not just another search and destroy game. With its fast, real-time action, impressive sound option and superb graphics, this machine-language program is the best of its genre.

PRICE £12.50
CASSETTE

DISK £16.25

BATTLEGROUND

Here is a program that should interest you war-gamers:

It is late 1944, and the Allied Forces are sweeping towards Berlin. As General of your sector, you have at your command tanks, planes, artillery, infantry, engineers and vehicles — an awesome array of fighting men and the machines of war. From intelligence reports you know that the enemy General is a shrewd tactician, not to be under-estimated. It will take planning and strategy to outwit this wily old campaigner.

The battle map of your sector will fill with markers, each showing the deployment of your forces. You and another player will slip into the roles of opposing German and American commanders as yet another battle unfolds. Battleground allows you to experience the total responsibility of a battle-area command. It will be up to you to deploy your forces. On your shoulders rests the decision whether to call for direct artillery gunfire or to order your planes into the air. You will constantly be watching for an enemy airdrop, always carefully manoeuvering your forces.

The stark reality of World War II comes alive in BATTLEGROUND.

PRICE £8.00
CASSETTE

PROGRAM OF THE MONTH

TLDIS & DLDIS

You've bought a super machine-code program but now wonder how it works. Maybe you even used a quick PEEK routine to glance through it when it was in memory. If so, you definitely noticed the complete lack of comments in the code, making it almost impossible for you to decipher and understand it.

Well Instant Software's Labelling Disassemblers are the answer to your problem.

TLDIS (Tape-based Labelling DIS-assembler) make three passes to assign labels (where appropriate) to the routines in a machine-language program. Their output is almost identical in that of a hand-assembled source cade.

You can send the disassembly to a line-printer (Radio Shack parallel port) for either TLDIS or DLDIS. (The difference between these utilities is the storage mode of the disassembly).

TLDIS can send the disassembly to cassette tape. DLDIS can send it to disk: both send it to the video monitor. The stored disassembly from TLDIS may be reassembled with Radio Shack's EDTASM^{TM} — the disassembly from DLDIS with Apparat's extension of EDTASM^{TM}. Because of the use of labels it is a simple matter to change any object code program by disassembling it and then making changes to the resultant source code, without losing track of jump/load addresses. Labels start with "AAOO" and increment up in even numbered steps (AAO2, AAO4, etc). The odd numbers (AAO1, AAO3, etc.) are left for you to use for the source code during reassembly.

The printing of the disassembly may be temporarily halted by using (SHIFT) @ (just as in BASIC) or it may be ended by pressing the (BREAK) key. It also has a comments column to display ASC11 characters used in a LD or CP opcode.

TLDIS and DLDIS may be relocated in memory to avoid conflict with the program you disassemble.

The next time you need to "climb inside" a machine-code program, take DLDIS or TLDIS with you. We promise that it will be an easier journey.

TLDIS £11.50 Cassette
DLDIS £15.50 Disk

THE ALL STARS

Here's a collection of our best selling games . . . the ones you'll want to play again and again. It includes: SANTA PARAVIA AND FIUMACCIO — Become the ruler of a medieval city state as you struggle to create a kingdom. Up to six players can compete to see who will become the King or Queen.

OIL TYCOON — Avoid oil spills, blowouts and dry wells as you battle to become the world's richest oil tycoon. Two players become the owners of competing oil companies . . . and there's room for only ONE at the top!

PARADISE TRADER — You're the captain of a trading schooner, sailing the Caribbean in search of profits. As you sail from island to island beware the dangers of the deep: pirates, ghost ships and hurricanes. Good sailing, skipper!

MILLIONAIRE — Here's $1000. Can you turn it into a million dollars in fifteen (simulated) years? It depends on your strategy as you buy and sell properties, negotiate bank loans, collect rentals and accept sealed bids.

TIMBER BARON — An in-depth experience of the timber business, from dropping trees, until the milled lumber reaches the market. Your transactions are affected by those unexpected eventualities that can upset even the most careful plans.

BATTLEGROUND — European Theatre, 1944: Your forces command are tanks, planes, artillery, infantry, engineers and vehicles. The battle map will fill with markers showing the development of your forces and the location of the enemy in one day of fighting. This two-player game will provide hours of entertainment.

Price £26.50 Disk

DOCTOR CHIPS

DR. CHIPS is a great icebreaker at cocktail parties. And if the need arose, he could entertain your early arriving guests while you finished dressing! Your friends will be asking you how the guy got into the computer.

Why shoulder the burdens of modern life in silence? Put your DR CHIPS to work today and get it all off your chest!

£12.50 cassette £14.75 Djsk

SEND 75p FOR FULL CATALOGUE
Refundable against purchase

Dealer Enquiries Welcome

Please state clearly the program(s) you require. Include your name, address & machine type + memory size. Prices include VAT, postage & packing.

ALL PRICES INCLUDE VAT & POSTAGE
24 Hour answering service on 021-771 2995

for Access orders

PLEASE SUPPLY: .....

I enclose a cheque/PO for £..... made payable to ANGLO AMERICAN or Debit my Access card number .....

Signature .....

NAME .....

ADDRESS .....

..... PC/8/82

ANGLO AMERICAN SOFTWARE CO.

138a Stratford Road
Sparkhill
BIRMINGHAM B11 1AG
021-771 2995

24 hour ansaphone

WORM!

Instant ATOM action with this compulsive game from A.P. Morris. See how you do against the hungry worm!

'WORM' is a game program for minimum memory Acorn ATOM users and entails steering a worm, which continually grows, across your screen without stopping, going over yourself or hitting the blocks. As the Worm grows the game gets harder, and your reactions have to get quicker!

You simply move the worm around with the following keys: 0 — up, P — left, L — down, O — right. Your score is shown in the corner of the screen and anything over 100 is good. If you get really good at it, the target score to beat is 147. After a crash you can restart the worm by pressing any key.

This program is particularly good for Acorn ATOM users with colour. Note that the lower case letters are important as they are labels in ATOM BASIC.

```
  0 REM***WORM***A.P.M. ***
    27*2*81***
 10 bK = #B000;L = K + 1;X = 16;Y = 8;C = 272;B =
    #8000;D = 0;P.$12;@ = 0;? E1 = 0
100 aZ = 0;DOZ = Z + 1;?K = 3;IF?L<255Z = 20;Y = Y - 1;IF
    Y<0Y = 15
110 ?K = 1;IF?L<255Z = 20;X = X + 1;IFX>31X = 0
120 ?K = 5;IF?L<255Z = 20;Y = Y + 1;IFY>15Y = 0
130 ?K = 2;IF?L<255Z = 20;X = X - 1;IFX<0X = 31
140 U.Z = 20
150 A = (Y*32) + X;IFB?A = #52ORB?A = 255G.c
160 B?A = 42;B?C = #52;C = A
170 R = A.R.%512;IFR?B<>32G.170
180 B?R = 255;D = D + 1;P.$30D;F.Z = 1TO10;WAIT;N.;G.a
190 cP.$7$7$7;LINK #FFE3;G.b
200 END
```

this is a HEX number.

Microspots are our regular "quick-action" program hints. They are designed to be short, useful and adaptable. However, they are not necessarily aimed at the complete beginner and therefore we advise readers to read through each very thoroughly before attempting to enter and use the program.

We will pay £20 for each Microspot submitted by readers that makes it into print! Address your envelope to "Microspot, Personal Computing, 145 Charing Cross Road, London WC2H 0EE".

Keep 'em short and keep 'em coming!

HARDWARE

12 OF THE BEST

Looking for a new micro or maybe just looking? Get to know twelve of the most popular machines on the market with our reviews and ratings.

Buying a computer these days is becoming increasingly more complicated, due to the ever widening choice of machines. Our Factfile section alone carries details of twenty-six computers under £1000 and excludes kits and "evaluation" boards designed for industry use.

Before the end of this year, at least three major new launches are planned, all under £500. In all probability there will be more, as companies strive to fill the seemingly insatiable demand for microcomputing hardware.

Strangely, with the computer market growing so rapidly, one thing that has remained in short supply is information, from anything other than the manufacturers themselves.

In this article Personal Computing tries to rectify this, with our round-up of twelve of the leading machines on the market. We tell you their respective strength and their weaknesses.

We have had our panel of experts, drawn from right across the microcomputing business, rate the machines for specific qualities.

What are they like as a first machine? How good for games? What about software 'back-up' – how many programs are available for you to run? We hope this article will help you decide to on a micro to suit your particular needs.

Ratings have been done on a percentage basis, marking out of 100 on each of the attributes concerned. Have a look down the tables and see which of the machines best suits your requirements.

With the number of dealers around now, it should be possible to wander in and get a 'hands-on' demonstration of your shortlisted micros, just as any decent hi-fi dealer will play you an LP or two when selling you an audio system.

Don't be afraid to ask for a demonstration of your intended purchase. Computers represent a substantial investment and you should be prepared to try out not only the one you *think* you want, but a couple of its rivals, too.

REVIEW RESULTS SUMMARY

Suitability as First Computer

1.VIC–20	92%
ZX-Spectrum	
3.ATARI 400	86%
4.Acorn ATOM	84%
ZX81	
6.Sharp MZ-80A	82%
7.Texas TI99/4A	80%
8.Commodore Pet	78%
Sharp MZ-80K	
10.BBC Model A	64%
11.Video Genie	52%
12.Tandy TRS-80	48%
Model 1	

Value for Money

1.ZX-Spectrum	100%
2.ZX81	92%
VIC-20	
4.Acorn ATOM	88%
5.BBC Model A	76%

TEXAS TI 99/4A

The TI 99 has had three incarnations in the UK and the third is a worthy effort. The Texas is unusual in its hardware set-up, as it uses a 16-bit central processor unit instead of the almost universal 8-bit. This means that, in theory, the processor can deal with twice as much information in any given time and so the computer as a whole should be able to operate quicker.

Unfortunately, the TI 99/4A is actually slower than most competitive machines! For all intents and purposes, the speed is such that a user would not be able to distinguish in operation between the Texas and any 'ordinary' 8-bit machine. The whizz-kids will condemn it nonetheless!

As a unit the 99/4A comes with 16K of RAM, magnificent manuals and BASIC tutors, inputs for tape, cartridges, joysticks, and other expansions. Its unique version of BASIC has a good set of commands to control the colour. No tape recorder is included in the price – so bear that in mind when planning a budget.

Program back-up for the Texas is limited, but what there is seems to be of high quality. For its asking price, the TI 99/4A offers a great deal – a full-size keyboard, colour output, good BASIC, good expansion possibilities, etc, etc.

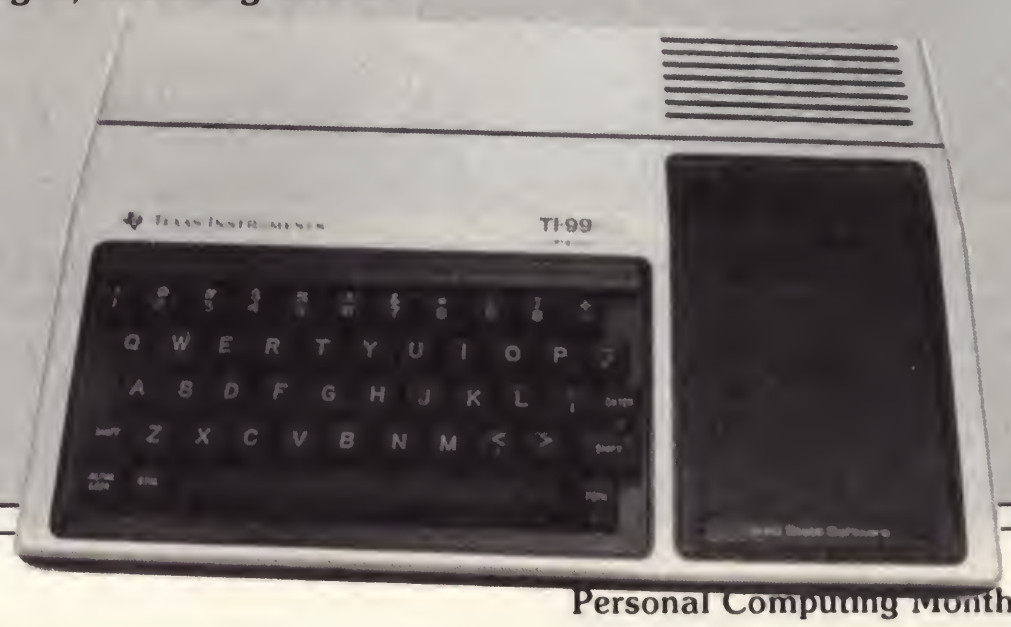
One thing you're never short of with the TI 99/4A is boxes. A complete system would comprise no less than eight, including theTV!

Address: Texas Instruments Ltd., Manton Lane, Bedford, MK41 7PA.

Price: Around £300 (16K RAM).

Machine – TEXAS TI 99/4A

Suitability as First Computer	– 80%
Ease of Operation	– 60%
Value for Money	– 40%
Graphics Capability	– 94%
Suitability for Games Programs	– 64%
Quality of Manuals Provided	– 62%
Suitability for Business Use	– 4%
Software 'Backup'	– 42%



ZX-Spectrum

The newest machine in our line-up. "Uncle Clive's" latest creation sets a price level which others will find hard to reach. For £125 he is offering a 16K full-colour computer and for £175 you can get four times that memory into the box!

Almost inevitably the Spectrum calls into doubt the continued existance of the ZX-81, as the price is not *that* different, once you add-on the cost of the extra memory.

The Spectrum retains the 'single-key' BASIC of the ZX-81, but provides more commands in the language and more facilities. The keyboard is an improvement over the earlier machine, but is still not a standard unit. In addition, there is a built-in loudspeaker and a good set of commands available to use it.

Overall early impressions of the Spectrum are that it will be hard to beat for anywhere near the price. Long term reliability has yet to be proven, but with all Sinclair's marketing expertise behind it you are sure to be sorely tempted to buy a Spectrum over the coming months!



Check our review of the Spectrum elsewhere in this issue.

Address: Sinclair Research Ltd, 6 Kings Parade, Cambridge, Cambs, CB2 1SN.

Price: £125 with 16K RAM, £175 with 48K (Mail order only, no dealers).

Machine – Spectrum	
Suitability as First Computer	– 92%
Ease of Operation	– 40%
Value for Money	– 100%
Graphics Capability	– 72%
Suitability for Games Programs	– 82%
Quality of Manuals Provided	– 84%
Suitability for Business Use	– 10%
Software 'Backup'	– N/A

Acorn Atom

A very popular machine the ATOM. Rightly so in our opinion. It has great versatility and the ability to produce colour displays with high resolution graphics.

The basic machine is "black and white", however, and is a little restricted in the amount of memory available to the user. Expansion *is* cheap, though, and there is an enormous amount of programs readily available, from a wide range of dealers.

One thing to beware of is the BASIC used on the ATOM. It is anything *but* standard. Although very useful, it is so unlike most other micro BASICs that converting programs from magazines and friends is, to put it mildly, troublesome!

We have been reliably informed, however, by ATOM users that using the machine is like riding a bike, once you've worked it out it's dead easy!

Acorn have just launched an upgrade for the ATOM – full BBC specification BASIC! This comes on two chips which plug into your ATOM board and give the option of ATOM BASIC or BBC BASIC, at the press of a switch.

The main advantage is that the BBC version is much closer to the usual BASIC and is much more capable than ATOM's own. In addition you will then be able to use all the programs worked out and marketed for the BBC Micro and more software is *never* a bad idea!

Address: Acorn Computers, Fulbourne Road, Cherry Hinton, Cambridge.

Price: £150 built, £135 in kit form. Basic unit has 2K of user RAM. BBC BASIC costs £45.

Machine – ATOM	
Suitability as First Computer	– 84%
Ease of Operation	– 60%
Value for Money	– 88%
Graphics Capability	– 96%
Suitability for Games Programs	– 82%
Quality of Manuals Provided	– 70%
Suitability for Business Use	– 24%
Software 'Backup'	– 94%



12 OF THE BEST

BBC Microcomputer

Launched with the greatest advance interest ever seen to help it along, the BBC Micro has, so far, been plagued by difficulties. The order book was well and truly full long before a single machine rolled off the production lines. This has inevitably led to delays in supply, which are only now clearing. The price has been raised considerably taking the machine out of the "good value for money" category.

There are two versions available, the A and the B. The former is intended as a downmarket 'first-timer's' micro, with 16K of user memory and the well thoughout BBC BASIC to offer.

The B is the 'heavy'! It will run discs and printer and has more outputs than most people would ever need. Mechanically both versions are superbly made and both offer the incredible multi-mode graphics set-up, which enables you to decide for yourself the quality and resolution of the full-colour display.

Herein, however, lies a major drawback. To use the best graphics available you have to give up 10K of your memory. The computer itself takes 3K more for its operating control system. On the Model A this leaves you with just under 3K to put your programs into!



Effectively, therefore, the 16K BBC Model A has no more usable memory than, say, a VIC-20 when using the best graphics mode.

A point to be aware of when choosing your machine is that manufacturers specify the amount of user memory available in several different ways.

Make sure you find out exactly how much RAM is able to accept user programs.

Address: BBC Microcomputer Systems, P.O. Box 7, London W3 6JX.

Price: Model A (16K) £299
Model B (32K) £399.

Machine — BBC Model A

Suitability as First Computer	— 64%
Ease of Operation	— 52%
Value for Money	— 76%
Graphics Capability	— 94%
Suitability for Games Programs	— 84%
Quality of Manuals Provided	— 48%
Suitability for Business Use	— 42%
Software 'Backup'	— 16%

Sharp MZ-80K

The Sharp has never somehow managed to achieve the notice it deserved. For anyone writing their own games or other graphics orientated programs the Sharp is well-nigh unsurpassed.

It has 25 (three-function) graphics keys on the keyboard, another 25 graphics symbols on the letter keys (as 'shift' characters) and an upper/lower case letter capability. The standard Sharp now offers 48K of memory built-in, along with the screen and tape machine, so there is nothing more to buy, or use, in order to run programs. At the moment Sharp are launching the MZ-80A, which will eventually take over from the MZ-80K.

This means that you can pick up an 80K for around £320 complete at the moment – and that makes it the bargain of the year!

Against the Sharp is the fact that the keyboard is not a standard item and so anyone who is used to typing will find it awkward to use.

There is a good selection of software on the market and an active users club.

A very versatile machine and one which would normally be an expensive way to begin BASIC bashing – but at the moment a real value-for-money contender for your cash.

Address: Sharp (UK) Ltd, Thorp Road, Newton Health, Manchester, M10 9BE.

Price: Around £320. Shop around for best deal. Comes with 48K of user memory.

Machine — SHARP MZ-80K

Suitability as First Computer	— 78%
Ease of Operation	— 90%
Value for Money	— 92%
Graphics Capability	— 78%
Suitability for Games Programs	— 84%
Quality of Manuals Provided	— 50%
Suitability for Business Use	— 44%
Software 'Backup'	— 86%



MZ-80A

The latest release from Sharp, following the PC 1500 hand-held 'computer' is the long-awaited MZ-80A. This is a direct competitor with the PETs and Tandy IIIs of this world, being one of the few machines on the market to arrive at its new home with tape machine and visual display unit built-in.

A development from the MZ-80K the new model has a standard typewriter keyboard (the MZ-80K was widely criticized for its lack of one) with a full set of graphics characters 'on-key'. This remains the strong point of Sharp, in that writing programs using graphic displays is made much easier by being able to get at the symbols used more readily.

If you are producing a border around an area, for example, and wish to use a pretty pattern, then looking up the graphic in a manufacturer's table and dutifully inserting the code into your program is a lot more work than simply pushing the key with the pretty patterns marked across it!

The 80A costs somewhere around £500 and is thus a very expensive 'first-time buy'. As with the Commodore PET, however, you should consider the machine as a whole — no need to tie up the living room and TV, or to purloin the family cassette recorder.

If you are serious about computing you should take a long look at the more powerful (and expensive) option represented by the Sharp, PET and BBC Model B machines. The latter must be considered expensive for what it offers in comparison but does have the best graphics ability of the lot.

Address: Sharp (UK) Thorn Road, Newton Heath, Manchester M10 9BE.

Price: Around £540 with 48K of user memory (RAM).

Machine — Sharp MK-80A

Suitability as First Computer	— 82%
Ease of Operation	— 80%
Value for Money	— 70%
Graphics Capability	— 78%
Suitability for Games Programs	— 76%
Quality of Manuals Provided	— 48%
Suitability for Business Use	— 64%
Software 'Backup'	— (N/A)

Tandy TRS-80 Model I

In some ways now the Tandy must be considered a slightly old fashioned machine, with its relatively limited choice of graphics characters, black and white screen and 'lots of boxes' approach.

There are now four Tandy computers, including the new-ish Tandy Colour Computer, which goes a long way to answering the questions now being asked of the TRS-80 Models.

The Tandy can work with a full system of printer and discs, for those who what to make their micros work for their living. The amouont of software available is prodigious and across a very wide range, from Space Invaders to word processors.

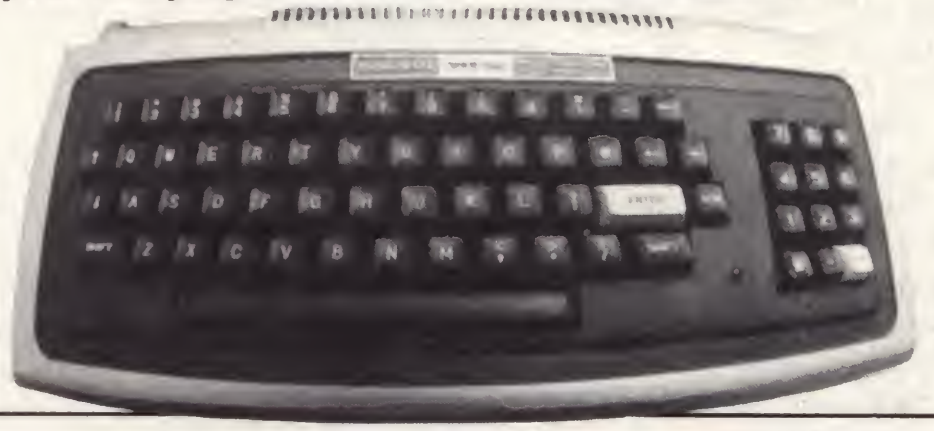
You should see the TRS-80 for yourself if you're buying a micro, as it appeals strongly to a lot of people and has that very good software back-up, along with the national dealer network of Tandy shops, who can supply expansions and programs.

Address: Tandy Corporation 12th floor, Tameway Tower, Bridge Street, Walsall.

Price: £229 (4K RAM): £339 (16K).

Machine — TRS80 I

Suitability as First Computer	— 48%
Ease of Operation	— 44%
Value for Money	— 46%
Graphics Capability	— 20%
Suitability for Games Programs	— 20%
Quality of Manuals Provided	— 88%
Suitability for Business Use	— 22%
Software 'Backup'	— 76%



VIC-20

Commodore ventured into low-cost computing with the VIC and early indications were that they had made a very shrewd move. The VIC-20 quickly established itself as an excellent first-time buy, with full-colour coming as standard.

As time has gone by, that position has been strengthened by the addition of a vast software library for VIC, making use of its colour and games capabilities.

The VIC has a slot to accept 'cartridges' as opposed to tapes (which are also catered for) which means that games, etc, which require more memory than the machine has can still be run, because the memory can be in the cartridge!

Expanding a VIC-20 is not the easiest thing in the world, because of the way its internal memory is laid out, but this is unlikely to bother a first time buyer. One advantage the VIC-20 has over some of its rivals is the BASIC it uses – a scaled-down PET language – which is flexible and easy to use.

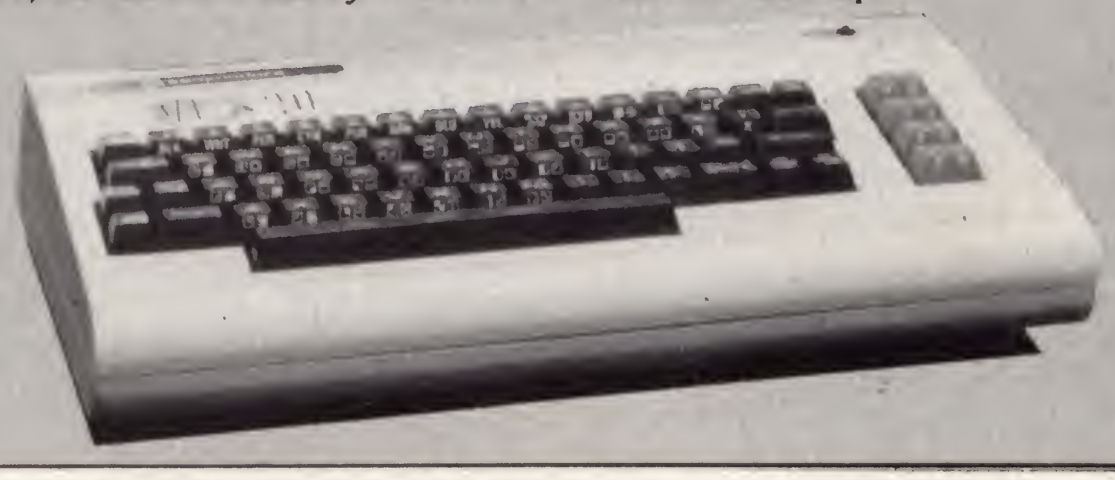
The VIC-20 represents a very attractive first-time buy and is likely to remain so for some time being both easy to operate and well supported by software companies.

Address: Commodore, Baker Street, High Wycombe, Bucks.

Price: Around £180 with 3K of user memory (RAM).

Machine — VIC-20

Suitability as First Computer	— 92%
Ease of Operation	— 92%
Value for Money	— 92%
Graphics Capability	— 82%
Suitability for Games Programs	— 90%
Quality of Manuals Provided	— 40%
Suitability for Business Use	— 22%
Software 'Backup'	— 64%



12 OF THE BEST

VIDEO GENIE

There are so many similarities between the Genie and the Tandy TRS-80 Models that it doesn't take a Mastermind to figure that there must be some connection. There is. The Genie is a copy of the Tandy!

It originated in those inscrutible Far Eastern places wherein such things are done, and even managed to improve over the original by having a built-in tape deck! The interface for this to the computer proved to be unreliable, however, and the latest model, the Genie II uses 'domestic tape', ie, does not come with tape deck.

The hole in the case left by removing the tape is filled with a numeric keypad, useful for entering machine code, amongst other things. The tape circuitry is vastly improved also, making the Genie II an attractive machine.

It suffers from the same drawbacks as the Tandy, in that the graphics are described by manufacturers as 'medium definition' — ie pretty limited in comparision with other machines.

Don't forget though that the TRS-80 and the Genie were not primarily designed for games-playing home enthusiasts, and their graphics and text handling reflect the more serious intentions of the designers.

Because it is entirely software compatible with the Tandy, the Genie can run any program written for the TRS-80 and thus Genie programs are in great supply!

Since the tape is built-in (Genie I) it is a little easier to use then the Tandy and is possibly better presented as a whole.



Address: Lowe Electronics, Chesterfield Road, Matlock, Derby, DE4 5LE.

Machine — Video Genie

Suitability as First Computer	— 52%
Ease of Operation	— 48%
Value for Money	— 48%
Graphics Capability	— 20%
Suitability for Games Programs	— 20%
Quality of Manuals Provided	— 88%
Suitability for Business Use	— 24%
Software 'Backup'	— 76%

Price: Around £280 with 16K.

ZX-81

Clive Sinclair's world-beating £70 computer needs no introduction. It has outsold every other machine in history and introduced some 300,000 people to the subject of computing. On value for money terms, the ZX-81 is practically beyond criticism. As a computer, however, it has its drawbacks!

The keyboard is cramped and difficult to use. Several 'shifts' are required to get at some of the functions. The BASIC it uses is completely unique and is such that anyone moving up from the ZX-81 to a bigger machine might have to take time adjusting.

The graphics capabilities are limted in all but the most expert of hands, so first time users will face obstacles in producing screen displays are interesting as some other more expensive, computers can manage.

There exsists also a huge "ZX-81 Economy" composed of companies who fashion a living exclusively from producing software cassettes and bits of hardware to hang-on the back of the ZX-81. This means that any purchaser can be assured of always having games to play, routines to run and other ways to spend money!

Having said all that, though, you have to return to the price. Sixty-nine pounds is amazing for any computer and with the low-cost add-ons available, and taking into account the excellent manual and BASIC tutor provided, the Sinclair ZX-81 has to be considered a very good buy for anyone wishing to make a first step into computing.



Address: Sinclair Research Ltd, 6 Kings Parade, Cambridge Cambs CB2 1SN.

Price: £69.95 with 1K of user memory.

Machine — ZX81

Suitability as First Computer	— 84%
Ease of Operation	— 36%
Value for Money	— 92%
Graphics Capability	— 22%
Suitability for Games Programs	— 58%
Quality of Manuals Provided	— 98%
Suitability for Business Use	— 16%
Software 'Backup'	— 94%

ATARI 400

The launch of ATARI's two home computers has caused a certain amount of surprise at their price level in the UK. They are considerably cheaper in the USA.

Nevertheless, the ATARI 400 is a fine little computer and one well suited to a first purchase. It has a 'pressure sensitive' keyboard, ie. the ZX-81 type. This example is considerably more positive than the Sinclair, however, thus making it easier to use.

The 400 can produce up to sixteen different colours, ina choice of up to 8 brightness levels. In addition there are no less than four sound generators. Graphics are produced in a 'multi-mode' fashion which allows the user the choice of high resolution (up to 320 x 192 screen positions).

In addition to the usual tape input/output for programs, the ATARI computers both have a cartridge slot, similar to the VIC-20, so that complete programs and extra memory can be plugged straight in. Joystick controls can also be added for the inevitable games playing!

At around £400 the ATARI 400 is a fairly expensive machine by today's standards, but it is one which has a lot to offer the newcomer to computing. Hopefully ATARI will bring the price down to a more reasonable level, allowing the 400 to compete more equally with the other small computers.



Address: Atari UK Ltd, PO Box 59, Alperton Lane, Wembley, Middx, Tel: 01-998 8844.

Price: Model 400 (16K) £400: Model 800 (32K) Around £650.

Machine — ATARI 400

Suitability as First Computer	— 86%
Ease of Operation	— 52%
Value for Money	— 48%
Graphics Capability	— 96%
Suitability for Games Programs	— 96%
Quality of Manuals Provided	— 48%
Suitability for Business Use	— 4%
Software 'Backup'	— 90%

PET 4000

Commodore's PET is the original home computer. The one that started it all! The original recipe has been so successful that it has varied little since the very first machines.

Modern PETs have a full-sized keyboard built-in, and the tape recorder is an external extra, where it was once housed in the PET itself Competing with the Sharp machines, the PET is probably an excellent *second* computer for most people. It is very versatile, has an excellent BASIC which makes it easy to use and comes with comprehensive — and comprehensible — manuals. (The Sharp manuals by contrast are notoriously rotten!)

For a first-time buyer the PET is expensive at around £600, when you add in the cost of the tape machine (about £60). It does have a lot to offer, including that built-in TV screen which means you are getting a complete 'package' for you money.

Must be worth a good long look if you're serious about computing, but is probably not worth spending out on at first if you're not really sure as yet. A good one to move up to!



Address: Commodore, 675 Avenue, Slough, Bucks. Telephone 75 74111.

Price: Around £600 with tape machine and 32K of usable memory.

Machine — PET 4000

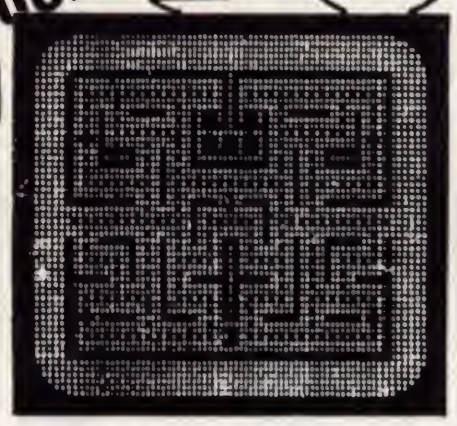
Suitability as First Computer	— 78%
Ease of Operation	— 84%
Value for Money	— 56%
Graphics Capability	— 44%
Suitability for Games Programs	— 72%
Quality of Manuals Provided	— 42%
Suitability for Business Use	— 58%
Software 'Backup'	— 96%

GHOST GOBBLERS! YUGDAB FIGHTERS!
2 GREAT NEW ARCADE GAMES FOR YOU

NEW!

Scarfman

WITH SOUND!!



America's latest Arcade craze. Its Eat or be Eaten. You control SCARFMAN around the maze, gobbling up everything in your path. You attempt to eat it all before the monsters devour you.

Available from your local dealer or

BOTH GAMES CAN BE PLAYED WITH OR WITHOUT THE MICRODEAL JOYSTICK SEND FOR DETAILS

Both Games Tandy Model 1 or 3 Level 2 and Video Genie Cassette 16K

£11.95

SPECIAL OFFERS
Both Games for Just

£22

Both Games + Microdeal Joystick Just

£40

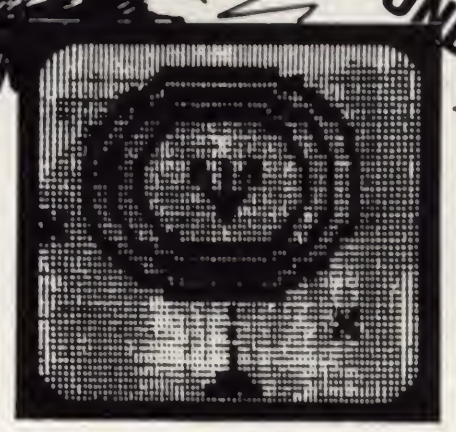
Prices include V.A.T. & Postage

We have over 1,000 programs for the Tandy Models 1 & 3. Video Genie & Tandy Color Computers Send for lists

NEW!

Space Castle

WITH SOUND!!



Will you save the Andromeda Galaxy by destroying the space castle or will the evil warlord Yugdab continue to rule unmolested? Locked in battle with Yugdab your main defence is your ability to skillfully handle your ship.

MICRODEAL

DEAL HOUSE, BRIDGES, BODMIN
CORNWALL PL30 5EF TEL: 0726 850821
DEALER ENQUIRES WELCOME

Access
WE WELCOME ACCESS

ZX81 USERS

You are using your computer for serious applications, and need to print out letters, reports etc on standard paper. In fact you want to use a real printer, such as an EPSON, SEIKOSHA, or even a daisy wheel.
Well now you can. Just as this advertisement was printed out on an EPSON dot matrix printer, so you can print out to a 'real' printer using our :-

SERIAL/PARALLEL INTERFACE

It does not matter which type of printer you have; the interface card is capable of sending information either way.

FEATURES

** CENTRONICS STANDARD PARALLEL OUTPUT INCLUDES HANDSHAKING
** RS232 SERIAL OUTPUT FULL SPEC INCLUDES BUSY HANDSHAKING LINE.
** PRINTS LISTING OF BASIC PROGRAM
** PRINTS HEXADECIMAL DUMP BETWEEN SPECIFIED START/END ADDRESSES.
** PRINTS FROM BASIC
** SOFTWARE IN ON BOARD EPROM
** SENDS ASCII OR SINCLAIR CODE
** SERIAL USE ALSO ALLOWS COMMUNICATION BETWEEN TWO SINCLAIR COMPUTERS OR TO OTHER COMPUTERS.

PRICE INCL VAT P & P is £45.95

and to add that extra touch:-

THE PROFESSIONAL **KEYBOARD** - the keyboard from DEAN ELECTRONICS that has come out top in all the reviews.

FEATURES

** PLUG IN - NO SOLDERING
** SPACE BAR LINKED TO SPACE KEY
** SPARE KEYS FOR YOUR OWN USE
** FULL TRAVEL KEYS

PRICE FOR KIT - EASY ASSEMBLY £28.95 incl VAT P & P

KEYBOARD CASES

SUITABLE FOR THE ABOVE OR ANY OTHER KEYBOARDS
** BLACK LEATHER GRAIN FINISH
** HOLDS ZX81 AND POWERPACK
** HOLDS RAMPACK
** HOLDS PRINTER INTERFACE

PRICE FOR CASE £14.95 incl VAT P & P

TRADE ENQUIRIES INVITED FOR INTERFACES/CASES.
SOFTWARE HOUSES WE HAVE A CARTRIDGE SYSTEM IN THE LAST STAGES OF DEVELOPMENT - ASK FOR DETAILS.

CAPITAL COMPUTERS
1 Branch Rd, Park St, St Albans Herts AL1 4JR
(0727) 72917

ingenious !

GENIE I

16K £279



32K £310

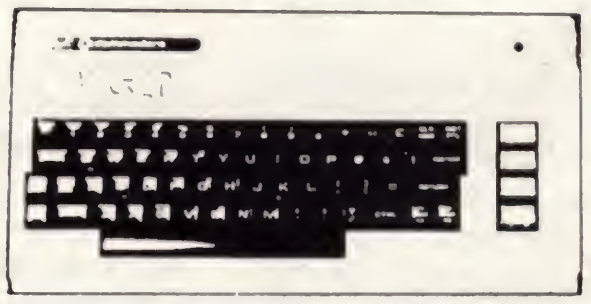
48K £339

Genie II business system with key pad £295.

IN BLACKPOOL

* SOFTWARE * PERIPHERALS * BOOKS
EPSON MZ80 FT/1 & 2 £345.00

COMMODORE VIC 20



Only £173.00

Available shortly Mysterious Adventures for VIC 20.

LEISURONICS COMPUTER STORES
64 Abingdon Street, Blackpool, Lancashire. Tel: 0253 27091
Please add 15% VAT to all prices.

TECHNIQUE

MAKING BETTER USE OF COLOUR ON THE VIC-20

Ever wondered how to produce multi-colour lines? Characters which change colour as they move around the screen? Chris Palmer explains how to make your VIC work harder!

The most obvious place to start adding colour to your programs is the choice of the screen (or background) colour and of the surrounding border. The first thing to consider is which colour combinations are most suited to the style of the program. For example, if it is an action game, you might use the brighter colours such as red, green or yellow or, for a board type of game, it would be a good idea to set the border colour and the screen colour the same, so as to give the impression that the whole screen is in use.

Other considerations are whether you require the person using the program to spend a lot of their time reading data from the screen. If so, then a combination of colours that are not garish but provide good definition are necessary, such as black or blue background colour and a white or yellow character colour. Also, if the program is broken down into several sections, then having a different colour combination for each section helps to emphasise the different functions of these sections.

Once you have decided on the colour combination you want to use, then next step is to decide the best way in which to implement them. If you have only one or two different combinations in a program, then it is best to just implement them directly using the POKE 36879 command and the values shown in the table in the VIC Manual. If, however, you need a greater range of combinations, then a subroutine which caters for all these can be added to your programs pretty early. The subroutine shown in Figure 2 uses the colour values as shown in Figure 1 to calculate the POKE value for changing the colour combination automatically. The colour for the Border is carried into the routine as the variable CB and the colour for the Screen as the variable CS. If you want a purple border with a light cyan screen, you would thus set CB = 4 and CS = 11, then GOSUB to the routine, which would then calculate the value 188 and POKE the colour register with it causing the screen to change.

Border Colours	Value	Screen Colours	Value
Black	0	Black	0
White	1	White	1
Red	2	Red	2
Cyan	3	Cyan	3
Purple	4	Purple	4
Green	5	Green	5
Blue	6	Blue	6
Yellow	7	Yellow	7
		Orange	8
		Light Orange	9
		Pink	10
		Light Cyan	11
		Light Purple	12
		Light Green	13
		Light Blue	14
		Light Yellow	15

Figure 1

```
1000 REM CS=COLOUR OF SCREEN:CB =
     COLOUR OF BORDER
1010 C1=CS*16:REM SET
     SCREEN BORDER
1020 C1=C1+CB+8:REM ADD
     BORDER COLOUR
1030 POKE 36879,C1: REM POKE
     COLOUR COMBINATION
1040 RETURN
```

Figure 2

It then becomes straightforward to rotate either the border or the screen colours from within a program by setting up a FOR ... NEXT loop adding one to CB or CS each time though.

Character Colour

Having now set up the screen and border colours, select and implement the acutal colours for the display. One of the problems with the VIC is that quality of its colour varies between television sets, so some colour combinations will appear blurred or indistinct on your TV; for example red lettering on a green background. The answer to this is to experiment and see which combination works best on your particular television set.

The VIC actually controls the printing colour by interpreting control codes placed within the quotes in a PRINT or an INPUT statement. When in the quote mode, these codes are generated by holding the

MAKING BETTER USE OF COLOUR



CTRL key down and pressing the keys at the top of the keyboard which are labelled with the colours. This approach works well if you are only using a few print lines directly, or if you need a lot of colour changes in one line. However, if you require more flexibility in the way your displays are coloured, (such as certain items of data displayed in a particular colour) then a systematic approach is better.

The routine shown in Figure 3 uses the colour codes 0-7 to select and print the control characters for those colours. The routine works by holding the character codes in the form of a string and then selecting the code required by using the MID$ command. The notation [BLK] etc, used in line 1120 means hold the CTRL key down and press the BLK key; this will place the reverse field character that represents black in the quotes.

```
1100 REM CC =CHARACTER COLOUR
1110 CC=CC+1
1120 PRINT MID$("[BLK][WHT][RED]
     [CYN][PUR][GRN][BLU]
     [YEL]",CC,1);
1130 RETURN
```

Figure 3

Using this routine means that you can directly equate numerical values to the colours that will appear on your screen. One important point to note is not to miss the semicolon off the end of line 1120 or, whatever you print after the colour code will appear on the next line!

There is an even quicker way to change the colour of printing on the screen and that is to POKE location 646 with the colour codes from 0 to 7, as this is the place where the VIC keeps track of the current printing colour, so when you POKE it, all the printing afterwards will appear in that colour. Other useful effects can be obtained by highlighting certain areas of text in reverse field. This is achieved by pressing the CTRL key and the RVS ON key when in 'quote' mode, before the actual text is entered.

On The Border

A way to further improve the visual impact of your programs is to place coloured borders around certain areas of the screen. The routine shown in Figure 4 uses the string handling commands to position and draw the border and a routine similar to that shown in Figure 3 to select the colour. The variable CC contains the character colour, WC and DC contain its values for 'how many characters wide' and 'how many deep' the border is, whilst TD and TR contain the values for the start positon for the border in characters down and across.

One point to be aware of when using this is that if you draw a border right up to the righthand edge of the screen, the VIC will force new lines in between thus breaking up the border.

VIC Colour Memory

The VIC has two separate areas of memory set aside for the screen; the first starts at decimal 7680 in the memory on the unexpanded VIC and contains the information for the character displayed in that position on the screen; the second area starts at decimal 38400 in the memory and contains the code for the colour of that position.

The advantage of this is that you can change the colour of items on the screen without having to print them again. This is especially advantageous in games because you can set up areas of the screen with different colour values so that as a character moves from one area to the next it will change colour, (a similar idea was used on the early space invader machines, where the invaders changed colour as they descended — but this was achieved by sticking different colour cellophanes across the display screen!)

The codes stored in this memory are the same as the border codes shown in Figure 1. It is important to remember this split memory when POKEing characters on to the screen, because if you don't set the colour code in the memory for the

```
1200 REM CC=CHARACTER COLOUR:DC=DEPTH
1210 REM WC=WIDTH:TR=START(CHR'S RIGHT)
1220 REM TD=START (CHR'S DOWN)
1230 PRINT"J";LEFT$("                    ",TD);TAB(TR);:REM 19 CURSOR DOWN
1240 REM PRINTMID$("[BLK][WHT][RED][CYN][PUR][GRN][BLU][YEL]",CC+1,1);
1250 PRINTTAB(TR);LEFT$("                              ",WC+1):REM 20 SPACES
1260 FORI=1TODC-2:PRINTTAB(TR);"  ";
1270 PRINT LEFT$("                              ",WC-2);"  ":REM 20 CURSOR RIGHT
1280 NEXT
1290 PRINTTAB(TR);LEFT$("                              ",WC+1):REM 20 SPACES
1300 RETURN
```

Figure 4

position of the character you are POKEing it will be displayed in the background colour, thus rendering it invisible!

Remember Resolution

Finally, this area of memory is also responsible for switching the display between Hi-res (the normal operating mode) and Multi-colour mode. This is achieved by POKEing a value of greater than 7 into the position in colour memory. What this does is change the way in which the VIC interprets the information found in character memory. Because this distorts the normal character it is only really useful when you are using definable character and can specify the pattern yourself.

The four combinations of colour you can now have in any one character are: Background colour, Border colour, Character colour and 'Auxiliary' colour.

The VIC retrieves the Background and Border colours from locations 36879, the Character colour from the location in colour memory and the 'Auxiliary' colour

```
10 INPUT"COLOUR OF SCREEN";CS
20 INPUT"COLOUR OF BORDER";CB
30 GOSUB 1000
40 REM MULTICOLOUR MODE
50 FORI=0TO7
60 READ A
70 POKE 7168+I,A
80 POKE 7168+(8*32)+I,0
90 NEXT I
100 PRINT"J"
110 POKE 36869,255
120 FORI=1TO50
130 P=INT(RND(1)*506+1)
140 POKE 7680+P,0
150 POKE 38400+P,10
160 NEXT I
170 FOR CC=0TO15
180 POKE 36878,
    PEEK(36878)AND 15
190 POKE36878,PEEK(36878)
    OR (CC * 16)
200 FORT=1TO500:NEXT T
210 NEXT CC
220 GOTO 170
230 DATA 5,5,5,5,175,
    175,175,175
1000 C1=CS*16
1010 C1=C1+CB+8
1020 POKE 36879,C1
1030 RETURN
```

Figure 5

from location 36878. The Character colour is set by POKEing the colour memory position with the Colour code (0-7) plus 8 in order to set that position to multicolour mode. The Auxiliary colour is set by POKEing location 36878 in the following way.

POKE 36878, PEEK (36878) AND 15
POKE 36878, PEEK (36878) OR [CC * 16]
where CC is the Colour code (0 — 15)

An example of the multicolour mode can be seen by typing and and running the routine shown in Figure 5., where a defined character is set up, placed on the screen in multicolour mode and then its component colours are altered.

Conclusion

As with all programming techniques, the best way to achieve competency is to play around with them until you are completely happy in their use.

Experiment with your own programs and try out all the various combinations of colour you can get. Gradually you will find it becoming easier and easier to build up complex routines which make full use of the VIC-20's capabilities. ■

VIC 20 • VIC 20 • VIC 20 • VIC 20 • VIC 20 • VIC 20

LLAMASOFT SOFTWARE!!

ARCADE QUALITY GAMES FOR THE VIC 20 . . .

DEFENDER (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. (8K) HIGH RESOLUTION COLOUR GRAPHICS, JOYSTICK CONTROLS.

ONLY £10.00

BOMB BUENOS AIRES

DEFENDER BOMB BA AS REVIEWED BY ("THE DAILY TELEGRAPH")

FLATTEN THE ARGENTINE CAPITAL WITH YOUR VULCAN BOMBER, AND THEN LAND IT IN SAFETY. LEVELS OF PLAY, HIGH RESOLUTION COLOUR GRAPHICS. WILL RUN ON THE UNEXPANDED VIC 20.

ONLY £4.95

OR BOTH PROGRAMS ON ONE CASSETTE

FOR ONLY £12.95

NEW "RATMAN". ANOTHER AMAZING ARCADE GAME FROM LLAMA SOFT. SQUASH THE RAT WHICH FALLS FROM THE HEAVENS BEFORE THEY DIG IN AND KILL YOU. "FAST AND FUNNY". **PRICE £8.95**. 8K OR LARGER MEMORY EXPANSION NEEDED.

AVAILABLE FROM: LLAMASOFT SOFTWARE
LINDON HOUSE, THE GREEN, TADLEY
BASINGSTOKE, HANTS
TEL: (07356) 5038

BBC MICROCOMPUTER

Probably one of the better versions of this popular arcade game for any Microcomputer. Full features, fast moving, sound and colour.
PAC MAN MODE 5M/C **£8**
Fast moving version of the latest arcade games, with colour and sound.
MIDDLE KINGDOM MODE 7 BASIC & M/C **£8**
Real time adventure game with over 300 rooms. Fight the many monsters and retrieve the lost treasure of Hylem.
REVERSI GOMOKO MODE 5 M/C **£8**
Response time under one second for the first 3 levels. 6 levels of play, Graphic Board etc.
GAME TAPE ONE MODE 5 BASIC & M/C **£8**
Breakout Snake and Hunt are fast moving with colour and sound. All games will run on Model A and Model B Computers and in black and white.

ACORN ATOM — **Quality Machine Code Software**

SPACE ADVENTURE (12K gr.4 m/c) **£6**
Real time adventure in an alien spaceship.
SPACE INVADERS (12K gr.4 m/c) **£6**
Full feature version of the arcade game.
REVERSI (7K gr.0 m/c) **£6**
6 levels of play, graphic board, problem setting, etc.
3D LABYRINTH (9K gr.3 m/c) **£6**
Find your way out of a 3D maze displayed in 3D.
AIR STRIKE (9K gr.3 m/c) **£6**
Attack the enemy but watch out for flak and enemy planes.
CHASE (9K gr.4 m/c) **£4**
Fast thinking required to beat the robots.
ROAD RACE (4K gr.0 m/c) **£3**
Try staying on the track for as long as possible, but beware of other cars overtaking.
FIZZLE BRICKS (4K gr.1 m/c) **£3**
Moving wall breakout with a difference.
ELIZA (7K gr.0 m/c) **£3**
Converse with your sympathetic computer. With excess of 100 replies.

All prices shown are inclusive, no extras. SAE for catalogue free with each order. All games with sound and supplied on quality C15 cassettes.

SPECIAL OFFER. Buy any two cassettes from the BBC and ATOM ranges and deduct £1 from the total. All prices shown are inc. No extras. SAE for full details of Software available. Mail Order only.

PRO SOFTWARE, 121 Tyn-y-Twr, Baglan, Port Talbot, West Glamorgan SA12 8YE.

VIC20

SOFTWARE

SOLITAIRE MAZE

A test of skill and patience for VIC-20 owners. Cover up the diamonds to win. Sounds easy-until you try it! Simple to convert to most other micros, too.

This maze game is a type of 'solitaire' which can confound you from seconds to hours.

The object of the game is to move your playing pieces, between one and five of them, so that they cover up the same number of diamonds which appear scattered around the maze.

Sounds simple, doesn't it? It will sound even simpler when you learn that the diamonds don't move during the game! Just try it and see how easy it is!

This is one of those infuriatingly difficult games that quickly becomes complusive. With any more than three pieces on the board it takes a great deal of thought and planning to achieve the cover up.

Your controls are A — move up, S — move down, K — move left, L — move right, Space Bar — stop. However, if you fancy changing the keys around a bit, look at lines 340 — 370 in the program and you'll see you can make the control keys any letter you like just by substituting between the quotation marks.

The rest of the game explains itself as you play, but start with



only one of two men and master that before complicating things any further.

PROGRAM LISTING

```
10 R=RND(-TI):S=36876:V=36878:DIMP(5),C(5)
20 PRINT"■■■
```

HOW IT RUNS

This game uses several of the special features of the VIC-20 which make this section a little larger than usual

Line 10 — Generates a radom number (N), initialises variable S as the memory address of the sound device and V as the volume level. Dimensions the size of the two arrays P and C.

Lines 20 — 50 — Print the introductory text and get the game level and number of pieces required.

Line 60 — Sets the screen to cyan with a white boarder and white text.

Lines 100 — 121 — Print the maze map onto the screen.

Lines 190 — 220 — Place the circles in the maze and bleep each time one is placed.

Lines 222 — 230 — As above but for the diamonds.



Lines 300 — 450 — Get the pressed key character, examine it and see if it is a valid movement or stop command. If valid look at the position you wish to move to and see if it is free, if so move. If it is a diamond then record this in the correct array.

Lines 2000 — 2120 — Check to see if all the diamonds have been covered. If they have wipe them out and replace with circles.

Lines 3000 — 3020 — End game. Revert screen to normal colours if player has finished.

HINTS ON CONVERSION

The main areas of conversion difficulty are the way in which the screen is split into two areas of memory, one for the position and the other for the colour. The former has addresses between 7680 and 8185, the latter is located between 38400 and 38905. In virtually all other systems the second set of addresses can be ignored and omitted from the program. The first set will, of course, have to be changed to suit the memory of your system.

Any references to locations between 36874 and 36878 are concerned with the generation of sound effects and may either be changed to suit your machine or ignored.

The only other location that may cause trouble is 36879 which controls the colour of the screen and its border. In this case the code is used in Line 60 and sets the screen to cyan with a white border — the text colour is then set to white by the next command on that Line.

S C I S O F T

EDUCATIONAL SOFTWARE for ZX 81

NEW VERSION

: STUDY PACKS :

Taking Exams next year? . . . . .

1. Superb book of Revision Notes
2. Programs of problems using random data - different each time! Answers given
3. Program - Hints on "How to Revise"
4. Programs of Multiple choice questions

"Most original and useful" . . . . . **J. R. DERBYS.**

"Very pleased with 'Physics', please send 'Chemistry A.S.A.P." . . . . . **A. A. SUSSEX.**

Physics "O", Chemistry "O/C", Biology "O"
£7.50 + 50p p&p
Maths "O" Part I £5.50 + 50p p&p

: JUNIOR SCHOOL PACK :
£10.00 + 50p p&p
Contains . . . . . .

1. Teachers **"MARKBOOK"** (also suitable for sec. schools) £4.50
2. New improved version of **"JUNGLE MATHS"**

"One of the best Junior programmes available . . . **B. J. Lancaster** (£4.50)

3. **"MAGIC SPELL".** A versatile spelling test program . . . . (£4.50)

5, Minster Gardens, Newthorpe, Eastwood, Notts.

Jungle Maths Now available for BBC!

Also available from "MICROWARE" LEICESTER

soon for B.B.C. + SPECTRUM!

ZX HARDWARE . . . .

PROFESSIONAL 40 KEY BOARD

- All legends and graphics in 2 colours
- No soldering to ZX81, just plug in
- Proper typewriter keys
- RAM/Printer compatible.

Kit £19.95 Built £24.95 Case £10.20
Repeat key add on TBA.

Range of in/out ports, music boards, motherboards, D to A converter boards, write for catalogue.

23 Way double sided, gold female edge connector, wirewrap type £2.95

Male connector £1.25
Ribbon cable £1.40 per metre

Mastering Machine code book £5.50
Programming for real applications £6.50
Tape for real applications £11.25

HARRIS & LOCKYER ASSOCIATES
(Sole distributors for Redditch Electronics)

Dept PC
33 Pedmore Close
Woodrow South
Redditch
Worcs
Tel (0527) 24452

Prices include VAT + P&P
Overseas add £1.80 postage
Delivery 3 days for in stock items else allow 28 days.
Official orders welcome.
Send SAE for free catalogue.

UP UP UP UP UP AND DOWN LISTER DOWN DOWN DOWN



This ingenious ATOM program from Peter Reber can save you a lot of time at the keyboard and make life easier into the bargain.



During the debugging of a program frequent LISTing is necessary. The ACORN ATOM has got the usual options of the LIST command, such as "LIST to line x" or "LIST from line x to line y" etc. A further help is the 'paged mode' which stops any program after 16 lines have been scrolled off the VDU display. The ATOM then waits until any key on the keyboard is pressed before continuing. In this manner every section of a program listing can be inspected at your leisure.

However, you may want to study a particular part of a program but when it is LISTed in the paged mode only half of that section appears on the screen. After pressing any key the second half appears — but the first half is scrolled *off* the screen!

The only thing to do is to hit the "ESC"-key at the right time and stop. This necessitates the retyping of LIST if we want to check the program further.

APPLEs for ATOMs?

With the CTRL-S feature of an APPLE it is possible to stop a listing at any time as long as CTRL-S is pressed. Here is a program that not only allows you to stop a listing but to list backwards as well. After all, 16 lines of program are not that much and the ability to move back and forth in a listing would often be helpful.

List Of Explanations

First, though, you have to know exactly how the LIST command works. This program was written by establishing where the machine jumps to on LIST and then disassembling the monitor LIST program. After studying the listing it was found that the only place to change the program flow was at the output routine, held in the machines RAM.

This program 'traps' the carriage return characters and tests if the CTRL key is pressed. If it is, then it waits for the SHIFT key to be pressed before continuing.

If the listing is stopped you can press the key 'S' and the cursor will 'fly' over all the lines on the screen while moving upwards. In fact every line is printed again, but in exactly the same place as the old one, so you only see the cursor moving. When the cursor comes to the top of the screen, the screen contents will scroll down and a new line will appear at the top. This process continues until you come to the beginning of your program where it will stop. You can escape from the LIST at any time with ESC-key. The program is fully transparent, eg the LIST command behaves in exactly the same way as usual.

How To Set Up The Program:

Relocate the text space to #2B00 (?18 = #2B). Enter the program via the keyboard. Again don't forget to type the end of assembly marker and RETURN as the last line which does not appear in the assembly listing. RUN the program, ie assemble it. Type LINK #2902, this 'revectors' the output routine. Type LIST and see how the program works. Then * SAVE the object code.

One last point. Be careful if your program uses the output routine and the CTRL-key, eg a game, because if the CTRL-key is pressed when a CR is output it would stop the program. If that happens you can press the SHIFT key and carry on since all the CPU register contents are retained.

(Memory requirements are 3K with all the REMs and comments removed.)

HOW IT RUNS

The ATOM stores a line in the same form it is written (ie ASCII format), except for the line number which is converted to a 2 byte binary number. End of line marker is a CR character 0DH. The lines are also sorted according to line numbers.

#(hash)	denotes a hexadecimal number
@	means immediate addressing (for assembler)
#DE, #DF	always points to the start of one of the 16 VDU lines
#E0	offset from start of the VDU line. Cursor position is (?#DF*256+?#DE+?#E0)
#58, #59	list pointer. Points to the CR preceeding the next line to be printed.

After backstepping we must take care that the list pointer and the Y register have the correct values, because the first thing the monitor routine does after we return from our patch is to add the length of the last printed line (in the Y register) to the list pointer.

Line 145 & 165:	Do not type these two lines. They are there only temporarily during a printout on the printer, so that I get a printout in pages and not as one long piece of paper, and work together with a program in screen memory.
Line 210:	Do not forget the start of assembly marker which is not printed in the assembly listing.
Line 370:	To get the cursor to the start of a VDU line.
Line 480:	We don't have to worry about the return addresses and the data on the stack since the monitor resets the stack pointer.
Line 510:	You can choose any key you would like. The value in operand field is ASCII — #20. SHIFT, CTRL and REPT are not detected by subroutine FE71.
Line 1040 up:	Why start searching from start of text and not just from present location backwards to the next CR? The line numbers are in binary, ie one or both bytes can be #D and that would crash the program. The only way we know for sure what is "line number" and what the "end of line marker"is, is by starting the search at the beginning.

UP AND DOWN LISTER

PROGRAM LISTING

```
 50 REM**WRITTEN FOR THE ACORN ATOM
 55 REM**THIS PROGRAM ALLOWS YOU TO STOP A
    LISTING AT ANY TIME
 60 REM**WITH THE CTRL KEY. YOU CAN THEN LIST
    BACKWARDS TOWARDS
 65 REM**LINE 0 BY PRESSING THE KEY 'S'. CONTINUE
    NORMAL LISTING
 70 REM**BY PRESSING THE SHIFT KEY
 75 REM**THE ESC-KEY WORKS AT ALL TIMES
 80 REM**AFTER HITTING BREAK BRING PROGRAM BACK
    INTO OPERATION
 85 REM**WITH LINK #2902. THIS ALSO RELOCATES THE
    TEXT SPACE
 90 REM**TO #2B00
 95 REM**********************************
100 DIM LL(50);        REM**SPACE FOR LABELS
110 S = #80; T = #82;  REM**POINTERS
120 FOR I=0 TO 50;     LL(I) = -1; NEXT
130 PRINT $21;         REM**VDU OFF, SUPPRESS
                       ASSEMBLY LISTING
140 GOSUBz;            REM**ASSEMBLY FIRST PASS
145 PRINT $2,$6;       REM**FOR HARDCOPY PRINTOUT
                       ONLY
150 GOSUBz;            REM**ASSEMBLY SECOND PASS
160 PRINT $6;          REM**TURN VDU ON AGAIN
165 ?18 = #90;G.600;   REM**FOR HARDCOPY PRINTOUT
                       ONLY
180 END
200z P = #2902;        REM**LOCATION COUNTER
210 2902  A9 2B     :LL0 LDA @ #2B   RELOCATE TEXT
                    SPACE
220 2904  85 12     STA #12
230 2906  A9 11     LDA @LL1& #FF    REVECTOR
                                     OUTPUT ROUTINE
240 2908  8D 08 02  STA #0208
250 290B  A9 29     LDA@LL1& #FFFF/256
260 290D  8D 09 02  STA #0209
270 2910  60        RTS
290 2911            \
300 2911            \ *MAIN PROGRAM STARTS HERE*
310 2911            \
320 2911  08        :LL1 PHP
330 2912  C9 0D     CMP @ #D         IS CHARACTER A
                                     CARRIAGE RETURN?
340 2914  F0 04     BEQ LL2
350 2916  28        PLP
360 2917  4C 52 FE  JMP #FE52        NO, PRINT IT
370 291A  20 52 FE  :LL2 JSR #FE52   OUTPUT A
                                     CARRIAGE RETURN
380 291D  2C 01 B0  BIT #B001        IS CTRL KEY PRESSED?
390 2920  50 04     BVC LL4          YES — BRANCH
400 2922  A9 0D     :LL3 LDA #D      RESTORE THE
                                     ACCUMULATOR
                                     CONTENTS
402 2924  28        PLP              AND RETURN. CR
                                     IS ALREADY PRINTED
410 2925  60        RTS
420 2926  8A        :LL4 TXA         SAVE X REGISTER
430 2927  48        PHA
440 2928  84 80     STY #80          SAVE Y REGISTER
450 292A  20 71 FE  :LL5 JSR #FE71   SCAN KEYBOARD
460 292D  C0 3B     CPY @ #3B        IS ESC-KEY PRESSED?
470 292F  D0 03     BNE LL6
480 2931  4C CF C2  JMP #C2CF        YES, ESCAPE
                                     FROM LISTING
490 2934  C0 FF     :LL6 CPY @ #FF   IS NO KEY
                                     PRESSED?
500 2936  F0 06     BEQ LL7
510 2938  C0 33     CPY@ #33         IS KEY S PRESSED?
520 293A  D0 EE     BNE LL5          NO, SCAN AGAIN
530 293C  F0 0C     BEQ LL8          YES, GO BACK IN
                                     LISTING
540 293E  2C 01 B0  :LL7 BIT #B001   IS SHIFT KEY PRESSED?
550 2941  30 E7     BMI LL5          NO, SCAN AGAIN
560 2943  A4 80     LDY #80          RESTORE REGISTERS
570 2945  68        PLA
580 2946  AA        TAX
590 2947  18        CLC
600 2948  90 D8     BCC LL3          GOTO EXIT
610 294A            \
620 294A            \ **HERE ON BACKSTEP*****
630 294A            \
640 294A  20 72 29  :LL8 JSR LL20    SEARCH FOR
                                     PRECEEDING LINE
650 294D  E0 3E     CPX @62          MOVE CURSOR UP
                                     ENOUGH THAT
                                     NEW LINE TO BE
660 294F  90 03     BCC LL9          PRINTED CAN BE
                                     INSERTED
670 2951  20 D3 29  JSR LL30         X HOLDS THE
                                     LENGTH OF LINE
680 2954  E0 1E     :LL9 CPX @30
690 2956  90 03     BCC LL10
700 2958  20 D3 29  JSR LL30
710 295B  20 D3 29  :LL10 JSR LL30
720 295E  20 D3 29  JSR LL30
730 2961  A5 82     LDA T            SET LISTING
                                     POINTER TO START
                                     OF
740 2963  85 58     STA #58          PRECEEDING LINE
750 2965  A5 83     LDA T+1
760 2967  85 59     STA #59
770 2969  20 24 2A  JSR LL40         PRINT LINE
780 296C  20 54 CD  JSR #CD54        OUTPUT A CR/LF
790 296F  18        CLC
800 2970  90 B8     BCC LL5          GO AND SCAN
                                     KEYBOARD AGAIN
1000 2972           \
1010 2972           \ **SEARCH FOR THE LINE
                    PRECEEDING THE ONE PRINTED
                    LAST**
1020 2972           \ S IS SEARCH POINTER, T IS
                    TEMPORARY STORAGE
1030 2972           \
1040 2972  A5 12    :LL20 LDA #12    MOVE START OF
                                     TEXT TO SEARCH
                                     POINTER
1050 2974  85 81    STA S+1
1060 2976  A9 00    LDA @0           SET LOW-BYTE OF
                                     SEARCH POINTER
                                     TO 0
1070 2978  85 80    STA S
1080 297A  C5 58    CMP #58          DID WE BACKSTEP
                                     TO THE START OF
                                     TEXT?
1090 297C  A5 81    LDA S+1
1100 297E  E5 59    SBC #59
1110 2980  90 0F    BCC LL22         NO
1120 2982  20 71 FE :LL21 JSR #FE71  YES, WAIT FOR
                                     KEY RELEASE
1130 2985  C0 FF    CPY @ #FF
1140 2987  D0 F9    BNE LL21
1150 2989  68       PLA              PULL RETURN
                                     ADDRESS OFF THE
                                     STACK
1160 298A  68       PLA
1170 298B  A5 85    LDA T+3          MOVE LENGTH OF
                                     FIRST PROGRAM
                                     LINE TO #80
1180 298D  85 80    STA #80          FOR EVENTUAL
                                     RETURN TO THE
                                     MONITOR
                                     PROGRAM
1190 298F  D0 AD    BNE LL7          UNCONDITIONAL,
                                     LINE LENGTH CAN
                                     NEVER BE 0
1200 2991  A5 80    :LL22 LDA S      STORE SEARCH
                                     POINTER
                                     TEMPORARILY IN T
1210 2993  85 82    STA T
```

```
1220 2995  A5 81     LDA S+1
1230 2997  85 83     STA T+1
1240 2999  A0 02     LDY @2          STEP OVER LINE
                                    NUMBER
1250 299B  A9 0D     LDA @#D
1260 299D  C8        :LL23 INY       SEARCH FOR NEXT
                                    CR, END OF LINE
1270 299E  D1 80     CMP (S),Y
1280 29A0  D0 FB     BNE LL23
1290 29A2  84 85     STY T+3         STORE LINE LENGTH
1300 29A4  A5 80     LDA S           ADD LINE LENGTH
                                    TO SEARCH
                                    POINTER
1310 29A6  18        CLC
1320 29A7  65 85     ADC T+3
1330 29A9  85 80     STA S
1340 29AB  90 02     BCC LL24
1350 29AD  E6 81     INC S+1
1360 29AF  C5 58     :LL24 CMP #58   IF SEARCH
                                    POINTER < LIST
                                    POINTER THE
1370 29B1  A5 81     LDA S+1         PRECEEDING LINE
                                    IS NOT FOUND YET
1380 29B3  E5 59     SBC #59
1390 29B5  90 DA     BCC LL22
1400 29B7  A0 02     LDY @2
1410 29B9  A9 0D     LDA @#D
1420 29BB  C8        :LL25 INY       DETERMINE
                                    LENGTH OF LAST
                                    PRINTED LINE
1430 29BC  D1 80     CMP (S),Y
1440 29BE  D0 FB     BNE LL25
1450 29C0  98        TYA
1460 29C1  AA        TAX
1470 29C2  E0 3E     CPX @62         AND ADJUST
                                    CURSOR POSITION
                                    IF IT IS
1480 29C4  90 03     BCC LL26        LONGER THAN 1
                                    VDU-LINE
1490 29C6  20 D3 29  JSR LL30
1500 29C9  E0 1E     :LL26 CPX @30
1510 29CB  90 03     BCC LL27
1520 29CD  20 D3 29  JSR LL30
1530 29D0  A6 85     :LL27 LDX T+3   GET LENGTH OF
                                    LINE NOW TO BE
                                    PRINTED
1540 29D2  60        RTS
1600 29D3            \
1610 29D3            \ **MOVE CURSOR UP*******
1620 29D3            \
1630 29D3  A0 00     :LL30 LDY @0
1640 29D5  B1 DE     LDA (#DE),Y     REMOVE CURSOR
                                    FROM SCREEN
1650 29D7  45 E1     EOR #E1
1660 29D9  91 DE     STA (#DE),Y
1670 29DB  A5 DE     LDA #DE
1680 29DD  38        SEC
1690 29DE  E9 20     SBC @#20        MOVE CURSOR 32
                                    POSITIONS DOWN
                                    = 1 LINE UP
1700 29E0  85 DE     STA #DE
1710 29E2  B0 0E     BCS LL32
1720 29E4  A5 DF     LDA #DF         CHECK IF WE
                                    MOVED THE
                                    CURSOR OFF THE
1730 29E6  C9 81     CMP @#81        SCREEN
1740 29E8  B0 06     BCS LL31
1750 29EA  20 F9 29  JSR LL35        YES, SCROLL THE
                                    SCREEN
                                    DOWNWARDS BY 1
                                    LINE
1760 29ED  C8        INY
1770 29EE  F0 02     BEQ LL32        UNCONDITIONAL
                                    BRANCH
1780 29F0  C6 DF     :LL31 DEC #DF   MOVE CURSOR TO
                                    TOP HALF OF
                                    SCREEN
1790 29F2  B1 DE     :LL32 LDA (#DE),Y
1800 29F4  45 E1     EOR #E1         PRINT CURSOR ON
                                    SCREEN
1810 29F6  91 DE     STA (#DE),Y
1820 29F8  60        RTS
1830 29F9            \
1840 29F9            \ ***SCROLL SCREEN
                     DOWNWARDS BY 1 LINE*******
1850 29F9            \
1860 29F9  20 66 FE  :LL35 JSR #FE66 WAIT FOR
                                    FLYBACK PULSE
1870 29FC  A0 FF     LDY @#FF
1880 29FE  B9 00 81  :LL36 LDA #8100,Y MOVE BOTTOM HALF
1890 2A01  99 20 81  STA #8120,Y
1900 2A04  88        DEY
1910 2A05  C0 FF     CPY @#FF
1920 2A07  D0 F5     BNE LL36
1930 2A09  20 66 FE  JSR #FE66       WAIT FOR
                                    FLYBACK PULSE
1940 2A0C  B9 00 80  :LL37 LDA #8000,Y MOVE TOP HALF
1950 2A0F  99 20 80  STA #8020,Y
1960 2A12  88        DEY
1970 2A13  C0 FF     CPY @#FF
1980 2A15  D0 F5     BNE LL37
1990 2A17  A9 80     LDA @#80        CURSOR TO HOME
                                    POSITION
2000 2A19  85 DF     STA #DF
2010 2A1B  C8        INY
2020 2A1C  84 DE     STY #DE
2030 2A1E  84 E0     STY #E0
2040 2A20  20 22 FE  JSR #FE22       ERASE TOP LINE
2050 2A23  60        RTS
2060 2A24            \
2070 2A24            \ **PRINT LINE***********
2080 2A24            \
2090 2A24  A0 01     :LL40 LDY @1
2100 2A26  B1 58     LDA (#58),Y     GET LINE NUMBER
                                    TO Z-PAGE AND READY
2110 2A28  85 25     STA #25         FOR PRINTING IN
                                    DECIMAL
2120 2A2A  C8        INY
2130 2A2B  B1 58     LDA (#58),Y
2140 2A2D  85 16     STA #16
2150 2A2F  A9 05     LDA @5
2160 2A31  8D 21 03  STA #0321       SET FIELD WIDTH TO 5
2170 2A34  20 89 C5  JSR #C589       PRINT LINE NUMBER
2180 2A37  A9 08     LDA @8
2190 2A39  8D 21 03  STA #0321       RESTORE FIELD
                                    WIDTH TO NORMAL
2200 2A3C  A0 03     LDY @3          STEP OVER LINE
                                    NUMBER
2210 2A3E  B1 58     :LL41 LDA (#58),Y GET CHARACTER
2220 2A40  C9 0D     CMP @#D         IS IT A CR, END OF
                                    LINE?
2230 2A42  F0 06     BEQ LL42
2240 2A44  20 4C CA  JSR #CA4C       PRINT CHARACTER
2250 2A47  C8        INY
2260 2A48  D0 F4     BNE LL41
2270 2A4A  84 80     :LL42 STY #80   SAVE LINE LENGTH
2280 2A4C  60        RTS
```

HINTS ON CONVERSION

This particular program has been written specifically for the Acorn ATOM computer and in machine code at that. Conversion to any other micro would inevitably require a sound knowledge of code programming. For this reason, we would not recommend that users of other machines attempt to adapt this routine to their own computer.

The Acorn ATOM is 'weird' in many ways, especially its particular version of BASIC, which was not written for home usage, but is extremely powerful in its own right. *Personal Computing* is currently working on a feature — which we hope to publish shortly — that will allow users of the ATOM to simply convert programs to run on their machines, and vice versa.

SHARP MZ-80K/MZ-80A/MZ-80B

Functional cassette software by Dale Hubbard

Buy 2 at £19.95 — take 1 at £5.95 FREE!!!!
VIC 20, SINCLAIR SPECTRUM, BBC, TEXAS T1994A, ATARI.

All programs in Standard Sharp Basic for 48k RAM upwards.
All programs supplied with exhaustive and attractively bound documentation.

DATABASE
The program that everyone needs. Facilities include sort, search, list, delete, change, totals, save file, line 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. **£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
Credit Sales
Cash Sales
Credit Purchases
Purchases – other
Sales Ledger
Purchase Ledger
Bank Account
Year to Date Summary

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. Sharp — Spellbinding!!! **£5.95**

MOTOR ACCOUNTANT
Find out exactly what that 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 really enjoy the fun of this program designed to keep all her recipes. Will even suggest a menu for a day/week! Excellent value. **£19.95**

Access Welcome

SPECIAL HARDWARE OFFER!! MAIL ORDER ONLY
MZ-80A PLUS ANY 3 PROGRAMS £477 + VAT
LIMITED STOCKS — HURRY!!!

Send cheque or P.O. or Cash (registered) or Credit Card no. to:

Gemini Marketing Ltd

Dept PCW(3) Quay House Quay Road Newton Abbot Devon TQ12 2BU
Or telephone us with your credit card order on (0626) 62869
All orders despatched 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 (A.K. or B) when ordering software.

LISTING SOFTWARE

Looking for a program to buy? Look no further! If it's available, it's listed here in our exclusive and comprehensive software checklists.

Looking through any computer magazine can be a bewildering experience if you're in search of a program. Count the hundreds of ads and thousands of titles on sale and it would be easy to lose heart!

We've tried to sort out the confusion, and the sheer numbers, to present an easily understood list for each machine. Where possible, we have eliminated duplications, so that the same tape with a different label is not listed twice. Rather it should be credited once, with as many suppliers as we could find.

Table Codes

In order to fit as many programs as possible into our pages, we have had to use codes for some columns, considerably shortening the wording.

The information given for each program is: Title, memory required to run it, company producing it, whether tape/cartridge or disk, type and supplier and price.

The codes we have used are:

Program Type

GM = Game
BS = Business routine
UT = Utility (ie. programming aid)
DO = Domestic
ED = Educational

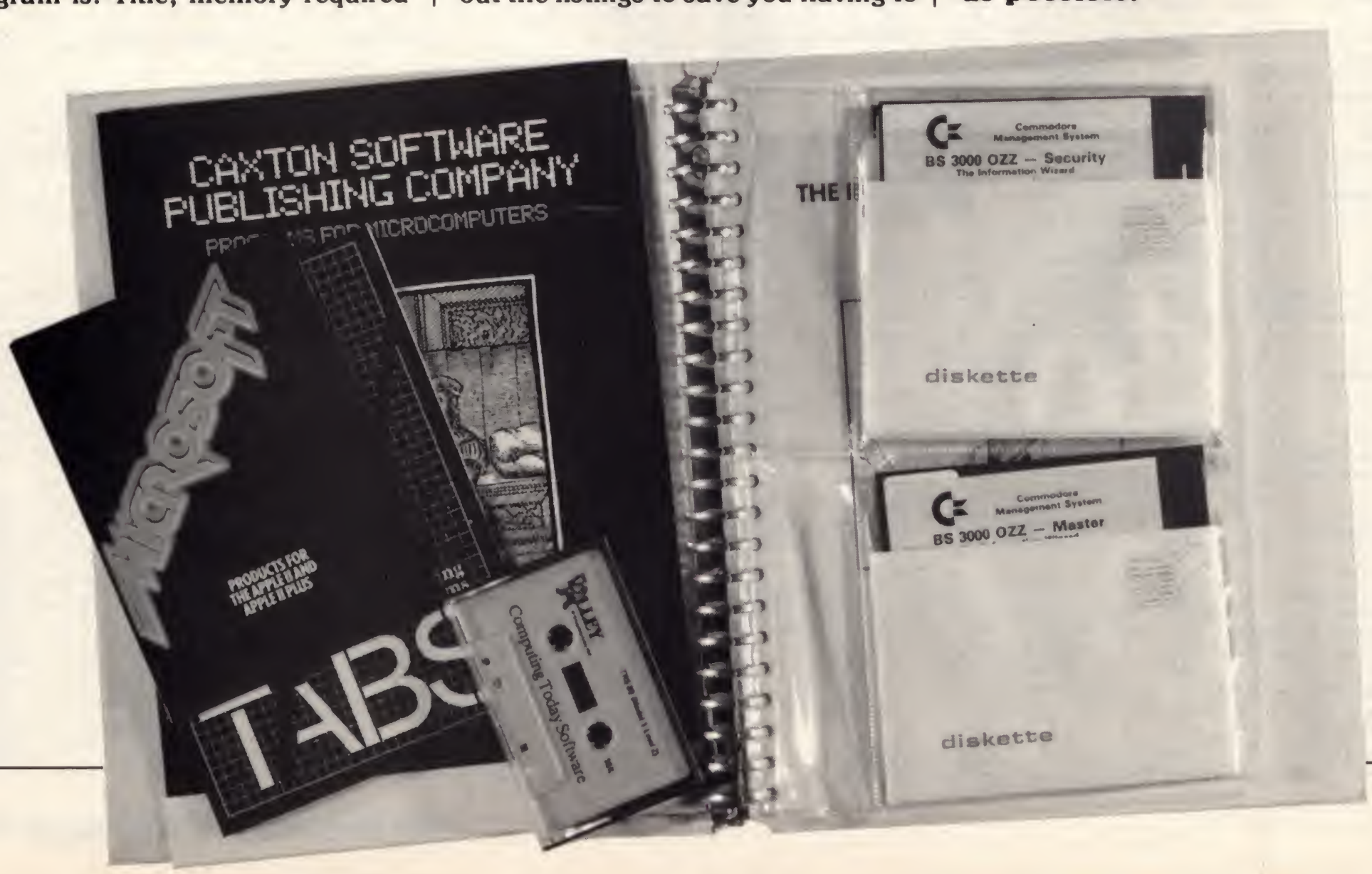
How Sold

R = Cartridge (may include memory)
C = Tape (cassette)
D = Disc (for expanded systems)
L = Listing (sold as print-out)

These tables are repeated throughout the listings to save you having to turn back and forth repeatedly. Once you've found the program you want, check the supplier code with the list of companies at the end of the article for address and telephone number.

Not Here?

To companies whose products are not listed herein we can only say TELL US ABOUT IT! This applies particularly to the smaller retailer who may sell only half a dozen or so programs for one machine. If you produce software for *any* of the machines on the market today, then we would love to include your wares in our checklists. Send it in to us, marked for the attention of the Editor (in our format *Please*!) or ring Chris Palmer on 01-437 1002 as soon as possible.



SOFTWARE LISTING



ZX81

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes & Prices
1K Chess	Gm	Artic	1K	C EH	£2.95
1K Games Pack	Gm	Artic	1K	C BT,EH	£6.00
1K Maths	Ed	Mr Purves	1K	C CV	£3.50
1K Super Trio	Gm	Software Masters	1K	C AO	£7.95
16K Maths	Ed	Mr Purves	16K	C CV	£3.50
3-D Labyrinth	Gm	dK'tronics	16K	C EE	£3.95
3-D Monster Maze	Gm	J K Greye	16K	C CN	£4.95
Adventure	Gm	Anglo American	16K	C GB	£6.00
Adventure A	Gm	Artic	16K	C EH,BT,CN	£6.00
				AB	£8.00
Adventure B	Gm	Artic	16K	C EH,BT,CN	£7.00
				AB	£8.00
Adventure C	Gm	Artic	16K	C AB,CH,BT,EH	£8.00
Adventure I	Gm	Abbersoft	16K	C CN	£9.95
Around Europe in 80hrs	Gm	S W Hessel	16K	C CN	£4.25
Asset Stripper	Gm	Micro Games	16K	C CN	£4.50
Asteroids	Gm	Quicksilva	16K	C CN	£5.50
Bagatelle	Gm	Cambell Systems	1K	C CN	£4.00
Bank Account	Bs	Transform	16K	C GZ	£8.75
Bank Account	Bs	Transform	32K	C GZ	£10.75
Battle of Britain	Gm	Micro Games	16K	C CN	£4.50
Beam Analysis	Bs	Hilderbay	16K	C FW	£25.00
Breakout	Gm	Anglo American	16K	C GB	£4.50
Breakout	Gm	Bug Byte	1K	C CN	£3.50
Budget & Address Book	Do	Mr Purves	16K	C CV	£4.00
Budget Programs (2)	Bs	Hilderbay	16K	C FW	£17.00
Bumper 7	Gm	Software Masters	1K	C AO	£4.95
Cassette G10	Gm	Psion	16K	C BO,DW	£5.95
Backgammon					
Cassette G11	Gm	Psion	16K	C BO,DW	£6.95
Chess					
Cassette G12	Gm	Psion	8K	C BO,DW	£4.75
Perilous Swamp					
Sorceror's Island					
Cassette G13	Gm	Psion	16K	C BO,DW	£3.95
Space Raiders					
Bomber					
Cassette G14	Gm	Psion	16K	C BO,DW	£5.95
Flight Simulation					
Cassette G2	Gm	Psion	16K	C BO,DW	£4.95
Feet/Metres Conversion					
Rings Round Saturn					
Secret Code					
Mind Boggling					
Silvelte					
Memory (Educ)					
Cassette G3	Gm	Psion	16K	C BO,DW	£4.95
Train Race					
Challenge					
Secret Message					
Mind That Meteor					
Character Doodle					
Currency Conversion					
Cassette G4	Gm	Psion	16K	C BO,DW	£4.95
Down Under					
Submarines					
Doodling With Graphics					
Invisible Invader					
Reaction					
Petrol Conversion					
Cassette G5	Gm	Psion	16K	C BO,DW	£4.95
Martian Knockout					
Graffiti					
Find the Mate					
Labyrinth					
Drop a Brick					
Continental (Educ)					
Cassette G6	Gm	Psion	16K	C BO,DW	£4.95
Galactic Invasion					
Journey into Danger					
Create					
Nine Hole Golf					
Solitaire					
Daylight Robbery					
Cassette G7	Gm	Psion	16K	C BO,DW	£4.95
Race Track					
Chase					
Nim					
Tower of Hanoi					
Docking the Spaceship					
Golf					
Fascinating Tower of Hanoi (problem)					
Cassette G8	Gm	Psion	16K	C BO,DW	£4.95
Tower Trail					
Blank					
Cassette G9	Gm	Psion	16K	C BO,DW	£6.95
Bio-Rhythms					
Your Bio-Rhythms					
Catacombs	Gm	J K Greye	16K	C CN	£4.95
Centipede	Gm	dK'tronics	16K	C EE,CN	£4.95
Centipede (Graphics)	Gm	dK'tronics	16K	C EE	£4.95
Champions Quiz	Ed	Rose Cassettes	16K	C CN	£4.50
Chess	Gm	Micro Gen	16K	C DZ	£6.50
Chess II Special	Gm	Artic	16K	C EH	£45.00
Computer Count ZX	Bs	Silicon Tricks	16K	C CN	£7.95
Constellation	Gm	Anglo American	16K	C GB	£8.00
Counter	Gm	Pizzel	16K	C CN	£5.50
Critical Path Analysis	Bs	Hilderbay	16K	C FW	£15.00
Damsel & the Beast	Gm	Anglo American	16K	C GB	£6.50
Damsel & the Beast	Gm	Bug Byte	16K	C CN	£6.50
Data Base	Bs	Mr Purves	16K	C CV	£10.00
Data Base	Ut	Cambell Systems	16K	C CN	£10.00

Death Isle	Gm	Buffer	16K	C	CN	£4.50
Defender	Gm	Quicksilva	16K	C	CN	£5.50
Deflex	Gm	dK'tronics	16K	C	EE	£3.95
Dictator	Gm	Anglo American	16K	C	GB	£9.00
Dictator	Gm	Bug Byte	16K	C	CN	£9.00
Diggles Kitchen	Do	Micro Computer SW	16K	C	HK	£4.99
Double Breakout	Gm	Beam Software	1K	C	BT	£6.00
Dragon Maze/Life	Gm	Software Masters	16K	C	AO	£6.95
Fast Life	Gm	dK'tronics	16K	C	EE	£3.95
Financial Package	Bs	Hilderbay	16K	C	FW	£8.00
Football Manager	Bs	Addictive Games	16K	C	HG	£7.95
					CN	£9.95
Forth Compiler	Ut	Artic	16K	C	EH	£35.00
GB Ltd	Gm	S W Hessel	16K	C	CN	£5.25
GCE Maths	Ed	Rose Cassettes	16K	C	CN	£4.50
Galaxian	Gm	Artic	16K	C	EH,BT	£6.50
					AB	£5.50
Galaxy Warrior/Star Trek	Gm	Artic	16K	C	EH,BT	£6.50
					AB	£5.50
Games Pack I	Gm	Silversoft	16K	C	CN	£4.95
Geography	Ed	Psion	16K	C	BO,DW	£6.95
Gold	Gm	Hilderbay	16K	C	CN,FW	£8.00
Greedy Gulch	Gm	Phipps Associates	16K	C	HL	£5.00
Gulp	Gm	Cambell Systems	16K	C	CN	£4.00
Hedgehog & Co	Gm	Buffer	1K	C	CN	£3.00
High Res. Graphics	Gm	Macronics	16K	C	CN	£4.00
History	Ed	Psion	16K	C	BO,DW	£6.95
House of Gnomes	Gm	Anglo American	16K	C	GB	£7.00
Inheritance	Gm	S W Hessel	16K	C	CN	£4.25
Invaders	Gm	Anglo American	16K	C	GB	£4.00
Invaders	Gm	Bug Byte	16K	C	CN	£4.00
Invaders	Gm	Quicksilva	16K	C	CN	£5.50
Inventions before 1850	Ed	Psion	16K	C	BO,DW	£6.95
Junior English I	Ed	Rose Cassettes	16K	C	CN	£4.50
Junior English II	Ed	Rose Cassettes	16K	C	CN	£4.50
Junior Maths I	Ed	Rose Cassettes	16K	C	CN	£4.50
Junior Maths II	Ed	Rose Cassettes	16K	C	CN	£4.50
Kingdom of Nam	Gm	Micro Games	16K	C	CN	£4.50
Knockout Whist	Gm	Anglo American	16K	C	GB	£4.00
Labyrinth	Gm	Axis	16K	C	CN	£5.95
Labyrinth	Gm	Software Masters	16K	C	AO	£5.95
Language Dictionary	Ut	Hewson	16K	C	DT	£3.75
Life	Gm	Artic	2K	C	BT	£3.00
Line Renumber	Ut	Hewson	16K	C	DT	£4.95
Love and Death	Gm	Automata	1K	C	CN	£5.00
Machine Code Monitor Disassembler	Ut	Micro Gen	16K	C	DZ	£3.95
Magic Cube	Gm	Cambell Systems	16K	C	CN	£4.00
Magic Mountain	Gm	Phipps Associates	16K	C	HL	£5.00
Man Page	Gm	Newsoft	16K	C	CN	£4.00
Master Maths IV	Ed	LCL	16K	C	CN	£5.00
Master Maths V	Ed	LCL	16K	C	CN	£5.00
Mathematics	Ed	Psion	16K	C	BO,DW	£6.95
Maths Pack	Ed	Artic	4K	C	BT	£11.00
Matrix Planner	Bs	G Asher	16K	C	CN	£6.00
Mazogs	Gm	Bug Byte	16K	C	CN	£9.00
Mini Space Invaders	Gm	Hewson	1K	C	DT	£3.95
Mission Impossible	Gm	Buffer	16K	C	CN	£4.50
Multifile	Ut	Anglo American	16K	C	GB	£17.50
Music & Composers	Ed	Psion	16K	C	BO,DW	£6.95
Music/Breakout/Invaders	Gm	Macronics	1K	C	CN	£7.95
Nasty Invaders	Gm	Giltrole	16K	C	DC	£4.95
Nasty Mountain	Gm	Giltrole	16K	C	DC	£4.95
Nightmare Park	Gm	Software Masters	16K	C	AO	£6.95
Novelists & Authors	Ed	Psion	16K	C	BO,DW	£6.95
Numerology	Gm	Carnell	16K	C	CN	£4.50
O Level Chemistry	Ed	Calpac	16K	C	CN	£4.95
O Level French	Ed	Rose Cassettes	16K	C	CN	£4.50
Optimisation Package	Bs	Hilderbay	16K	C	FW	£20.00
Oracle's Cove	Gm	Doric	16K	C	CN	£6.95
Passwords	Gm	Giltrole	16K	C	DC	£3.95
Payroll	Bs	Hilderbay	16K	C	AB,FW	£25.00
Pharaoh's Tomb	Gm	Phipps Associates	16K	C	HL	£5.00
Phipps Adventures I	Gm	Phipps Associates	16K	C	CN	£5.00
Pilot	Gm	Hewson	16K	C	DT	£5.95
Planet Lander	Gm	Hewson	1K	C	DT	£3.75
Poets & Playwrites	Ed	Psion	16K	C	BO,DW	£6.95
Program Merge	Bs	ACS	16K	C	CN	£5.50
Program Pack I	Gm	Bug Byte	1K	C	CN	£3.50
Program Pack I	Ut	Anglo American	16K	C	GB	£3.50
Program Pack II	Gm	Bug Byte	16K	C	CN	£4.50
Program Pack II	Ut	Anglo American	16K	C	GB	£3.50
Program Pack III	Gm	Bug Byte	1K	C	CN	£3.50
Program Pack IV	Gm	Bug Byte	16K	C	CN	£4.50
Program Pack V	Gm	Bug Byte	16K	C	CN	£4.50
Program Pack IV	Gm	Bug Byte	16K	C	CN	£4.50
Program Store	Bs	ACS	16K	C	CN	£5.50
Program Store Toolkit	Bs	ACS	16K	C	CN	£5.50
Programmer's Toolkit	Ut	Hewson	16K	C	DT	£6.50
Purchase Ledger	Bs	Transform	16K	C	GZ	£8.75
Purchase Ledger	Bs	Transform	32K	C	GZ	£10.75
QS Asteroids	Gm	Quicksilva	4K	C	GD	£5.50
QS Defenders	Gm	Quicksilva	4K	C	GD	£5.50
QS Invaders	Gm	Quicksilva	8K	C	GD	£5.50
Revamped Chess	Gm	Micro Gen	16K	C	DZ	£6.50
Revise Chemistry	Ed	Sci-Soft	16K	C	CN	£7.50
Revise Maths	Ed	Sci-Soft	16K	C	CN	£5.50
Revise Physics	Ed	Sci-Soft	16K	C	CN	£7.50
Sales Ledger	Bs	Transform	16K	C	GZ	£8.75
Sales Ledger	Bs	Transform	32K	C	GZ	£10.75
Scramble	Gm	Quicksilva	4K	C	GD	£5.50
Screenkit I	Bs	Picturesque	16K	C	CN	£4.95
Secret Valley	Gm	Newsoft	16K	C	CN	£6.50
Secret of Tenworth Manor	Gm	Hilderbay	16K	C	AB	£14.95
Shop Window	Bs	Cambell Systems	16K	C	CN	£7.00
Sorcerer's Castle	Gm	Micro Gen	16K	C	DZ	£3.95
Space Intruders	Gm	Hewson	4K	C	DT	£5.95
					CN	£4.95
Space Invaders	Gm	Macronics	16K	C	CN	£4.95
Space Invaders	Gm	Macronics	1K	C	CN	£3.95
Space Invaders	Gm	dK'tronics	16K	C	EE	£4.95
Space Invaders/Planetoids	Gm	Software Masters	16K	C	AO	£6.95
Space Trek	Gm	Beam Software	16K	C	BT	£8.00
Spellbound	Ed	Transform	16K	C	GZ	£3.75
Spelling	Ed	Psion	16K	C	BO,DW	£6.95
Star Quest	Gm	Pizzel	16K	C	CN	£5.50
Star Trek	Gm	Buffer	16K	C	CN	£4.50
Star Trek	Gm	Bug Byte	16K	C	CN	£5.00
Star Trek	Gm	Macronics	16K	C	CN	£3.95
Star Trek	Gm	Silversoft	16K	C	CN	£4.95
Sargon Chess	Gm	Hilderbay	16K	C	AB	£22.50
Statistics	Bs	Hewson	1K	C	DT	£3.75
Stock Control	Bs	Hilderbay	16K	C	AB,FW	£25.00
Super Breakout	Gm	Essential S/W	1K	C	CN	£6.00
Super Invasion	Gm	Beam Software	1K	C	BT	£6.00
Super Invasion	Gm	Essential S/W	1K	C	CN	£6.00
Super Program I Pints/Litres Conversion Invasion from Jupiter Skittles Magic Square Doodle Kim						
Liquid Capacity	Gm	Psion	16K	C	BO,DW	£4.95
Super Wumpus	Gm	Silversoft	16K	C	CN	£4.95
Ten Exciting Games	Gm	Beam Software	1K	C	BT	£6.00
Test Pack	Ed	Mr Purves	16K	C	CV	£7.50
The Bible	Gm	Automata	1K	C	CN	£5.00
The Collector's Pack	Do	Psion	16K	C	BO,DW	£9.95
The Fast One	Bs	Cambell Systems	16K	C	CN	£15.00
The Plug Record Recorder	Do	Psion	16K	C	BO,DW	£9.95
Time Bandits	Gm	Newsoft	16K	C	CN	£4.50
Time Ledger	Bs	Hilderbay	16K	C	FW	£15.00
Very Nasty Mountain	Gm	Giltrole	16K	C	DC	£6.95
Video Index	Bs	Video Software	16K	C	CN	£9.95
Video-add	Bs	Video Software	16K	C	CN	£5.95
Videograph	Ed	Video Software	16K	C	CN	£5.95
Videomap	Ed	Video Software	16K	C	CN	£5.95
Videoplan	Bs	Video Software	16K	C	CN	£5.95
Videoview	Do	Video Software	16K	C	CN	£5.95
Volcanic Dungeon	Gm	Carnell	16K	C	CN	£4.50
Vucalc	Bs	Psion	16K	C	BO,DW	£7.95
Vufile	Bs	Psion	16K	C	BO,DW	£7.95
Wordpack	Ed	Wida Software	16K	C	FY	£19.00
ZX Bomber	Gm	Micro Gen	16K	C	DZ	£3.95
ZX Breakout	Gm	Micro Gen	16K	C	DZ	£3.95
ZX Bug	Gm	Artic	16K	C	BT,EH	£7.00
ZX Chess I	Gm	Artic	16K	C	CN,EH,BT	£6.50
ZX Chess II	Gm	Artic	16K	C	CN,BT	£13.00
					EH	£9.95
ZX Forth	Ut	Artic	16K	C	AB	£35.00
ZX Graphical Chess	Gm	Artic	16K	C	CN	£13.00
ZX Othello	Gm	MOI	16K	C	CN	£6.95
ZX Scramble	Gm	Micro Gen	16K	C	DZ	£3.95
ZX Space Invaders	Gm	Micro Gen	16K	C	DZ	£3.95
ZX81 Chess	Gm	Software Masters	16K	C	AO	£6.90
ZXAS	Bs	Bug Byte	16K	C	CN	£5.00
ZXDB	Bs	Bug Byte	16K	C	CN	£6.50
ZXMC	Bs	Picturesque	16K	C	CN	£6.50
Zombie/Sword of Peace	Gm	Artic	16K	C	BT,EH	£6.50
					AB	£5.50
Zor	Gm	Pizzel	16K	C	CN	£5.50

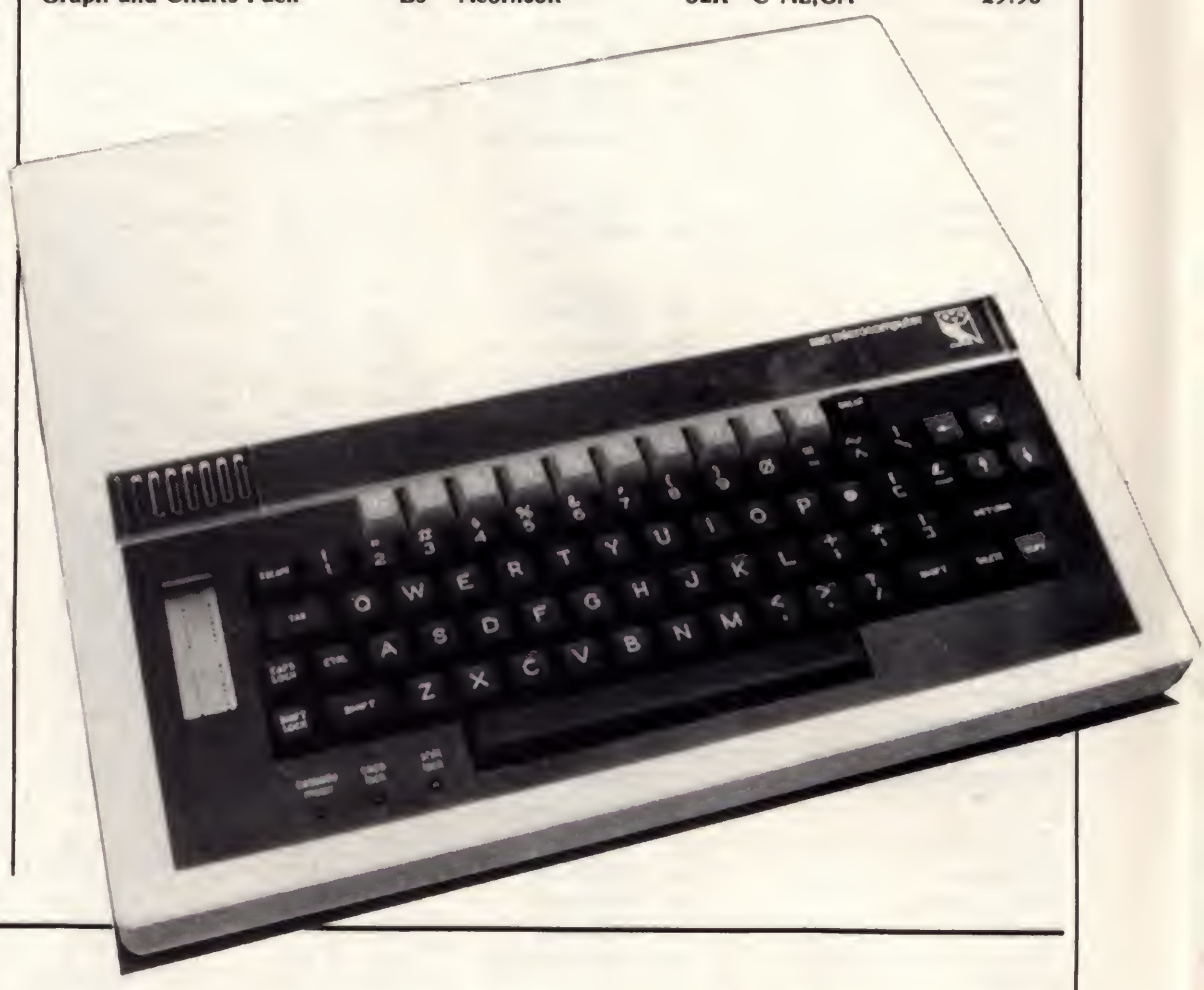
SOFTWARE LISTING

TEXAS

A-Maz-Ing	Gm	Texas	8K	R AB,CH	£24.00
Addition, Subtraction I	Ed	Texas	8K	R AB	£35.00
Addition, Subtraction II	Ed	Texas	8K	R AB	£35.00
Attack	Gm	Texas	8K	R AB	£30.00
Beginning Grammar	Ed	Texas	8K	R AB	£20.00
Blackjack Poker	Gm	Texas	8K	R AB	£24.00
Blasto	Gm	Texas	8K	R AB	£25.00
Car Wars	Gm	Texas	8K	R AB,CH	£25.00
Chequebook Manager	Bs	Texas Max	16K	D AB	£19.00
Connect 4	Gm	Texas	8K	R AB	£24.00
Early Reading	Ed	Texas	8K	R AB	£35.00
Editor Assembler	Ut	Texas	8K	R AB	£115.00
Electrical Eng'g Library	Bs	Texas Max	16K	C AB	£24.00
Electrical Eng'g Library	Bs	Texas Max	16K	D AB	£35.00
Extended Basic	Ut	Texas	8K	R AB	£100.00
Graphing Package	Do	Texas Max	16K	C AB	£14.00
Graphing Package	Do	Texas Max	16K	D AB	£19.00
Hangman	Gm	Texas	8K	R AB	£24.00
Household Money Management	Do	Texas	8K	R AB	£25.00
Hunt The Wumpus	Gm	Texas	8K	R AB,CH	£25.00
Hustle	Gm	Texas	8K	R AB	£30.00
Mailing List	Bs	Texas Max	16K	D AB	£60.00
Market Simulation	Bs	Texas	32K	C AB	£9.00
Market Simulation	Bs	Texas	32K	D AB	£19.00
Maths Routine Library	Ed	Texas Max	16K	C AB	£24.00
Maths Routine Library	Ed	Texas Max	16K	D AB	£35.00
Mind Challenges	Gm	Texas	16K	R CH	£24.95
Multiplication	Ed	Texas	8K	R AB	£35.00
Music Makers	Do	Texas	8K	R AB	£35.00
Music Maker	Ed	Texas	16K	D AB	£14.00
Music Skills Trainer	Ed	Texas Max	16K	C AB	£19.00
Music Skills Trainer	Ed	Texas Max	16K	D AB	£24.00
Number Magic	Ed	Texas	8K	R AB	£18.00
Oldies but Goodies	Gm	Texas Max	16K	C AB	£9.00
Oldies but Goodies	Gm	Texas Max	16K	D AB	£14.00
Othello	Gm	Texas	8K	R AB	£40.00
Personal Record Keeping	Do	Texas	8K	R AB	£50.00
Personal Report Generator	Do	Texas	8K	R AB	£70.00
Physical Fitness	Do	Texas	8K	R AB	£20.00
Pre-School Learning Fun	Ed	Texas	8K	R AB	£17.00
Programming Aids I	Ut	Texas	16K	C AB	£9.00
Programming Aids I	Ut	Texas	16K	D AB	£14.00
Programming Aids II	Ut	Texas	16K	D AB	£24.00
Programming Aids III	Ut	Texas	16K	D AB	£19.00
Saturday Night Bingo	Gm	Texas Max	16k	C AB	£14.00
Soccer	Gm	Texas	8K	R AB,CH	£30.00
Speech Editor	Gm	Texas	8K	R AB	£35.00
Statistics	Do	Texas	8K	R AB	£45.00
Structural Eng'g Library	Bs	Texas	16	C AB	£24.00
Structural Eng'g Library	Bs	Texas Max	16K	D AB	£35.00
TI Invaders	Gm	Texas	8K	R AB,CH	£40.00
TI Trek	Gm	Texas Max	16K	D AB	£14.00
Teach Yourself Extended Basic	Ed	Texas	32K	C AB	£20.00
Teach Yourself Extended Basic	Ed	Texas	32K	D AB	£29.00
Teach Yourself Basic	Ed	Texas	32K	C AB	£30.00
Teach Yourself Basic	Ed	Texas	32K	D AB	£40.00
Terminal Emulator	Ut	Texas	8K	R AB	£57.00
Tombstone City	Gm	Texas	8K	R AB,CH	£40.00
Tunnels of Doom	Gm	Texas	8K	R AB,CH	£40.00
US Football	Gm	Texas	8K	R AB	£24.00
Video Chess	Gm	Texas	8K	R AB,CH	£50.00
Video Games I	Gm	Texas	8K	R AB,CH	£25.00
Video Games II	Gm	Texas	8K	R AB	£25.00
Yahtzee	Gm	Texas	8K	R AB	£30.00
Zero Zap	Gm	Texas	8K	R AB	£24.00

BBC

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes & Prices
Algebraic Manipulation	Ut	Acornsoft	16K	C AL,GA	£9.95
Characters	Ut	Computer Concepts	16K	C GJ	£6.67
Code Race	Gm	Computer Concepts	16K	C GJ	£6.67
Creative Graphic Pack	Ut	Acornsoft	16K	C AL,GA	£9.95
Desk Diary	Bs	Acornsoft	16K	C AL	£9.95
Early Warning	Gm	A&F Software	16K	C GE	£6.00
Graph and Charts Pack	Bs	Acornsoft	16K	C AL,GA	£9.95
Lisp	Bs	Acornsoft	16K	C AL,GA	£16.85
Minefield	Gm	A&F Software	16K	C GE	£6.00
Mulitfile	Bs	Bug Byte	16K	C EA	£25.00
Othello	Gm	Computer Concepts	16K	C GJ	£8.95
Peeko Computer	Bs	Acornsoft	16K	C AL,GA	£9.95
Polecat	Gm	A&F Software	16K	C GE	£6.00
Lisp	Ut	Acornsoft	32K	C AL,GA	£16.85
Monsters	Gm	Acornsoft	32K	C AL,GA	£9.95
Othello	Gm	Computer Concepts	32K	C GJ	£8.95
Peeko Computer	Ut	Acornsoft	32K	C AL,GA	£9.95
Philosopher's quest	Gm	Acornsoft	32K	C AL,GA	£9.95
Snake	Gm	Computer Concepts	32K	C GJ	£6.67
Snapper	Gm	Acornsoft	32K	C AL,GA	£9.95
Space Warp	Gm	Bug Byte	32K	C GA,EA	£11.50
Teacher's Toolkit	Ed	Wida Software	32K	C FY	£30.00
Wordwise	Gm	Computer Concepts	32K	C GJ	£74.75
Valley, The	Gm	CT Software	32K	C PF	£9.95
Algebraic Manipulation	Ut	Acornsoft	32K	C AL,GA	£9.95
Backgammon	Ut	Bug Byte	32K	C EA	£8.00
Characters	Ut	Computen Concepts	32K	C GJ	£6.67
Chess	Gm	Bug Byte	32K	C EA	£11.50
Code Race	Ut	Computer Concepts	32K	C GJ	£6.67
Creative Graphics	Ut	Acornsoft	32K	C AL,GA	£9.95
Defender	Gm	Acornsoft	32K	C AL,GA	£9.95
Desk Diary	Bs	Acornsoft	32K	C AL,GA	£9.95
FORTH	Ut	Acornsoft	32K	C AL	£16.85
Golf	Gm	Bug Byte	32K	C GA,EA	£7.00
Graph and Charts Pack	Bs	Acornsoft	32K	C AL,GA	£9.95



TRS 80

A-Maz-Ing	Gm	Molimerx	4K	C AJ	£6.33
Adventure I	Gm	Adventure Int.	16K	AJ	£13.77
Adventure III	Gm	Adventure Int.	16K	C AJ	£13.77
Adventure III	Gm	Adventure Int.	16K	D AJ	£13.77
Adventureland	Gm	Adventure Int.	24K	D AB	£18.99
Adventure Mysterious	Gm	Adventure Int.	16K	C AJ	£10.06
Adventure Mysterious	Gm	Adventure Int.	32K	D AJ	£13.50
Airflight Simulation	Gm	Instant S/W	16K	C GB,AB	£9.95
Airmail Pilot	Gm	Instant S/W	16K	C GB,AB	£8.50
Ajedit	Bs	Molimerx	32K	C AJ	£49.95
Alien Armada	Gm	Molimerx	16K	C AJ	£10.06
Alien Armada	Gm	Molimerx	32K	D AJ	£13.23
Alien Attack Force	Gm	Instant S/W	16K	C GB,AB	£8.50
Alien Defence	Gm	Soft Sector Mkting		C GB	£15.50
Alien Defence	Gm	Soft Sector Mkting		D GB	£19.75
All Stars	Gm	Instant S/W		D GB	£26.50
				AB	£28.95
All Turret Gunner	Gm	Instant S/W		C GB,AB	£8.50
Amateur Log	Ut	Molimerx	32K	D AJ	£18.40
Angel Worms	Gm	Adventure Int.	8K	C AB	£14.35
Animation	Ut	Molimerx	16K	C AJ	£17.20
Animation	Ut	Molimerx	32K	D AJ	£20.65
Android Nim	Gm	Molimerx	16K	C AJ	£10.06
Armoured Patrol	Gm	Adventure Int.	16K	C GB	£15.50
Armoured Patrol	Gm	Adventure Int.	16K	D AB	£18.99
Assembly Package	Ut	Molimerx	32K	D AJ	£74.75
Asteroids	Gm	Molimerx	16K	C AJ	£10.06
Asteroids	Gm	Molimerx	32K	D AJ	£13.50
Astro Navigator	Gm	Molimerx	16K	C AJ	£14.95
Astroball	Gm	Molimerx	16K	C AJ	£13.77
Astrolog	Ed	Molimerx	16K	C AJ	£10.93
Astronomical Calendar	Ed	Molimerx	16K	C AJ	£10.93
Asylum	Gm	Med Systems		C BT	£12.00
Atlantian Odyssey	Gm	Guild		C GB	£19.75
Atlantian Odyssey	Gm	Guild		D GB	£21.50
Attack Force	Gm	Big 5 S/W	16K	C GB,BT	£10.95
BI Nuclear Bomber	Gm	Instant S/W	16K	C GB	£12.50
				BT	£12.95
BQ81	Bs	Baust Computing	48K	D HA	£79.95
Back 40	Gm	Molimerx	16K	C AJ	£10.06
Back 40	Gm	Molimerx	32K	D AJ	£13.50
Back 40 III	Gm	Adventure Int.	16K	C AB	£14.35
Backgammon	Gm	Adventure Int.	16K	C AB	£7.99
Balrog Sampler	Gm	Adventure Int.	16K	D AB	£33.70
Bandito	Gm	Acorn	16K	C AJ	£7.49
Basic Compiler Accel.	Ut	Microsoft	16K	C AJ	£22.94
Basic Compiler Accel. 3	Ut	Microsoft	16K	C AJ	£45.95
Basic Compiler Accel. 3	Ut	Microsoft	16K	D AJ	£49.95
Basic Insert	Ut	Molimerx	16K	C AJ	£10.95
Basic Insert	Ut	Molimerx	32K	D AJ	£14.39
Basic Programming System	Ut	Instant S/W	16K	C AB	£12.50
Basketball	Gm	Molimerx	16K	C AJ	£10.95
Basketball	Gm	Molimerx	32K	D AJ	£14.39
Battle of Britain	Gm	Molimerx	16K	C AJ	£15.55
Battle Ground	Gm	Instant S/W	16K	C GB,AB	£8.50
Bedchest III	Gm	Adventure Int.	16K	C AB	£20.95
Beewary	Gm	Molimerx	16K	C AJ	£10.06
Beginner's Russian	Ed	Instant S/W	16K	C GB,AB	£8.50
Biorhythm	Ed	Molimerx	16K	C AJ	£8.63
Blackboard	Ut	Molimerx	16K	C AJ	£10.06
Blackjack Master	Gm	Molimerx	16K	C AJ	£21.15
Blackjack Master	Gm	Molimerx	32K	D AJ	£25.42
Blink 1	Ut	Molimerx	32K	D AJ	£17.00
Blockade	Gm	Molimerx	16K	C AJ	£7.48
Bright & Early	Ed	Molimerx	16K	C AJ	£8.90



SOFTWARE LISTING

Business Analysis	Bs	Instant S/W	16K	C	GB	£59.25
Business Analysis	Bs	Instant S/W	16K	D	GB,AB	£82.00
Buzzword	Ed	Molimerx	16K	C	AJ	£5.75
CTN Stock	Bs	Baust Computing	48K	D	HA	£79.00
Calendar	Ut	Molimerx	16K	C	AJ	£10.29
Cash Register	Bs	Molimerx	16K	C	AJ	£10.29
Checker King	Gm	Personal S/W	16K	C	AJ	£16.10
Chemical Formulae	Ed	Molimerx	16K	C	AJ	£10.95
Cheque Book	Dm	Molimerx	16K	C	AJ	£15.53
City Encounters	Ut	Molimerx	16K	C	AJ	£17.20
Climate Comp	Bs	Instant S/W	16K		AB	£20.50
Code Breaker	Gm	Molimerx	16K	C	AJ	£7.49
Combat	Gm	Adventure Int.	16K	C	AB	£12.50
Company Director	Gm	Molimerx	16K	C	AJ	£17.19
Compression Utility	Ut	Instant S/W	16K	C	GB	£15.75
					AB	£16.50
Comproc	Ut	Molimerx	16K	C	AJ	£15.80
Comput-A-Organ	Ed	Molimerx	16K	C	AJ	£6.85
Computer Acquire	Gm	Adventure Int.	16K	C	AB	£10.15
Computer Acquire	Gm	Avalon Hill	16K	C	GB	£17.25
Computer Pools	Do	Molimerx	16K	C	AJ	£16.68
Conflict 2500	Gm	Avalon Hill	16K	C	BT	£12.95
Consequest of Chester Wood	Gm	Adventure Int.	16K	C	AB	£18.99
Constellation	Ed	Molimerx	16K	C	AJ	£14.30
Constellation	Ed	Molimerx	32K	D	AJ	£17.83
Conv/CPM	Ut	Molimerx	32K	D	AJ	£20.70
Convoy Raider	Gm	Avalon Hill		C	BT	£10.95
Cop 16K	Ut	Molimerx	16K	C	AJ	£12.95
Copsys	Ut	Molimerx	16K	C	AJ	£12.95
Corplan	Gm	Molimerx	16K	C	AJ	£32.79
Cosmic Fighter	Gm	Big 5 S/W		C	GB,BT	£10.95
Cosmic Patrol	Gm	Instant S/W	16K	C	GB,AB	£12.50
Cosmic Patrol	Gm	Instant S/W	16K	D	GB,AB	£16.25
Creole Lobster Catcher	Gm	Molimerx	16K	C	AJ	£10.06
Cribbage	Gm	Molimerx	16K	C	AJ	£14.38
Cross Reference	Bs	Molimerx	16K	C	AJ	£8.45
Cube Hunt	Gm	Molimerx	16K	C	AJ	£10.35
Curse of Crawley Manor	Gm	Adventure Int.	16K	D	AB	£18.99
DLDIS	Ut	Instant S/W	16K	D	GB	£15.50
					AB	£16.50
DSM	Ut	Racet Computers	32K	D	AJ	£46.00
Danger in Orbit	Gm	Instant S/W	16K	C	AB	£12.50
Danger in Orbit	Gm	Instant S/W	16K	D	GB	£15.50
Dark Void	Gm	Molimerx	16K	C	AJ	£10.06
Darts	Gm	Molimerx	16K	C	AJ	£10.06
Data Base Management	Bs	Hubert Howe	32K	C	AJ	£28.75
Data Base Management	Bs	Hubert Howe	32K	D	AJ	£32.20
Datestone of Ryn	Gm	Automated Simulation	16K	C	GB	£13.50
Datestone of Ryn	Gm	Automated Simulation	16K	D	GB	£15.50
Day of the Week	Bs	Molimerx	4K	C	AJ	£5.75
Decision Master	Ut	Sytonic S/W	32K	D	GB	£35.50
Defence Command	Gm	Big 5 S/W		C	GB,BT	£10.95
Defend	Gm	Molimerx	16K	C	AJ,CH	£14.95
Defend	Gm	Molimerx	32K	D	AJ	£18.40
Deflections	Gm	Adventure Int.	8K	C	AB	£14.35
Descriptive Statistics	Bs	Molimerx	16K	C	AJ	£15.40
Differential Equations	Bs	Molimerx	16K	C	AJ	£16.10
Direction Finder	Ed	Molimerx	16K	C	AJ	£15.40
Disassembler	Ut	Molimerx	16K	C	AJ	£10.35
Disassembler	Ut	Buy Byte	16K	C	GB	£8.25
					AB	£8.50
Disc Directory	Ut	Molimerx	32K	D	AJ	£20.13
Disc Editor	Ut	Instant S/W	16K	D	GB	£30.50
Disc Scope	Ut	Instant S/W	16K	D	GB	£15.50
Discaid	Ut	Molimerx	32K	D	AJ	£19.49
Discator	Ut	Molimerx	32K	D	AJ	£29.90
Dnieper River Line	Gm	Avalon Hill	32K	C	BH	£12.95
Dnieper River Line	Gm	Avalon Hill	32K	D	BH	£17.55
Doctor Chips	Gm	Instant S/W	16K	C	GB	£12.50
Doctor Chips	Gm	Instant S/W	16K	D	GB	£14.75
Dominoes	Gm	Molimerx	16K	C	AJ	£9.15
Dominoes	Gm	Molimerx	32K	D	AJ	£12.65
Dosort	Ut	Molimerx	32K	C	AJ	£27.60
Double Take 3741	Ut	Molimerx	64K	D	AJ	£44.85
Dragon Quest	Gm	Instant S/W	16K	C	GB	£13.25
Dragon Quest	Gm	Instant S/W	16K	D	GB	£17.50
Dragons of Hong Kong	Gm	Adventure Int.	32K	C	AB	£18.99
Draughts	Gm	Molimerx	16K	C	AJ	£14.95
Draughts	Gm	Molimerx	32K	D	AJ	£18.40
Draw and Graphics Resolver	Bs	Molimerx	16K	C	AJ	£10.95
Dreamworld	Gm	Molimerx	16K	C	AJ	£10.06
Driver	Gm	Molimerx	4K	C	AJ	£6.33
Duel-n-Droids	Gm	Molimerx	16K	C	AJ	£10.93
Dungeon Escape	Gm	Computer Shack	16K	C	GB	£11.95
Dungeon Escape	Gm	Computer Shack	16K	D	GB	£15.50



Dynamic Device Driving	Ut	Instant S/W	16K	D	GB	£20.50
Dynamic Device Driving	Ut	Instant S/W	16K	C	GB	£15.50
					AB	£16.50
Edas	Ut	Molimerx	32K	D	AJ	£53.49
Edit	Ut	Molimerx	16K	C	AJ	£20.13
Editor Assembler Plus	Ut	Molimerx	16K	C	AJ	£24.95
Edjust	Ut	Molimerx	32K	D	AJ	£18.40
Electric Accountant	Bs	Molimerx	48K	D	AJ	£28.75
Electronic Breadboard	Ut	Instant S/W	16K	C	GB	£39.75
					AB	£40.95
Elemental Maze	Ed	Molimerx	16K	C	AJ	£10.93
Eliminator	Gm	Adventure Int.	16K	C	GB	£15.50
Eliminator	Gm	Adventure Int.	16K	D	AB	£18.99
Emperor	Gm	Molimerx	16K	C	AJ	£15.53
Empire of the Overmind	Gm	Avalon Hill	48K	C	BT,BH	£17.95
Enhanced Basic	Ut	Molimerx	16K	C	AJ	£27.60
Enhanced Basic	Ut	Molimerx	32K	D	AJ	£31.05
Epson Patch	Ut	Molimerx	16K	C	AJ	£13.80
Epson Patch	Ut	Molimerx	32K	D	AJ	£17.25
Escape from Tramm	Gm	Adventure Int.	16K	D	AB	£18.99
Everest Explorer	Gm	Molimerx	16K	C	AJ	£10.06
Everest Explorer	Gm	Molimerx	32K	D	AJ	£13.50
Everyday Russian	Ed	Instant S/W	16K	C	GB,AB	£8.50
Fairytale Adventure	Gm	Molimerx	16K	C	AJ	£10.06
Family Tree	Do	Molimerx	32K	D	AJ	£20.70
Farmer Brown	Gm	Molimerx	16K	C	AJ	£7.49
Fed	Ut	Molimerx	32K	D	AJ	£27.60
Fetch	Ut	Molimerx	32K	D	AJ	£15.53
File Handling for Cassette	Ut	Molimerx	16K	C	AJ	£15.93
File Handling for Disc	Ut	Molimerx	32K	D	AJ	£28.75
Filter Package	Ut	Molimerx	32K	D	AJ	£40.25
Financial Analysis	Bs	Molimerx	32K	D	AJ	£46.00
Find it Quick	Ut	Instant S/W	16K	D	GB	£39.75
					AB	£40.95
Flight Path	Gm	Instant S/W	16K	C	GB,AB	£8.50
Flight Plan	Ut	Molimerx	32K	D	AJ	£20.70
Flying Circus	Gm	Instant S/W	16K	D	AB	£24.50
					GB	£25.00
Forbidden City	Gm	Fantastic S/W	16K	D	GB	£27.75
Forest of Mordor	Gm	Molimerx	16K	C	AJ	£8.63
Fortran	Ut	Molimerx	32K	D	AJ	£74.75
Fortress	Gm	Soft Secto Mktingr	16K	D	GB	£15.50
Fortress	Gm	Soft Sector Mkting	16K	C	GB	£11.95
Fox and Hounds	Gm	Molimerx	16K	C	AJ	£7.48
French Vocabulary	Ed	Molimerx	16K	C	AJ	£17.19
Frog	Gm	Adventure Int.	16K	C	AB	£12.50
Frog	Gm	Molimerx	16K	C	AJ	£7.48
Galactic Empire	Gm	Adventure Int.	16K	C	AJ,AB	£9.78
Galactic Empire	Gm	Adventure Int.	32K	D	AB	£18.99
Galactic Revolution	Gm	Adventure Int.	16K	C	AB	£18.99
Galactic Revolution	Gm	Adventure Int.	16K	C	AJ	£9.78
Galactic Trader	Gm	Adventure Int.	16K	C	AJ	£9.78
Galactic Trader	Gm	Adventure Int.	32k	D	AB	£18.99
Galaxy Invasion	Gm	Big 5 S/W	16K	C	GB,BT	£10.95
Gammon Challenger	Gm	Molimerx	16K	C	AJ	£10.06
Gammon Challenger	Gm	Molimerx	32K	D	AJ	£13.51
Gauntlet of Death	Gm	Programmer's Guild	16K	C	GB	£15.50
Gauntlet of Death	Gm	Programmer's Guild	16K	C	GB	£15.50
Gencop	Ut	Molimerx	16K	C	AJ	£10.06
Geography Explorer	Ed	Instant S/W	16K		AB	£40.95
Ghost Town	Gm	Adventure Int.	24K	D	AB	£18.99
Golden Voyage	Gm	Adventure Int.	24K	D	AB	£18.99
Golf	Gm	Molimerx	32K	D	AJ	£17.19
Guns of Fort Defiance	Gm	Avalon Hill	32K	C	BH	£12.95
Guns of Fort Defiance	Gm	Avalon Hill	32K	D	BH	£14.95
HMS Impetuous	Gm	Adventure Int.	32K	D	AB	£18.99
House of 30 Gables	Gm	Instant S/W	16K	C	AB	£8.50
Hyperlight Patrol	Gm	Fantastic S/W	16K	D	GB	£11.25
ID Mailing List	Ut	Instant S/W	16K	D	GB	£19.50
					AB	£20.50
IRV	Ut	Instant S/W	16K	D	GB	£23.75
IRV	Ut	Instant S/W	16K	C	GB	£19.50
					AB	£20.50
Interlude	Gm	Syntonic S/W		C	GB	£20.25
Interlude	Gm	Syntonic S/W		D	GB	£23.50
Invasion Orion	Gm	AutomatedSimulation		C	GB	£13.25
Invasion Orion	Gm	Automated Simulation		D	GB	£15.75
Investor's Paradise	Gm	Instant S/W	16K	C	AB	£8.50
Jabbertalky	Gm	Automated Simulation	16K	D	GB	£18.95
Jet Fighter Pilot	Gm	Instant S/W	16K	C	GB,AD	£12.50
Kid's Gallery	Gm	Instant S/W	16K	C	AB	£8.50
Label	Gm	Instant S/W	16K	C	GB	£18.75
					AB	£20.50
Labyrinth	Gm	Med Systems	16K	C	GB	£11.75
					BT	£10.95
Laser Defence	Gm	Med Systems	16K	C	GB	£11.95
Laser Defence	Gm	Med Systems	16K	D	GB	£14.50
Little Red Riding Hood	Gm	Adventure Int.	16K	C	AB	£14.35
Local Call for Death	Gm	Adventure Int.	32K	D	AB	£18.99
Lords of Karma	Gm	Avalon Hill	40K	D	BH	£14.95
Lunar Lander	Gm	Adventure Int.	16K	C	AB	£12.50
Lunar Lander	Gm	Adventure Int.	16K	D	AB	£18.99
Mail File	Ut	Instant S/W		D	GB	£75.25
Master Directory	Ut	Instant S/W	16K	D	GB	£21.00
Master Reversi	Ut	Instant S/W	16K	D	GB	£23.75
Matchmaker	Gm	Adventure Int.	16K	C	AB	£14.35
Maths Master	Ed	Instant S/W	16K	C	AB	£8.50
Maxi-Micro Manager	Bs	Adventure Int	48K	R	AB	£84.50
Meteor Mission	Gm	Big 5 S/W	16K	C	GB,BT	£10.95
Midway Campaign	Gm	Avalon Hill	16K	C	BT	£10.95
Minotaur	Gm	Instant S/W	16K	C	AB	£8.50
Missile Attack	Gm	Adventure Int.	16K	C	AB	£12.50
Mission Impossible	Gm	Adventure Int.	24K	D	AB	£18.99
Monopolist	Gm	Baust Computing	4K	C	HA	£7.95
Monopolist	Gm	Baust Computing	4K	D	HA	£10.95
Mountain Shoot	Gm	Adventure Int.	16K	D	AB	£18.99
Music Master	Gm	Instant S/W		C	GB,AB	£8.50
Musical Yat-C	Gm	Adventure Int.	16K	C	AB	£12.50
Mystery Funhouse	Gm	Adventure Int.	24K	D	AB	£18.99
News 80	Bs	Baust Computing	48K	D	HA	POA
Night Flight	Gm	Instant S/W	16K	C	GB,AB	£8.50
Norton Forth	Gm	Adventure Int.	32K	D	AB	£33.70
Nuke War	Gm	Avalon Hill	16K	C	BH	£10.95
Oil Tycoon	Gm	Instant S/W	16K	C	AB	£8.50
					GB	£9.95
Old McDonald's Farm	Gm	Adventure Int.	16K	C	AB	£14.35
Perfect Pong	Gm	Instant S/W	16K	C	GB,AB	£12.75
Personal Bill Paying	Do	Instant S/W	16K	C	AB	£6.50
Pirate Adventure	Gm	Adventure Int.	24K	D	AB	£18.99
Planet Miners	Gm	Avalon Hill	16K	C	BH	£10.95
Planetoids	Gm	Adventure Int.	16K	C	AB	£12.50
Programmer and Primer	Ut	Instant S/W	16K	C	AB	£8.50
Programmer's Converter	Ut	Instant S/W	16K	C	AB	£8.50
Pyramids of Doom	Gm	Adventure Int.	24K	D	AB	£18.99
QSL Manager	Do	Instant S/W	16K		AB	£16.50
Quick Change	Bs	Baust Computing	16K	C	HA	£9.95
Quick Change	Bs	Baust Computing	16K	D	HA	£12.95
Renumer and Compress	Ut	Instant S/W	16K	C	AB	£8.50
SDM	Gm	Adventure Int.	16K	C	AB	£20.12
Santaparavia	Gm	Instant S/W	16K	C	AB	£8.50
Savage Island I	Gm	Adventure Int.	24K	D	AB	£18.99
Savage Island II	Gm	Adventure Int.	24K	D	AB	£18.99
Showdown	Gm	Adventure Int.	16K	C	AB	£12.50
Silverflash	Gm	Adventure Int.	16K	C	AB	£12.50
Simutec	Gm	Adventure Int.	16K	C	AB	£12.50
Six Microstories	Gm	Adventure Int.	32K	D	AB	£14.35
Sky Warrior	Gm	Adventure Int.	16K	D	AB	£18.99
Slag	Gm	Adventure Int.	16K	C	AB	£14.35
Space Intruder	Gm	Adventure Int.	16K	C	AB	£14.35
Space Shuttle	Gm	Instant S/W	16K	C	AB	£12.50
Star Fighter	Gm	Adventure Int.	16K	C	AB	£20.95
Star Scout	Gm	Adventure Int.	16K	C	AB	£14.35
Star Trek 3.5	Gm	Adventure Int.	32K	D	AB	£18.99
Stock or Bonds	Gm	Avalon Hill	16K	C	BH	£12.95
Stone of Sisythus	Gm	Adventure Int.	32K	D	AB	£33.70
Strange Odyssey	Gm	Adventure Int.	24K	D	AB	£18.99
Sunday Golf	Gm	Adventure Int.	16K	D	AB	£18.99
Surveyor's Apprentice	Ed	Instant S/W	16K	C	AB	£8.50
Swamp War	Gm	Instant S/W	16K	C	AB	£12.50
TL DIS	Ut	Instant S/W	16K	C	AB	£12.50
TRS Test	Ut	Instant S/W	16K	C	AB	£8.50
Tanktics	Gm	Avalon Hill	16K	C	BH	£15.95
Teacher's Aid	Ed	Instant S/W	16K		AB	£34.50
Temple of the Sun	Gm	Instant S/W	16K		AB	£16.50
The Count	Gm	Adventure Int.	24K	D	AB	£18.99
The Mean Checkers Machine	Gm	Adventure Int.	16K	C	AB	£14.35
Treasure Quest	Gm	Adventure Int.	16K	C	AB	£14.35
Tunnels of Fahad	Gm	Adventure Int.	16K	C	AB	£12.50
Two Heads of the Coin	Gm	Adventure Int.	32K	D	AB	£18.99
Typing Teacher	Ed	Instant S/W	16K	C	AB	£8.50
Ultra Man	Ut	Instant S/W	16K		AB	£21.50
Voodoo Castle	Gm	Adventure Int.	24K	D	AB	£18.99
Voyager	Gm	Avalon Hill	16K	C	BH	£12.95
What Next?	Gm	Baust Computing	4K	D	HA	£6.95
What Next?	Gm	Baust Computing	4K	C	HA	£3.95
Zossed in Space	Gm	Adventure Int.	16K	D	AB	£14.35
Zossed in Space	Gm	Adventure Int.	16K	C	CH	£10.00
Valley	Gm	CT Software	16K	C	PF	£9.95

SOFTWARE LISTING

ATARI 400

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes & Prices
3-D Supergraphics	Ut	United S/W of America	48K	C BC	£29.95
3-D Supergraphics	Ut	United S/W of America	48K	D AB	£39.95
6502 Disassembler	Ut	Quality S/W	16K	C BC	£8.95
6502 Disassembler	Ut	Quality S/W	16K	D BC	£11.95
747 Landing Simulation	Gm	Atari	24K	C GC	POA
				AB	£16.75
Adventureland	Gm	Adventure Int.	24K	C BC	£14.95
				AB	£16.50
Adventures 1-12	Gm	Adventure Int.	32K	C CH	£16.50
Air Strike	Gm	English S/W	16K	C CH,HM	£15.95
Alpha Fighter	Gm	Dinacomp	24K	C AB	£11.99
Analog Adventure	Gm		32K	D BC	£34.95
Angle Worms	Gm	Adventure Int.	8K	C AB	£12.50
Ants Hill	Gm	Atari	8K	C GC	POA
				AB	£11.25
Armoured Patrol	Gm	Adventure Int.	16K	C AB	£16.50
Assembler Editor	Ut	Atari		R AB,HM	£39.95
Assembler	Ut	Quality S/W	16K	C BC	£14.95
Assembler Editor	Ut	United S/W of America	16K	R BC	£34.50
Asteroids	Gm	Atari	16K	R AC, BC,CH, HM	£29.95
				BC	£18.95
Atari Word Processor	Bs	Atari	32K	C AB	£95.95
Atari Word Processor	Bs	Atari	32K	C BC	£85.00
Atari Word Processor	Bs	Atari	32K	D HM	£99.95
Atari World Graphics	Ut	United S/W of America	48K	D BC	£43.95
Avalanche	Gm	Atari	16K	C GC	POA
				CH	£13.95
				AB	£16.75
Babel	Gm	Atari	16K	C GC	POA
				AB	£16.75
Balrog Sampler	Gm	Adventure Int.	32K	C AB	£24.95
Basic A Plus	Ut	OSS S/W	48K	D BC	£52.50
Basic A Plus and Operating System A	Ut	OSS S/W	48K	D BC	£99.50
Basic Program Compress.	Ut	Atari	32K	D AB	£16.75
Basic Utility/Renumber	Ut	Atari	16K	C AB	£16.75
Basics of Animation	Ed	Santa Cruz	24K	D BC	£10.95
Basics of Animation	Ed	Atari	16K	C BC	£9.95
Basics of Animation	Ed	Santa Cruz	16K	C AB	£13.95
Basketball	Gm	Atari	16K	C AC,HM	£24.50
Basketball	Gm	Atari	16K	R AB,BC	£29.95
Beneath the Pyramids	Gm	Chrystal	48K	C CH,AB	£19.99
Black Jack	Gm	Atari	16K	C GC	POA
				AC,BC	£8.95
				AB,HM	£9.95
Black Jack Shooter	Ed	Atari	16K	C AB	£16.75
Bob's Business	Bs	Santa Cruz	16K	C AB	£9.95
British Heritage Jigsaw Puzzle	Gm	Thorn EMI	16K	C BC,HM	£19.95
Bumper Pool	Gm	Atari	16K	C GC	POA
				AB	£11.25
Calculator	Bs	Atari	24K	D BC	£16.95
Caverns of Mars	Gm	Atari	16K	C BC,HM	£24.50
Caverns of Mars	Gm	Atari	16K	C BC,HM	£24.50
Centipede	Gm	Atari	16K	R GC	POA
				BC,HM	£29.95
Champelo	Gm	Dinacomp	16K	C AB	£10.99
Character Generator	Ut	Data Soft	16K	C BC	£9.97
Character Generator	Ut	Data Soft	16K	D BC	£12.50
Checker Kim	Gm	Personal S/W	16K	C BC	£15.95
Chrystals	Gm	Dinacomp	24K	C AB	£9.99
Code Cracker	Gm	Atari	8K	C GC	POA
				AB	£11.25
Computer Acquire	Gm	Avalon Hill	16K	C GB	£17.25
Computer Chess	Gm	Atari	16K	R GC	POA
				CH,AC,HM	
				AB,BC	£24.95
Conflict 2500	Gm	Avalon Hill		C GB,AB	£12.50
Controller	Gm	Avalon Hill	32K	D BH	£17.95
Conversational French	Ed	Atari	16K	C AC,BC	£32.50
Conversational French	Ed	Atari	16K	R AB,HM	£39.95
Conversational German	Ed	Atari	16K	C AC,BC	£32.50
Conversational German	Ed	Atari	16K	R AB,HM	£39.95
Conversational Italian	Ed	Atari	16K	R AB,HM	£39.95
Conversational Italian	Ed	Atari	16K	C AC,BC	£32.50
Conversational Spanish	Ed	Atari	16K	R AB,HM	£39.95
Conversational Spanish	Ed	Atari	16K	C AC,BC	£32.50
Convoy Raider	Gm	Avalon Hill	16K	C BH	£10.95
				GB,AB	£12.50
Cribbage and Dominoes	Gm	Thorn EMI	16K	C CH,BC,HM	£14.95
Crush, Crumble, Chomp	Gm	Avalon Hill	16K	C GB	£15.50
Crush, Crumble, Chomp	Gm	Avalon Hill	16K	D GB	£17.95
Crypts of Terror	Gm	In Home S/W	16K	C CH,HM	£19.95
Curse of Crawley Manor	Gm	Adventure Int.	16K	C AB	£16.50
Cypher Bowl	Gm	Artsci Inc.	32K	D BC	£22.45
DI Nuclear Bomber	Gm	Avalon Hill	16K	C BH	£10.95
Darts	Gm	Thorn EMI	16K	C CH,BC,HM	£19.95
Data Management S/W	Bs	C E S/W	48K	D AB	£101.00
Data Management System	DO	Atari	32K	D AB	£20.50
Datestone of Ryn	Gm	Avalon Hill		D GB	£15.50
Datestone of Ryn	Gm	Avalon Hill		C BC	£14.95
				GB	£13.50
Deflections	Gm	Adventure Int.	8K	C AB	£12.50
Disc Fixer	Ut	Atari	16K	D AB	£22.50
Display List	Ed	Santa Cruz	16K	C BC	£9.95
Display List	Ed	Santa Cruz	16K	D BC	£10.95
Dnieper River	Gm	Avalon Hill	48K	C BH	£15.95
				CH	£14.50
Domination	Gm	Atari	24K	C GC	POA
				AB	£16.75
Dos 2	Ut	Atari	32K	D AB	£21.95
Dragon of Hong Kong	Gm	Adventure Int.	32K	C AB	£16.50
Eastern Front	Gm	Atari	16K	C CH	£24.95
Eastern Front	Gm	Atari	16K	D AB	£30.25
Empire of the Overmind	Gm	Avalon Hill		C BH	£17.95
				CH	£18.95
Empire of the Overmind	Gm	Avalon Hill		D GB,AB	£24.95
Escape from Tramm	Gm	Adventure Int.	16K	C AB	£16.50
European Capitals	Ed	Atari	16K	C AC,BC	£8.95
				AB,HM	£9.95
European Scene Jigsaw Puzzle	Gm	Thorn EMI	16K	C BC,HM	£19.95
Extended WSNA	Ut	Atari	16K	C AB	£19.00
Fantasy land 2041	Gm	Chrystal	48K	C CH,AB	£34.99
Fastgammon	Gm	Quality S/W	16K	C BC	£9.95
Forest Fire	Gm	Dinacomp	24K	C AB	£15.99
Frog	Gm	C E S/W	16K	C AB	£9.95
Galactic Chase	Gm	Spectrum	16K	C AB,BC,HM	£15.99
Galactic Chase	Gm	Spectrum	16K	D AB	£20.25
Galactic Chase	Gm	Spectrum	16K	D BC,HM	£17.95
Galactic Empire	Gm	Adventure Int.	32K	C BC	£14.95
				AB	£16.50
Galactic Guest	Gm	Chrystal	48K	C CH,AB	£19.99
Galactic Trader	Gm	Adventure Int.	32K	C AB,CH	£16.50
Galaxy	Gm	Avalon Hill	16K	C BH	£12.95
Galaxy	Gm	Avalon Hill	16K	D BH	£14.95
Ghost Hunter	Gm	Arcade Plus	16K	C CH	£16.95
Ghost Town	Gm	Adventure Int.	24K	C BC	£14.95
				AB	£16.50
Giant Slalem	Gm	Dinacomp	16K	C AB	£11.99
Golden Voyage	Gm	Adventure Int.	24K	C BC	£14.95
				AB	£16.50
Gomoku	Gm	Artsci Inc	16K	C BC	£14.95
Graph it	Ut	Atari	16K	C AC,BC	£11.95
				AB,HM	£13.95
Graphic Sound Demo	Gm	Atari	16K	D GC	POA
				AB	£16.75
Graphics Machine	Ut	Santa Cruz	16K	C AB	£13.50
Guns of Fort Defiance	Gm	Avalon Hill	32K	C BH	£12.95
HMS Impetuous	Gm	Adventure Int.	32K	C AB	£16.50
Hangman	Gm	Atari	16K	C AC,BC	£8.95
				AB,HM	£9.95
Hickory Dickory Dock	Gm	Thorn EMI	16K	C BC,HM	£19.95
Home Financial Mg'ment	Dm	Thorn EMI	16K	D HM	£29.95
Horizontal/Vertical Scrolling	Ed	Santa Cruz	16K	C AB	£13.95
House of Usher	Gm	Chrystal	48K	C AB,CH	£19.99
Humpty Dumpty/Jack & Jill	Gm	Thorn EMI	16K	C BC,HM	£19.95
Intruder Alert	Gm	Dinacomp	16K	C AB	£15.99
Invasion Orion	Gm	Avalon Hill		C GB	£13.25
Invasion Orion II	Gm	Avalon Hill		D GB	£15.75
Invitation to Prog I	Ed	Atari	16K	C AB,HM	£15.95
Invitation to Prog. II	Ed	Atari	16K	C GC	POA
				AB,BC,HM	£22.95
Invitation to Prol. III	Ed	Atari	16K	C AB,BC,HM	£22.95
Jawbreaker	Gm	On Line	48K	D BC	£22.95
Jumbo Jet Lander	Gm	Thorn EMI	16K	C BC,HM	£29.95
K Dos	Ut	K Bite	32K	D BC	£53.95
Kids I	Ed	Santa Cruz	16K	C AB	£9.95
Kids II	Ed	Santa Cruz	16K	C AB	£9.95
Kingdom	Gm	Atari	16K	C AC,BC	£8.95
				AB,HM	£9.95
Krazy Shoot Out	Gm	K Bite	16K	C BC,CH,HM	£29.95
Lazerwords	Gm	Chrystal	16K	C AB	£19.99
Letter Writer	Bs	CE S/W	16K	C AB	£19.95
Little Chrystal	Gm	Chrystal	48K	C CH,AB	£26.99
Little Red Riding Hood	Gm	Adventure Int.	16K	C AB	£12.50
Local Call for Death	Gm	Adventure Int.	32K	C AB	£16.50
Lords of Karma	Gm	Avalon Hill	48K	C CH,BH	£12.95
Lords of Karma	Gm	Avalon Hill	48K	D CH,BH	£14.95
Lunar Lander	Gm	Adventure Int.	16K	C AB	£16.50
Macro Assembler	Ut	Atari	32K	R BC,HM	£59.95
Matchmaker	Gm	Adventure Int.	16K	C AB	£12.50
Micro Chess	Gm	Personal S/W	16K	C BC	£15.95

Microsoft Basic	Ut	Atari		C	AB,BC,HM	£59.95
Midway Campaign	Gm	Avalon Hill	32K	C	AB	£12.50
Mind Bogglers	Gm	Versa Computing	16K	C	BC	£8.95
Mini Wordprocessor	Ed	Santa Cruz	32K	C	AB	£9.95
Minotaur	Gm	Atari	24K	C	GC	POA
					AB	£11.25
Missile Command	Gm	Atari	16K	R	BC,AC,CH HM	£29.95
Mission Impossible	Gm	Adventure Int.	24K	C	BC	£14.95
					AB	£16.50
Monarch	Gm	Dinacomp	16K	C	AB	£10.99
Moon Probe	Gm	Dinacomp	16K	C	AB	£9.99
Mortgage Loan Analysis	Ed	Atari	16K	C	AB,BC,HM	£13.95
Mountain Shoot	Gm	Adventure Int.	16K	C	AB	£16.50
Mountain Shoot	Gm	Analog S/W	16K	C	BC	£10.95
Mouskattack	Gm	On Line		D	CH	£22.95
Movie Scenes	Gm	Atari	16K	C	BC	£9.95
Moving Maze	Gm	Dinacomp	16K	C	AB	£9.99
Music Composer	Gm	Atari	16K	R	AC,BC	£32.50
					AB,HM	£35.95
Mystery Funhouse	Gm	Adventure Int.	24K	C	BC	£14.95
					AB	£16.50
Nomino's Jigsaw	Gm	Dinacomp	24K	C	AB	£15.99
Norton Forth	Gm	Adventure Int.	32K	C	AB	£24.95
Nuke War	Gm	Avalon Hill	16K	C	BH	£10.95
					AB	£16.50
Old McDonald's Farm	Gm	Adventure Int.	16K	C	AB	£12.50
Operating System A Plus	Ut	OSS S/W	48K	D	BC	£52.50
Outlaw Howitzer	Gm	Atari	24K	C	GC	POA
					AB	£16.75
Pac-Man	Gm	Atari	16K	R	GC	POA
					BC,HM	£29.95
Page Flipping	Ed	Santa Cruz	16K	C	BC	£9.95
Page Flipping	Ed	Santa Cruz	16K	D	BC	£10.95
Personal Finance	Gm	Atari		R	BC,HM	£49.00
Pilot (Educator)	Ut	Atari	16K	C/R	AB,BC,HM	£79.95
Pirate Adventure	Gm	Adventure Int.	24K	C	BC	£14.95
					AB	£16.50
Planet Miners	Gm	Avalon Hill	24K	C	BH	£10.95
Player Missile Graphics	Ed	Santa Cruz	24K	D	BC	£19.95
Player Missile Graphics	Ed	Santa Cruz	24K	C	BC	£18.95
					AB	£19.95
Poker & Solitaire	Gm	Artsci Inc.	16K	C	BC	£10.95
Program Pack I	Ut	Avalon Hill	16K	C	GB	£3.50
Purchase Ledger	Bs	Atari	48K	C	AB	£149.95
Pyramid of Doom	Gm	Adventure Int.	24K	C	BC	£14.95
					AB	£16.50
QS Forth	Ut	Quality S/W	24K	D	BC	£44.90
Quest for Power	Gm	Chrystal	48K	C	CH,AB	£26.99
Race in Space	Gm	Analog S/W	16K	C	BC	£14.95
Rescue at Rigel	Gm		32K	C	BC	£22.45
Reversi	Gm	Artsci Inc	16K	C	BC	£14.95
Rings of the Empire	Gm	Dinacomp	16K	C	AB	£15.99
Rotate and Tilt	Gm	Thorn EMI	16K	C	BC,HM	£14.95
Sales Ledger	Bs	Atari	48K	C	AB	149.95
Sands of Mars	Gm	Chrystal	48K	C	CH,AB	£26.99
Savage Island I	Gm	Adventure Int.	24K	C	BC	£14.95



SOFTWARE LISTING

Savage Island II	Gm	Adventure Int.	24K	C	BC	£14.95
					AB	£16.50
Scram	Gm	Atari	16K	C	GC	POA
					AB,CH,HM	£17.50
Shooting Gallery	Gm	Analog S/W	16K	C	BC	£14.95
Six Microstories	Gm	Adventure Int.	32K	C	AB	£12.50
Sky Warrior	Gm	Adventure Int.	16K	C	AB	£16.50
Snooker and Billiards	Gm	Thorn EMI	16K	C	BC,HM	£19.95
Sound Editor	Gm	Atari	16K	C	GC	POA
					AB	£16.75
Sound Tutorial	Ed	Santa Cruz	16K	C	AB	£13.95
Space Invaders	Gm	Atari	16K	R	AB,CH,H-M,BC	£29.95
Space Tilt	Gm	Dinacomp	16K	C	AB	£9.99
Space Trap	Gm	Dinacomp	24K	C	AB	£12.99
Space Trek	Gm	Atari	24K	C	GC	POA
					AB	£13.50
Star Raiders	Gm	Atari	16K	R	HM,AC,BC CH	£29.95
Star Trek 3.5	Gm	Adventure Int.	32K	C	BC	£14.95
					AB	£16.50
Star Warrior	Gm	Epyx	32K	C	BC	£28.95
States and Capitals	Ed	Atari	16K	C	AC,BC	£8.95
					AB,HM	£9.95
Statistics I	Gm	Atari		C	AC,BC	£11.95
					AB,HM	£13.95
Stock and Bonds	Gm	Avalon Hill	32K	C	BH	£12.95
Stone of Sisythus	Gm	Adventure Int.	32K	C	AB	£24.95
Strange Odyssey	Gm	Adventure Int.	24K	C	BC	£14.95
					AB	£16.50
Stud Poker	Gm	Dinacomp	16K	C	AB	£10.99
Submarine Commander	Gm	Thorn EMI	16K	C	BC,HM	£24.50
Summer	Gm	Chrystal	16K	C	AB	£11.99
Sunday Golf	Gm	Adventure Int.	16K	C	AB	£16.50
Super Breakout	Gm	Atari	16K	C	AC,HM	£24.50
Super Breakout	Gm	Atari	16K	R	AB	£35.95
Tack Trek	Gm	Atari	24K	C	GC	POA
					AB	£13.50
Tank Trap	Gm	Quality S/W	16K	C	BC	£8.95
Tank Trap	Gm	Quality S/W	16K	D	BC	£11.95
Tanktics	Gm	Avalon Hill	32K	C	CH	£16.95
Tari Trek	Gm	Quality S/W	16K	C	BC	£8.95
Tari Trerk	Gm	Quality S/W	16K	D	BC	£11.95
Tele Link	Gm	Atari	16K	R	HM	£21.50
Tele Link	Ut	Atari	16K	R	AB	£19.95
Telelink	Ut	Data Soft	16K	R	BC	£14.95
Terrie	Gm	Atari	32K	C	GC	POA
					AB	£16.75
Text Wizard	Ut	Data Soft	16K	D	AB	£99.95
The Count	Gm	Adventure Int.	24K	C	BC	£14.95
					AB	£16.50
Threshold	Gm	On-Line	32K	C	HM	£24.95
Thunder Island	Gm	Analog S/W	16K	C	BC	£10.95
Touch Typing	Ed	Atari	16K	C	AC,BC	£14.95
					AB,HM	£15.95
Tournament Pool and 8 Ball Pool	Gm	Thorn EMI	16K	C	CH,BC,HM	£19.95
Triple Blockade	Gm	Dinacomp	16K	C	AB	£12.99
Two Heads of the Coin	Gm	Adventure Int.	32K	C	AB	£16.50
Video Easel	Gm	Atari	16K	R	GC	POA
					AB,BC,HM	£24.50
Visicalc	Bs	Personal S/W	32K	D	BC	£119.95
Voodoo Castle	Gm	Adventure Int.	24K	C	BC	£14.95
					AB	£16.50
Voyager	Gm	Avalon Hill	32K	C	CH,BH	£12.95
Waterloo	Gm	Chrystal	48K	C	CH	£32.99
Wizard and the Princess	Gm	On Line	48K	D	CH	£22.95
World War III	Gm	Chrystal	48K	C	CH,AB	£19.99

SHARP MZ-80K

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes & Prices
3-D Basic	Gm	Kuma	6K	C AX,AO,AB	£6.32
Address Book	Gm	Highlight S/W	4K	C CC,AB	£4.60
Aladdin's Cave	Gm	Kuma		C AX,CH	£6.32
Aldebaren I	Gm	Sharpsoft	20K	C CH	£5.85
Alien Attack	Gm	J Wolsencroft	24K	C CZ	£4.60
Analysis Book	Bs	Microtek	48K	C EQ	£95.00
Animate	Gm	Kuma	48K	C AX,AB,AO	£9.20
Apollo Front Panel	Bs	Kuma	20K	C AX	£14.35
Apolloword	Bs	Kuma	48K	C AX,AC,AO	£28.70
Apolloword	Bs	Kuma	48K	D AX,AC,AO	£63.25
Ardensoft Toolkit	Ut	Kuma	20K	C AX	£40.25
Asteroids	Gm	Sharpsoft	20K	C CH	£5.85
Astro Dodge	Gm	Kuma		C AX,CH	£6.32
Auto Cross	Gm	Highlight S/W	6K	C CC,AB	£4.60
Backgammon	Gm	Highlight S/W	10K	C CC,AB	£5.75
Bank Account	Do	Highlight S/W	6K	C CC,AB	£4.60
Basic Compiler	Ut	Sharp	48K	C AB	£34.50
Basic Extensions	Ut	Kuma	20K	C AX,AO,AB	£14.95
Basic Plus	Ut	Kuma		C AX	£13.80
Bio-Rhythm	Gm	Highlight S/W	6K	C CC,AB	4.60
Block QC	Gm	Sharpsoft	20K	C AB	£3.50
Block Stop	Gm	J Wolstencroft	24K	C CZ	£4.60
Blockade	Gm	Kuma	48K	C AX,AO,AB	£6.32
Bomber	Gm	Kuma	6K	C AX,AO,AB	£6.32
Breakout	Gm	Kuma	48K	C AX,AO,AB	£6.32
Breakout	Gm	Sharpsoft	20K	C AB	£5.75
Bridge	Gm	Highlight S/W	22K	C CC	£12.95
Brownian Motion	Ed	Kuma		C AX	£12.00
CPM	Ut	Chrystal	48K	C AX,AO	£172.50
Calc II	Bs	Kuma	20K	C AX,AO,FZ	£39.65
Camelot	Gm	Kuma	48K	C AX,AC,AB AO,FZ	£6.32
Carols	Gm	Kuma	48K	C AX,AO,AB	£6.32
Cash Book	Bs	Microtek	48K	C EQ	£95.00
Casino	Gm	Kuma		C AX	£6.32
Catch 2000/Invader	Gm	Kuma	12K	C AX,AO,AB	£6.32
Cesil III	Ed	Kuma	20K	C AX	£17.20
Chase	Gm	Highlight S/W	6K	C CC,AB	£5.75
Chess	Gm	Kuma	12K	C AX,AO,FZ,CH	£12.00
Children's Maths	Ed	Kuma		C AX	£6.32
Chrystal Basic	Ut	Chrystal	48K	C AX,AO	£46.00
Colditz	Gm	Sharpsoft	20K	C CH	£8.46
Combat	Gm	Highlight S/W	6K	C CC,AB	£5.75
Combat	Gm	Kuma	12K	C AX,AO,AB	£6.32
Commands	Gm	Sharpsoft	20K	C AB	£5.85
Composer	Gm	Highlight S/W	6K	C CC,AB	£5.75
Concentration	Gm	Kuma	12K	C AX,AO,AB	£6.32
Connect 4	Gm	Highlight S/W	6K	C CC,AB	£4.60
Cosmiad	Gm	Highlight S/W	10K	C CC,AB	£5.75
Cosmiad	Gm	Kuma	12K	C AX,AC,AO,AB	£9.20
Count and Add	Ed	Highlight S/W	22K	C CC,AB	£5.75
Cribbage	Gm	Kuma	12K	C AX,AO	£12.00
Cricket	Gm	Kuma		C AX	£6.32
Cursed Chambers	Gm	J Wolstencroft	48K	C CZ	£5.75
Data Base	Bs	Kuma	48K	C AX,AO	£33.95
Data File	Gm	Gamer	48K	C CZ	£29.95
Disassembler	Ut	Kuma	20K	C AX,AO,AB	£12.00
Donky Derby	Gm	Kuma	12K	C AX,AO,AB	£6.32
Double Precision Basic	Ut	Sharp	48K	C AB	£28.75
Double Precision Basic	Ut	Sharp	48K	D AX	£46.00
Drunken Driver	Gm	Highlight S/W	6K	C CC,AB	£5.75
Dybug	Ut	Kuma		C AX	£16.65
Editor Assembler	Ut	Sharp	48K	C AB	£15.50
Editor Assembler	Ut	Sharp	48K	D AX	£51.75
Election '84	Gm	Sharpsoft	20K	C CH	£8.45
Electronic Organ	Gm	Kuma	12K	C AX	£6.32
Electrons I	Ed	Kuma		C AX	£12.00
Electrons II	Ed	Kuma		C AX	£12.00
Empire II	Gm	Sharpsoft	20K	C AB	£5.85
Enigma	Gm	Kuma	12K	C AX	£6.32
Escape Forth	Gm	J Wolstencroft	24K	C CZ	£4.60
Evasion	Gm	Kuma	6K	C AX,AO	£6.32
Executive	Gm	Kuma	6K	C AX,AB	£9.20
Exploring Africa	Gm	Kuma	6K	C AX,AB	£6.32
F DOS	Ut	Sharp	48K	C AB	£57.50
Fall Out	Gm	Kuma	6K	C AX,AO	£6.32
Fireballs	Gm	Kuma	6K	C AX,AB	£6.32
Football Manager	Gm	Highlight S/W	10K	C CC,AB	£5.75
Forth	Ut	Kuma		C AX	£40.20
Foundry Package	Bs	Microtek	48K	C EQ	POA
Four in a Row	Gm	Kuma	6K	C AX,AO,AB	£6.32
Fox and Geese	Gm	Highlight S/W	6K	C CC,AB	£4.60
Fruit Machine	Gm	Kuma	6K	C AX,AO,AB	£6.32
Full Accounting	Bs	Microtek	48K	C EQ	POA
Guess Word	Gm	Kuma	6K	C AX,AB	£6.32
Hangman	Gm	Kuma	6K	C AX,AO,AB	£6.32
Head On	Gm	Highlight S/W	10K	C CC,AB	£6.90
Head On	Gm	Kuma	6K	C AX,AO,AB	£6.32
Head On	Gm	Sharpsoft	20K	C CH	£5.85
Hissing Sid	Gm	Kuma		C AX	£6.32
Home Budget I	Do	Kuma	6K	C AX,AC,AO,AB	£6.32
Hunter Killer	Gm	Kuma	48K	C AX,AB	£6.32
I Spy	Ed	Highlight S/W	22K	C CC	£5.75
Instant Addition And The Four Rules	Ed	Kuma		C AX	£6.32
Intruder	Gm	Kuma	48K	C AX,AO,AB	£6.32
Invaders	Gm	Kuma	20K	C FZ	£6.30
J S Line 4	Gm	Kuma	48K	C AX,AB	£6.32
Junior Maths and Stepping Stones	Ed	Kuma		C AX	£6.32
Juntori	Gm	Sharpsoft	20K	C AB	£5.85
Kentucky Derby	Gm	Kuma		C AX	£6.32
Knights Commander	Ut	Knights	48K	C AX	£28.75
Knights Commander	Ut	Knights	48K	D AX	£74.75
Knights Fortran	Ut	Knights	48K	C AX	£34.50
Knights Wee Pascal	Ut	Knights	48K	C AX	£23.00
Large Display	Gm	Kuma	48K	C AX	£6.32
Las Vegas	Gm	Sharpsoft	20K	C AB	£5.85
Life	Gm	Kuma	48K	C AX,AO,AB	£9.20

Lunar	Gm	Kuma	48K	C AX,AO,AB	£6.32
Lunar Lander	Gm	Kuma	48K	C AX,AO,AB	£6.32
MZ Othello	Gm	Kuma	48K	C AX	£12.00
Madness	Gm	J Wolstencroft	24K	C CZ	£4.60
Maniac	Gm	Highlight S/W	6K	C CC,AB	£5.75
Map of England	Gm	Kuma	48K	C AO	£6.32
Map of Englad	Gm	Kuma	48K	D AX	£12.00
Mastermind	Gm	Highlight S/W	6K	C CC,AB	£4.60
Mastermind	Gm	Kuma	48K	C AX,AO,FZ,AB	£6.32
Match the Character	Ed	Highlight S/W	22K	C CC,AB	£4.60
Match the Word	Ed	Highlight S/W	22K	C CC,AB	£5.75
Maths	Ed	Highlight S/W	22K	C CC	£5.75
Melody	Gm	Kuma	48K	C AX	£6.32
Memory Tests	Ut	Kuma	20K	C AX,AO,AB	£6.32
Minefield	Gm	Kuma	48K	C AX	£6.32
Miz-Maze	Gm	Kuma	48K	C AX,AO	£6.32
Monkey Climb	Gm	Kuma	48K	C AX,AO	£6.32
Moonlander	Gm	Highlight S/W	10K	C CC,AB	£5.75
Mortar Attack	Gm	Kuma	48K	C AX,AO	£6.32
Music Composer/Editor	Ed	Kuma	48K	C AX,AC,AB	£12.00
Narpex	Ed	Kuma		C AX	£28.70
Newton/Conservation	Ed	Kuma		C AX	£12.00
Pac Man	Gm	Kuma		C AX	£9.20
Pascal	Ut	Sharp	48K	C AB	£34.50
Patience	Gm	Kuma	48K	C AX,AO	£6.32
Payroll	Bs	Microtek	48K	C EQ	£65.00
Picture Count	Ed	Highlight S/W	22K	C CC,AB	£5.75
Pilot	Ut	Kuma		C AX	£17.25
Poker	Gm	Kuma	48K	C AX,AO,AB	£6.32
Pontoon	Gm	Kuma	48K	C AX,AO,AB	£6.32
Poseidon	Gm	Highlight S/W	6K	C CC, AB	£5.75
Princess & Monster Maze	Gm	Kuma	48K	C AX,AB	£6.32
Program Filing Index	Bs	Kuma	20K	C AX	£6.32
Quadrax	Gm	Kuma	48K	C AX,AO,AB	£6.32
Quest	Gm	J Wolstencroft	48K	C CZ	£4.60
Race Track	Gm	Kuma	48K	C AX,AO,AB	£6.32
Racing	Gm	Kuma	48K	C AX	£6.32
Raider	Gm	Kuma	48K	C AX,AO,AB	£6.32
Reactor	Gm	Kuma	48K	C AX,AB	£6.32
Rhymes	Gm	Kuma	48K	C AX,AB	£6.32
Road Hunter	Gm	Kuma	48K	C AX,AO,AB	£6.32
Rocket	Ed	Kuma		C AX	£6.32
Semi Conductors I	Ed	Kuma		C AX	£12.00
Semi Conductors II	Ed	Kuma		C AX	£12.00
Shape Match	Gm	Kuma	48K	C AX,AO	£6.32
Shapes	Ed	Highlight S/W	22K	C CC,AB	£5.75
Sharp Demo	Gm	Kuma	48K	C AX,AO	£6.32
Show Jumping	Gm	Kuma	48K	C AX,FZ	£6.32
Shudo	Gm	Kuma	48K	C AX	£6.32
Simon	Gm	Kuma	48K	C AX	£6.32
Slave Interpreter	Ut	Kuma		C AX	£16.65
Snakes and Ladders	Gm	Kuma	48K	C AX,AO	£6.32
Solid State Non VAT Accounts	Ed	Kuma		C AX	£33.90
Solid State VAT Accounts	Ed	Kuma		C AX	£33.90
Space Battle	Gm	Kuma	48K	C AX,AO,AB	£6.32
Space Invaders	Gm	Kuma	48K	C AX,AO,AC,AB	£6.32
Space Pursuit	Gm	Kuma	48K	C AX,AO,AB	£6.32
Star Trek	Gm	Kuma	10K	C AX,AC,AO	£6.32
Stock Control/Invoicing	Bs	Microtek	48K	C EQ	£316.00
Stomper	Gm	Kuma	10K	C AX,FZ,AB	£6.32
Stomper/Minefields	Gm	Sharpsoft	20K	C AB	£5.85
Submarine	Gm	Kuma	10K	C AX,AO	£6.32
Super Simon	Gm	Kuma	48K	C AX,AO	£6.32
Supercopy	Ut	Kuma	20K	C AX	£12.00
Superfire	Gm	Kuma	48K	C AX	£6.32
Supermouse	Gm	Kuma	48K	C AX,CH	£6.32
Swordmen	Gm	Kuma	48K	C AX,AO	£9.20
Tank Wall	Gm	Kuma	48K	C AX,AO	£6.32
Tenpin Bowling	Gm	Kuma	48K	C AX,AO	£6.32
Timetabling Aid	Ed	Kuma	20K	C AX	£22.45
Towering Inferno	Gm	Sharpsoft	20K	C CH,AB	£5.85
Towers of Hanoi	Gm	Kuma	48K	C AX	£6.32
Track Layer	Gm	Kuma	48K	C AX,CH	£6.32
Trader Smith	Gm	Kuma	48K	C AB	£6.32
Tycoon	Gm	Kuma	48K	C AX,AO	£6.32
UFO	Gm	Kuma	6K	C AX,AC	£6.32
Waves I	Ed	Kuma		C AX	£12.00
Waves II	Ed	Kuma		C AX	£12.00
Wordpro	Bs	Kuma	48K	C AX,AC	£45.45
Wordpro	Bs	Kuma	48K	C AX,AC	£91.95
Zen Dos	Ut	Kuma	4K	C AX	£66.16
Zen Editor Assembler	Ut	Kuma	20K	C AX,AO,AB	£22.45
Zenmod	Ut	Kuma	4K	C AX,AB	£12.00



SOFTWARE LISTING

VIC20

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes & Prices
3-D Maze	Gm	Adcom	8K	C AB	£7.50
3-D Maze	Gm	Hi-Tech	3K	C FZ	£8.30
				CF,AO	£8.62
A-Maz-Ing	Gm	Audiogenic	8K	C AA,CH,HM	£6.99
Alien	Gm	Commodore	3K	R FZ,AB,GF CF,DM,CH FD,FP,AA	£19.95
Alien Attack	Gm	Adcom	5K	C AB	£7.00
Alien Attack	Gm	Hi-Tech	3K	C CF,AO	£8.62
Alien Blaster	Gm	Paysoft	5K	C FP	£5.25
Alien Blitz	Gm	Audiogenic	3K	C AA,HM	£7.99
Alien Blitz	Gm	Audiogenic	5K	C CH	£7.99
Alien Maze	Gm	Adcom	8K	C AB	£7.50
Alien Maze	Gm	Hi-Tech	3K	C FZ	£8.30
				CF,AO	£8.62
Alien Wars	Gm	Hi-Tech	3K	C FZ	£8.30
				AY	£7.80
				CF,AO	£8.62
Amok	Gm	Audiogenic	5K	C AA,HM	£6.99
Ant Raiders	Gm	PR Software	3K	C GV	£7.50
Asteroid Belt	Gm	Adcom	8K	C AB	£7.50
Asteroid Belt	Gm	Hi-Tech	3K	C CF,AO	£8.62
Asteroids	Gm	Bug Byte	5K	C CH	£7.00
Avenger	Gm	Commodore	3K	R FZ,AB,GF CF,DM,CH FD,FP,AA	£19.95
Balloon Bomber	Gm	Hi-Tech	3K	C CF,AO	£8.62
Blitz	Gm	Commodore	3K	C FD	£4.99
Car Drive	Gm	Adcom	5K	C AB	£7.00
Car Drive	Gm	Hi-Tech	3K	C FZ	£8.30
				AY	£7.80
				CF	£8.62
Car Race	Gm	Adcom	5K	C AB	£7.00
Car Race	Gm	Hi-Tech	3K	C CF,AO	£8.62
Charset 20	Gm	Adcom	8K	C AB	£8.00
Charset 20	Gm	Rabbit S/W	3K	C AH	£4.99
Code Breaker	Gm	Adcom	5K	C AB	£5.00
Code Breaker	Gm	Rabbit S/W	3K	C AH	£2.99
Cosmic Battle	Gm	Adcom	5K	C AB	£8.00
Cosmic Battle	Gm	Rabbit S/W	3K	C AH	£4.99
Crazy Balloon	Gm	Hi-Tech	3K	C CF,AO	£8.62
Deflection	Gm	Adcom	5K	C AB	£7.00
Deflection	Gm	Hi-Tech	3K	C CF,AO	£8.62
Dragon Maze	Gm	Adcom	8K	C AB	£7.50
Dragon Maze	Gm	Hi-Tech	3K	C FZ	£8.30
				CF,AO	£8.62
Dune Buggy	Gm	Rabbit S/W	3K	C AH	£4.99
Duplicate	Gm	Paysoft	5K	C FP	£5.25
Fire Trek	Gm	Hi-Tech	3K	C AY	£7.80
				FZ	£8.30
				CF,AO	£8.62
Fly Snatcher	Gm	PR Software	3K	C GV	£7.50
Frogger	Gm	Rabbit S/W	8K	C AH	£7.99
Games Tape I	Gm	Titan	3K	C HJ	£5.00
Grand Prix	Gm	Hi-Tech	3K	C FZ, 8.30	
				AY	£7.80
Gun Men	Gm	Hi-Tech	3K	C AY	£7.80
				FZ	£8.30
				CF,AO	£8.62
Hangman	Gm	Paysoft	5K	C FP	£5.25
Hangman Maths	Gm	Audiogenic		C AA,HM	£7.99
Hesdon	Gm	Hi-Tech	3K	C CF,AO	£8.62
Highways Plot	Gm	Adcom	8K	C AB	£5.00
ICBM	Gm	Hi-Tech	3K	C CF,AO	£8.62
Invader Fall	Gm	Hi-Tech	3K	C FZ	£8.30
				CF,AO	£8.62
Indi 500	Gm	Hi-Tech	3K	C CF,AO	£8.62
Intro. to Basic I	Ed	Commodore	3K	C AA,AB	£14.95
Invader Fall	Gm	Adcom	8K	C AB	£7.50
Invader Fall	Gm	Audiogenic	3K	C AA	£6.99
Jelly Monsters	Gm	Commodore	3K	R AB,CF,DM GC,GF,AA CH	£19.95
Jungle	Gm	Adcom	5K	C AB	£6.00
Jungle	Gm	Rabbit S/W	3K	C AH	£4.99
Kiddy Checkers	Gm	Audiogenic	3K	C AA,HM	£6.99
Lunar Lander	Gm	Adcom	5K	C AB	£7.00
Lunar Lander	Gm	Hi-Tech	3K	C CF,AO	£8.62
Lunar Maths	Ed	Titan	3K	C HJ	£6.00
Machine Code Monitor	Ut	Commodore	3K	R AA,AB	£34.95
Machine Code Monitor	Ut	Commodore	3K	R GF	POA
Master Wits	Gm	Audiogenic	3K	C AA,HM	£6.99
Maths Hurdler/Monster Merge	Gm	Audiogenic		C AA,HM	£7.99
Maze Men	Gm	Titan	3K	C HJ	£6.00
Memory Pack	Ut	Commodore	16K	R FZ	£74.95
Memory Pack	Ut	Commodore	3K	R FZ'	£24.95
Memory Pack	Ut	Commodore	8K	R FZ	£44.95
Meteor Run	Gm	Anglo American	3K	R GB	£25.90
Meteroid	Gm	Adcom	5K	C AB	£10.00
Missile Command	Gm	Adcom	5K	C AB	£9.00
Missile Commander	Gm	Hi-Tech	3K	C CF	£8.62
Moak	Gm	Audiogenic	5K	C CH	£6.99
Mole Attack	Gm	Hi-Tech	3K	C CF,AO	£8.62
Music Maker	Gm	Adcom	5K	C AB	£10.00
Naval Attack	Gm	Titan	3K	C HJ	£7.00
Naval Battle	Gm	Hi-Tech	3K	C CF,AO,FZ	£8.62
New York	Gm	Paysoft	5K	C FP	£5.25
Night Flight	Gm	Rabbit S/W	3K	C AH	£4.99
Othello	Gm	Hi-Tech	3K	C FZ	£8.30
				CF	£8.62
				AO,AY	£7.80
Pack Man	Gm	Hi-Tech	3K	C FZ	£8.30
				AO	£8.62
				AY	£7.80
Programmer's Aid	Ut	Commodore	3K	R AA,AB	£34.95
Rabbit Functions	Ut	Rabbit S/W	3K	C AH	£4.99
Rabbit Writer	Ut	Rabbit S/W	16K	C AH	£9.99
Road Race	Gm	Commodore	3K	R FZ,AB,GF CF,DM,CH, GC,FD,FP AA	£19.95
Robot Zap	Gm	Paysoft	5K	C FP	£5.25
Rugby Game	Gm	Adcom	5K	C AB	£7.00
Rugby Game	Gm	Hi-Tech	3K	C CF,AO	£8.62
Seawolf/Bounceout	Gm	Audiogenic		C AA,HM	£8.99
Simple Simon	Gm	Audiogenic	5K	C AA,HM	£6.99
Six Program Pack: War Game, Smash Out, Black Jack, Logic, Pick Up Game, Alarm Clock	Gm	PR Software	3K	C GV	£7.50
Ski Run	Gm	Rabbit S/W	3K	C AH	£4.99
Skier	Gm	Hi-Tech	3K	C CF,AO	£8.62
Skimetts	Gm	Audiogenic	3K	C AA	£6.99
Slot Machine	Gm	Hi-Tech	3K	C CF,AO	£8.62
Space Defence	Gm	Adcom	5K	C AB	£10.00
Space Defender	Gm	Hi-Tech	3K	C CF,AO	£8.62
Space Division	Gm	Audiogenic	3K	C AA	£6.99
Space Invaders	Gm	Hi-Tech	3K	C CF,AO,FZ	£8.62
Space Storm	Gm	Rabbit S/W	3K	C AH	£6.99
Space Wars/Battle Zone	Gm	Titan	3K	C HJ	£6.00
Spiders from Mars	Gm	Audiogenic	5K	R CH,AA	£24.99
Spiders of Mars	Gm	Anglo American	3K	R GB	£25.90
Star Battle	Gm	Commodore	3K	R AA,CH,AB CF,DM,GC	£19.95
Star Wars	Gm	Audiogenic	3K	C AA	£6.99
Star Wars II	Gm	Titan	3K	C HJ	£7.00
Stella Shootout	Gm	Adcom	5K	C AB	£15.00
Stunt Cycle	Gm	Coloursoft	5K	C FP	£7.75
Sub Attack/Missile Command	Gm	PR Software	3K	C GV	£7.50
Submarine	Gm	Hi-Tech	3K	C CF,AO,FZ	£8.62
Super Breakout	Gm	Adcom	5K	C AB	£7.00
Super Breakout	Gm	Coloursoft	5K	C FP	£7.75
Super Breakout	Gm	Hi-Tech	3K	C CF,AO	£8.62
Super Expander High Resolution Pack	Ut	Commodore	3K	R AA,AB,FZ	£34.95
Super Lander	Gm	Commodore	3K	R AA,AB,FZ CF,CH,DM FD,FP,GF	£19.95
Super Moonlander	Gm	Hi-Tech	3K	C CF,AO	£8.62
Super Slot	Gm	Commodore	3K	R CH,GC,AA DM,AB,FZ FD,CF	£19.95
Super Snake	Gm	Adcom	5K	C AB	£7.00
Super Snake	Gm	Hi-Tech	3K	C CF,AO	£8.62
Super Worm	Gm	Rabbit S/W	3K	C AH	£4.99
The Alien	Gm	Audiogenic	8K	C CH,AA	£7.99
Treasure Carrying	Gm	Hi-Tech	3K	C CF,AO	£8.62
UFO Shooting	Gm	Adcom	5K	C AB	£7.00
UFO Shooting	Gm	Hi-Tech	3K	C CF,AO	£8.62
VIC Code Monitor	Ut	Commodore	3K	R FZ	£34.95
VIC Men	Gm	Coloursoft	5K	C FP	£7.00
VICalc	Ut	Audiogenic	3K	C AA, HM	£6.99
Vicgammon	Gm	Bug Byte	8K	C CH	£7.00
Vicmen	Gm	Anglo American	3K	C GB	£7.00
Vicmen	Gm	Bug Byte	5K	C CH	£7.99
Vic Cube	Gm	Hi-Tech	3K	C CF,AO	£8.62
Wall Street	Gm	Audiogenic	3K	C AA,HM	£6.99



ATOM

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes & Prices
3-D Asteroids	Gm	Program Power	5K	C GK	£6.85
747 Flight Simulator	Gm	Bug Byte	12K	C CH,GA,GB	£8.00
Adventure	Gm	Program Power	12K	C CH,GK	£9.15
Adventures	Gm	Acornsoft	12K	C EJ	£30.00
Air Attack	Gm	Program Power	12K	C CH,GK	£9.15
Alien Maze	Gm	Program Power	8K	C GK	£5.69
Astro Birds	Gm	Program Power	12K	C CH,GK	£9.15
Atom Adventure	Gm	Acornsoft	12K	C GA,AL	£11.50
Atom Business Games	B/G	Program Power	12K	C GK	£7.99
Atom Business Cassette	Bs	Acornsoft		C AL	£7.50
Atom Business Pack	Bs	Acornsoft		C AY,FA	£11.50
Atom Chess	Gm	Acornsoft	12K	C GA,EA,AL	£11.50
Atom Forth	Ut	Acornsoft		C GA,EJ,AL	£11.50
Atom Life Category	Bs	Acornsoft		C AL,GA	£11.50
Atom List	Ut	Acornsoft		C AL	£17.25
Atom Store	Bs	Program Power	12K	C GK	£9.15
Atom Synthesiser	Gm	Acornsoft	12K	C AL,GA	£11.50
Atomic Cube	Gm	A&F S/W	12K	C GE	£4.95
Backgammon	Gm	Bug Byte	7K	C GA	£7.00
Chess	Gm	Bug Byte	12K	C CH,GA,GB	£9.00
Chess	Gm	Program Power	12K	C GK	£9.15
Constellation	Gm	Program Power	12K	C GK	£7.99
Cowboy Shootout	Gm	Program Power	12K	C CH,GK	£7.99
Cylon Attack	Gm	A&F S/W	12K	C GE	£4.95
Dambusters	Gm	Program Power	10K	C GK	£5.69
Data Base	Ut	Acornsoft	6K	C EJ,FZ,FA,GA	£11.50
Death Satelite	Gm	A&F S/W	12K	C GE	£6.00
Demon Dungeon	Gm	Program Power	5K	C GK	£6.85
Desk Diary	Bs	Acornsoft	12K	C FA,EJ,AL,GA	£11.50
Disassemble Program	Ut	Program Power	4K	C GK	£6.85
Dragon's Lair	Gm	Program Power	12K	C GK	£6.85
Early Warning	Gm	A&F S/W	12K	C GE	£4.95
Easy Talker	Ed	Acornsoft	16K	C AW	£5.00
Escape	Gm	A&F S/W	8K	C GE	£4.95
Fall of Rome	Gm	Program Power	12K	C GK	£7.99
Forth Tape	Ut	Acornsoft		C FA	POA
Forth, Theory & Practice	Bs	Acornsoft		C AL	£6.00
Galaxian	Gm	Bug Byte	12K	C CH,GA,GB	£8.00
Games Pack 1:	Gm	Acornsoft		C AY,FA,GA	£11.50
Asteroids			10K	EJ,AL,CH	
Sub Hunt			6K	FZ	
Break Out			4K		
Games Pack 10:	Gm	Acornsoft	2K	C AY,FA,GA	£11.50
10 Games for minimum Atom				EJ,AL,CH, FZ	
Games Pack 11:	Gm	Acornsoft	12K	C AY,FA,GA	£11.50
Missile Base				EJ,AL,CH	
Snooker				FZ	
Dominoes					
Games Pack 2	Gm	Acornsoft		C AY,FA,GA	
Dog Fight			10K	EJ,AL,CH	
Mastermind			4K	FZ	
Zombie			4K		
Games Pack 3:	Gm	Acornsoft		C AY,FA,GA	£11.50
Rat Trap			10K	EJ,AL,CH	
Lunar Lander			6K	FZ	
Black Box			10K		
Games Pack 4:	Gm	Acornsoft		C AY,FA,GA	£11.50
Star Trek			8K	EJ,AL,CH	
Four Row			12K	FZ	
Space Attack			10K		
Games Pack 5:	Gm	Acornsoft		C AY,FA,GA	£11.50
Invaders			10K	EJ,AL,CH	
Wumpus			3K	FZ	
Reversi			4K		
Games Pack 6:	Gm	Acornsoft		C AY,FA,GA	£11.50
Dodgems			10K	EJ,AL,CH	
Simon			8K	FZ	
Amoeba			6K		
Games Pack 7:	Gm	Acornsoft		C AY,FA,GA	£11.50
Life Forms			8K	EJ,AL,CH	
Ballistics			10K	FZ	
Snake			10K		
Games Pack 8:	Gm	Acornsoft		C AY,FA,GA	£11.50
Star Date			8K	EJ,AL,CH	
Gomoku			8K	FZ	
Robots			10K		
Games Pack 9:	Gm	Acornsoft		C AY,FA,GA	£11.50
Snapper			8K	EJ,AL,CH	
Minotaur			12K	FZ	
Babies			8K		
High Stats	Bs	Program Power	12K	C GK	£7.99
Hyper Fire	Gm	Program Power	12K	C GK	£9.15
Introductory Pack	Ed	Acornsoft	3K	C GA,FA,AL	£23.00
Invader Force	Gm	Program Power	12K	C GK	£9.15
Invaders	Gm	Bug Byte	12K	C CH,GA,GB	£8.00
Lunar Lander	Gm	Program Power	12K	C GK	£7.99
Martians	Gm	Program Power	12K	C GK	£7.99
Maths Pack 1:	Ed	Acornsoft	4K	C EJ,FA,FZ,AL, GA	£11.50
Maths Pack II:	Ed	Acornsoft	6K	C EJ,FA,FZ, AL,GA	£11.50
Microbudget	Bs	Program Power	12K	C GK	£9.15
Mine Field	Gm	A&F S/W	6K	C GE	£4.95
Missile Command	Gm	A&F S/W	12K	C GE	£4.95
Mode 4 VDU	Ut	Program Power	12K	C GK	£7.99
Munchy Man	Gm	Program Power	5K	C GK	£5.69
Music Box	Gm	Program Power	12K	C GK	£7.99
Peeko Computer	Ed	Acornsoft	6K	C GA,FA,AL	£11.50
Polaris	Gm	A&F S/W	12K	C GE	£3.95
Polecat	Gm	A&F S/W	12K	C GE	£4.95
Pontoon	Gm	A&F S/W	12K	C GE	£3.95
Programmer's Toolkit	Gm	Program Power		C GK	£28.15
Reversi	Gm	Program Power	8K	C GK	£5.69
Robot Control	Ed	Acornsoft	16K	C AW	£35.00
Robot Nim	Gm	A&F S/W	6K	C GE	£3.95
Sketch Pad Program	Gm	Program Power	5K	C GK	£5.69
Softscreen	Ut	Computer Concepts	12K	C GJ	£11.50
Space Fighter	Gm	Program Power	12K	C GK	£9.15
Space Invaders	Gm	Computer Concepts	12K	C GJ	£7.80
Star Trek	Gm	Program Power	5K	C GK	£6.85
Super Race Track	Gm	Program Power	12K	C GK	£5.69
Tangle	Gm	A&F S/W	6K	C GE	£3.95
The Soft VDU	Gm	Acornsoft	8K	C AY,FA,GA, EJ,AL,CH,FZ	£11.50
Time Tutor	Ed	A&F S/W	6K	C GE	£3.95
Utility Pack 1	Ut	Acornsoft	2K	C FA,GA,AL,GA	£11.50
Warlords	Gm	Program Power	12K	C GK	£7.99
Word Pack ROM	Ut	Acornsoft	8K	C AL,EJ,GA	POA
Word Processing Pack	Bs	Acornsoft	8K	C FA	POA
Word Tutor	Bs	Acornsoft	12K	C GA,EJ,FA,AL	£11.50

SOFTWARE DEALERS

Supplier Code

AA Micro Centre Ltd
30 Dundas Street
Endinburgh EH3 6JN
031 556 7354

AB Micro and Video Palace
62-64 Kensington High Street
London W8
01 937 8587

AC Laskys
7-9 Queensway
London W23RX
01 200 0444

AD Datarite Terminals Ltd
Caldare House
144-146 High Street
Chadwell Heath
Essex RM6 6NT
01 590 1155

AH Cream Computer Shop
Rabbit Software
380 Station Road
Harrow
Middlesex
863 0833

AJ Molimerx Ltd
A J Harding
1 Buckhurst Road
Town Hall Square
Bexhill-On-Sea
East Sussex
(0424) 220391/223636

AK GW Computers Ltd
55 Bedford Court Mansions
Bedford Avenue
London WC1
01 636 8210/631 4818

AL Acornsoft Ltd
4a Market Hill
Cambridge
CB23NJ
0223 316039

AM Acorn Computers
Fulbourne Road
Cherry Hinton
Cambridge

AN Microcomputers Products Int.
8 Cambridge House
Cambridge Road
Barking
Essex 1G11 8NT
591 6511

AP KGB Micros Ltd
14 Winsor Road
Slough
Berks
Slough (0753) 38581/38319

AR Software Ltd
387 8832/388 9927

AT Atlantic Micro System
70-72 Honor Oak Park
London SE23 1DY
01 699 2202

AU TCL Software
59/61 Theobalds Road
London WC1
405 5240/2113

AV I A S
Cambridge Road
Orwell
Royston
Herts
0223 207689

AW Intelligent Artefacts Ltd
Cambridge Road
Orwell
Royston
Herts
0223 207689

AX Kuma Computers
11 York Road
Maidenhead
Berks
0628 71778

AY Microstore
327 Kings Road
London SW3
352 9291

AZ London Retail
98 Moysen Road
London SW16 6SH
01 677 2052/7341

BC Maplin
PO Box 3
Rayleigh
Essex
0702 552911/554155

BD Caxton Software
Publishing Co.
10-14 Bedford Street
Covent Garden
London WC2
01 379 6502

BG Elcon Research Ltd
Viking Way
Banhill
Cambridge CB3 8EZ
0954 81825

BH Avalon Hill Games
650 High Street
North Finchley N12
445 3044

BJ Lifeboat Associates
PO Box 125
London WC2H 9LU
836 9028

BK L & J Computers
192 Honey Pot Lane
Queensbury
Stanmore
Middx HA7 1EE
204 7525

BL Peach Tree Software
International
(Susan Jane)
MSA House
99 King Street
Maidenhead
Berks
0628 71011

BM ACT (Microsoft) Ltd
Freepost
Birmingham B16 8BR
(David Low)
021 454 8585

BN Personal Computer Palace
4-6 Castle Street
Reading
Berks
0734 589249

BO Sinclair Software
Sinclair Research Ltd
6 Kings Parade
Cambridge
CB2 1SN
0276 66104

BP Leicester Computer Centre Ltd
67 Regent Road
Leicester
LE16YF
0533 556268

BQ TABS Ltd
Sopers House
Chantry Way
Andover
Hants
SP10 12U
0264 58933

BR IBR Microcomputers
Suttons Industrial Park
London Road
Earley
Reading
0734 664111

BS Computer Plus
47 Queens Road
Watford
Herts
WD1 2LH
0923 33927

BT The Essential Software Co.
Dept BT (Visconti Ltd)
47 Brunswick Centre
London WC1
866 5445

BU Guestel
8-12 New Bridge Street
London EC4
583 2255

BV Lowe Electronics
Chesterfield Road
Matlock
Derbyshire DE4 5LE
0629 4995

BW Gate Micro System Ltd
The Nethergate Centre
35 Yeaman Shore
Dundee
0382 28194

CC Highlight Software
3 Nether Court
Halstead
Essex
0787 475714

CD Omega Plus
2c Graham Road
London E8 1BZ

CE Southern Software
PO Box 39
Castleigh
Hants SO5 5WQ

CF Sigma Systems
54 Park Place
Cardiff
Cardiff 21515/34869

CG Planet Software
10 Norton Drive
Eaton
Norwich

CH Brighton Gamer
24 Gloucester Road
Brighton
Sussex
0273 698424

CM Simple Software
15 Havelock Road
Brighton
Sussex
0273 504879

CN Buffer Micro Shop
374A Streatham High Road
London SW16
769 2887

CO Pixel Productions
39 Ripley Gardens
London W1 48HF

CP Computics Microsoft
1 Bell Lane
Wheatley
Oxford
OX9 1XY

CQ KW Software
155 Ronginglow Road
Sheffield
S11 7PS

CU Level 9 Computing
229 Hughenden Road
High Wycombe
Bucks

CV J Purves
12 Stobhill Road
Gorebridge
Midlothian
EH23 4PL

CW Cambell Systems
Rous Road
Buckhurst Hill
Essex
IG9 6BL

CZ J Wolstencroft
Sagar Fold
Preston
Chipping (09956) 327

DA Ground Control
Alfreda Avenue
Hullbridge
Essex SS5 6LT
Southend (0702) 230324

DB Mick Bignell
01 953 8385

DC Giltrole Ltd
Dept PCW, PO Box 50
Rugby
Warks CV21 4DH

DD Deep Thought Software
20 Chauntsingers
Alton
Hants

DE Silversoft
40 Empress Avenue
Ilford
Essex

DF Michael Orwin
26 Brownlow Road
Willesden
London NW10

DG Hisoft
60 Hallam Moor
Liden
Swindon
Wiltshire

DH The Soft Option
Bamberplan Ltd
PO Box 11
Cranbrook
Kent
058080 310

DI Wild Bills Computer Rodeo
PO Box 721439A
London
01 246 8000

DJ Microcomputer Spacedrome
3 Westholm
London NW11
01 458 5845

DK Spider Software
98 Avondale Road
South Croydon
Surrey
01 680 0267

DL Xavier Business Systems
7 North Lane
Clayton
Scarborough
Yorkshire
(0723) 583509

DM Camden Electronics
(Systems Division)
462 Coventry Road
Small Heath
Birmingham
021 773 8240/021 772 5718

DN Sumlock Electronic Services
Royal London House
198 Deansgate
Manchester
M3 3NE

DO Microstyle
29 Belvedere
Lansdowne Road
Bath
(0225) 334659

DP Small Systems Engineering Ltd
2-4 Canfield Place
London NW6
01 328 7145

HM Gemini electronics
2-4 Enfield Place
London NW6
01-328-7145

DQ Woodland Software
103 Oxford Gardens
W10 6NF
01 960 4877

DT Hewson Consultants
7 Graham Close
Blewbury
Oxon
(0235) 850075

DU Silicon Office Services
240 Durants Road
Enfield
Middx
EN3 7AZ
01 805 0903

DV Sirton Computer Systems
Unit 14
29 Willow Lane
Mitcham
Surrey
01 640 6931

DW Psion Ltd
2 Huntsworth Mews
Gloucester Place
NW1 6DD

DX JRS Software
19 Wayside Avenue
Worthing
Sussex
Worthing 65691 (evenings and weekends only)

DZ Micro Gen (Dept PCI)
24 Agar Crescent
Bracknell
Berks
0344 27317

EA Anglia Computer Centre
88 St. Benedicts Street
Norwich
NR2 4AB
0603 26002

EB SBD Software
15 Jocelyn Road
Richmond TW9 2TJ
01 948 0461

EE dK'tronics
23 Sussex Road
Gorleston
Great Yarmouth
Norfolk
(0493) 602453

EF Computech Systems
168 Finchley Road
London NW3 6HP
01 794 0202

EG Electronics Experts
Avondale Workshops
Woodland Way
Kingswood
Bristol
BS15 1QH

EH Artic Computing
396 James Reckitt Avenue
Hull HU8 0JA

EI Knights TV & Computers
108 Rosemount Place
Aberdeen
0224 630526

EJ Microage Electronics
135 Hale Lane
Edgware
Middx
01 959 7119

EN Davinci Computer Shop
65 High Street
Edgware
Middx

EO Calco Software
Lakeside House
Kingston Hill
Surrey
01 546 7256

EQ Microtek Ltd
15 Lower Brook Street
Ipswich
Suffolk
(0473) 50512 or 52466

ER Diskwise Ltd
25 Fore Street
Callington
Cornwall
05793 3780

ES Control Technology
39 Gloucester Road
Gee Cross
Hyde
Cheshire
SK14 5JG
061 368 7558

ET Comp Shop
311 Edgware Road
London W2
01 262 0387

EU Micro Computer Prods
Cambridge House
Cambridge Road
Barking
Essex IG11 8NT
01 591 6511

EV GW Computers
55 Bedford Court Mansions
Bedford Avenue
London WC1
01 636 8210

EW C/WP Computers
108 Rochester Row
London SW1P 1JP
01 828 3127

EX Metrotech Mail Order
Waterloo Road
Uxbridge
Middx
0895 58111 x 274/269

EY Microsystems Ltd
Summerfield House
Vale
Guernsey
0481 47377

EZ Superior Systems Ltd
178 West Street
S14ET
0742 755005

FA Control Universal Ltd
Unit 2
Andersons Court
Newnham Road
Cambridge
0223 358757

FB Pete & Pam Computers
98 Moyser Road
London SW16
01 677 2052/7341

FC Zenith Data Systems
Bristol Road
Gloucester
0452 29451

FD Commodore Information
675 Ajaz Avenue
Slough
Berks
Slough 79292

FE Logic Computers
31 Palmer Street
London SW1H 0PR
01 222 1122/5492

FF Overseas Computer Systems Cons.
182a Queens Road
Watford
Watford 48580

FG Blyth Computers
Wenhaston
Halesworth
Suffolk
050 270 565

FH Taurus Computer Design
47 High Street
Baldock
Herts
SG7 6BG

FI HITEC (Austria)
Zollergasse 15
A-1070
Vienna
Austria
01043 222 934331

FJ Graffcom Systems
102 Portland Road
Holland Park
London W11
01 727 5561

FK Electronic Aids (Tewkesbury)
Mythe Crest
The Mythe
Twekesbury
Glos GL20 6EB
0386 831020

FP Twickenham Computer Centre
72 Heath Road
Twickenham
Middx
892 7896 or 891 1612

FQ Sbd Software
15 Jocelyn Road
Richmond
948 0461

FR Beebug
PO Box 50
St Albans
Herts
(Independent User Group for BBC Micro)

FS RAM Computer Services Ltd
15-17 North Parade
Bradford
0274 391166

FT Ozwise Computers
28 Crofts Road
harrow
Middx HA1 2PH
01 863 2309

FU Compusense
PO Box 169
Palmers Green
London N13 4HT
01 882 0681

FV The Avery Computer Company
13 The Mall
Bar Hill
Cambridge
(Crafts Hill 80991)

FW Hilderbey Ltd
8/10 Parkway
Regents Park
London NW1
01 485 1059

FX Micromedia
Vine Cottage
Tentelow Lane
Norwood Green
Middx
01 843 9457

FY Wida Software
2 Nicholas Gardens
London W5 5HY
01 567 6941

FZ Superior Systems Ltd
178 West Street
Sheffield
0742 755005

GA Eltec Services Limited
231 Manningham Lane
Bradford
BD8 7HH
(0274) 491372

GB Anglo American Software
138a Stratford Court
Sparkhill
Birmingham
021 771 2995

GC Castle Electronics
15 Castle Street
Hastings
East Sussex
0424 437875

GD Quicksilva
95 Upper Brownhill Road
Maybush
Southampton
Hants
0703 771248

GE A&F Software
10 Wilpshire Avenue
Longsight
Manchester
061 320 5482

GF SRS Microsystems
161 Bramley Road
Oakwood
London N14 4XA
01 363 8060

GG Stirling Microsystems
241 Baker Street
NW1
01 486 7671

GI Lander Microsystems
32 Clockhouse Lane
Collier Row
Romford Essex
Romford 26325

GJ Computer Concepts
16 Wayside
Chipperfield
Herts
09277 62955

GK Program Power
5 Wensley Road
Leeds LS7 2LX
0532 683186

GV PR Software
28 the Fairway
South Ruislip
Middx
HA4 0RY

GZ Transform Ltd
41 Keats House
Porchester Mead
Beckenham
Kent
01 658 1661

HA Baust Computing Consultants
31 Peak Lane
Fareham
Hants PO14 1RX
0329 281480

HG Addictive Games
Dept YC PO Box 278
Conniburrow
Milton Keynes
MK14 7NE

HH J K Greye Software
Dept YC
16 Park Street
Bath
Avon
BA1 2TE

HJ Titan Programs
83 Ashwood Road
Rudloe
Corsham
Wiltshire
SN13 0LG
(0225) 810132

HK Micro Computer Software
Unit D6
Pear Industrial Estate
Stockport Road
Lower Bredbury
Stockport
SK6 2BP
061 494 2441

HL Phipps Associates
99 East Street
Epsom
Surrey
KT17 1EA

HM Gemini Electronics
50 Newton Street
Manchester M1
061 236 3083

dk'tronics

ZX 80/81 Hardware Software

4K Graphics rom



SOME OF THE GRAPHICS NOW POSSIBLE ON THE ZX81

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.

ZX Keyboard

Now with repeat key and facilities to add numeric pad. The keyboard has all the 80/81 functions on the keys. The keyboard has been specially designed for the Sinclair computer and is supplied ready-built and tested. It also has facilities for 3 extra buttons which could be used for on/off switch, reset, etc. £27.95. Numeric add on £10

Now from dk'tronics

a. 4K Tool Kit full of utilities to aid the programmer in constructing and debugging. E.PROM version for use with graphics ROM £9.96 cassette version £6.95.

b. 16K Ram massive add on memory fully assembled and tested £19.95.

c. Flexible Ribbon Connector (as illustrated).



16K 81 Software

AS SEEN AT THE ZX MICROFAIR



CENTIPEDE
This is the first implementation of the popular arcade game on any micro anywhere. Never mind your Invaders, etc., this is positively stunning, the speed at which this runs makes ZX Invaders look like a game of simple snap. £4.95.

3D/3D LABYRINTH
You have seen 3D Labyrinth games, but this goes one stage beyond; you must manoeuvre within a cubic maze and contend with corridors which may go left/right/ up/down. Full size 3D graphical representation. £3.95.

GRAPHIC ROM SOFTWARE

★ **Asteroids**
★ **Space Invaders**
★ **Centipede**

dk'tronics

Buy now why wait and pay more
Immediate delivery

Send off the coupon today or telephone Great Yarmouth (0493) 602453 during office hours quoting Barclaycard or Access number.
(Please add on £1 for P/P).

23 Sussex Road,
Gorleston,
GREAT YARMOUTH,
Norfolk.

Please state type of machine and which ROM memory size when ordering.

Please send me ..... 4K Graphics ROM/S @ £29.95.
Please send me ..... ZX Keyboard/s @ £27.95. (Numeric add on £10)
Please send me ..... Centipede/s @ £4.95.
Please send me ..... Labyrinth @ £3.95.
Please send me ..... Graphics ROM software Centipede @ £4.95.
Please send me ..... Space Invaders and Asteroids @ £4.95 each
Please send me ..... 4K Tool Kit @ £9.96. (Cassette version £6.95).
Please send me ..... 16K RAM add on memory @ £19.95.
Please send me ..... Flexible Ribbon Connector/s @ £10.

I enclose £ .....

Name .....

Address .....

.....

Please add on £1 for P/P.

Cheques/P.O. payable to DK Tronics.

MICROTERMS

Get to grips with terminology in this month's issue dictionary. A quick reference guide to common computer jargon.

Address
A label or name (usually a *binary* or *hexadecimal* number) specifying a particular *memory* location.

ASCII
American Standard Code for Information Interchange — representing letters, numbers etc by 128 permutations of a 7-bit code.

Assembly Language
Means of representing *program* statements in mnemonics and conveniently handling *memory* addressing by use of symbolic terms.

BASIC
Beginner's All Purpose Symbolic Instruction Code. An easy to learn, widely used computer language.

Bit
A single *binary* digit, representing either a 'one' or a 'zero'.

Binary:
Numbering system with the base 2, using the digits 0 and 1 instead of the *decimal* series 0 to 9. All digital computers work on *data* and *instructions* presented as *binary* numbers.

Buffer
(1) An area of memory designated to hold *data* being transferred between devices working at different speeds, eg the fast processor and the slower *keyboard*, *printer* or *disc*.
(2) An electronic device in a signal path designed to allow signals to pass in one direction but to hold back unwanted voltages in the opposite direction, which might damage the sending apparatus.

Bug
An error in *software*.

Bus
(Sometimes spelt Buss). Basically, the multiple wiring common to several parts of a computer and the number of channels therein — eg a 16-bit bus addressing 64K *memory* locations or a 20-way bus addressing 1 *megabyte*. Bus is now generally identified with the pattern of connections to the plugs and sockets whereby optional units (eg more memory) may be connected to a computer.

Byte
A *binary* number, usually of eight *bits*. It can represent a number from 0 to 255 (8-bit byte) as there are 256 possible combinations of "ones" and 'zeros" eight bits long.

Compiler
Software which converts *high level language* statements into either *assembly language* statements, or into *machine code*.

CUTS
Computer Users Tape System. Definition of system for storing *data* on cassette tape as series of tones to represent *binary* 1's and 0's.

Data
Simply, information. The raw material that the computer processes.

Debug
To correct the errors in a *program*.

Disc (Disk)
Magnetic storage device allowing fast random access to a large volume of *data*. A full-size hard disc will hold, say, 5 *megabytes* or more; a smaller *floppy disc* typically holds from 80 to 250 *kilo* bytes but in either case the capacity is being increased all the time.

EPROM
Erasable Programmable Read Only Memory. Writing typically takes one minute and erasing, by ultra-violet light, 10 minutes or longer.

Execute
To perform a sequence of *program* steps.

Execution Time
The time taken to perform an *instruction*.

Firmware
Instructions or *data* permanently stored in *ROM*.

Flag
A linen object that one salutes — but sailors use them to send messages. So do computers. A flag is an indicator signal (usually just one *bit*) that generally signals a condition.

Graphics
Literally — drawings; a method of producing graphs or pictorial figures on a suitable output device, usually a video monitor (TV set for most hobby computers) but sometimes a chart recorder or printer.

Hard Copy
A computer printout or listing on paper.

Hardware
All the electronic and mechanical components making up a system.

Hex
Shortened version of Hexadecimal, meaning '6 plus 10', which is a funny way of saying 16. It refers to the number system with a base of 16. This uses 0 to 9 and then A to F of the alphabet to represent its 16 digits. Two hex digits can be conveniently used to represent a byte (eight bits).

IEEE
Institute of Electronic and Electrical Engineers (in USA) — a body which has set a number of standards for more orderly interchange of information between various electronic devices, including computers.

Instruction
A set of *bits* which causes the *CPU* to carry out a particular task. Usually a basic or fundamental command understood by the *microprocessor*.

Instruction Set
That set of fundamental *instructions* which control a *microprocessor's* or computer's basic set of possible operations. In general, the larger the instruction set the more powerful the microprocessor.

Interpreter
An interpreter is a *software routine* which accepts and *executes* a *high level language program*, but unlike a *compiler*, does not produce intermediate *machine code* but converts each instruction as received.

I/O
Input/Output. A computer generally has one or more *ports* through which it communicates with 'the outside world' — *peripheral* devices such as a *keyboard*, video display *(VDU)*, *printer* etc. An I/O port may be just an input or just an output or it can be bidirectional.

Kilo (K)
Normally means 1000, but stands for1024 (2^{10}) when referring to memory.

Keyboard
A device, similar to a typewriter, which is used to code *alphanumeric* characters in ▶

MICROTERMS

a form that the computer can recognise. The usual method of interacting with a microcomputer for hobbyists.

Language
A repertory of commands — symbols, expressions etc, used to 'call up' the instructions or procedures a *processor* can execute. Higher-level languages are easily understood by mere humans and computers designed to work with such languages (*BASIC*, for example) use an *interpreter* to change this into the *machine code* under which the processor operates.

Location
Physical position; *memory* location is the same as *address*.

Loop
Program technique where one section of program (the loop) is performed many times over.

Machine Language (Code)
The lowest (and tediously detailed) level of *program instructions*. All higher level coding must be converted to *machine language* (by *compiler* or *interpreter)* before a *processor* can obey it.

Memory Map
Chart showing how *memory* is used by a computer. The arrangement of *data* and *program* within the memory.

Memory Mapped I/O
A technique of using *I/O* facilities by addressing I/O *ports* as if they were *memory locations*.

Micro (also u)
Prefix signifying one millionth. Also used descriptively of something very small.

Micro Program
Program inside a *CPU* which controls the actions performed by the CPU chip itself.

Modulator
A device, included in every good hobby computer, which takes the computer's output and converts it to an RF signal on a suitable TV channel, giving you a cheap, convenient visual display — even if you don't understand what's on the screen!

Monitor
(1) The first level of computer *operating systems:* the *program* which turns *machine code* commands into action, managing input, output etc.
(2) A TV-type device which is specially constructed to handle Video signals from a computer that does not have a *modulator*.

n-sec
Nanosecond, one-thousand-millionth of a second.

Non Volatile
Memory which will retain *data* content after power supply is removed, eg *ROM*.

Octal
Base 8 number system. Character set is decimal 0-8.

Parallel
A method whereby *data*, so many *bits* wide, can be transferred simultaneously over a group of wires — one wire per bit. An 8-bit system requires eight wires. In effect, the bits are transferred 'in parallel'.

Peripheral
Device attached to a computer, eg *printer, plotter, disc* unit, but not necessarily essential to its use.

Pointer
In the *microprocessor*, or in *memory* external to it, pointers can be *registers* allocated to listing memory *address* — they 'point' to memory locations.

Port
Terminal which the *CPU* uses to communicate with the outside world.

Printer
A device for producing typed or printed copy *(hard copy)*.

Print Out
Same as *hardcopy*.

Program
A set of *instructions*, either in *mnemonics*, in *digital (binary)* form or in a *high-level language*, which tells the computer to perform a sequence of tasks.

Program Counter
Register in the *microprocessor* which keeps track of which part of the program is being *executed*.

PROM
Programmable Read Only Memory. Proms are a special form of *ROM*, which can be individually programmed by the user.

RAM
Random Access Memory. Read write memory. *Data* may be written to or read from any location in this type of memory.

Reset
Simply — go back to the start, do not pass GO, do not collect 200 bytes. A switch whereby computer control is returned to the *monitor* or low-level *operating system* and all internal *variable* values are changed to zero. This may be the only way of getting out of some endless *loop* which has arisen from a programming error.

Register
A general-purpose *memory*, or set of memory *locations*, built into the *microprocessor* itself. Sometimes, particular registers may be designated for a specific purpose.

ROM
Read Only Memory. *Memory* device which has its *data* content established as part of manufacture and cannot be changed.

Routine
A whole *program* or part of a program designed to perform a single function or action.

RS232
A communications *interface* used for *modems* and for serial *printers*.

Run
Instruction to *execute* a *program*.

Serial
Transfer of *data* one *bit* at a time.

Software
The different kinds of *program* required to work a computer.

Source Code
Program written in one of the *high-level languages* and requiring *compilation* into *machine language* before use.

String
A sequence of characters.

Subroutine
A part of a *program* which performs a specific task and which is available for use elsewhere in a program, as often as you like.

Syntax
The grammar of a programming *language*.

TTY
Teletype.

VDU
Visual Display Unit. Usually a TV set in hobby computers, but may be a video monitor which accepts the output directly from the computer.

Volatile
Memory devices that will lose *data* content if power supply removed (ie *RAM)*.

Word
Parallel collection of *binary* digits much as *byte*.

Word Processor
A computer with *software* for entering, editing, storing, formatting and printing text, rather than processing figures.

CLASSIFIED

THE PATH TO SUCCESSFUL SALES!

01-437 1002

Extension 213

ADVERTISEMENT RATES

Semi-Display (min 2 cms)

1-3 insertions **£7.25** per cm
4-11 insertions **£6.75** per cm
12+ insertions **£6.25** per cm

Lineage 30p per word (min 15 words)
Box Nos. **£2.50**

Closing date 2nd Friday of the month preceding publication date.

All advertisements in this section must be prepaid. Advertisements are accepted subject to the terms and conditions printed on the advertisement rate card (available on request)

Send your requirements to:

PERSONAL COMPUTING MONTHLY
CLASSIFIED ADVERTISING,
145, CHARING CROSS RD,
LONDON WC2H 0EE.

ZX 81 (16K) EDUCATIONAL SOFTWARE

"O" LEVELS NEXT YEAR?

It's easy to revise Maths and French using your ZX 81

MATHS CASSETTE - 3 programs. First program teaches and tests. 2nd and 3rd programs are timed tests using generated questions from the "O" Level syllabus. Help and explanations are given where appropriate.

FRENCH CASSETTE - 6 programs. First 3 programs are teach and test Grammar programs. Programs 4, 5 and 6 are comprehensive Vocabulary tests.

ALSO AVAILABLE - An Educational Quiz and a large range of Junior Maths and English programs (8-13 years)

£4.50 per cassette (p & p free) or send sae for catalogue to - **ROSE CASSETTES**, 148 Widney Lane, Solihull, West Midlands B91 3LH.

Our software has received good reviews in "Your Computer" and "Educational Computing" and is included in the Muse library of Educational Software

---

POCKET COMPUTERS FROM THE SPECIALISTS

SHARP PC-1500 PC-1211 CASIO FX-702P
Hardware Software Books Consumables
IN STOCK NOW CE-155 (8K RAM) £79.95.
Trade in your PC1211 for a PC1500
Send for a free copy of "THE ELKAN FILE". Full of "Top Secret" information. See us on **Prestel** - page 258 2022
NEW - Books for the TANDY COLOR COMPUTER & APPLE

New books for PC-1211:
POCKET COMPUTER PRIMER £6.95
SCIENCE & ENGINEERING SOURCEBOOK . £7.50
POCKET MAGIC £7.50
Optional cassette of 25 programmes at £6.95 available with each book. Add 50p per item p&p.

ELKAN ELECTRONICS
FREEPOST (no stamp required) 28 Bury New Road, Prestwich, Manchester M25 6LZ Tel: 061 773 8714

THE DEADLINE FOR CLASSIFIED ADVERTISING TO APPEAR IN THE NEXT ISSUE IS FRIDAY 9th JULY

BBC COMPATIBLE COMPUTER to cassette leads. - Type (1). Two 3.5mm plugs and one 2.5mm plug. - Type (2). 5 Pin Din. £4.50 each - Electronics Applied, 4 Dromore Road, Carrickfergus, Co. Antrim BT38 7PJ.

ZX81 EDUCATIONAL PROGRAMS

Two programs — one cassette — £4.95 incl. p. & p.

On Side One is BONES
A friendly humanoid is drawn onto the screen. You have to identify the various named bones as indicated by a flashing cursor.

On Side Two is MAP
A map is drawn onto the screen. You have to identify the various highland regions of the UK and Eire as indicated by a flashing cursor.

On screen scoring, auto loading, personalised programs from:

ZEDUCATE SOFTWARE
59 Gorsewood Rd, St. Johns, Woking, Surrey GU21 1UZ

ZX-EPROM

2716 ZX-Eprom Programmer, with ZIF socket, low cost at £27.75 (A)
Enables M/C and Basic routines to be stored in Eprom
25V Stabilised supply for (A) £7.75 (B)
Eprom-Read Card £8.25 (C)
Eprom Programmed with **Breakout** Life + Toolkit (Renumber, Read, Data, Restore, Block-fill, Block-delete, Size, Free, + Others £8.25 (Used with C)
Simple to use, full instructions - Programs supplied. Connect directly to ZX81/0
P&P on A and B £1 (U.K.). £2 overseas

ORME ELECTRONICS
2, Barripper Road, Camborne, Cornwall

ZX81 16K RAM

- 16K RAM, UPGRADEABLE.
- BUILT IN KEYBOARD SOUNDER (fast mode)
- NEAT BLACK PLASTIC CASE.
- ONLY **£25.95** to above specification.
- OR **£21.95** Non upgradeable, no sounder.
- SAE for more details of these and our 16K RAM & I.O. BOARD, still available at **£45.00**.
- All inclusive prices. Orders to:

Ground Control

Alfreda Avenue, Hullbridge, Essex, SS5 6LT.

RING 01 437 1002 AND ASK FOR CLASSIFIED ADVERTISING TO BOOK YOUR SPACE. DON'T DELAY DO IT TODAY!

NASCOM 1&2

Compression Assembler - NEW - £12 (£27 in ROM) The only one of its kind for the Nascom, this full Z80 assembler compresses source to 50% normal size. Thus bigger programs fit in memory & loading/saving takes half as long. As a bonus, assembly is twice as fast as for other assemblers! It is 6K and comes with a utility to convert source from ZEAP.

Extension Basic - over 100 sold - £15 (£25 in ROM) Enhances ROM BASIC with 30 new keyboards: AUTO, GET, FIND, RENUMBER, REDUCE, REPEAT . . UNTIL, ELSE, TRACE, VDU, XREF etc. And you can add even more. EB can also run any standard BASIC program and is only 4K.

Q-DOS - disk filing for G805 drive - £25 (£35 in ROM)

Colossal Adventure - NEW - £8 Rumours tell of fantastic treasures hidden in the depths - and naturally they are guarded! Colossal Adventure has 200 detailed locations & dozens of artefacts, yet it has been compressed to only 16K.

Asteroids: fast action in space. Must be played! £8
Bomber: flatten your least favorite cities £5
Missile Defence: fast action nuclear defence . £8
Nightmare Pork: battle the pigs and the puns . £5
Breakout/Gunner/Minefield/Surround/Wumpus £6

FREE P&P. NO VAT. Money back if not happy. Full documentation. (Nascom 1s need Nas-Sys/Cottis B.)
Send order, or request for full details to:

LEVEL 9 COMPUTING
229 Hughenden Rd., High Wycombe, Bucks HP13 5PG.

ZX SPECTRUM SOFTWARE, graphic games, S.A.E. details, Mike O'Neill, 5 Castlefields Road, Cheltenham, Glos GL52 6YW.

LEARN BASIC THE EASY WAY!

The ZX BASIC TUTOR turns a ZX81 into a teaching machine, teaching you BASIC programming in six easy stages. Full instructions supplied. Requires 16K Ram Pack Cassette, £5.

Eon Computing, 17 Sidney Road, Wood Green, London N22 4LT.

Same Day Dispatch Mail Order Only

16K RAM PACK £29.95 incl. free cassette - ALIEN ATTACK (7K M/c). Quite simply the best! Also available **64K RAM PACK** - same size, same quality as the 16K RAM - £62.95. Normally despatched within 10 days of receipt of order.
GAMES PACK £4.95, includes: - 3-D Battle (M/code-1K), City Bomb (M/code-1K), Warp Wars (16K), Snake (16K), Sweet Tooth (16K), Slalom (16K) & Black Holes (16K).
TOOLKIT includes: Line renumber (incl. GO TO & GO SUB), search & list, search & replace, screen file, hyper-graphics mode, free space, tape wait routine. ALL FOR ONLY £4.95.
GRAPHICS TOOLKIT: 22 exciting M/code routines to enable you to produce screen displays as never before. Incls. draw & undraw, border, foreground, background, 4 way scrolling etc. etc. ONLY £4.95.
BATTLE SHIPS (13K): First ZX81 version of the old favourite Battle Ships & Cruisers. ONLY £4.95.
All above software for ZX81 with 16K RAM.

JRS SOFTWARE
19 WAYSIDE AVENUE, WORTHING, SUSSEX BN13 3JU
TELEPHONE: WORTHING 65691

PERSONAL COMPUTING MONTHLY
CLASSIFIED ADVERTISEMENT — ORDER FORM

If you have something to sell now's your chance! Don't turn the page — turn to US!

Rates of charge: 30p per word per issue (minimum of 15 words). Box Nos. £2.50p per issue

All you have to do is print your advertisement in the coupon . . . . . .

					£1.50
					£3.00
					£4.50
					£6.00
					£7.50
					£9.00
					£10.50
					£12.00
					£13.50
					£15.00

Please place my advert in **PERSONAL COMPUTING MONTHLY** for . . . . . issues commencing as soon as possible.

I am enclosing my Cheque/Postal Order/International Money Order for: (delete as necessary) £. . . . . (Made payable to A.S.P. Ltd)

VISA OR Debit my Access/Barclaycard (Delete as necessary) We welcome Access

All classified advertisements must be paid for in advance.

Please use BLOCK CAPITALS and include post codes.

Name (Mr/Mrs/Miss) (delete accordingly) .....

Address .....

.....

.....

Signature ..... **Date** .....

Daytime Tel. No. .....

PLEASE MENTION
PERSONAL COMPUTING MONTHLY
WHEN REPLYING TO ADVERTISERS

AB & C COMPUTER 44
ACORN SOFT 9
ADDICTIVE 59
A & F SOFTWARE 45
ANGLO AMERICAN SOFTWARE 60
ARTIC COMPUTING 35
BUFFER MICRO SHOP 50
CAMBRIDGE LEARNING 50
CAPITAL COMPUTERS 68
C & E MICROCOMPUTERS 14
COMP SHOP 100
COMPUTER CONCEPTS 50
CONTROL TECHNOLOGY 45
C SOFT 35
DATA ASSETTE 99
D K TRONICS 94
ELECTRONIC AIDS 35
ELLANBEE GRAPHICS 50
FULLER MICRO SYSTEMS 2
GAMER 59
GEMINI ELECTRONICS 42
GEMINI HUT LTD 74
GILTROLE 57
GRUNDY ..... 10 & 11
HARRIS & LOCKYER ASS 73
IBET SYSTEMS 44
INTERFACE 34
KEMPSON (MICRO) 57
LEISURONICS COMPUTER STORES 68
LLANA SOFTWARE 71
MICHAEL ORWIN 9
MICROCOMPUTER SOFTWARE 57
MICRODEAL 68
PHOENIX MARKETING 6
QUICKSILVA 18
SCISOFT 73
SHIVA PUBLISHING 14
SINCLAIR RESEARCH ..... 38 & 39
..... INSERT
SIR COMPUTERS 14
SOUTHERN SOFTWARE 44
STRIPLAND LTD 49
VIDEO SOFTWARE 57

FULLER FD SYSTEM £39.95

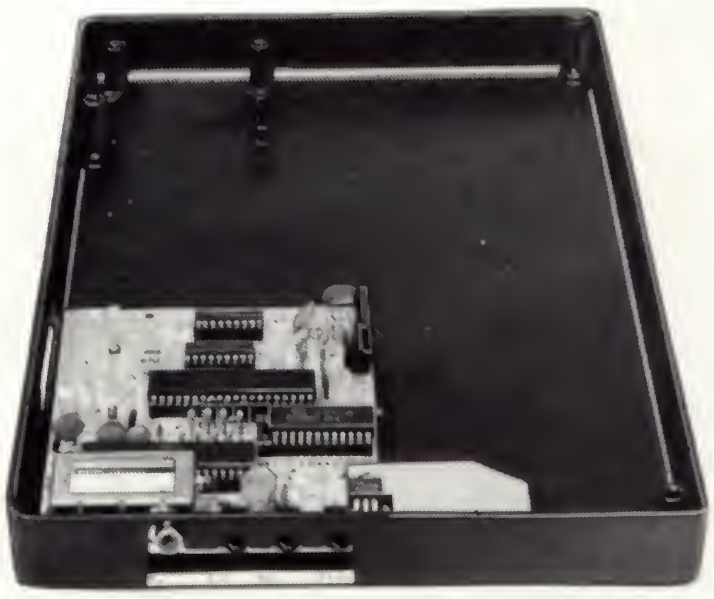
Professional Keyboard & Case for Sinclair ZX81 & ZX Spectrum

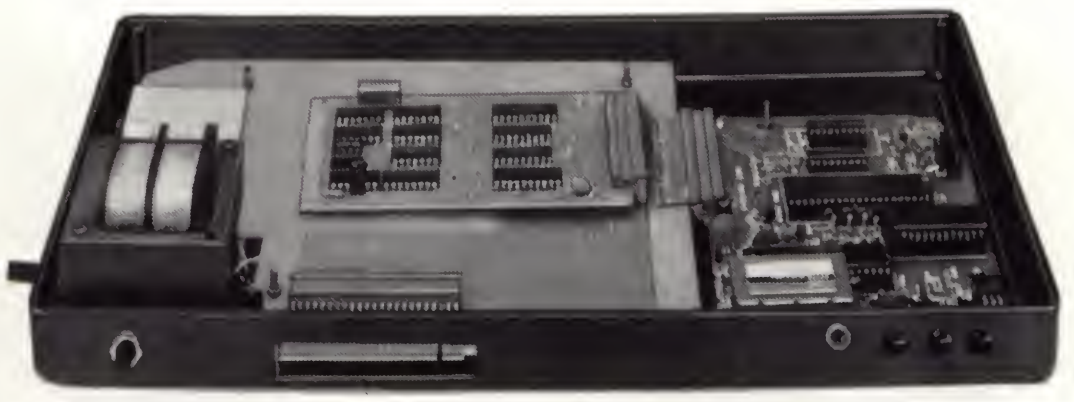


The ZX81 fits inside
The tough ABS injection moulded plastic case measures 8" x 14" x 2½" and hooks up to your ZX printed circuit board in minutes. No technical know how or soldering is required.

The ZX16K Memory Module will fix inside the case, using the new Adaptor Board at £9.75 or the Motherboard.
By removing the ZX PSU from its case this can also be fixed inside. We will carry out the installation work free of charge if required.

KEYBOARD LAYOUT:
All the Sinclair ZX81 keys are duplicated on our layout, with extra shift and new line keys. The professional momentary action key switches have a guaranteed life of 10^6 operations. The unit is fully built tested and comes complete with a money back guarantee.





INSTALLATION
Simply unscrew the ZX printed circuit board from its case and screw it into the FD Case.

MOTHERBOARD:
We also manufacture a mother board which allows expansion to the ZX memory and 1/0 facilities WITHIN the case, as well as our power supply unit and reset switch.

AD Code		Price †	Qty	Amount
Fuller	FD System 42 Keyboard & case	39.95		
	FD System Motherboard	15.95		
	FD 16K. Memory Module	29.95		
	FD 64K. Memory Module	78.95		
	FD PSU 9 Volts at 2 amp.	12.95		
	FD *Shipping and Handling*	2.50		

Keyboard Only Available!
Built £24.95
Kit £18.95 (+P.P. 80p)

Mail to **FULLER MICRO SYSTEMS,**
The ZX Centre, Sweeting Street, Liverpool 2. England, U.K.
SAE for more details — Enquiries: Tel. 051-236 6109

Name .....
Address .....
City/State/Zip .....

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 an 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

New products arriving daily

'Phone your order to reserve

Many items over stocked on Sale Offer

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

DINERS CLUB INTERNATIONAL · AMERICAN EXPRESS

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

311 Edgware Road, London W2
Telephone: 01-262 0387
OPEN (LONDON) - 10am - 6pm - Monday to Saturday