Personal Computing Today

NOVEMBER 1982
65p

NEW

SOFTWARE CHECKLIST
Pick out a program

HARDWARE
Get the micro low-down from our Factfile

SPECTRUM & VIC 20
How they shape up graphically

TUNE YOUR BBC B INTO TELETEXT

MICRO BUYING
Get it right first time

PROGRAMS FOR VIC, BBC, ATARI, ZX81, ATOM, TRS-80

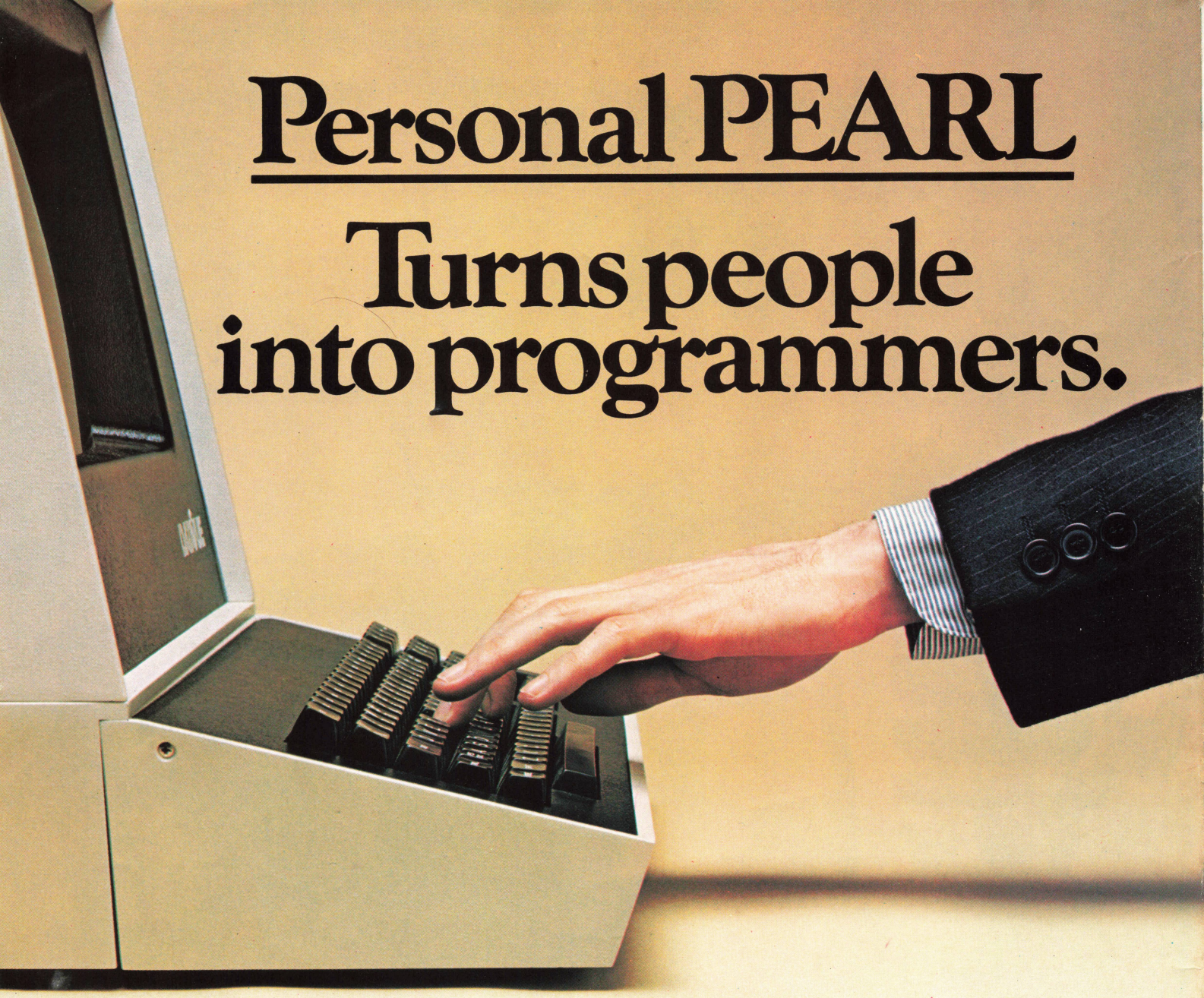


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Volume 1 Number 4 November 1982

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Elspeth Joiner

Editorial Assistant:
Chris Palmer

Advertisement Manager:
Beverley McNeill

Advertisement Executive:
Coleen Pimm

Managing Editor:
Ron Harris

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MM Design & Print

Managing Director:
T J Connell

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Last month yet another new computer was launched into the sea amongst the fleet of existing ones but it breaks with the tradition set by previous computer designers.

The Jupiter Ace does not use BASIC as its mother language. Instead it uses FORTH, a recently written programming language which has gathered a substantial following in a short time-span.

Launching a micro on the market running in FORTH says a lot for manufacturers and designers Jupiter Cantab's high impressions of this language, but could be a big risk for the firm.

Steven Vickers and Richard Altwasser must be praised for carrying out the courage of their convictions. But it could cause sales problems in convincing buyers to opt for FORTH.

FORTH itself was chosen by the Jupiter entrepeneurs because it is a very powerful and flexible language. In essence it is quite straightforward to pick up the thread of FORTH. You build up a string of command words starting from a basic dictionary. All these commands represent a procedure that the computer has to carry out. If you can already use BASIC it will be awkward learning FORTH because the programming notation works in reverse.

This form of notation is much quicker than the standard Basic method and FORTH is said by many to be an excellent language because of it. Versions of FORTH are available for the Atom, Pet, TRS-80, BBC, Sharp, and Texas computers. Unfortunately, people are slow to take to anything that breaks the bounds of tradition so Jupiter Cantab will have quite a hard task convincing people that theirs is the machine to buy.

To try and overcome people's reservations, with the Ace comes an operators guide which includes a complete FORTH tutorial. Steven Vickers wrote the ZX Spectrum manual for Sinclair Research so is a dab-hand at documentation.

Both Vickers and Altwasser have a good computing pedigree being the real brains behind the Sinclair ZX Spectrum. The idea for the Ace came to them while working on the Spectrum's design, and the Ace project started when the Spectrum had been completed. The price of the Ace is competitive at £89.95 and with the market as buoyant as it now is the Ace should sell well providing Jupiter Cantab can convince people of FORTH's potential as a reliable and easy-to-use programming language.

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

CONTENTS

NOVEMBER



NEWS

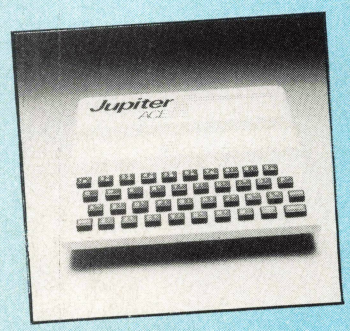
Newstalk 8
Catch up on what's occurring in the home computer industry.

NEXT MONTH

Next Month 13
Here's an inkling of what is to come in our festive Christmas issue.

LETTERS

Letters 16
Scrutinise the news and views of your fellow readers in Your Letters.



VIC20 SOFTWARE

VIC 20 Function Keys 18
Find out how to use the VIC 20's function keys properly, an area almost untouched by the VIC manual.

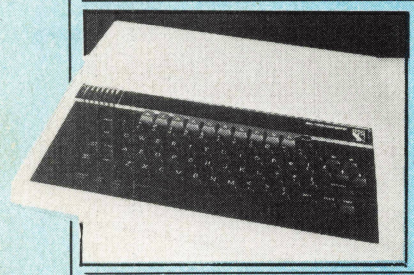
ATARI 400 SOFTWARE

Sardaukar Assault 21
Defend the golden tower against an assault by the meanest space warriors you will ever find.

COMPUTER CLUBS

Clubhouse 26
Find out how to start your own computer club from your front room.

BBC TECHNIQUE



Tune Into Teletext 30
Get the best out of the BBC B's teletext graphics mode.

DEALERS

Look Before You Leap 35
Highlighted this month is the Spectrum Computer Group who started off in photography and now sell computers.

TECHNIQUE

TRS-80 Tipster 40
Some programming hints for Tandy owners.

REVIEW



Software Reviews 44
Avoid the one-day wonders with our honest games reviews.

REVIEW

Shaping Up Graphically 48
Today graphics are one of the most important facilities available on a computer. Our lead feature takes two best selling machines the VIC 20 and Spectrum and compares their graphics capabilities.





TI 99/4A MICROSPOT

Message Simulator 53
Turn your TI into an instant printer.



LETTERS

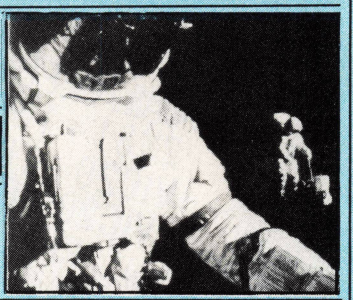
Micro Answers 56
Our resident computer doctor does his monthly diagnosing and curing.

FEATURE HARDWARE

Microbuying 60
Want to buy a computer but don't know where to start? Read our special report and get it right first time round.

PROGRAMMING TECHNIQUE

Gamesboard 64
Ayo is the name of this months game. One of the oldest strategy games around is taken apart for programming purposes.





TRS 80 SOFTWARE

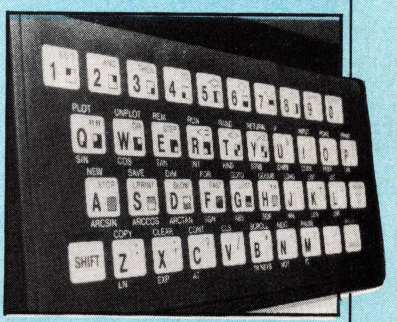
Saturn Attack 72
Avoid the menacing mines guarding valuable mineraloids littered across the planet Saturn. Touch one and you and your TRS-80 will soon be obliterated.

BBC MICROSPOT

Pitching into the BBC 78
A short sharp program to sort out sound envelopes on the BBC.

REFERENCE

Factfile 81
Find out which computer will be best suited to your needs in our regular reference section.



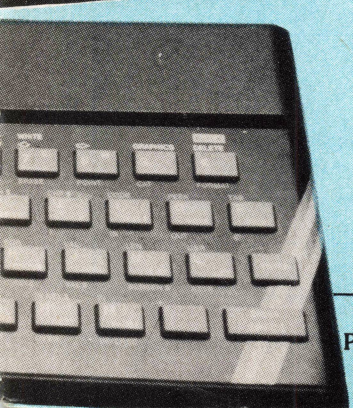
REFERENCE

Software Checklist 91
Need Asteroids for your Atom? Want Space Invaders for your Spectrum? Check out the Checklist and find out who can supply you.

REFERENCE

Micro Terms 110
Baffled by byte or perplexed by peek? Micro Terms will set you straight.





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EXAMPLE — DIGGLES KITCHEN

INDEX – VOL. TWO WORLDWIDE RECIPES

PART ONE	PART TWO
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PHEASANT IN BASIL	HUNGARIAN BEEF
TURKEY BYZANTE	BRAISED STEAK IN GUINNESS
ORANGE CHICKEN	HALIBUT A LA CREME
COQ AU VIN	COD PORTUGUESE
POULET NICOISE	GARLIC BREAD
BOLOGNESE SAUCE	CABBAGE & ONION SALAD
LASAGNE AL FORNO	COURGETTES NATUREL
MOUSSAKA	GOLDEN CAULIFLOWER
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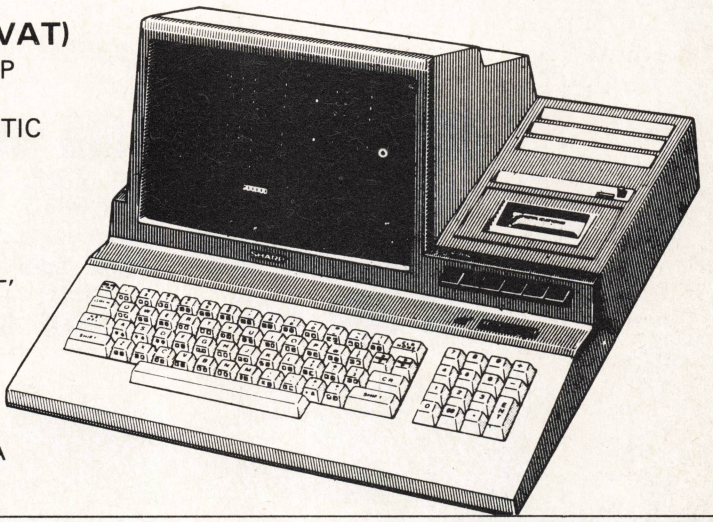
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NEWS



Jupiter Ace Comes FORTH

Now, from the people who helped bring you the ZX Spectrum, comes the Jupiter Ace. Designed by Steven Vickers and Richard Altwasser, both late of the Sinclair fold, the Jupiter's pedigree is instantly recognisable. Looking like a cross between a ZX81 and a Spectrum it contains a whole host of goodies and, shock horror, what appears to be a proper keyboard.

The basic specifications of the machine are as follows; Z80A central processor, 8K ROM, 3K RAM, 32 x 24 character display, high-resolution graphics, upper and lower case letters, inbuilt cassette interface and a programmable sound generator.

Although there is nothing too different in these, the real difference is in the language the computer comes with. Up till now all home computers have come fitted with BASIC, either supplied on cassette or programmed into a ROM. The Jupiter Ace has broken with tradition by being fitted with the computer language FORTH as standard.

FORTH is a higher level, structured language that is a lot more powerful than BASIC, and because it is compiled it runs a lot faster. The Ace offers unique editing facilities, allowing you to edit FORTH words even after they have been compiled. They are already planning peripherals for the machine including a parallel Centronics printer interface and a 16K memory expansion unit. The Ace can be expanded to up to 48K of RAM so it looks like there will be a rush from the ZX81 peripheral manufacturers to convert their memory expansions for it.

The Jupiter Ace is available from Jupiter Cantab by mail order and costs £89.95. It comes complete with all the necessary connecting leads and a comprehensive manual and FORTH tutorial. We will be looking at the Jupiter Ace in greater detail in a later issue, so watch this space!

Trendsetting Sinclair

Once again it looks like Clive Sinclair has started a fashion in the computer world, only this time it is in the publishing side. Following the recent price slash of the ZX81 Melbourne House publishers have decided to knock £2.00 off the price of their best selling ZX81 book 'Not only 30 programs for the ZX81', bringing it down to £4.95.

Where will it all end? Will Texas start giving away the 99/4a with cornflake packet tops or will BIC produce the first disposable computer. It could all get very silly so we shall just have to sit back and wait.

BBC Boffins Book

A new book has just been released that looks set to become the bible for all BBC microcomputer users. Titled THE BBC MICRO REVEALED it is a look at some of the BBC micro's more interesting and useful features. It is written by sometime PCT contributer and BBC boffin, Jeremy Ruston.

In the book he looks at the way the BBC organises its memory, techniques uses in speeding up programs, the construction of unique display modes, and lots more besides. The book costs £7.95 and is available through all good book stores, computer shops and W H Smiths.

Asteroid Lander

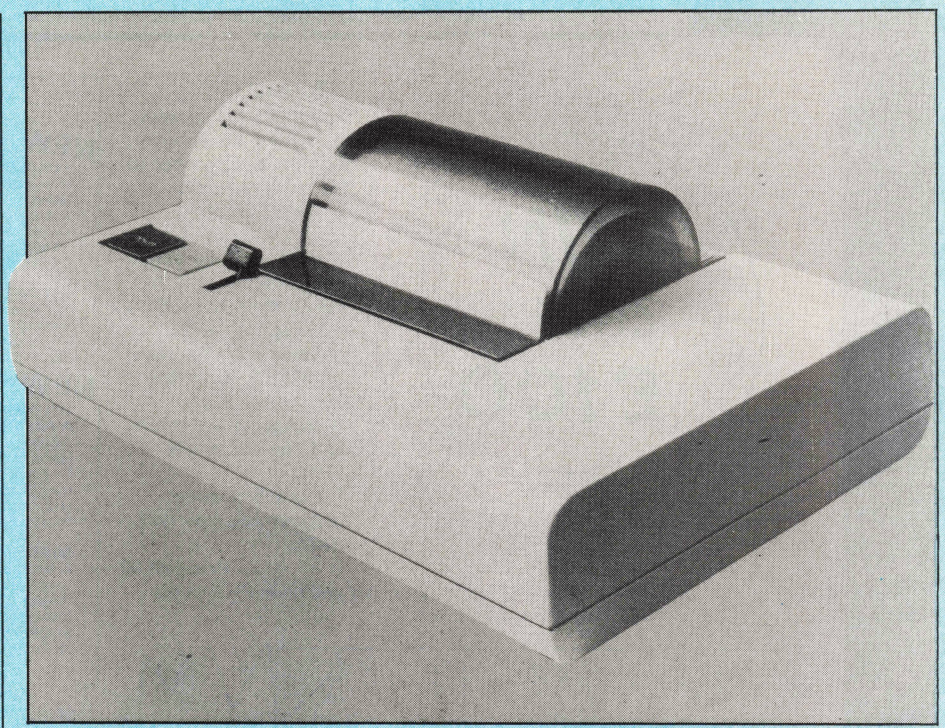
Apologies are due to all those who bought our September issue hoping to run Asteroid Lander on their BBC computers. Bugs found their way into this program causing havoc throughout.

But don't despair. If you want a correct program listing of this game just drop us a line and we will be delighted to send you one at the speed of light. We await your call.

Stop Press . . .

Hot news from Commodore which has just cut the price of VIC 20s by a cool £30 to £169.99. The reason is to keep in line with US policies.

Low Cost Printer Bonanza

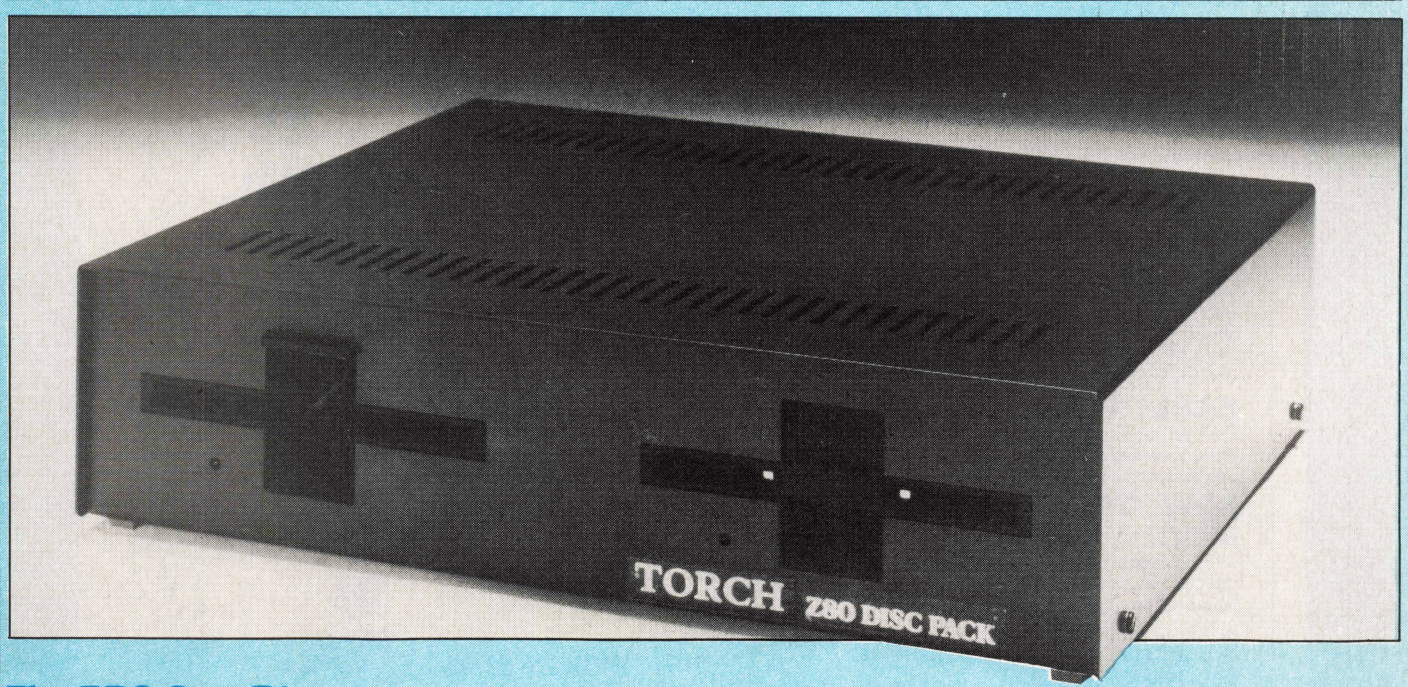


Two new low cost printers have recently come onto the market and should make life a little more affordable for the home computer user.

First up is a professional thermal printer for the ZX81. It prints 40 columns on paper that is 4.34 inches wide and comes complete with an interface cable that will plug into the ZX81. Also included is through-bus which will enable it to be used with a RAM pack attached to the machine. If it operates like the Sinclair printer then there should be no problem in using it with the ZX Spectrum as well.

It costs £94.50 excluding VAT and is available from: the Computer Printer Division, Dean Electronics Limited, Glendale Park, Fernbank Road, Ascot, Berkshire.

Second is the 2400 printer from Amber Controls. This little baby is a 24 column dot matrix printer that uses 58mm wide paper. It has been designed with both serial and parallel interface capabilities in order that it can be driven by the widest possible range of microcomputers. Currently it can be used by the BBC microcomputer, Acorn Atom, Dragon, VIC 20, Spectrum, TRS 80 and the UK 101. All you have to do is state which machine you want to use it with and Amber will provide you with the suitable connecting cable. The cost is £69.95 plus VAT and further details are available from Amber Controls Limited, Central Way, Walworth Industrial Estate, Andover, Hampshire.



The BBC Gets Discs

Available now from Torch Computers of Cambridge is something for people who have bought a BBC computer and want disc drives.

The Torch Disc Pack is an 800K twin disc drive with a Z80 processor thrown in for good measure. It costs just over three times as much as the Model A computer, weighing in at a healthy £995.00 excluding VAT.

Having the Z80 strapped to it does give the BBC the ability to run CP/M software, which could be particularly useful to people who are using the BBC as a small business micro, as it gives them access to a wide range of business software, such as accounting, financial planning and modelling packages. Also available are FORTRAN, PASCAL, FORTH, LISP and COBAL languages for those tired of using BASIC. All the operating system software is contained in two 8K ROMs, so hopefully it will not use up any of your valuable memory space.

For further information contact: Torch Computers of Cambridge on 0223 841 000.

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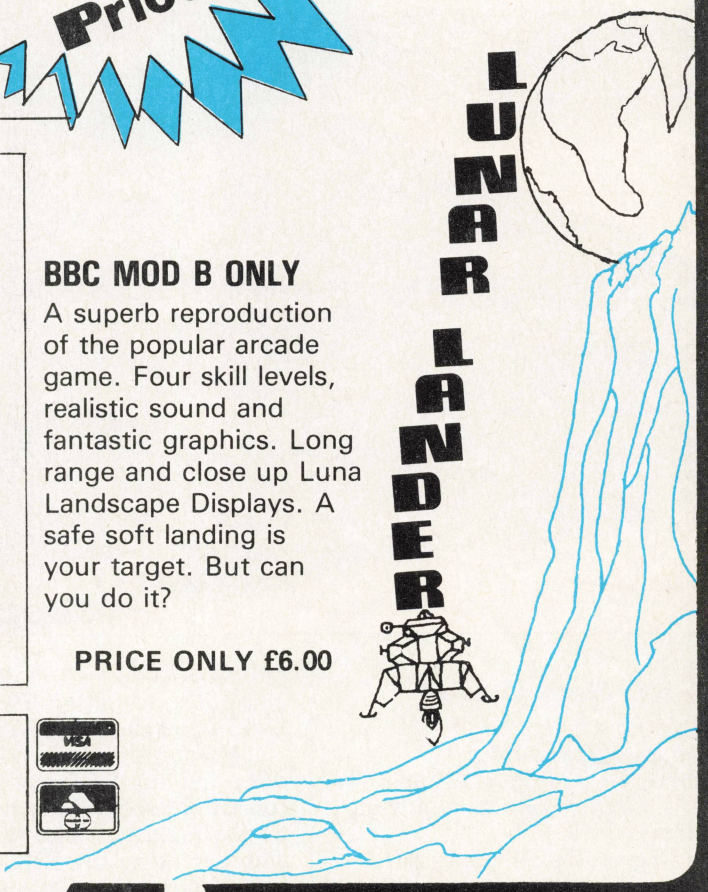
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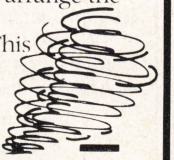
If you are over 3 years old, and still young enough to hit the keys, then these new VIC programs are for you.

From top software publishers ASK, they let you learn—and laugh about it too.

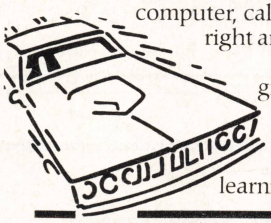
Fabulous graphics. Demanding ideas that make learning lots more fun.

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TWISTER. Designed to improve concentration and logic. Rearrange a geometric puzzle—a bit Rubik cube-like—so that no row or column contains a repeated colour. There can be from 3-10 columns and if you cannot get out of it, Twister will do it for you. For really clever users you can go into the Super-Twister mode where you must arrange the squares so that no diagonal, as well as row or column, contains the same coloured square. This is so difficult that the computer does not give you the answer! Supposedly designed for age 8 upwards.



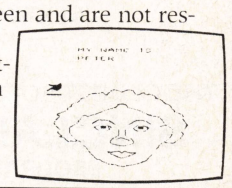
NUMBER CHASER. Designed to improve estimating and multiplication skills for 5-12 year olds. A car race where you move against the computer according to your skill at estimating the given sum. We forget that in the age of the calculator estimating is important to see if your computer, calculator etc has come up with the right answer.



Number Chaser has superb graphics and sound—you would not want more than a few of these in a classroom at any one time since the level of excitement, as well as learning, is very high.

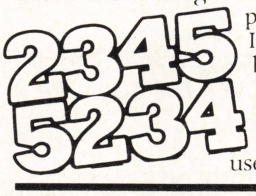
FACEMAKER. This is designed to improve spelling, to expand vocabulary and also sharpen observational skills. Designed for 5-12 year olds this is an interactive program where you draw people's faces.

Superb graphics that—like most of these ASK programs—fill the monitor or TV screen and are not restricted to the normal VIC format.



A beautifully crafted piece of software that will find many applications in school and at home. It will also be of special benefit to people teaching children who are slow to learn to read.

WE WANT TO COUNT. This is a program for children of three years and upwards who want to learn numbers and to count things correctly. There are four parts in the program with games-type graphics. In two of these you can select levels between one and five. This program has been designed to be extremely simple to operate so that, once loaded, children can use it entirely on their own.



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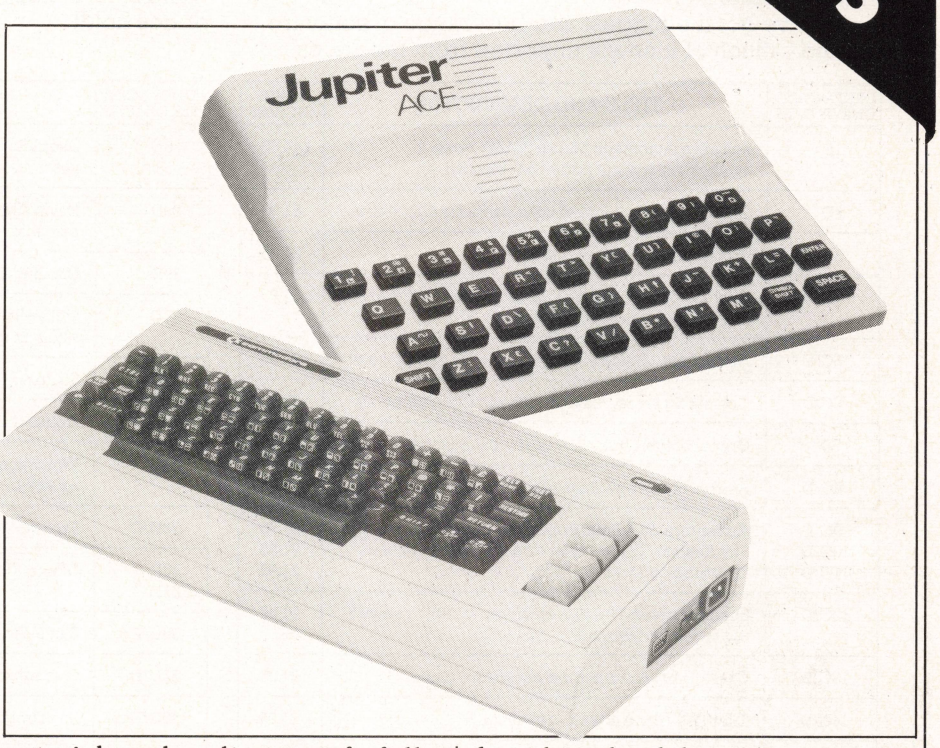
Personal Computing Today

COMING NEXT MONTH
On Sale from November 5

Jupiter Ace

Hot off the production line is the very latest personal computer from a new, but experienced team Jupiter Cantab. Called the Jupiter Ace there is bound to be a lot of talk about this new entry into the computer race because it is unconventional. The programming language of the machine is FORTH, not BASIC. (See p3 and p8 for more details).

Jupiter Cantab unveiled the Ace at the Personal Computer World Show in September and we took one away with us to scrutinise. Next month we will tell you the results and explain the language FORTH, showing how it differs from BASIC, as well as revealing the pros and cons of using it.



Win A Commodore 64

In December Personal Computing Today is giving you the chance to win one of the most exciting computers launched this year, the new Commodore 64.

Personal Computing Today's first competition is your means to that end. The 64 is in essence a bigger and better VIC 20 — it has 64K of on-board memory capacity, high resolution graphics including a 3D effect, sound facilities, and standard interfaces making the machine useful for both business and home entertainment purposes. The normal price of a Commodore 64 is about £300 so just think of the saving you could make if you enter and win our competition.

Full details of what you'll have to do to try and win your own Commodore 64 will be revealed in our next issue. Don't miss this opportunity by keeping an eye out for December's Personal Computing Today.

Programs Galore

As Pac-man fever is sweeping the country and turning into an industry in itself we are keeping up to the minute with a version running on the Nascom 2. But don't cry out in anguish, the listing if fully documented to enable you to convert it to whatever machine you possess in as painless a way as possible. All the standard features of the popular arcade game are there, the gobbling ghosts running riot in the maze and your lone man who spends his time either fleeing from the crazy gobblers or chasing them in hot pursuit.

Ever indulged in a little wishful thinking? Like hitting fame and fortune in the guise of a music composer? Now's your chance to do so, even if using a VIC 20 program is cheating a bit, but in this technological world who cares? This particular composer program enables you to write your own melodies and if you like what you hear, save them on tape and bring them out later to entertain a few friends. VIC 20 Melody Maker is very flexible and easy to use which means it won't be long before you start taking on popstar Gary Numan, of synthesised music fame.

Sharp owners who feel they have been hard-done-by on the programs front can take advantage of our Sharp Shooter program running next month. This speedy maze game will give you a run for your money and keep your fingers at your Sharp MZ80K's keyboard, as you blast at black and white faced enemy troops. You have to be quick off the mark to pick them off because you must beat the set time limit.

Regulars

All our monthly regular features will be there for your perusal and digestion. Clubhouse is devoted to the Acorn Atom machine and the Manchester Acorn Users Group gets space to say how it operates. Micro Factfile is full of information on computer hardware to help you make a choice of machine, or some piece of equipment to add-on to your existing computer. Software Checklist is updated with the latest programs to help you sort out your personal library. And December's Gamesboard features the thinking-man's game, Chess.

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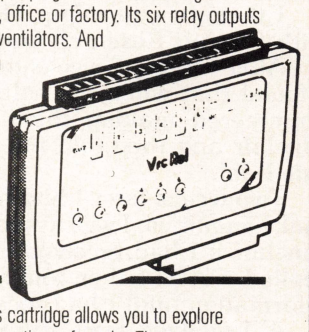
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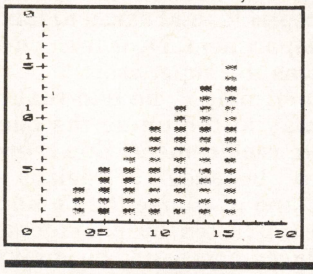


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YOUR LETTERS

This page is where you get the chance to put your opinions in print. Personal Computing Today welcomes letters from you on any aspect of microcomputing and views in general – as long as they're printable!

Please drop us a line to: The Editor, Personal Computing Today, 145 Charing Cross Road, London, WC2H 0EE.

Dear Sirs,

I thought you might like to learn of my experience with Sinclair Research Limited.

After waiting 8 weeks to receive a 16K ZX Spectrum, I found that when the colour was used, the characters shimmered making them difficult to read. I phoned Sinclair and they told me to send the computer back; this I did.

Two weeks later I had heard nothing, so I phoned to make enquiries. I was asked by the telephone operator at Sinclair if I had received a card from them, to which I replied, no. She then told me that she could give me no information until I had received a card.

A few days later the card arrived, and I phoned Sinclair quoting the reference number on the card. I was told by the operator that although I had received the card and had quoted the reference number, she could not find out any information. She assured me that because I had the card my computer was soon to be dealt with, and I should phone back in a few days; this I did.

It was now five weeks after sending my Spectrum for repair, and feeling a little annoyed I phoned Sinclair, gave my name and reference number to the operator and waited. I was told very politely that my computer was nearing the top of the pile. I told the operator, also politely, that this was unacceptable, and asked to talk to the manager of the service department; I was then put on to someone, who said she was the supervisor.

I explained my case to her, only to be told that my computer was working its way to the top of the pile. I then asked for an immediate replacement. She refused this request, saying that because of delays in despatching new machines, and of course the infamous design fault, she had been instructed by management that no such immediate replacements would be possible. But she said she might be able to rush things along in a weeks time.

I was forced to ask for a full refund, which she immediately agreed to.

I may now never take up the hobby of home computing, because at the moment there is no comparable machine to the Sinclair ZX Spectrum in price and function available. But if Clive Sinclair thinks that he can use this fact to keep his customers happy and loyal to his company then he is sadly mistaken, and his company does not deserve to prosper.

As you may have worked out by now, I am not a very happy person, because this sort of bad service does not only reflect on Sinclair, who don't seem to care anyway, it also tends to reflect on British service as a whole as opposed to Japanese companies who have always given me excellent after sales service, i.e. Vivitar UK and Pioneer UK. If this sort of experience is widespread it must also affect the sales of your magazine.

I have sent a copy of this letter to Mr Sinclair hoping it may help other customers and in turn Sinclair themselves in the future.

Yours faithfully,
Keith Allen
London

Editors reply: this was just one of many letters on the same subject and Clive Sinclair's reply follows below.

Dear Ms Joiner

In response to the many queries which, I understand, your magazine has received, I would like to personally explain the current delivery situation for our new ZX Spectrum personal computer.

The general public's response to our new computer has far exceeded our expectations and we have been 'swamped' with orders. This and some small initial production delays have led in turn to considerable delays in delivery.

Regrettably, many of our customers may have to wait up to 12 weeks, from our receipt of their order, for delivery of their Spectrum and we are writing to them all to apologise for the inconvenience and to offer them the chance of an immediate refund.

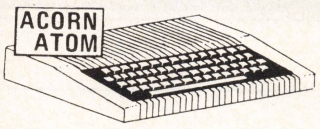
For those customers who continue to wait, we shall be sending out with each Spectrum, in compensation for the delay, a £10 voucher, which can be used in part-payment for a ZX Printer or to buy a complete pack of five rolls of printer paper.

We are also providing customers with a new demonstration tape containing:

1. **A complete 'keyboard trainer' to introduce the Spectrum.**
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3. **A series of illustrative programmes – Bubble Sort, Evolution, Life, Monte Carlo and Waves.**

Finally, I would like to assure you and all our customers that the initial problems with the Spectrum have now been completely overcome. Production is running smoothly at 5,000 units per week and will rise sharply over the coming months. We are confident that our present backlog will be cleared by the end of September and hope that you will see current delays in the context of our successful delivery of more than 500,000 computers in the last two years.

Yours sincerely
Clive Sinclair
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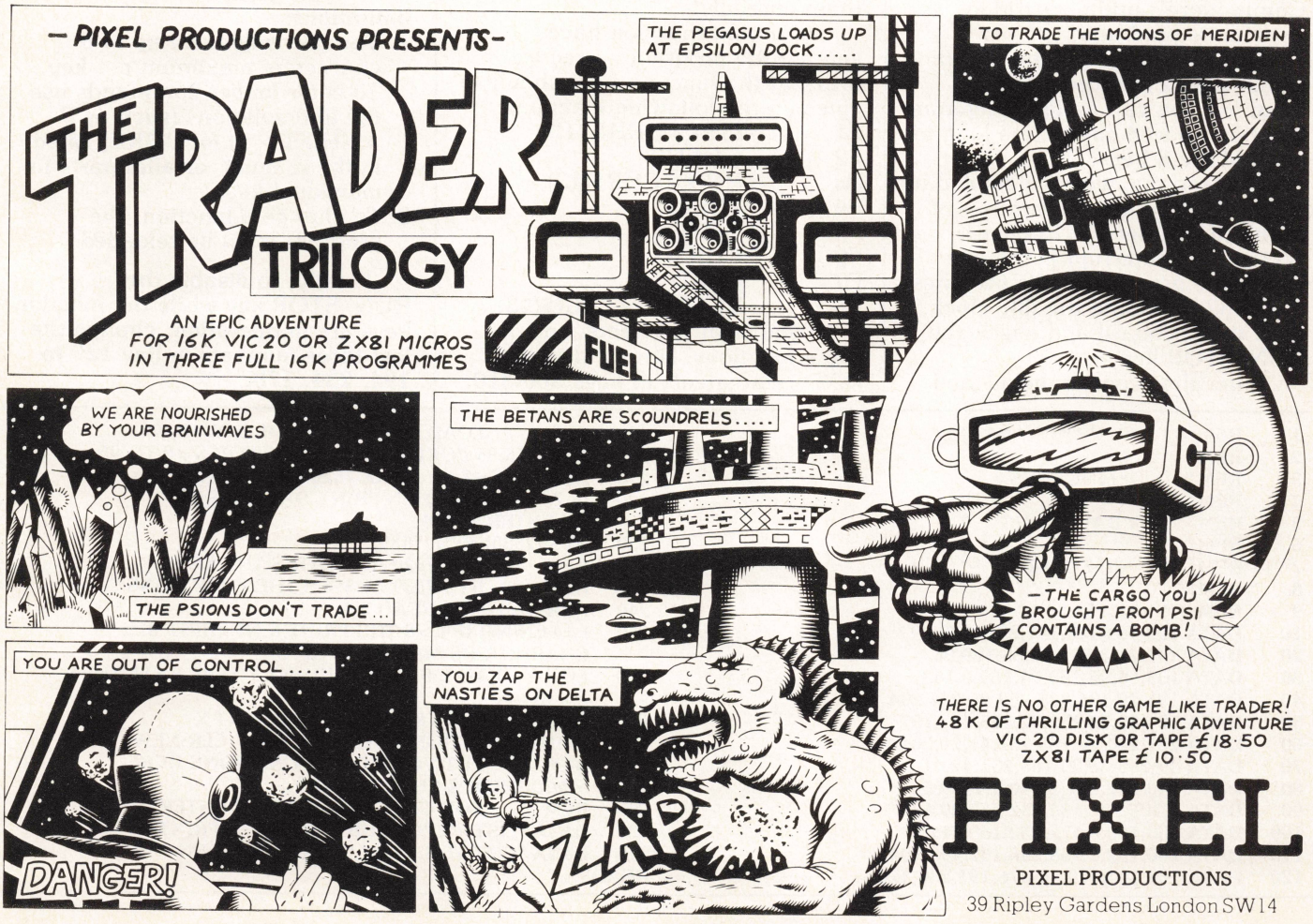
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MICROSPOT

VIC 20 FUNCTION KEYS

In many manuals use of the VIC 20s function keys have been omitted but now Dave Tong shows you how to make the most of them in a simple routine.

The four function keys on the right hand side of the VIC 20 are probably the most neglected part of the whole computer. Relegated to 'PRESS F1 TO START THE GAME', and dismissed with less than a page of text and a simple basic program by two books, the VIC REVEALED and the PROGRAMMERS REFERENCE GUIDE, the only way to use them as true definable function keys has been to spend £35 on one of Commodore's utility cartridges.

That is until now!

Using a simple 160 byte routine which sits at the top of BASIC memory, you can assign a separate function up to 8 characters long to each of the 8 keys.

This routine, which is loaded by a BASIC program, becomes part of the IRQ (Interrupt ReQuest) vector. This interrupt is the one which the processor calls 60 times a second to update the jiffy clock, scan the keyboard and check the RUN/STOP key.

Enter the program below and SAVE it before you RUN it! When the program has finished, it NEWs itself.

Now type RUN and press RETURN. All being well, the screen should clear and the messages "FUNCTION KEYS DEFINED" and "READY" should appear, along with the cursor. If you get the message "DATA ERROR", then you have made a mistake entering the data statements in lines 10-120. Check them carefully!

Assuming that you have entered the program correctly, pressing the function keys should give you the following functions:

F1 LIST + CHR$ (13)
F2 GOSUB
F3 RUN + CHR$(13)
F4 PRINT
F5 GOTO
F6 CHR$(
F7 LOAD
F8 RETURN + CHR$(13)

If you wish to change any of these functions, simply alter the DATA statements in lines 300-310.

To eliminate the need to press carriage return, you can add one by simply entering '←' at the appropriate point(s).

For example: if you wish to LIST the program whenever a key is pressed, change the appropriate DATA statement to "LIST←".

The function keys can be cleared by pressing RUN/STOP and RESTORE together. To re-enable the keys, enter 'SYS 7520'.

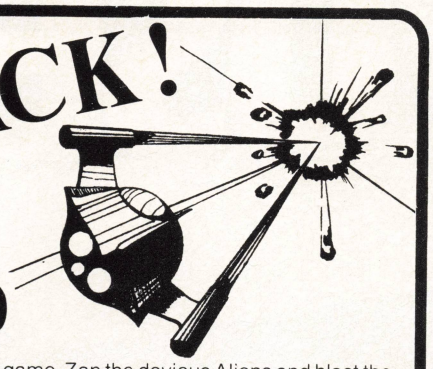
The program has two limitations:

1. You can only have up to 8 characters maximum per key. To enter longer commands use the abbreviations (such as P <SHIFT> O for POKE) listed in the manual, or allot parts to individual keys.
2. To change a function, the program must be reloaded.

Finally, to disable the RUN/STOP key while the function keys are in operation, change the last three numbers in line 120 to 194, 234, 170.

```
1   REM ***************
2   REM*               *
3   REM*  DEFINE KEYS  *
4   REM*               *
5   REM*  BY DAVE TONG  *
6   REM*               *
7   REM*   (C) 7/7/82   *
8   REM*               *
9   REM ***************
10  DATA 120,169,128,141,20,3,169,29
20  DATA 141,21,3,88,133,56,169,96
30  DATA 133,55,96,160,64,169,0,153
40  DATA 191,29,136,208,250,96,234,234
50  DATA 72,138,72,152,72,165,197,197
60  DATA 251,240,44,133,251,41,29,201
70  DATA 39,208,36,24,165,251,42,41
80  DATA 240,172,141,2,240,3,24,105
90  DATA 8,105,128,133,252,169,29,133
100 DATA 253,160,0,177,252,153,119,2
110 DATA 200,192,8,208,246,132,198,104
120 DATA 168,104,170,104,76,191,234,170
199 REM      LOAD MACHINE CODE ROUTINES
200 POKE 55,96:POKE56,29:CLR:Z = 0:FOR X = 0 TO 95
210 READ Y:Z = Z + Y:POKE 7520 + X,Y:NEXT X
220 IF Z < > 12270 THEN PRINT"DATA ERROR!
    RE-ENTER":STOP
230 SYS (7520):SYS (7539)
235 REM      SYS 7520 ACTIVATES THE KEYS
236 REM      SYS 7539 ERASES THE FUNCTIONS
240 FOR X = 1 TO 8:READ N$
250 L = LEN(N$):IF L > 8 THE PRINT X;N$:PRINT"8
    CHARACTERS MAXIMUM!":STOP
260 FOR Y = 1 TO L:P = ASC(MID$(N$,Y,1)):IF P = 95 THEN
    P = 13
270 POKE 7607 + Y + 8 * X,P:NEXT Y:NEXT X
280 PRINT"FUNCTION KEYS DEFINED.":CLR:NEW
298 REM      PUT YOUR OWN FUNCTIONS HERE
    <MAXIMUM 8 CHARACTERS!>
299 REM      FOR CARRIAGE RETURN ENTER'←'
300 DATA "LIST←", "GOSUB", "RUN←", "PRINT"
310 DATA "GOTO","CHR$(","LOAD","RETURN←"
READY
```

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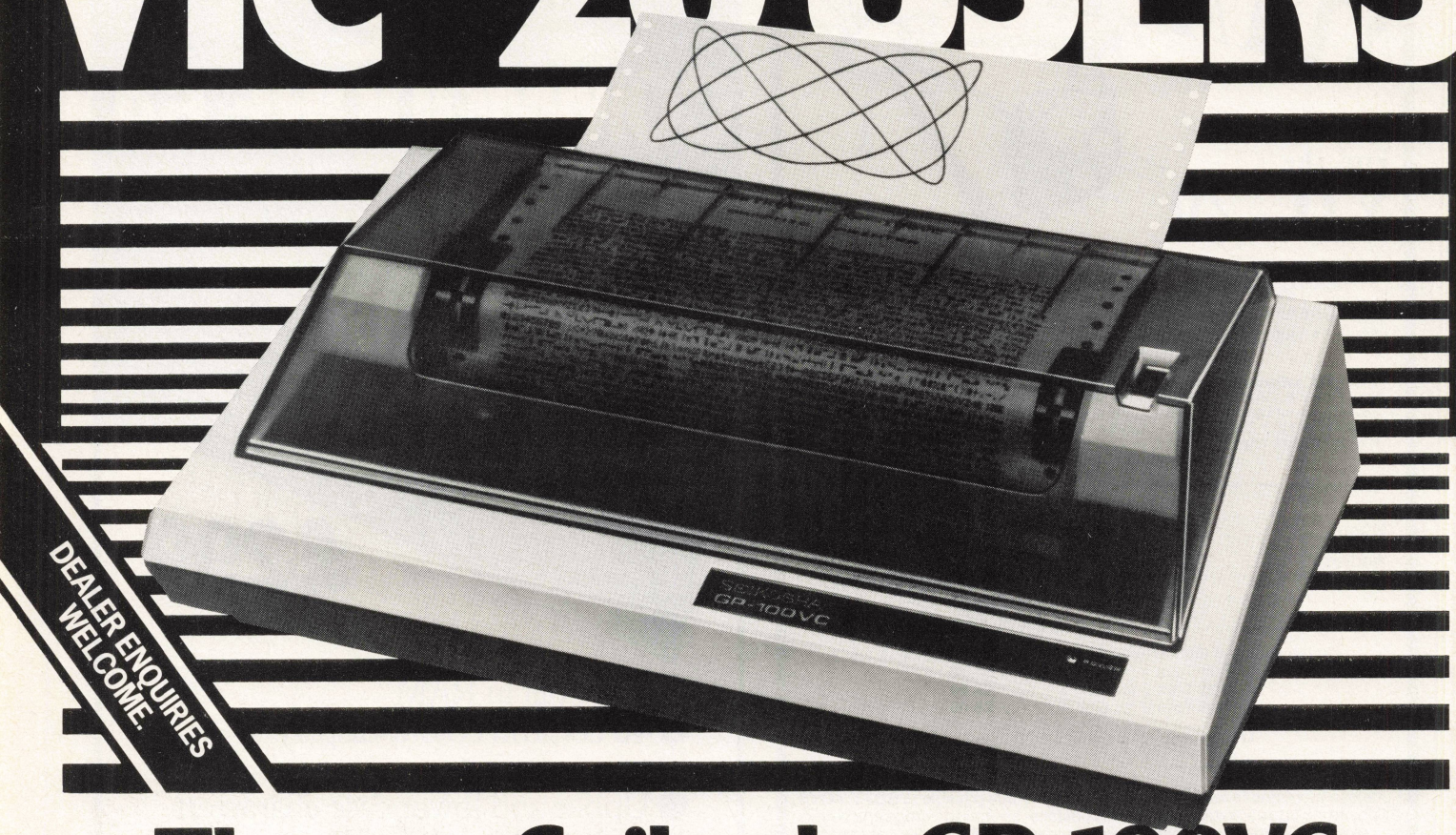
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ATARI 400/800

SOFTWARE

SARDAUKAR ASSAULT

Defend the Golden Tower against hoards of attacking space warriors in this Atari game by Chris Palmer.



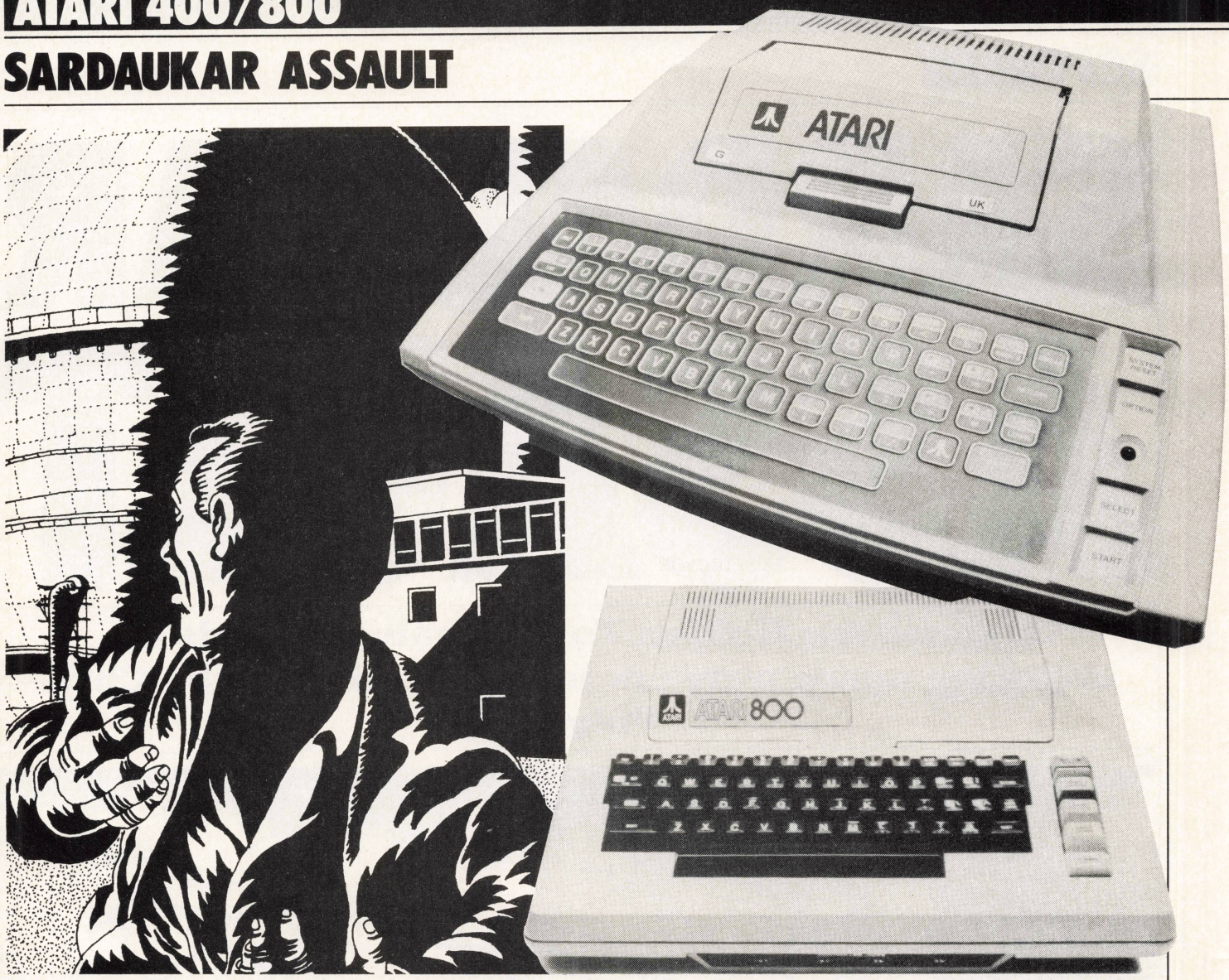
Trapped on a remote outpost somewhere at the edge of the galaxy you are the last remaining defender of your empire. Materialising above your base are scout ships of the dreaded Sardaukar fleet. Can you destroy them before they blast through the golden tower and damage your power base? If you succeed in wiping out one wave, then an even stronger fleet is sent against you. See how many of them you can destroy before you are overrun.

Sardaukar Assault is written in BASIC for the Atari 400/800 with a minimum memory of 16K. The game is controlled by a joystick plugged into the lefthand port, but can be easily converted to use the keyboard.

When the game starts, the joystick controls the movement of a gold coloured dot, which is the point to which your defence laser will fire. To destroy the alien attackers you have to hit them with the laser. The game ends when the Sardaukar's laser shots have penetrated the green power base at the bottom of the tower. After each successive wave your tower is rebuilt.

ATARI 400/800

SARDAUKAR ASSAULT



HOW IT RUNS

10-25	Sets up the position array and clears all its positions.
30-90	Prints up beginning screen and rotates the background colours.
100-130	Sets up specific variables, changes the graphics mode and sets the colours.
135-137	Goes to the routines to print the mountains and the golden tower. Also reads the joystick.
140-155	Tests for the fire button. Checks to see whether a ship has been encountered and checks to see whether all the ships have been cleared.
157-175	Plots laser track from base.
180	Plots laser aiming position.
185-200	Random jumps for alien fire and alien appearance.
999	End of main program loop.
1000-1050	Draws mountains.
1100-1180	Draws golden tower and power base.
2000-2110	Reads joystick and examines new position.
3000-3080	Plots Sardaukar ship randomly on screen.
4000-4100	Checks to see if position is occupied by an active alien and if so explodes it.
5000-5090	Changes graphic mode, prints wave number and score so far.
6000-6110	Plots Sardaukar shots from random ship position and checks to see if power base has been reached.
7000-7100	Explodes base and prints end of screen display.
7200-7260	Provides screen flash and wipes out base.

HINTS ON CONVERSION

Sardaukar Assault is written using Atari BASIC, which is quite like most forms of Microsoft, so the BASIC in the program should be easily convertible. It is run in graphics mode 7 + 16, which gives the computer a screen resolution of 160 x 96 in 4 colours. The graphics commands used are: PLOT, which turns on a single dot, DRAWTO, which draws a line from the current PLOT or DRAWTO position to the specified location, SETCOLOR, which primes a colour register with a colour and a luminosity, COLOR, which changes the PLOT or DRAWTO colour and LOCATE, which reads the value of a dot into a specified variable.

All the commands should be able to be duplicated on another machine providing it has a PLOT or DRAWTO equivalent. The one feature of the Atari that you might have trouble in duplicating is that if you change the colour or luminance in a SETCOLOR statement, then everything that has been plotted in that colour now assumes the new colour. On the BBC computer this can be achieved by using the VDU19 command.

To convert the game to run with the keyboard, change line 2010 to a keyboard GET statement and then change lines 2020 -2055 to alter the values of X and Y according to which key has been pressed.

PROGRAM LISTING

```
 10 REM SARDAUKAR ASSAULT
 20 CLR : DIM P(20,2):KILL = 4
 25 FOR I = 0 TO 20:FOR T = 1 TO 2:P(I,T) = 0:NEXT
    T:NEXT I
 30 GRAPHICS 2 + 16
 40 POSITION 16,0
 50 PRINT #6, "SARDAUKAR"
 60 POSITION 17,2
 70 PRINT #6, "ASSAULT"
 75 FOR P = 1 TO 3
 80 FOR I = 1 TO 14:SETCOLOR 4,I,10:SOUND P,I*
    10 + P,10,12:FOR T = 1 TO 50:NEXT T:NEXT I
 90 NEXT P
100 REM SET UP VARIABLES
110 Z = 1:X = 80:CO = 0:PL = 1
120 GRAPHICS 7 + 16
130 SETCOLOR 4,0,0:SETCOLOR 0,1,12:SETCOLOR
    1,6,12:SETCOLOR 2,11,12
135 GOSUB 1000
137 GOSUB 2000
140 IF STRIG(0)< >0 THEN 175
150 IF L< >0 THEN GOSUB 4000
155 IF CO> =KILL THEN GOTO 5000
157 SOUND 0,150,8,15
160 COLOR 1:PLOT 80,60:DRAWTO X,Y
165 SOUND 0,200,8,15
170 COLOR 0:PLOT 80,60:DRAWTO X,Y
175 SOUND 0,0,0,0
180 COLOR 1:PLOT X,Y:COLOR 0:PLOT X,Y
185 O = INT(RND(1)* 20 + 1)
190 IF O>16 AND O<18 THEN GOSUB 3000
200 IF O<15 AND O>8 THEN GOSUB 6000
999 GOTO 137
1000 REM DRAW MOUNTAINS
1005 PLOT 1,75
1010 FOR I = 1 TO 159 STEP 5
1020 Y = INT(RND(1)* 20 + 76)
1030 COLOR 2
1040 DRAWTO I,Y
1050 NEXT I
1100 REM DRAW BASE
1105 COLOR 1
1110 FOR I = 70 TO 80
1120 PLOT I,95:DRAWTO I,96 - (I - 68)  2/4
1130 PLOT 160 - I,95:DRAWTO 160 - I,96 - (I - 68)↑2/4
1140 NEXT I
1145 COLOR 3
1150 FOR Y = 90 TO 95
1160 PLOT 78,Y:DRAWTO 82,Y
1170 NEXT Y:Y = 50
1175 FOR P = 1 TO 3:SOUND P,0,0,0:NEXT P
1180 RETURN
2000 REM READ JOYSTICK
2010 S = STICK(0)
2020 IF S = 7 THEN X = X + 2
2030 IF S = 11 THEN X = X - 2
2040 IF S = 13 THEN Y = Y + 2
2050 IF S = 14 THEN Y = Y - 2
2055 IF S = 15 THEN RETURN
2060 IF X>159 THEN X = 159
2070 IF X<1 THEN X = 1
2080 IF Y>70 THEN Y = 70
2090 IF Y<1 THEN Y = 1
2100 LOCATE X,Y,L
2110 RETURN
3000 REM PLOT SARDAUKAR
3010 IF PL>KILL THEN RETURN
3020 A = INT(RND(1)* 140 + 5)
3030 B = INT(RND(1)* 20 + 5)
3040 P(Z,1) = A:P(Z,2) = B:Z = Z + 1:IF Z>20 THEN 7000
3050 COLOR 3:FOR P = 1 TO 6
3060 PLOT P/2 + A,B + P:DRAWTO (A + 6) - P/2,B + P
3065 SOUND 0,200,10,7 + P:SOUND 1,201,12,7  - P
3070 NEXT P:PL = PL + 1
3075 SOUND 0,0,0,0:SOUND 1,0,0,0
3080 RETURN
4000 REM ALIEN HIT
4010 FOR I = 1 TO Z
4020 IF X> = P(I,1) AND X<P(I,1) + 6 AND Y> =  P(I,2) AND
    Y<P(I,2) + 6 THEN 4040
4030 NEXT I:RETURN
4040 A = P(I,1):B = P(I,2)
4060 COLOUR 0:FOR P = 1 TO 6
4070 PLOT P/2 + A,B + P:DRAWTO (A + 6) - P/2,B + P
4075 SOUND 0,200 - P* 20,10,15
4080 NEXT P
4090 P(I,1) = 0:P(I,2) = 0:SC = SC + 10:CO = CO + 1
4095 SOUND 0,0,0,0
4100 RETURN
5000 REM END OF WAVE
5010 GRAPHICS 1 + 16:WA = WA + 1
5020 POSITION 0,0
5030 PRINT #6;"WAVE ";WA;" COMPLETED"
5040 PRINT #6;"SCORE =  ";SC
5045 KILL = KILL + 2:CO = 0:PL = 1:FT = 0
5050 FOR T = 1 TO 1000:NEXT T
5060 FOR I = 1 TO 20:FOR T = 1 TO 2
5070 P(I,T) = 0
5080 NEXT T:NEXT I
5090 GOTO 100
6000 REM SARDAUKAR FIRE
6010 FP = INT(RND(1)* Z + 1)
6015 IF P(FP,1) = 0 THEN RETURN
6020 COLOR 2
6025 SOUND 0,100,6,15
6030 PLOT P(FP,1) + 3,P(FP,2) + 5
6040 DRAWTO 80,62 + FT
6045 SOUND 0,50,6,15
6050 COLOR 0
6060 PLOT P(FP,1) + 3,P(FP,2) + 5
6070 DRAWTO 80,62 + FT
6100 FT = FT + 1:IF FT>28 THEN 7000
6105 SOUND 0,0,0,0
6110 RETURN
7000 REM END
7010 FOR I = 5 TO  - 10 STEP  - 0.5
7020 FOR T = 1 TO 14
7025 SOUND 0,T + 200 - I* 2,10,T
7030 SETCOLOR 0,1,T
7040 FOR P = 1 TO I:NEXT P:NEXT T:NEXT I
7045 SOUND 0,0,0,0:GOSUB 7200
7050 GRAPHICS 1 + 16
7060 POSITION 0,0:PRINT #6;"GAME OVER"
7070 PRINT #6;"SCORE =  ";SC
7080 PRINT #6;"PRESS FIRE TO START"
7090 IF STRIG(0)< >0 THEN 7090
7100 RUN
7200 FOR I = 0 TO 14:SETCOLOR 4,0,I:NEXT I :SOUND
    0,10,4,15
7210 FOR I = 14 TO 0 STEP  - 1
7215 SOUND 0,10,4,I
7220 SETCOLOR 4,0,I:FOR T = 1 TO 3* I
7230 NEXT T:COLOR 0
7240 PLOT 70,90 - I:DRAWTO 90,90 - I
7250 NEXT I
7260 RETURN
```

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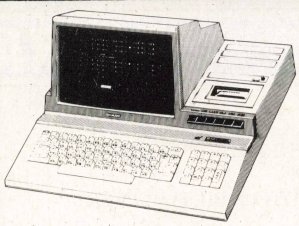
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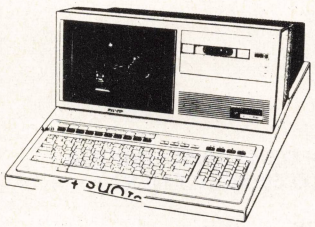
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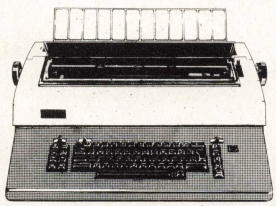
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COMPUTER USERS CLUB

Starting a computer club yourself is not as difficult as you might at first think. Neville Ian Ash goes through the motions with you giving useful advice throughout.

Microcomputers are selling so fast, that in a radius of just one mile, there are almost bound to be enough people interested in forming their own computer club. Someone needs to take the first step and because it appears complicated, many people never set up or join a computer club. But it's still the best way to find out more about micro-computing in a non-commercial atmosphere.

And apart from the people in your area who already own their own micros, there will be lots more who are interested but haven't bought their first machine.

Finding Members

How do you go about finding members? Once people know you are forming a club, there will be no shortage of potential members.

Contact your local dealer who will tell you about his customers in your immediate area and will be interested in your club as a potential market.

Visit your local library, who will be willing to put a message on their notice board. Your local town hall often offers the same service.

Write to your local newspapers telling them of your intention, explaining that the area needs a computer club, and become local news. You can also take classified advertisements in local papers, although you will find this is fairly expensive.

Newsagents have card advertisements which cost only a few pence a week and produce surprising results for the low outlay.

Don't forget to write in to Personal Computing Today and we will print your request on our club page.

Next you must decide what sort of group you would like to run. Micro computer organisations can be split into two broad categories, clubs and user groups.

The club will have a general interest in micro computing and when its membership grows, special sub-groups often form according to the special interests of the members. But in the beginning you need the club approach because it appeals to as many people as possible.

While a group is specialised according to a particular brand of micro like the ZX81, VIC, BBC or Dragon, it can also be concerned with a special interest like the PASCAL language, the 6502 chip or robotics.

It's important to make all types of people welcome, especially the ones who have yet to make that final decision and buy a micro computer. So don't try and take a complicated approach to computing.

Premises – where?

You could hold your first meeting at home, but it's rather crowded when you have ten people and their micro-computers.

You really need somewhere special for your meetings and as finance is always a problem, costs must be kept as low as possible.

Logical low cost places for holding your meetings can be the local dealer, or arrange to hire a room over a pub, a church hall, or the local library. Looking further



afield technical colleges and town halls are also possibilities. Your main consideration must be low cost combined with continued availability on a regular basis.

Meetings – monthly, fortnightly, weekly?

Clubs and groups make lots of work and its extremely important at the earliest stage to spread the load. Otherwise your club can literally take you over and run your life...Keeping things informal, come to an agreement with people to handle each aspect of the proceedings.

Equipment for the meetings will have to come from your members unless a local dealer agrees to use his premises and equipment. Make sure they have insurance cover for their equipment when it is used out of the house. Many people add them to the contents policy but some have no cover at all. Once your membership is large enough approach an insurance broker who could produce a special policy for the club or special rates for your members.

Once you have delegated the jobs involved consider how often your club will hold meetings. Remember that people are coming along specially for the evening, so you need to plan a program for each meeting. You could have meetings once a week, but its better to start off once a month, until you have gauged the demand.

Starting off the program seems quite a problem, but lets break it down. Everyone likes to see new hardware and software, so your first contact must be the loal dealer. Your club represents potential business and he will probably be quite willing to demonstrate the latest product. In fact he may become a valuable member of your club.

The ACC – Amateur Computer Club can also help you. They act as a co-ordinating body for the clubs and regional groupings. They can also help you set up your own club and can be contacted at:— Amateur Computer Club, St. Johns College, Oxford, OX1 3JP.

The micro computer distributors also have information they can supply and may even arrange demonstrations, if their main one is in your area.

Don't forget the expertise in your own club. There's bound to be a wide range of knowledge from the real beginner to the computer buff. He will be delighted to explain the finger points and solve those problems that kept you up all night.



What To Charge Members

While you are setting up the club it's best to take a small fee at the door for each meeting, so the running costs are covered. Once things become stable, arrange a formal meeting and set an annual subscription, payable in advance. If you have plans for a newsletter and a software library, remember they all cost money, and the best way to get it is from an annual subscription.

As a guide membership ranges from £2.50 upwards purely according to the frequency of the meetings and the services offered by the club.

If you offer a software library, it may just cost you the time to make copies, but people are usually quite willing to pay a fee for each tape or disc. Put a margin on these copies and it all helps club expenses. After all, one club offers a disc full of programs for £3 — a bargain — and if the disc costs the club £1.50, its a fair return to running expenses.

If you decide to run a newsletter and it gets off the ground, you can sell advertising space to local dealers and suppliers. Some of your members can become advertisers as well.

Costs will always rise more than you expect and one area to keep a close eye on is postage and stationary.

Now you know how simple it can be to set up your own club, take the plunge and start tomorrow by writing to your local paper.

If you have any problems setting up your computer club don't hesitate to let us know and we will try and help you out.

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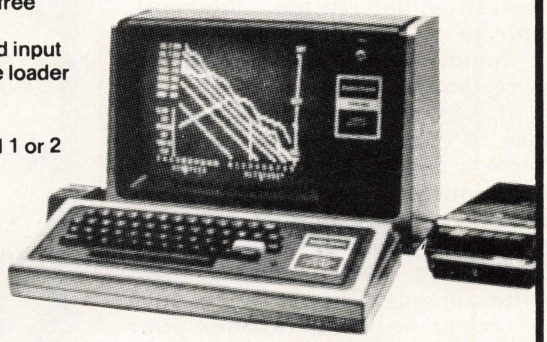
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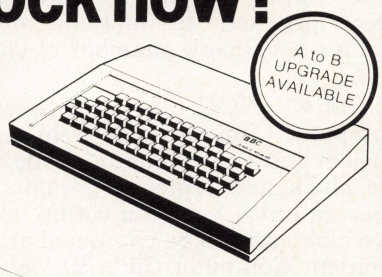
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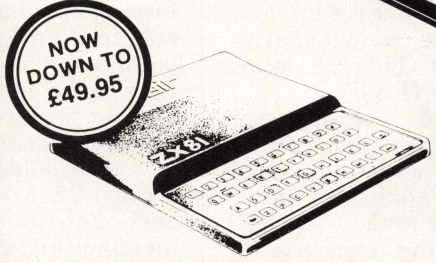
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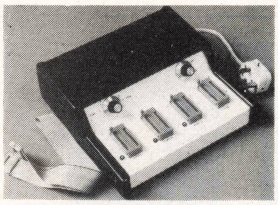
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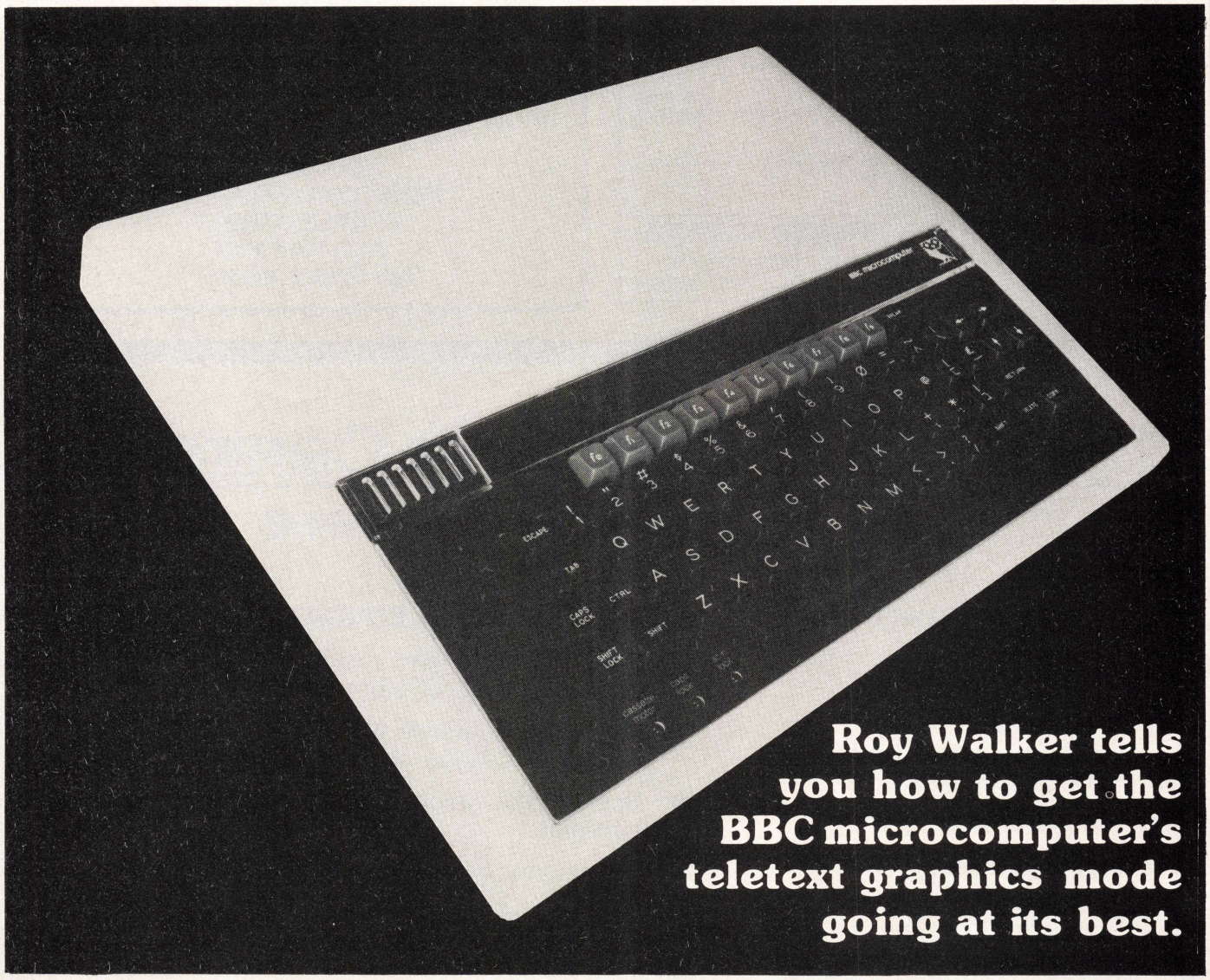
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TECHNIQUE

TUNE INTO TELETEXT



Roy Walker tells you how to get the BBC microcomputer's teletext graphics mode going at its best.

The BBC computer has some sophisticated graphics capabilities; but unfortunately using 'high resolution' often means wasting too much RAM on the display, and not having enough left over for the program itself. The 'cheapest' mode, in terms of memory, is MODE 7 — which uses a full teletext characters set. But nowhere in the Provisional User Guide are you told how to make use of the functions supplied.

A good way to get ideas is to look through the programs on the 'Welcome' cassette which comes with the computer, and see how they work. Although these programs have an irritating 'mugtrap' making it impossible to break out of the chain-loading, there is a way around it.

(By pressing BREAK the screen clears, and the program is

supposedly erased. But now type OLD, press RETURN, and the program is ready to LIST for your examination.

The way in which the internal organs of the BBC computer work are quite complex. As well as printing characters on the screen, it is possible to print control codes. When a control code is printed, an 'invisible' character is put on the screen, while the computer reads the code and executes the implied command. For instance:

PRINT CHR$ (7)

will print a space, but will also sound a short beep. The VDU command (Visual Display Unit) does just the same, except it does not return a line-feed to the cursor. Briefly, this is the Mode 7 character set:

TABLE A

0 – 31	See User Guide Page 188.
32	Space.
33 – 90	Upper case characters.
91 – 126	Lower case characters.
127	Delete previous character.
129 – 135	Set text colour.
136	Text flash on.
137	Text flash off.
141	Double height.
145 – 151	Define graphic character.
156	Background off.
157	Background on.
160	Space.
161 – 218	Upper case characters.
219 – 254	Lower case characters.
255	Inverse space.

The colours available in Mode 7 are as follows:

TABLE B

1	RED
2	GREEN
3	YELLOW
4	BLUE
5	MAGENTA
6	CYAN
7	WHITE

A more detailed explanation for some of the character functions is needed:

129 – 135

Using these codes it is possible to set the colour of the text following. The colour code is only valid for the single line after it, i.e. a maximum of 39 characters. The codes are used in the form PRINT CHR$ (128 + n); , where 'n' is a colour value from Table B.

Thus: PRINT CHR$ (130); "GO AWAY!" will print the cordial greeting in green.

136

This provides an automatic flash for the text of the following line, e.g. PRINT CHR$ (136); "GO AWAY!" makes the text flash on and off about once a second.

137

This is used to disable the effect of code 136, PRINT CHR$ (136); "GO"; CHR$(137); "AWAY!" will only flash the 'GO' and not the 'AWAY'.

141

Using this code gives you a 'double height' function. The code and text must be entered twice; once for the top half and once for the bottom.

e.g. PRINT CHR$(141); "DOUBLE HEIGHT";';CHR$(141); "DOUBLE HEIGHT"

It is also possible to create your own characters by printing the top half of one with the bottom half of another.

145 – 151

These codes allow user-definable graphics in the seven colours. The graphics are built up on a six unit grid;

1	2
4	8
16	32

Any character is defined by filling in certain units.

e.g. (a)

1	2
4	8
16	32

1 + 8 + 16 = 25

(b)

1	2
4	8
16	32

2 + 4 + 32 = 38

Each character defined must have its own code in the ranges 160 – 191, and 224 – 255. This means that if the unit number is less than 32, it gets 160 added to it, and if it's greater than 32 it gets 192 added to it. Therefore the code for (a) is 160 + 25 = 185, and the code for (b) is 38 + 192 = 230

The colour for the defined character depends on the first control code.

e.g. To print (a) in red;

PRINT CHR$(145); CHR$(185)

and to print (b) in blue;

PRINT CHR$(148); CHR$(230)

This short program will show you all the possible characters:

```
10 N = 160: PROCCHR
20 N = 224: PROCCHR
30 END
40 DEFPROCCHR
50 C = 1
60 FOR Q = N TO (N + 31)
70 PRINT  Q,  CHR$(144 + C);
   CHR$(Q)
80 REPEAT UNTIL INKEY$(0) <> ""
90 C = C + 1 : IF C = 8 C = 1
100 NEXT Q
110 ENDPROC
```

N.B. "" = null string.

157

This fills a single line with a background in the most recently defined colour — if no colour has been defined it uses white.

e.g. To fill the line with red;

PRINT CHR$(129%; CHR$(157)

156

This code is used to turn the background mode off.

e.g. PRINT CHR$(130);CHR$(157); TAB(20);CHR$(156)

will print half a line of green.

One advantage of using CHR$ rather than VDU is that a long command can be set up as a single string, and can then be called simply by typing the string name. Many of the control codes can be built up into a compound function, providing quite a complex text display. Try this for a farewell:

```
100 A$ = CHR$ 134 + CHR$157
    + CHR$132 + CHR$
    136 + CHR$141
    + "GOODBYE!!!" + CHR$156
110 PRINT A$:PRINT A$
120 GOTO 120
```

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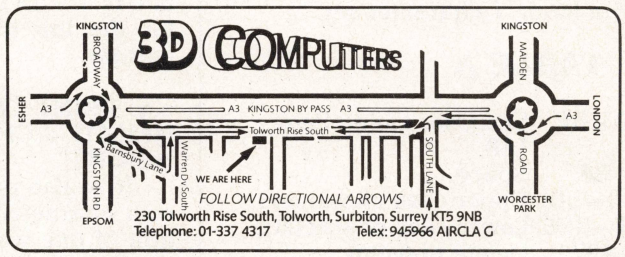
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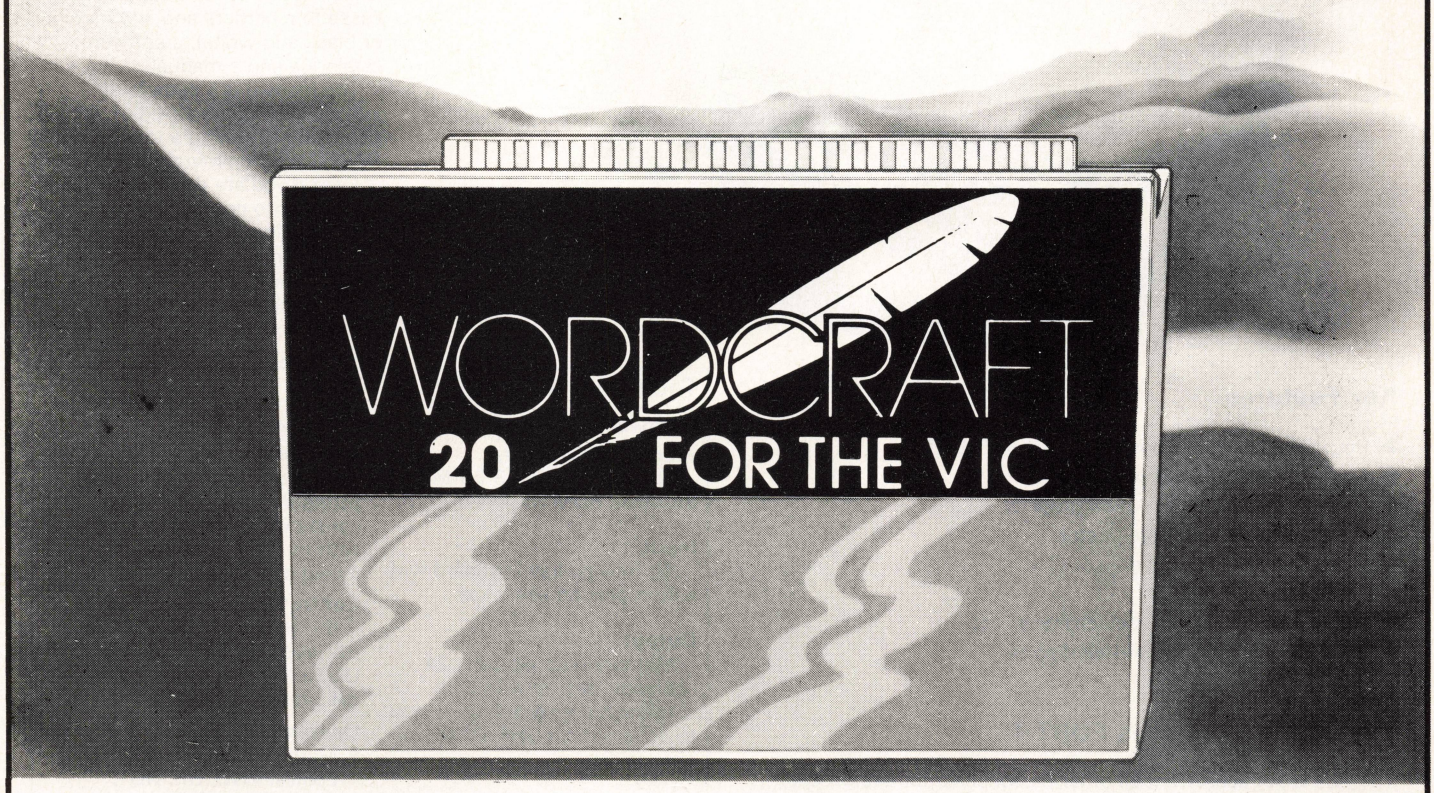
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Output
Memory-mapped 32 x 24 character display with high resolution user graphics. Output to drive normal UHF TV set on channel 36.

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SPECTRUM COMPUTER GROUP

LOOK BEFORE YOU LEAP

This month the Spectrum Computer Group is under scrutiny for its selling techniques.

One of the biggest problems facing the first time computer buyer is the decision of where to go when they decide to take the plunge. Until now the choice has been between the specialist computer shops and the high street chain stores. On the one hand the specialist stores provide the buyer with a lot of technical information, but are a little daunting for the novice, while the high street stores are almost the opposite. A little while ago another force moved onto the computer scene in the form of the Spectrum Computer Group. Despite its name, the Spectrum group has not nothing to do with Uncle Clive and his cohorts. The Computer group is in fact a division of the successful Spectrum (UK) Ltd, Britain's largest photographic retailers.

Spectrum (UK) is a voluntary trading group which dealers can join in order to share in the benefits given by a large group with the power to offer discounts through bulk buying. Spectrum has a large number of photographic retail outlets and it was through twenty of these that they made their first steps into the computer marketplace.

The shops that are involved with the Spectrum organisation carry a wide range of computers, from the old standards such as the VIC 20 and the Atari 400/800, to the larger machines such as the Sharp and Apple. The latest arrival to the fold is the Dragon 32, which



LOOK BEFORE YOU LEAP

by all accounts is selling like hot-cakes. Although the project was started using already established Spectrum photographic dealers they are now moving towards computer dealers who have not before considered carrying such a range of small microcomputers.

To someone used to the usual format of computer shops the Spectrum group of dealers might come as a bit of a suprise. For instance, Andrews in Teddington has been a Spectrum photographic dealer for a long time and recently decided to sell a computer range. Andrews has two photographic shops in Teddington although the computer section is at the moment residing in their third shop, which is yet another sort of retail shop.

No Demos

It is very strange walking into the shop and finding state of the art technology nestling on the shelfs with the latest prints from Athena. At the moment the shop does not carry the full range of Spectrum computers but are concentrating on the VIC, Atari, Sharp and Nascom to get a feel for the market. All the machines were on display but sadly they weren't being demonstrated for two reasons. First, there is the problem of local kids treating the shop as a free arcade, making it difficult for the staff to discriminate between potential buyers and time-wasters. And second, the trained member of staff dealing with the computers had just left, leaving them in the lurch until another member of staff is retrained.

This situation brings to the fore one of the criteria that Spectrum apply to their dealers. When a dealer is accepted into the group at least one of their staff must go along to an existing dealer to receive full training on the machines sold and follow this up by attending training sessions for new products. The training sessions that Spectrum run are usually carried out with assistance of the manufacturers to make sure that the dealers are up to date on the various machines' latest developments.

In Andrews, the machines had a varied but not comprehensive range of software and peripherals, although anything out of stock can quickly be ordered from the main warehouse if required. From studying the groups adverts it seems that it does carry most of the main titles from the manufacturer and also some from independent suppliers. They also carry a standard range of computer books.

Another type of Spectrum dealer is Surrey Micro Systems of Wallington. Before becoming Spectrum dealers this firm were business computer system dealers, specialising in the Tandy TRS-80. Alongside the Tandy they now carry the Atari 400/800, VIC 20, Nascom 'Special Edition', Sharp MZ80A, Dragon 32, Apple and the Texas TI 99/4a.

The fact that they are a Tandy dealer has stood them in good stead for Dragon sales. It is not common knowledge but the Dragon can run the Tandy Color Computers software. So you can imagine their delight when they discovered that they had a ready made software base from which to sell the Dragon.

Surrey Micro Systems carried a more professional air than Andrews in Teddington, although I expect this will change soon, as Andrews are thinking about opening two more shops that will be more heavily biased towards computers. Both shops offer an extended warranty on the computers they sell. The structure of the extended



warranty is that for a certain percentage of the price of the computer you will receive a two year cover, instead of the obligatory one year period during which you can return your computer, if it is faulty, to the centre from which you bought it. There it will be repaired or replaced within three or four days. At the moment Spectrum runs a 'Flying Engineer' service, where the engineer is mobile and calls into the shop as soon as a faulty machine is reported This gives a remarkably fast turn around time with none of the delays of sending the machine back to the factory for repair or replacement.

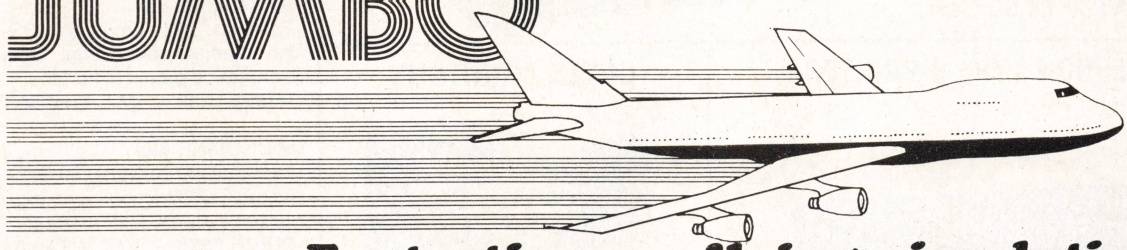
So what does all this add up to in terms of a place to buy your home computer? Because of the Spectrum Computer Group's relative youth it is difficult to assess whether or not it will work. Certainly the idea of making computers a lot more accessible to the public is a good one, but the dividing line between technical overkill and the blind leading the blind is a narrow one. The one point about the Spectrum group is whether in the developing price-slashing war it can still maintain the admirable standards already set and remain competitive.

On the whole the Spectrum stores I visited were quite adequate for the job they are undertaking. Although the more expertise available the better equipped Spectrum will be to help you.



INNOVATIVE
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JUMBO



Fantastic new flying simulation

Occasionally a program comes along of such magnitude that it is hard to describe it, especially within the space allowable in an advertisement. Jumbo is such a program. There have, of course, been flying simulation programs before, but they have all rather fallen into the trap of trying to produce a graphic representation of the ground at some stage or other in the program, thus taking up space, and/or they have concentrated on the single act of flying. In other words, although one gets the feeling of flying a small aircraft, one is not going anywhere.

Jumbo is a fantastically accurate simulation of flying a Boeing 747. These planes are not small, and are not flown by eye. They are flown by eyes and instruments, and the instrument graphics in this simulation are really first class. As you may know, the primary instrument of an aircraft is the artificial horizon. This is simulated very well, and includes instrument landing approach indicators. Graphic maps of very high quality are produced and it is possible to fly in all of the British Isles including Southern Ireland, and to New York on the Eastern U.S. seaboard. The actual airports are at London, Birmingham, Manchester, Prestwick, Edinburgh, Belfast, Shannon and New York.

The program was written by two authors who combined their joint skills to produce a unique piece of software. The programmer got the last byte of performance out of the machine and the pilot the last drop of authenticity out of the simulation. Other simulation programs produce at best a similarity towards flying. With Jumbo you really feel that you are behind the controls.

The authors have used a number of gimmicks and programming techniques. For instance, it is possible to switch on an automatic pilot and to jump forward in time in increments of one minute or one hour — otherwise of course a flight from London to New York or vice versa would take some 8 hours to simulate. Whilst in this time skip the various controls are left as they are but fuel consumption and distance to go are taken forward at their correct rate.

A chart is supplied containing various items of data which you will need, including the take-off data for a 747 with various take-off weights, flap retractions, climb and cruise speeds and descent distances.

Realising that not everybody can fly a 747 and that there is even a large proportion of the population that cannot fly anything, two important items of assistance have been added. First of all is the documentation. This is split into two parts. The second is a "manual" on flying the 747. In other words, the instructions for running the program. The first part, however, is what amounts to an instruction manual for flying. It assumes that the user knows nothing about aircraft and although we do not purport that it gets anybody up to any sort of standard after it has been assimilated, the reader should have sufficient knowledge of flying and the theory of flight to fly in the program itself. The second feature of assistance to the novice pilot is a feature in the program which enables the user to practice landings. When the program is started, if one presses the P key, the aircraft is automatically put 11 miles out from London Airport approaching on an instrument landing.

The controls are pretty well complete, even to dive and wheel brakes. The flying track may be continuously monitored on the map display. Bearing and distance to your intended point of landing are available all the time. The instruments, incidentally, consist of:

Artificial horizon	Attitude	Fuel
Aileron indicators	Compass	Elapsed time
Indicated airspeed	Turn indicator	Distance to landing
Power setting	Flap indicator	Rate of climb
Elevators	Altimeter	

Six maps may be chosen, as follows:

Scotland, Northern England, Southern England, Ireland, Eastern U.S.A., The whole of the U.K.

Route information and present position are shown on the map displayed. It is very difficult to think of any factor that the authors have overlooked. Even the quite meaningful thinning of the air with increasing height, which greatly affects the airspeed indicator in real life, is taken into consideration. Rather than having a fixed stalling speed, this continuously changes with the flight configuration, the weight, height and power setting, again as it does in real life.

We like to think that we publish good programs. Jumbo is outstanding. It is available on tape or disk for 16K or 32K memory machines. It is compatible with the Model I and Model III Tandy, Video Genie, Genie I and Genie II machines.

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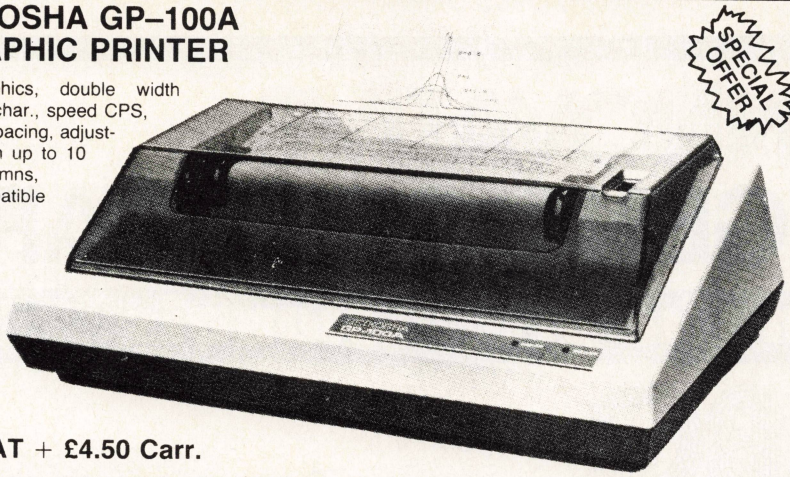
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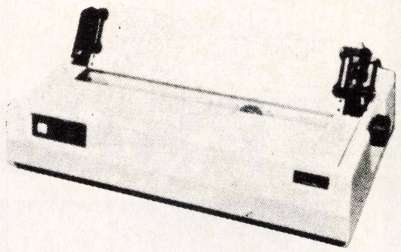
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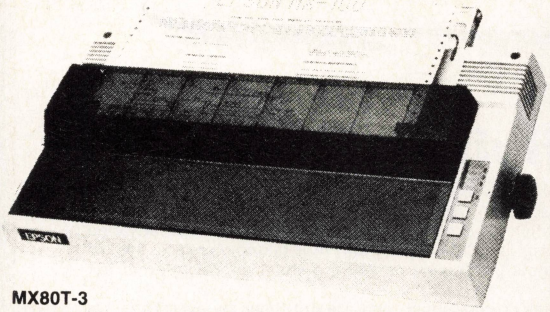
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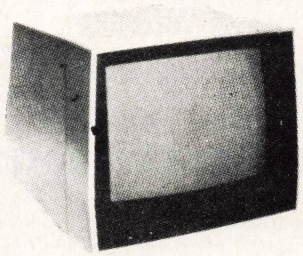
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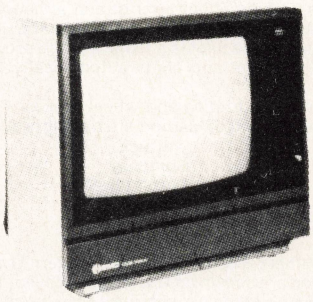
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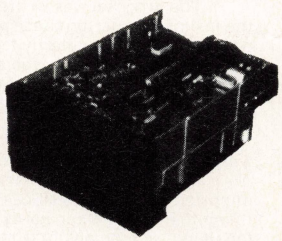
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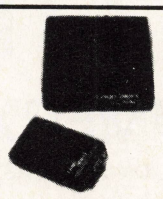
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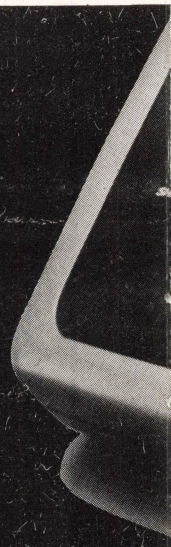
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TRS 80 TIPSTER



Some useful tips for TRS-80 owners to help their programming have been gathered together by David Bell.

During the two years, or so, that I have been using my Model 1 TRS-80, I have picked up a number of tips to assist my BASIC programming.

I do not pretend that any of these are of my own origin, most have been discovered by reading the many computer journals that are freely available, either from the bookstall or by mail order. In addition to these journals there is one book available that deserves a special mention, this is "Basic Faster and Better and Other Mysteries" by Lewis Rosenfelder. This is available through Molimerx Ltd at a price of £19.90 plus postage. I wouldn't say that this book was for a beginner, in fact a great deal of it requires some knowledge of a Disc Operating System (DOS), but it's 290 pages are packed with useful tips and subroutines, and is well worth the money.

One of the earliest tips that I picked up was a way of disabling the BREAK Key. If you are not using a DOS system this will work by placing the following at the start of your program:—

```
POKE 16396,23
```

Once this is added you will be unable to stop your program running (without doing a reset) unless you provide a suitable subroutine, say, using a GOSUB 20000 with the following at line 20000:—

```
POKE 16396,20:RETURN
```

When, at a later stage, I could afford to have a line-printer added to my system, I found the following routine useful. It alerts the user if the printer is not ready, thus avoiding your program going into that endless 'limbo' when it reaches the first LPRINT.

```
IF (PEEK(14312) AND
240)<> THEN PRINT
" * *PRINTER NOT READY * *
```

While on the subject of printers, if you POKE 16414,141 and POKE 16415,5 this will change PRINT statements to LPRINT. POKEing 16414,88 and 16414,4 will return the command to PRINT. This could be incorporated into the earlier printer checking routine in the form of a conditional GOSUB.

POKE 16421,0 will disable the printer, while POKE 16421,6 will return to normal operation. Both pokes assume DOS not present.

This tip is probably very obvious, but, if you enter the command RUN you erase all of the programe variables, rather a nuisance if you have only interrupted the program to do some editing. Instead if re-RUNning the program, enter GOTO nnnn (where nnnn is a suitable line number), your program will commence at that line number with your variables still intact.

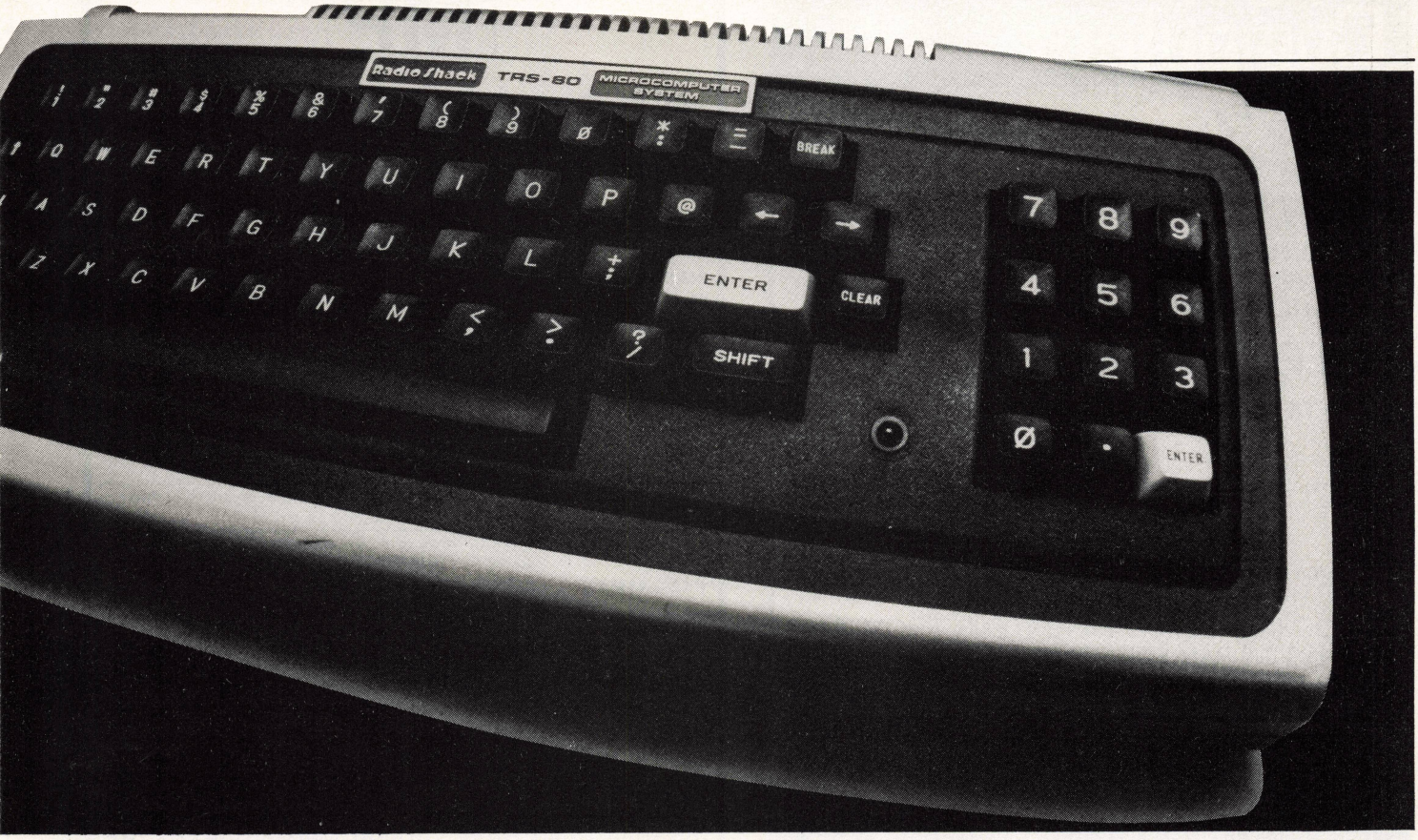
If you should have a system tape whose name you have forgotten, the following one-line program should display it, without you having to make hundreds of futile attempts to do so:

```
INPUT # - 1, A$:PRINT A$.
```

Type and RUN this program, start the tape recorder with the unknown system tape on it and press play. Providing you have the correct volume setting you will get the tapes file-name with the letter U added to the beginning eg, UGALAXY. If you ignore the U the rest of the name is the file-name.

Whenever you are in Level II Basic, and try to insert a comma or colon into a data string you will get the response "EXTRA IGNORED". You may overcome this by using the INKEY$ function in the following fashion:

```
10  REM INPUT A STRING TO
    INCLUDE COMMAS AND
    COLONS
20  PRINT "INPUT A
    STRING: - >";
30  S$ = INKEY$:IF S$ = " "GOTO
    30
40  PRINT S$;:IF S$ = CHR$(13)
    THEN 60
50  A$ = A$ + S$:GOTO 30
60  PRINT A$
```



Now something to help with BASIC program protection. A nice little routine that will stop certain program lines being viewed on the video screen. I will use the test line PRINT"THIS IS A TEST LINE":REM * * *

Enter the line in the normal way then go into the EDIT mode for that line. Space along until the cursor is over the last character (the third *) and press 'C' to change the character. Press the shift key and the up-arrow together and the cursor will jump to the top of the line and the character will disappear. Press <ENTER> to finish editing the line. Now if you type RUN the message "THIS IS A TEST LINE" will be displayed, but if you try and LIST the program the line will only flash on the screen briefly. The disadvantage to this is that the line would still print out on a line printer.

A rather more devious method of hiding a basic program line is this. Type in the same line again and, again, enter the line EDIT mode. Press X to position the cursor at the end of the line and press the SHIFT KEY. While holding the shift key down press the LEFT ARROW until the cursor is over the first letter of the line (the P of PRINT), none of the other characters should have been erased. Release the keys and type in anything over the top of the characters on your original line. Once you are at the end of the line press the <ENTER> key to end the editing session. When you now list the line, only the characters you typed in during the edit session will be displayed (something rude maybe!) but if you run the program, the original PRINT line will be shown.

One final tip. You can change your 'Protected Memory' from BASIC by using the following program line, but this must be followed by a CLEAR command to get the computer to read the new setting. In this progam line (I suggest line number 1), M! is equal to your desired memory size minus 1.

```
M! = 59999: POKE16562,M!/256:
POKE165 61,M! - INT(M!/256)
 *256:CL-
EAR50
```

Have you ever heard the word GARBAGE COLLECTION or STRING SPACE COMPRESSION? I have an economy priced database that appears to take forever to run, simply because of this problem. Every so often you may wonder what this is. Sometimes the machine just sits there and appears to do nothing while the keyboard and everything else is locked out.

To understand what is happening — if you defined 20 strings as three characters in length and later redefined those same strings as two characters in length, you would expect those 20 strings to take up a total of 40 bytes but this is not so! They actually take up 100 bytes as the newly defined strings are added to the old usable ones. Eventually the computer runs out of free string space and has to clear out this 'garbage' to release new space. This is what is known as garbage collection.

For those fortunate enough to own a Model II or Model III, Molimerx Ltd advertises a program called 'Garbage Collection' which retails at round the £50 mark. I have not tried this product, but from the desciption it looks impressive and I have never known this company to misrepresent a product. Those with the Model I are stuck with a machine that appears to 'lock-up' while clearing out its memory of unwanted string space. A few of the Disc Operating Systems have a facility built in to them whereby you may activate an 'ALIVE' facility. This shows a moving graphic symbol at the top right of the screen to show that your computer is still processing.

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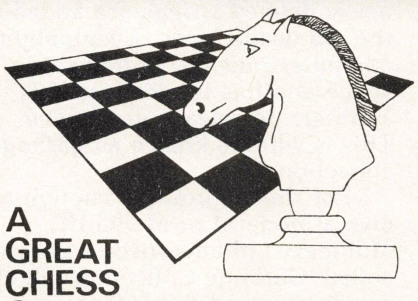
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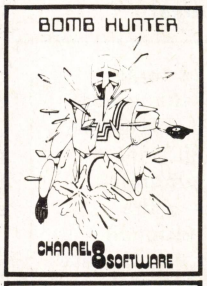
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SOFTWARE REVIEWS

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 PCT 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: **Horizons**
Type: **Tape**
Supplier: **Sinclair**
Machine: **ZX Spectrum**
Price: **Supplied Free**

This tape is a compendium of various programs for the ZX Spectrum and is included with every Spectrum sold and supplied to anyone lucky enough to already have one.

The tape starts, not suprisingly, with a program entitled 'Introduction' which is broken down into three parts. The first is a loading check which makes sure you have the tape volume set correctly, the second part loads two high-resolution pictures directly onto the Spectrum screen. These two on their own should prove that the Spectrum is well up in the graphic and colour stakes. The final section of this program gives a graphic breakdown of the machine and attempts to put each component in perspective as to its function. The remainder of this side of the tape contains four keyboard trainer programs and a keyboard dictionary.

Side B contains eight programs which show different facets of the Spectrum's capabilities. It kicks off with the compulsory game, in this case a version of the bat and ball game Breakout. Next comes a program entitled Bubblesort. A slightly strange choice this, but I suppose it would be useful to someone writing a home database or even a business program needing a sort routine. The next program is a simulation entitled Evolution in which you can observe the population changes of a colony of rabbits and their predators, foxes.

The fifth program is a version of Conway's classic game Life. You set up colonies of organisms and watch them grow, stabilise and die from the comfort of your favourite armchair. Sixth on the list is a slightly odd one. Called Monte-Carlo, it bears little resemblence to the racing car game you would expect. Instead it displays on the screen the results of throwing two dice and gradually compiles a histogram, which it compares with a chart of the expected results.

Finally the last program is very useful to anyone writing games or graphics software. Called Character Generator, it does just that. With this program you can call up, change or create your own custom characters and store them on tape.

C.P.

Ratings Table

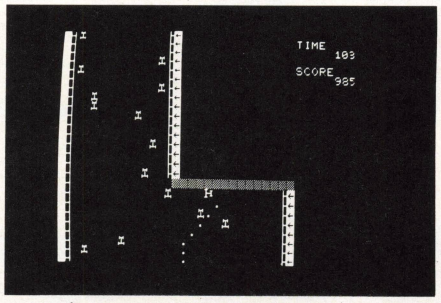
Program Quality	* * * *
Value for Money	N/A
Presentation on Screen	* * *
Ease of Use	* * * *
Crashproofing	* * *
Supplied Instructions	* * *
Overall	75%

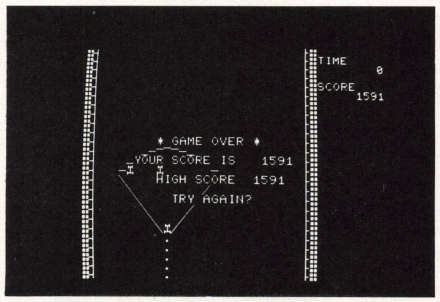
Title: Monaco Grand Prix
Type: Tape
Supplier: Knights Computers
Machine: Sharp MZ – 80K
Price: £5

No prizes for guessing what this game is about. You have to steer your Sharp symbol of a car through a track filled with other Sharp symbols of a car, all moving slower that you are.

The idea is to keep going as long as possible, without running up the exhaust pipe of one of the others. The Sharp keeps score of how you're doing and writes up rude messages if you aren't doing very well.

The only controls are left, right and speed. There are five levels of difficulty and each one puts more cars on the track and moves you quicker towards them. The race track twists and winds, changing width drastically as it goes and for a final killer, there





Two Sharp Racetracks

are tunnels to navigate!

Once in one of these your car's headlights come on and all you can see is what appears in the cone of light produced by them. Time to react is thus dramatically reduced and crashing is almost inevitable. Not much fun.

Overall not a bad race game, but limited as all these types are. After all, there are only so many ways of running into something! Good fun for a while though and handy to have around for passing the odd minute or six.

R.H.

Ratings Table

Program Quality	* * * *
Value for Money	* * *
Presentation on Screen	* * *
Ease of Use	* * * *
Crashproofing	* * * *
Supplied Instructions	* *
Overall	65%

Title: Alien Defense
Type: Tape
Supplier: Microdeal
Machine: TRS-80 Models I and III

This is an arcade style game with fast action, reasonable graphics and good sound effects.

Alien Defense is a shoot the aliens game played in the horizontal mode rather than the vertical mode. You control a space ship that travels horizontally across a moving landscape. Above this landscape are scattered a liberal helping of aliens, and hidden in the mountains of the landscape are a number of your men (15 to start with).

Occaisionally an alien lander will carry off one of your men, and if you destroy the lander while it is accomplishing this, and you catch your falling man you score 500 points. Different point values are scored for the differing alien craft that you destroy, but for every 25 aliens destroyed you obtain a further bonus of 100 points for each of your men that you have left. As well as firing at the aliens you start with three Smart Bombs. These bombs will destroy everything on the screen except your ship, and this includes your men. There is also a Warp Drive facility that you can activate to get you our of tight positions. While you are firing upon the aliens, they, of course, are firing at you. The missiles that they fire can only be destroyed by one of your Smart Bombs, though their bombs can be destroyed by your fire.

Overall I enjoyed the game and its complexity, but I did find the control keys difficult to manage. The number keys 1,2 and 3 control your ship by changing its direction, moving it up and down respectively. The number keys 8 and 9 move it forward and fire your gun. The space bar drops a Smart Bomb and the ENTER key activates Warp Drive. All this, I found, quite a lot to handle, though all except the ENTER key felt comfortable under the hand.

Up to two people can play the game and there is a top ten score board in true arcade style. Well worth buying this one.

D.B.

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation on Screen	* * *
Ease of Use	* * *
Crashproofing	* * *
Supplied Instructions	* * *
Overall	70%

Title: Desk Diary
Type: Tape
Supplier: Acornsoft
Machine: BBC Micro Models A and B
Price: £9.95

Acornsoft's Desk Diary cassette contains two essential programs for the minor business tycoon with a BBC Micro.

The Diary itself, known as a 'Planner', looks after appointments while 'Address Book' takes the tedium out of filing, in the form of a simple database storing a large number of files alphabetically. Each file consists of a name, address, post code and telephone number. It is possible to amend the files and space is provided in each for extra information which can be used to code the entries. This is a very useful feature as it allows selective searches (e.g. for 'mailshots' or for finding birthdays by the month) and the program will display all or part of the required files on screen with an optional output to a printer.

Anyone needing a personal secretary will be pleased with Acornsoft's Planner. It displays a very flexible appointments and reminders diary on screen and uses the computer's built-in clock to give an alarm at the time of each appointment on the day of use. The program will cope with single or recurring commitments and 'unavailable' days. It is easy to page forwards and backwards through the diary and review future reminders such as holidays and bill repayments. A 'coming soon' option shows all the entries in the diary for up to 30 days.

Both programs run in the teletext mode and make good use of the BBC Micro's colour and sound capabilities.

C.W.

Ratings Table

Program Quality	* * * *
Value for Money	* * * * *
Presentation on Screen	* * * *
Ease of Use	* * * *
Crashproofing	* * * *
Supplied Instructions	* * *
Overall	85%

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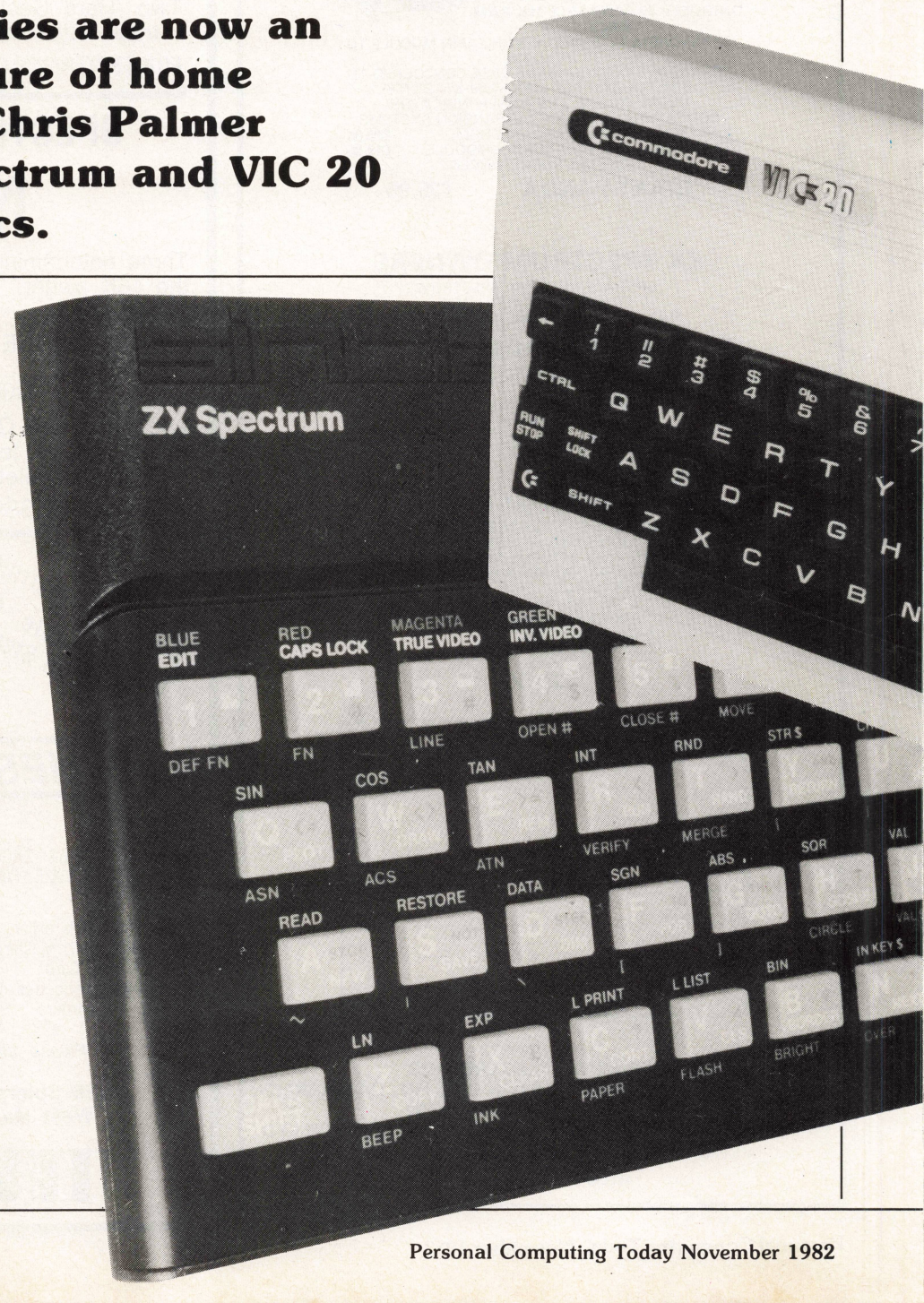
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MACRONICS

SHAPING UP GRAPHICALLY

Graphics capabilities are now an all-important feature of home computers. Here Chris Palmer compares the Spectrum and VIC 20 computers graphics.



If you observe the more recent technology battles, such as Hi-Fi or Video, you may have noticed a trend in the manufacturers advertising towards highlighting minor changes in their products that are supposed to make them streets ahead of the competition, whereas often you only benefit from such changes if you happen to be a bat, or have an oscilloscope handy.

The computer industry seems to be heading for the same sort of confrontation waving its favourite battle standard, graphics capability. For an example, if you study the Sinclair Research brochure surrounding the Spectrum launch, you will notice that in the comparison chart, the machine's graphic capabilities occupied nine out of 20 criteria.

Graphics are a very important part of a computer's facilities and in this review we take the Commodore VIC 20 and the Sinclair Spectrum to find out how they fair against each other in a graphical sense, as well as seeing how their high-resolution graphics work. Because the Vic 20 doesn't have high resolution graphics in its standard form, the system used in this review included the Super Expander cartridge. This cartridge provides the computer with an extra 3K of memory as well as adding the high-resolution commands to the machine's

vocabulary. The Spectrum used was the standard 16K model.

Before looking at the machines and their graphics power it is as well to set the stage and examine the needs and uses of high-resolution graphics.

In its simplest incarnation, high-resoltuion graphics are a method by which a computer can display information with great accuracy and, because of its purely visual nature, that information can be quickly understood by the user. These standards still hold true, even in the field of video games.

If you think about it, in the game Space Invaders the computer is placing targets on the screen and then converting the keyboard input you are giving it into the position of the laser base. The introduction of high-resolution graphics into this game means that the characters can be made more easily recognisable by drawing them in greater detail. Their movements can also be made smoother. It is true that these games can be played on machines without high-resolution graphics but they lose a lot of their appeal due to poor displays and jerky movements.

Graphics Other Uses

So high-resolution graphics make games a lot more interesting and demanding, what else can they be used for? Because these graphics allow the computer to display information with great accuracy they are ideally suited to producing graphs and charts. This application places the computer in the realms of the scientist and the teacher where the result of the computer's calculations needs to be displayed quickly and with great accuracy, without having to resort to tables of figures.



The other use to which these graphics are put to, which is not particularly serious in nature, but still has some relevance, is the production of designs and patterns on the screen. If some thought is given to the use of graphics in this way then the result can be quite beautiful and can even be considered to be an art form in itself. Having now outlined some of the uses of high-resolution graphics we can now look at the two machines and see how they aquit themselves.

First up is the VIC 20, costing £199.95 for the standard model. As mentioned earlier the VIC does not come with high-resolution graphics built into it, these have to be added separately in the form of a cartridge.

This cartridge, the Super Expander, costs £34.95 from most Commodore dealers and plugs directly into the expansion socket on the back of the VIC. The resolution of the screen, when one of the graphics modes is selected, is 160 X 160 pixels. It is worth pointing out at this moment that the VIC uses an indirect method of accessing these screen positions. The actual values that you use in the graphics statements range from 0 to 1023 in the X and Y directions, which means that if you plot a point at 500,500 on the screen and another at 501,501 you will not actually see two seperate points because of the scaling factor involved in changing the values in the statement to the actual screen resolution.

The graphics commands that the Super Expander make available are fairly comprehensive and allow most shapes to be plotted. One aspect of the graphics which takes a bit of getting used to is the way in which colour is handled. First off, the colour command is spelt COLOR, which, if you are like me and only give the manual a cursory glance before launching into the program, can provide some baffling syntax errors from the work go.

Hectic High-resolution

The other colour problem is unfortunately caused by the way in which the VIC generates its high-resolution screen. To enable you to display single pixels on the screen the VIC uses the same technique as for creating definable characters. It fills the screen with characters and then balnks out the pixel information within each. Then, when you give it a command to plot a point or draw a line it calculates which character occupies that position on the screen and which part of the character contains the dot you want accessed, then modifies that position in memory.

This method works very well except when you want to colour a dot in. Because the VIC is only set up to think about character sized ▶

SHAPING UP GRAPHICALLY

pieces of screen colour memory, when it comes to changing the colour of two dots inside that character it just gives up. The VIC does offer some compensation in the form of its second graphics mode, the multi-colour mode. This mode does allow you more control over the on-screen colours but at a price. Without getting too technical, in this mode the VIC now interprets the character data in a different fashion, reading two bits in the character byte to represent one on the screen as opposed to a direct one to one correlation. The result of all this memory juggling is that your horizontal resolution is halved but your colour power is doubled.

Two commands which warrant a bit of special attention are the circle and paint commands. The first command, circle, does as its name suggests, draw a circle. What makes it special is that it also allows you to draw ellipses and arcs. This is made possible by allowing you to specify the radius in both X and Y directions as well as letting you specify how much of the circle is to be drawn, in gradians. A gradian is one-hundreth of the circumference of the circle, with 0 gradians being at the three o'clock position.

The paint commands function once again reflects its name. It allows you to fill an area on the screen with a specified colour between either lines you have drawn or the edge of the screen. One point that is worth noting is that this command leaks! For instance, if you have plotted a circle and there is a small break in its circumference then when you paint inside the circle it will leak out and fill up the rest of the screen, so beware.

The last point about the VIC which I am going to mention is that if you are going to use the VIC with the Super Expander to write software for anyone elses use, then bear in mind that this software will only run on another machine if it has the Super Expander fitted. So if you are thinking of making your fortune writing high-resolution games for the VIC using the Super Expander then your market is going to be restricted to people who also own one.

Spectrum

Sinclair's Spectrum, however, does not suffer from this problem as it has its high-resolution graphics already built in. The graphic command set is not so extensive but this is compensated for by the fact that you have a greater overall screen resolution, 255 X 175 to be precise. The colour control is also a little more accessible with the colour comm and on the VIC being replaced with three separate commands BORDER, PAPER and INK. It still suffers from the same colour problems as mentioned for the VIC, that being that you can't plot points or lines close to each other in different colours. The Spectrum also arranges its screen in a different fashion to most other micro computers.

The origin, position O,O, is at the bottom left corner of the screen, instead of the more usual top left, so take this into account when converting other machines programs to run on your Spectrum. The other, and slightly more annoying difference, is the way in which it handles its DRAW statements. On the VIC, if you want to draw a line from position 25,73 to position 78,102 you would phrase the statement with 23,73 as the start position and 78,102 as the end position, and the VIC would then just join up the dots. On the Spectrum, however, you would have to PLOT 25,73 and then DRAW 53,29 which is the difference between the points. This is necessary because the Spectrum uses a relative form of line drawing. If you want to draw lines around the screen you are continually having to calculate the difference between your current position and the position you want to be in. For an example of how involved this can become, compare the listings program 1, for the VIC and the Spectrum.

Once more the Spectrum offers compensation for this, in that you can draw curves and arcs using the DRAW statement by specifying the number of radians through which the line must turn while it is being drawn. Overall the Spectrum does have better quality graphics than the VIC, but to let you make your own evaluations I have included three programs that were written and run on both machines and the screen displays they produced. This should give you an indication of the way in which the graphics commands are used and what you can expect to get out at the other end.

User Defined Graphics

The other aspect of these machines which falls under the general title of high-resolution graphics is their ability to produce user-defined characters. On the Spectrum this is explained in the manual which also gives some useful examples. Unfortunately Commodore doesn't even admit to this being one of the VIC's capabilities in its user manual and it is only when you read a copy of the firm's Programmers Reference Guide that you become aware of the fact that you can create any character you want. Both machines have good and bad points in the way they handle user-defined graphics. For instance, the VIC allows you to redefine the whole of one character set, providing you have enough memory, whereas the Spectrum only allows you to redefine 21 characters.

In its favour, the Spectrum allows you to input the character data in binary form, meaning that you break down your character into eight rows of ones and zeros and feed that information into the computer. With the VIC you have to work out the values and feed in the information in decimal.

PROGRAM LISTING

VIC GRAPHICS COMMANDS

GRAPHIC	Sets the graphic mode between normal, multi-colour and mixed.
COLOUR	Sets the screen, border character and auxiliary colours.
REGION	Changes the character colour.
POINT	Plots a single point on the screen in a specified colour.
DRAW	Draws a line in a specified colour between two or more points.
CIRCLE	Draws a circle of specified radius about a centre.
PAINT	Fills in an area with a specified colour.
CHAR	Places text on a graphics screen.
SCNCLR	Clears the graphics screen.

COLOURS AVAILABLE IN HI-RES

Black	White
Red	Cyan
Purple	Green
Blue	Yellow
Orange	Light Orange
Pink	Light Cyan
Light Purple	Light Green
Light Blue	Light Yellow

SPECTRUM GRAPHICS COMMANDS

PLOT	Plots a single point in the current INK colour.
DRAW	Draws a line from the current screen position a specified amount in the X and Y direction.
CIRCLE	Draws a circle of a specified radius around an origin.
POINT	Reads an X,Y co-ordinate giving different values for a point set or unset.
PAPER	Sets the background colour of the screen.
INK	Sets the printing or plotting colour.
BORDER	Sets the colour of the border.

COLOURS AVAILABLE IN HI-RES

Black	Blue
Red	Purple
Green	Cyan
Yellow	White

SPECTRUM

```
 10 REM WINDOW & CIRCLES
 20 PAPER 0: BORDER 0: INK 7: CLS
 30 FOR I = 0 TO 255 STEP 10
 40 PLOT I,0: DRAW 255 - I, I * .686
 50 DRAW  - I, 174 - I * .686
 70 DRAW I,I * .686 - 174
 80 NEXT I
 90 FOR I = 30 TO 60 STEP 15
100 CIRCLE 127,87,I
110 NEXT I
```

Program 2

```
 10 REM SIN, COS, AVERAGE
 20 PAPER 0: BORDER 0: INK 7: CLS
 30 PLOT 10,10: DRAW 0,155
 40 PLOT 10.87: DRAW 235,0
 50 FOR I = 10 TO 245
 60 LET X = I: LET Y = SIN (I/20) * 80 + 87
 70 LET Y1 = COS (I/20) * 80 + 87
 80 LET Y2 = (Y + Y1) /2
 90 PLOT X,Y
100 PLOT X,Y1
110 PLOT X,Y2
120 NEXT I
```

Program 3

```
 10 REM OCR CHARACTERS
 20 FOR I = 65 TO 74
 30 FOR T = 0 TO 7
 40 READ A
 50 LET A$ = CHR$ I: POKE USR A$ + T,A
 60 NEXT T: NEXT I
 70 STOP
100 DATA 126,66,66,66,66,66,66,126
110 DATA 12,4,4,4,4,4,6,6
120 DATA 7,1,1,1,7,4,4,7
130 DATA 14,2,2,2,15,3,3,15
140 DATA 24,24,24,24,27,31,3,3
150 DATA 7,4,4,4,7,1,1,7
160 DATA 14,10,8,8,15,9,9,15
170 DATA 15,9,1,1,2,4,4,4
180 DATA 30,18,18,18,63,51,51,63
190 DATA 31,17,17,17,31,3,3,3
```

VIC 20

Program 1

```
 10 REM WINDOW & CIRCLES
 20 GRAPHIC 2
 30 COLOUR 0,0,1,0
 40 FORI = 0 TO 1023 STEP 30
 50 DRAW 2,I,0 TO 1023,I TO 1023 - I,1023
    TO 0,1023 - I TO I,0
 60 NEXT I
 70 CIRCLE 2,512,512,300,300
 80 CIRCLE 2,512,512,200,200
 90 CIRCLE 2,512,512,100,100
```

Program 2

```
 10 REM OCR CHARACTERS
 20 CG = 7168 + 8 * 48
 30 FORI = 0T079
 40 READ A
 50 POKE CG + I,A
 60 NEXT I
100 POKE 36869,255
110 END
200 DATA 126,66,66,66,66,66,66,126
210 DATA 12,4,4,4,4,4,6,6
220 DATA 7,1,1,1,7,4,4,7
230 DATA 14,2,2,2,15,3,3,15
240 DATA 24,24,24,24,27,31,3,3
250 DATA 7,4,4,4,7,1,1,7
260 DATA 14,10,8,8,15,9,9,15
270 DATA 15,9,1,1,2,4,4,4
280 DATA 30,18,18,18,63,51,51,63
290 DATA 31,17,17,17,31,3,3,3
READY.
```

Program 3

```
 10 REM SIN COS AVERAGE
 20 GRAPHIC 2
 30 COLOR 0,0,1,0
 40 DRAW 2,10,10, TO 10,1013
 50 DRAW 2,10,512, TO 1013,512
 60 FORI = 10 TO 1013 STEP 5
 70 X = I: Y = SIN(I/80)* 400 + 512
 80 Y1 = COS(I/80)* 400 + 512
 90 Y2 = (Y + Y1)/2
100 POINT 2,X,Y
110 POINT 2,X,Y1
120 POINT 2,X,Y2
130 NEXT I
READY.
```

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MICROSPOT

TI PRINTER SIMULATOR

This short, sharp program by Mike O'Regan instantly allows you to use your TI99/4A as a message teleprinter.

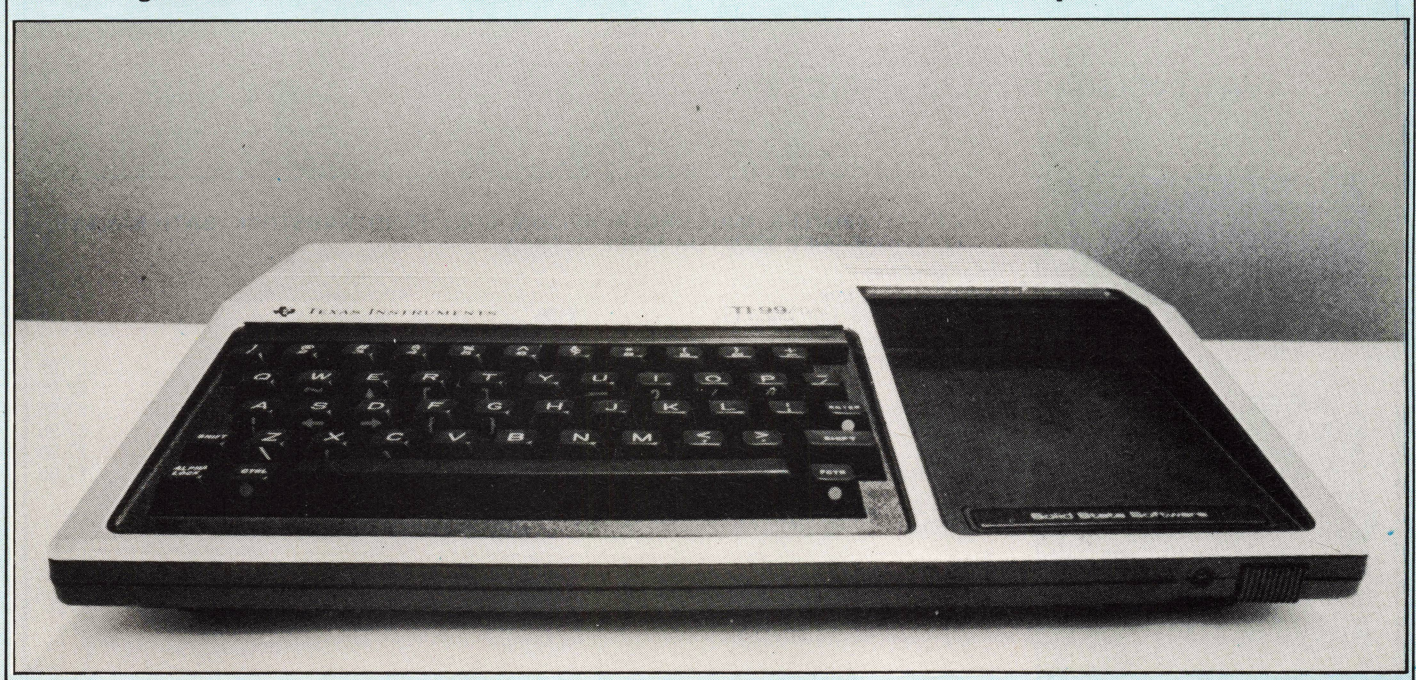
```
80      REM set message to string variable M$ (28 characters or
less)
90      REM set line number to variable Y
100     FOR I = 1 TO LEN(M$)
110     a = asc (seg$ (M$,i,l))
120     Call CHAR (104, "0000001818")
130     Call COLOR (10,2,16)
140     Call HCHAR (y,i + 2,104)
150     Call HCHAR (y,i + 2,A)
160     Call SOUND (20, - 3,0)
170     NEXT I
180     RETURN
```

If you ever wanted to use your computer to transmit messages, read on.

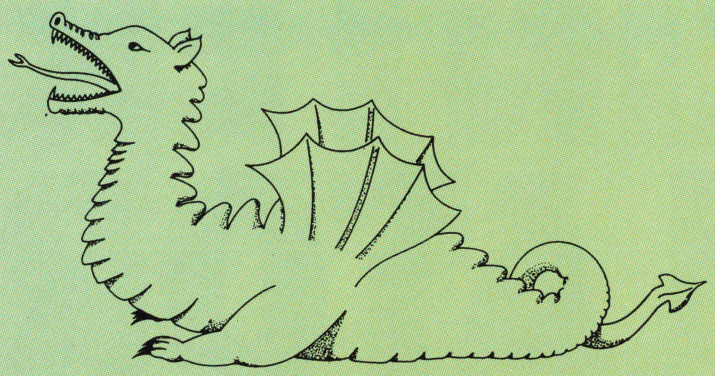
This is a routine to simulate a teleprinter and print a message on any line specified. It prints a white square with a large black dot in the centre, which marks the position of each character in the message before moving along the line to reveal the next character, at the same time making a realistic imitation of the sound of a teleprinter.

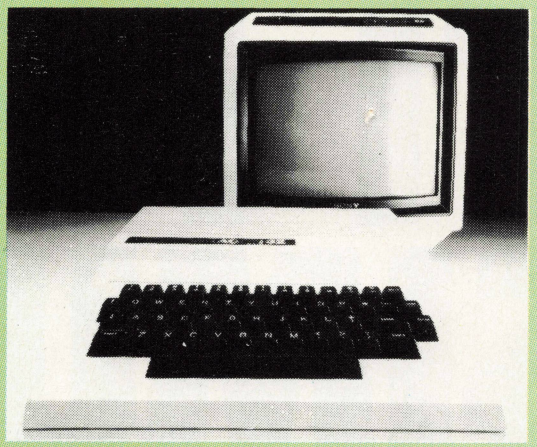
PROGRAM NOTES

Line 110	sets each character of the message to the variable A (for line 150).
Line 120	defines the 'moving dot', character.
Line 130	sets the colour of the 'dot' to black on white.
Lines 140 and 150	print the 'dot' followed by the message character.
Line 160	produces 20 milliseconds of white noise to simulate a teleprinter.



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PROGRAMMING STATEMENTS AND COMMAND

MATHEMATICAL AND LOGICAL OPERATORS

Symbol	Operation
↑	Exponentiation
–	Unary minus
★	Multiplication
/	Division
+	Addition
–	Subtraction
>	Greater than
<	Less than
=	Equal to
<>	Not equal to
>=	Greater than or equal to
<=	Less than or equal to
NOT	logical NOT
AND	logical AND
OR	logical OR

BASIC LANGUAGE STATEMENTS

CLEAR	LINE INPUT
CLS	ON . . . GOSUB
DATA	ON . . . GOTO
DEF	POKE
DEFUSR	PRINT
DIM	PRINT TAB
END	PRINT USING
EXEC	PRINT @
FOR TO STEP NEXT	READ
GOSUB	REM
GOTO	RESTORE
IF	RETURN
INPUT	STOP
LET	

SOUND GENERATION STATEMENTS

PLAY	SOUND

CASSETTE RECORDER CONTROL STATEMENTS

AUDIO	CLOSE	EOF (–1)	OPEN
CLOAD	CSAVE	INPUT	PRINT
CLOADM	CSAVEM	MOTOR	SKIPF

PRINTER CONTROL STATEMENTS

LLIST	OPEN	PRINT

SYSTEM COMMANDS

CONT	LIST	RUN
DEL	NEW	TROFF
EDIT	RENUM	TRON

GRAPHICS STATEMENTS

CIRCLE (x,y)	LINE	PCOPY	PUT
COLOUR	PAINT	PMODE	RESET
DRAW	PCLEAR	PRESENT	SCREEN
GET	PCLS	PSET	SET

STRING FUNCTIONS

ASC	INKEY$	LEN	STRING$
CHR$	INSTR	MID$	STR$
HEX$	LEFT$	RIGHT$	VAL

NUMERIC FUNCTIONS

ABS	INT	POINT	SQR
ATN	JOYSTK	POS	TAN
COS	LOG	PPOINT	TIMER
EXP	MEM	RND	USR
FIX	PEEK	SGN	VAPTR

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TEXAS INSTRUMENTS

TECHNICAL ENQUIRIES

MICROANSWERS is Personal Computing Today's Technical Enquiries Service. Each month we will endeavour 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.

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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 PCT.

Dear PCT
I have an unexpanded VIC 20, a tape recorder, and a 1515 Printer. I have a tape on file of a three column list from this with a program to open the tape to the printer I can print one copy at a time, but for more copies I must rewind the tape every time. I want to make several copies continuously. Common sense tells me the way to do this is to put the file into the computer memory in a program with a loop, and print the output of the program. I just cannot find out how to do this, please help me — it's driving me mad.
D D Knight
Birmingham

The answer to your problem is to read the data from the tape into an array. Once the information is in the computer you can process it or print it out as many times as you like.

For further information on how to create and use arrays consult Appendix C: VIC BASIC in the VIC manual.

Dear Sirs,
Having the intention of purchasing a microcomputer I bought the first issue of your magazine and found it most informative.

It is apparent in the article therein that the Sinclair ZX81 or ZX Spectrum would be more than adequate for the work in mind, except for the printer. I need to print at least a 64 character line with upper and lower case, inlcuding descenders.

Would you please advise me if it is possible to use another printer with either of these computers and if so, suggest suitable equipment?
W G H Wye
Hemel Hempstead

I am afraid to tell you that there are, as far as we know, no printers directly compatible with the ZX81 or Spectrum that can handle 64 characters per line. In order to print out that number of characters you would need to use a Centronics parallel printer, but you would need to buy an interface to connect it to the computer. A firm called Memotech produce this sort of device and it costs about £35.

Dear Sir
I am very interested in computing and I would like to find out about machine code programming, as the whole thing is a total mystery! I have heard several good reports about 'Mastering Machine Code on your ZX81 by Toni Baker.

I have, however, on order a Sinclair ZX Spectrum. I was wondering if this book would also serve as an introduction to machine code on the Spectrum (I believe they use the same processor the Z80A), or should I wait for a book on machine code for the Spectrum?
Stuart Slicer
Bradford

Unfortunately, Toni Baker's book about machine code programming is not much use with regard to the Spectrum because it is aimed specifically at the ZX81. There is a book soon to be published by Melbourne House Publishers entitled 'Spectrum Machine Language for the Absolute Beginner'. It costs £6.95 and is available from the firm at 131, Trafalgar Road, Greenwich, London SE10.

Dear Sir,
Please could you tell me if I bought the black and white Acorn Atom and the BBC ROM would I now have a colour computer with 16K RAM (the same as the BBC Microcomputer Model A)? i.e. could the BBC ROM turn it a colour computer and expand the memory without any other add-ons?
G J Bees
Swansea

The straight answer is no. But if you didn't buy last month's PCT I suggest you try and get hold of a copy now. We reviewed the Atom with the BBC Basic board in October to find out exactly what the configuration could do.

Dear Sirs,
I would be most grateful, as a newcomer to computer programming if you could help with the following problem.

I own a VIC 20, fully expanded to 32K, and as you know, when this occurs, the screen address starts from location 4096 (decimal) instead of 7680 and the colour address also changes from a starting point of 38400 to 37888. The start of BASIC moves from 4096 to 4608.

I do not want to continually remove the plug-in board (quite a difficult task), as the computer is intended for mainly business use. If a program is published for an unexpanded machine e.g. a games program, is it possible to insert a subroutine at the beginnong of the program that will allow the computer to re-calculate the difference in screen addresses? (For example, if the CPU is "informed" that location 7680 really means location 7680 minus 3584 and so on throughout the addresses, I reason that it should then be possible to type in the "unexpanded" program exactly as written for automatic conversion in the subroutine.

Is such a program possible and if so, would you please publish a listing?

Without wishing to appear greedy, may I request that sometime in the future you publish a "sort" program that allows sorting into alphabet order, a list of names that have just been "READ" from a tape bearing in mind that after READing, no cursor appears!!

Many thanks in anticipation.

Yours Sincerely
A E Sellive
Shropshire
P.S. Looks like the best computer magazine so far!

The problem you have is quite common amongst VIC 20 owners but happily it can be solved by using a very clever little software package that has been developed by Arfon Microelectronics. The program, called Min Vic is loaded in before you load any other program and when run fools the VIC into thinking that it is a standard system. The result of this is that you can run standard Vic programs in an expanded system without all the problems of having to change all the screen POKE statements.

Dear PCT

I am planning to buy a computer in December, I would like to know how much memory the Commodore 64 has and how much it will cost. I read the article about it in the September issue and was most impressed.

I have had access to a VIC 20 and liked it very much. Also, can you buy a VIC 20 cassette recorder plug as I would like to convert my domestic recorder to do the job, or is this impossible?

Dane Smith
London

As it stands, the Commodore 64 has a standard 64K of memory space on board which is more than adequate for the majority of applications. The price of the machine is not yet definite but is reported to sell for around the £300 mark, when it is finally released.

It is impossible to convert your own domestic recorder for use with a VIC 20. Commodore sell its own brand of cassette recorder for use with the VIC as part of the system for a very good reason. All the software produced by Commodore is recorded at the correct volume levels which makes it much more reliable and a lot easier to use. It's much better to stick to the proper machine.

Dear Sir

I am currently developing a program, which will be my first practical outside application, for an outside voluntary organisation and would welcome your assistance in the solution of the final (I hope) problem.

The problem is written in BBC basic and the following is an outline:— following the input of a set of data common to all the program requests the input of a name (N$) and a set of variables relevant to that person from which it then calculates value (Z). Storing both into a one dimensional array it then proceeds to request the next name and variables thus giving at the completion a list of names and values from the array which has been incremented by one at each return. Viz:

N$ (1) Fred ...Z(1) 1000
N$ (2) Joe ...Z(2) 1234
N$ (3) Tony ...Z(3) 1500

I now require to list the 'result' from the information in store preferably without re-inputting the data. The result will be the list of values in descending order with the associated name to that value, i.e. for the data overleaf.

1. Tony 1500
2. Joe 1234
3. Fred 1000

A standard sort for the values of Z in the array will produce the right hand list but a similar sort applied to N$ could obviously result in an alphabetical list with the order of names not relative to their values. i.e.
1. Fred would become paired with 1500 not the actual 1000.

What system is required to associate N$(x) and Z(x) in order to achieve a satisfactory sort and listing?

Keith Worthington
Cheshire

The easiest way to produce the sorted list that you require is to change the numeric variables into string variables and then place both sets of data into a two-dimensional string array. Even though the numbers are now in the form of strings they will still sort true.

If you need to do any calculations with these numbers this will have to be done before or after you change them into strings. Having now placed the two lists in the one array when you do the sort on the numbers you will also be able to swap the names over at the same time, thus keeping the order correct.

PRIORITY REPLY

November 1982 Issue

Personal Computing Today Reader Enquiry Service

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NEW

SPECTRUM GAMES

Two 16K programmes on cassette

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(ZX81 - 16K RAM ONLY)

Draw/Undraw
Foreground On/Off
Border/Unborder
Fill screen
Reverse screen

Print position controls - UP, DOWN, LEFT, RIGHT
Editprint - moves next PRINT position to first edit line.

Scroll Facilities - UPSCROLL, RIGHTSCROLL, LEFTSCROLL.

Onscreen/Offscreen
Background On/Off
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All these routines are in machine code for SUPER-FAST response! GRAPHICS TOOLKIT uses only 2K of your RAM and that includes space to load the programmer's TOOLKIT described below.

ALL FOR ONLY £5.95 ($11.90)

An ESSENTIAL addition to your 16K RAM ZX81

TOOLKIT Provides the following additional facilities

Renumber - including GOTO's and GOSUB's
Search and list
Search and replace
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Hyper graphics mode
Fillscreen
Reverse screen
Tape wait
All these routines are written in machine code and together take up only 1K of your precious RAM - an incredible achievement!!

FOR 16K - ONLY £4.95 ($9.90)

NEW

16K SPECTRUM + £42.50 = 48K SPECTRUM

We did it for the ZX81 - we've now done it for the ZX SPECTRUM! Add on memory at an amazingly low price. Increase your 16K to a massive 48K with the

32K RAM BOARD

ONLY £42.50

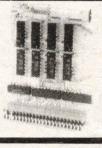
Using fewer components on a high quality double sided board to give you top performance, reliability and economy.
You can carry on writing larger programmes in sections ready to MERGE when your extra 32K RAM BOARD arrives within 21 days.
Installation is simple - the entire fitting is completed in just a few minutes (with the aid of a screwdriver - NO SOLDERING!)

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NEW

As reviewed in 'ZX Computing' August/Sept '82

ECONO TECH 16K RAM PACK



We believe the Econo Tech is the lowest priced 16K RAM available.

No frills - just a reliable and economical way to expand your ZX81.

ONLY £20.95 ($39.95)

With advances in microtechnology we are now able to offer the

64K RAM PACK

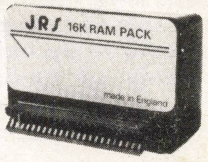
ZX81, yet having external dimensions no larger than the 16K RAM.

Same quality as the 16K RAM below but giving massive memory to your

ONLY £62.95 ($119.95)

As reviewed in 'Your Computer' March 82

16K RAM PACK



Quite simply the best available plus FREE 'Alien Attack' (7K M/code) on cassette value £5.75 ($11.00)

Fully built, tested and guaranteed.
Uses existing power supply (Min. 600 m.a.)

Compatible with printer
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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:
IChing, Mastermind, Robots, Basic Hangman.
PLUS Large screen versions of Invaders and Maze of Death, ready for when you get 16k.
Cassette 1 costs £3.80

CASSETTE 2

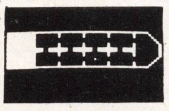
Ten games in Basic for 16k ZX81

Cassette Two contains Reversi, Awari, Laser Bases, Word Mastermind, Rectangles, Crash, Roulette, Pontoon, Penny Shoot and Gun Command.
Cassette 2 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 photo torpedo tracking.
PRINCESS OF KRAAL
An adventure game.
BATTLE Strategy game for 1 to 4 players.
KALABRIASZ World's silliest card game, full of pointless complicated rules.
CUBE Rubik Cube simulator, with lots of functions including 'Backstep'.
SECRET MESSAGES This message coding program is very txlp qexi jf.
MARTIAN CRICKET A simple but addictive game (totally unlike Earth cricket) in machine code. The speed is variable, and its top speed is very fast.
Cassette 3 costs £5.

CASSETTE 4

8 games for 16k

ZX-SCRAMBLE (machine code)

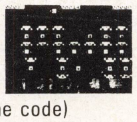


Bomb and shoot your way through the fortified caves.

GUNFIGHT (machine code)



INVADERS (machine code)



FUNGALOIDS (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 4×4×4 board, this is a game for the brain. It is very hard to beat the computer at it.
7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available from J. Steadman).
Cassette 4 costs £5.

"SPECTRUM SOFTWARE WANTED"

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

ZX99 AUTOMATIC TAPE CONTROLLER FOR THE SINCLAIR ZX81

● DATA PROCESSING

The ZX99 gives you software control of up to four tape drives (two for reading, two for writing) allowing merging of data files. This is achieved by using the remote sockets of the tape drives, controlled by USR statements or commands.

● RS232C INTERFACE

The ZX99 has an RS232C output allowing connection with any such printer using the full ASCII character code (you can now print on plain paper in upper or lower case, and up to 132 characters per line) at a variable baud rate up to 9,600

● SPECIAL FEATURES

There are so many special features it is difficult to list them all, for example:

AUTOMATIC TAPE COPY: You can copy a data file regardless of your memory capacity as it is processed through the Sinclair block by block.
TAPE BLOCK SKIP: Without destroying the contents of RAM
DIAGNOSTIC INFORMATION: To assist in achieving the best recording settings.

The ZX99 contains a 2K ROM which acts as an extension to the firmware in the Sinclair ROM. The ZX99's ROM contains the tape drive operating system and the conversion to ASCII for the RS232C output.

There is an extension board on the rear to plug in your RAM pack (larger than 16K if required). The unit is supplied with one special tape drive lead, more are available at £1 each.

NOW ONLY
£49.95
PLUS
£2.95 p&p



● ZX99 SOFTWARE

We now have available "Editor 99", a quality word processing program including mail-merge, supplied on cassette for £9.95. Also following soon:

* **Stock Control (October)**
* **Sales Ledger (November)**
* **Business Accounts**
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* **Tax Accounting**

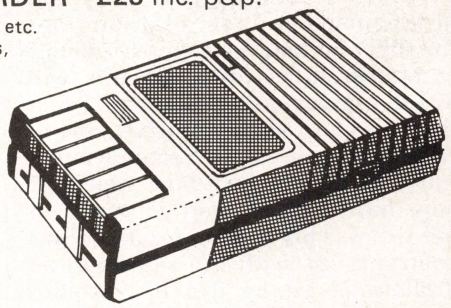
Dept. PC3 Data — Assette, 44 Shroton Street, London NW1 6UG. 01-258 0409

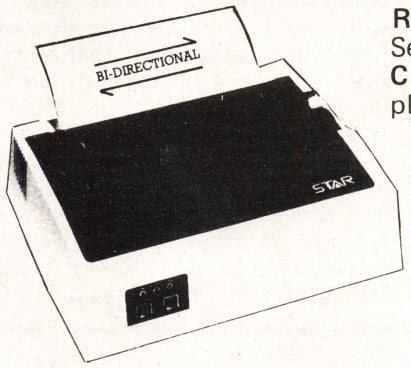
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data-assette®
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Tel 01-258 0409

● FERGUSON CASSETTE RECORDER £28 inc. p&p.

Tested with ZX81, Acorn, BBC, Dragon etc. etc.
Features: Din, Ear, Mic. and Remote sockets, Tape Counter, Tone Control, Built-in Mic., Autostop. Battery/mains. Recommended by Acorn for use with BBC computer.





● STAR DP8480

RS232C (SERIAL) **£285** plus £6 Securicor delivery
CENTRONICS (PARALLEL) **£265** plus £6 Securicor delivery

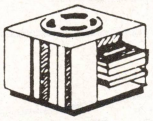
This professional printer works with almost any computer with very good upper and lower case typeface.

- Bi-directional
- 80 column width (10" paper)
- Switchable — Tractor or Friction Feed
- 80 chrs. per second

● 2,000 SHEETS OF PRINTER PAPER

£19.50 plus £3.50 p&p.

● E690 REVOLVING CASSETTE RACK



Single — **£2.99** (holds 32 tapes or 20 in cases)
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All plus £1 p&p.

● BBC CASSETTE LEAD

7 pin plug to two 3.5mm plugs and one 2.5mm plug.
Only **£2** inc. P & P.
Other leads available — please telephone.

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High quality, screw assembled cassettes supplied with library boxes. Any lengths available.

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Charge my Access/Visa No. . . . . .
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FEATURE

HARDWARE

MICRO BUYING

GET IT RIGHT FIRST TIME

If you want to venture into the world of computing but are unsure about how to take those first steps our feature on microcomputer buying will help you get it right first time.

Buying a microcomputer is a unique experience. Unlike buying a car or a record player many people do not really know what they will use their computer for once they have bought it. Because you don't know what you want it for, it is very difficult to decide what to look for in the computer when you look round the shops. We have put together some of the major and minor points to look out for when you take your wallet in your hands and buy a microcomputer.

The first thing to do is to try and give yourself an order of priority for the different functions you want your computer to perform, as this will avoid embarrassing silences when the salesman asks you what sort of computer you want. Secondly, you have to decide just how much of your hard earned cash you want to get rid of. This is also useful in your confrontation with the salesman as it allows you to be firm and resolute when you see hoards of bright, shiny computers that cost just that little bit more than you can afford.

So, to establish your priorities you have to decide whether you want to play games, work out your home accounts, teach your children to speak French (like in the TV advert) or just explore the wonderful world of home computing. If you can arrange these sorts of criteria in an order that satisfies you then half the battle is won.

The salesman will then most probably show you the computer which he thinks is most suited to your ideas, but beware of the dealer who appears to be deaf when you state your purpose and then bases his judgment of your requirements on the size of your wallet and how easily he can get you to sign on the dotted line.

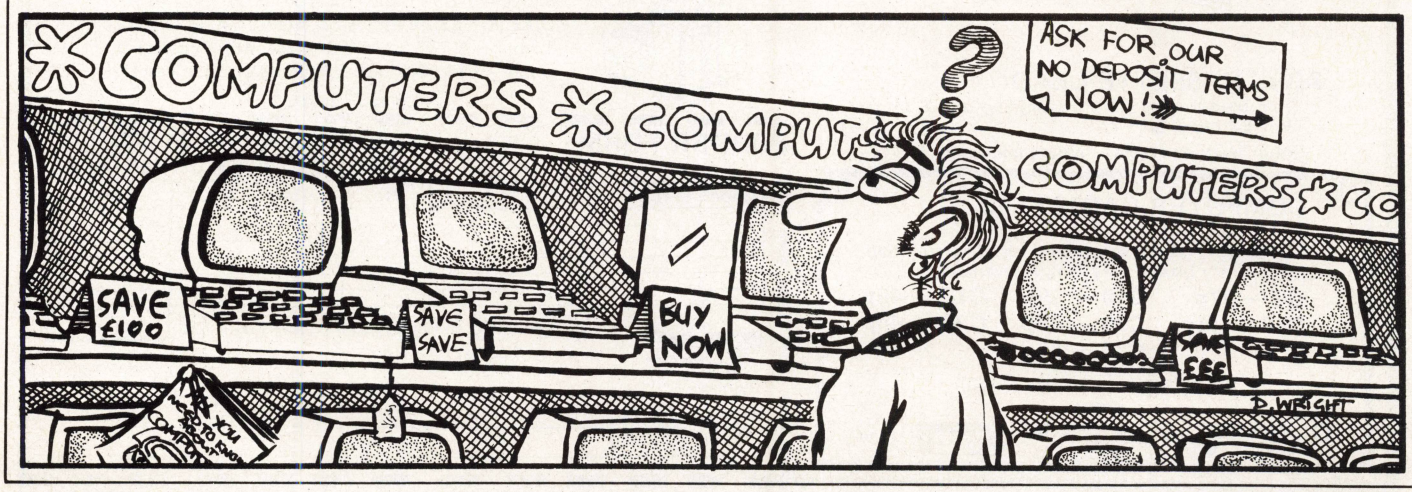
The first way to establish whether or not the computer you are being shown will do what you want it to is to ask to see a software demonstration. This has two benefits, first you will be able to see how the computer copes with the task and also it should give you a good idea of what software is available for that machine.

This is an important point because if it is your first computer and you haven't any programming knowledge then you will be relying on commercially written software until you have gained enough experience to write it yourself. If the salesman can't show you the application you want try to find out why this is and do not be put off by avoidance tactics.

Games People Play

If you want to use the computer as a games machine then check on what sort of screen display it produces. Is it colour, does it support high resolution graphics and how easy are these features to use when you get round to writing your own games? Also find out whether or not you an use joysticks or paddles and if so, how much software is around that will use these features, or how easy it is to write software for them yourself. If in doubt ask the salesman to demonstrate a game — they will usually jump at the opportunity to show off their prowess at the latest verion of Cosmic Rhino or Attack of the Space Gerbils.

Following on from the question of software it is important that you find out what software is available for the computer, what form it comes in and how much it costs. Machines like the Texas TI99/4a



have quite a limited range, where as the Tandy TRS-80 machines have perhaps one of the best software libraries in existence. A sure-fire way of finding out how well your machine is supported is to consult our Software Checklist at the back of the magazine. Another useful way to find out about any machine you are thinking of buying is to contact some of the computer users clubs in your area and find out if there are any members that already own the machine you are interested in.

Beginners Beware

If you are a complete beginner, ask to be shown the manuals and documentation that comes with the computer. See if you can understand them easily and make sure that the documentation is complete. Bear in mind that you will be living by this manual for the first couple of months after you buy your computer. If the manual does not come up to scratch, but you still want the computer, find out if there are any independent books that will give you the help you require. Some manufacturers produce self-teaching guides that are based around their own makes of computers.

One point that is usually overlooked by people when they buy a computer is the after sales service and support the dealer can give. If you buy your micro from a high street chain store then it is unlikely that they will be able to give anything more than the standard warantee period and this usually means sending the computer back to the manufacturer. Find out the dealer's attitude to you ringing them up or calling round with problems other than hardware faults on the machine. It is very reassuring to know that there is a friendly voice on the end of a telephone who can help you out of any jams.

Where To Buy

Buy where can you buy your computer from? Remember that you are buying a piece of complex technology and not something simple like a clock radio. Unless you know exactly what you want and are sure that you can handle all the problems on your own I would be wary of high street stores and mail order operations. It is usually worth paying the recommended price for your computer and going to a specialist computer dealer because they will have a lot more understanding of what you want and the best way for you to get it. Remember, if you are buying a cut-price computer then the money that the company loses on the discount has got to be recouped somewhere and this usually means lack of support.

We have compiled a checklist of points to watch out for when you are evaluating a computer. They are not hard and fast rules because every computer is different and they may have particular features that outweigh some of their disadvantages.

CHECKLIST

Standard Home Computer

Memory: At least 16K. If this memory size isn't standard then the memory expansion should be cheap and easily fitted.
Screen Format: At least 30 columns, although 40 columns is a more acceptable standard. Tape Recorder: If the Computer uses a domestic tape recorder then it should come with all the necessary connecting leads. If it uses its own tape recorder then check the price because its virtually essential to have one.
Display Unit: If the computer doesn't contain its own then find out what it needs e.g. domestic television or video monitor. Once again check that you will get the necessary leads and modulator.
Language: Most machines will come with BASIC built in, find out whether other languages can be added later.
Expansion: The computer should contain at least a printer socket.

Games Computer

Screen Format: The machine should be able to run a colour screen and support high resolution graphics.
Expansion: The computer should have at least one port for attaching joysticks or paddles.
Sound: Sound should be available either through the television speaker or through an internal speaker.
Cartridges: These are not essential but they are a very quick and safe method of using games.

Home-Business Computer

Memory: Definitely 16K, although 32 or 48K is more useful.
Screen Format: The computer should have the ability to run either a 40 or an 80 column screen.
Expansion: The computer should be able to support a range of printers as well as a disc drive unit.
Software: The computer should have a wide range of business software that is tried and tested.

Educational Computer

Keyboard: The keyboard should preferably be laid out like a typewriter qwerty style and have moving keys.
Expansion: The computer should be able to link up to a network of other computers, thus cutting costs on printers and discs.
Display Unit: The computer should be able to drive a cheap monitor or television set.



Sinclair ZX Spectr

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

From only £125!



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

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

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

Professional power– personal computer price!

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

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

You have the facility to support separate data files.

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

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

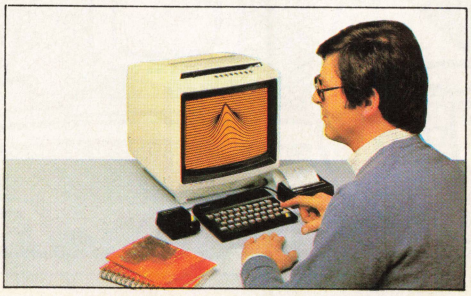
You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

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

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

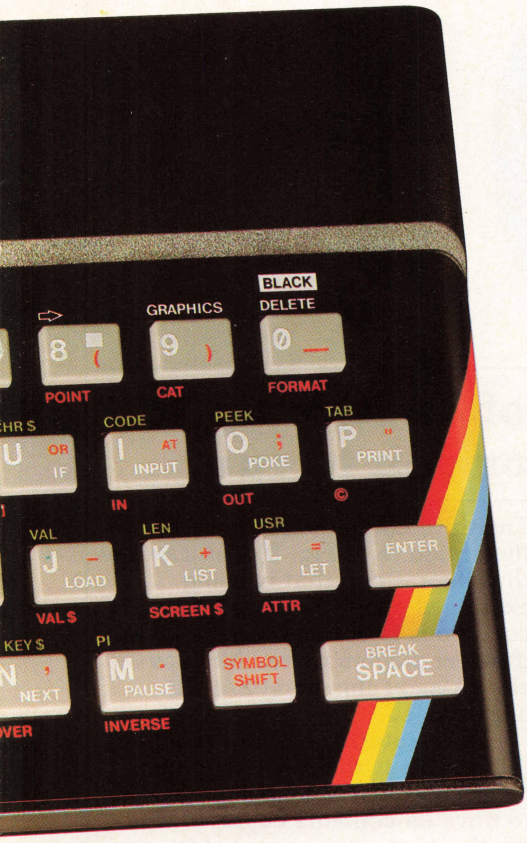
There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



Key features of the Sinclair ZX Spectrum

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

um



RS232/network interface board

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

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

ZX Spectrum

Available only by mail order and only from

sinclair

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

The ZX Printer – available now

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

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

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

The ZX Microdrive – coming soon

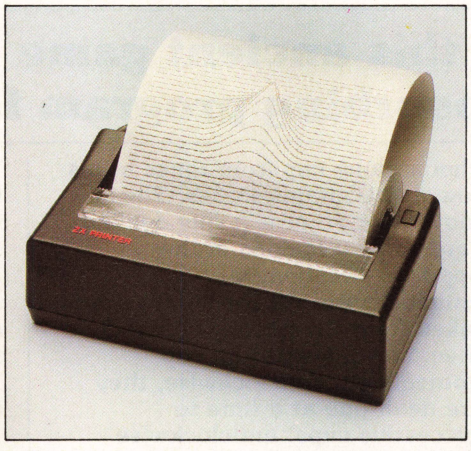
The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

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

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

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

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





How to order your ZX Spectrum

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

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

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

Please tick if you require a VAT receipt ☐

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

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

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

Address

PCT811

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

AYO!

A.E. Ward brings this ancient game of Tactics up to date with an absorbing program for you to run.

If you were to search for the oldest board game in the world it would be difficult to find one older than Mancala, popular in ancient Egypt. It is not a single game but a class of games which all involve the movement of pieces (anything from stones to seashells), distributing them amongst rows of cups.

Ayo (pronounced: eye oh) is a Nigerian version of Mancala which is played with two rows of six cups and 48 identical pieces, referred to as stones.

At first glance Ayo may seem very simple, almost on a par with noughts and crosses, but it can be fully as tactical as chess if played well. It takes a good memory to analyse more than one move ahead due to the fact that some moves change the whole face of the board. If you were brought up on chess and draughts then you could find Ayo mind-expanding, and very infuriating.

The Rules

The board is made of two rows of six cups each. There are two players and each player has a territory consisting of one of the rows of cups. Points are scored, one for each stone captured from your opponents row. The aim is to have the highest score you can at the end of the game. Figure 1 shows the graphics representation of the board that the computer will print on the screen at the beginning of a game. It is the starting position with each cup dressed with 4 stones. The cups are lettered from A to L for identification.

When playing the computer you will have row A to F. The computer will have row G to L. When it is a players move he chooses one cup from those in his row that contains stones. The movement process is like dealing cards only it is done in the opposite direction, ie. anticlockwise. All the stones are taken from the chosen cup and then, starting with the cup immediately anticlockwise, they are dealt one at a time to successive cups, anticlockwise around the board.

As an example, Fig. 2 shows the position reached if from Fig. 1 the computer were to play cup K. There is an important rule about playing cups containing large numbers of stones. Stones must not be dealt back into the cup they came from within the same move. This means that if there are more than 11 stones in the cup played then the 12th and if applicable the 23rd and even the 34th stones go, not into the cup they came from, but into the next cup after that.

The source cup is skipped over.

Stoned At Last

However many stones there are in the chosen cup the dealing goes on until the last stone is dealt to another cup. Capturing is carried out after movement has finished. It is best described via the flow chart algorithm in Fig. 3. As an example, Fig. 4 a,b, and c shows the three phases of an imaginary move in which you capture some stones. One point to notice is that capturing goes clockwise, opposed to the preceding movement. Notice also that there are three conditions to fulfil before capturing from a cup. Two are obvious from Fig. 3. First, the cup must be in your opponents row. Second, the stones in it must total either 2 or 3 after the movement phase of your turn. The third condition follows from the structure of Fig. 3. You can see that if for a cup that is being examined one of the first two conditions is not fulfilled then it is the next players move. All cups clockwise at this point are left unexamined.

The capturing has not reached them. This is the third condition.

A cup must have been reached to have its contents captured. Put another way, you cannot skip over uncapturable cups in order to capture from cups further clockwise. Of course in most moves the last cup dealt to does not fulfill one of the first two conditions. Then no capturing takes place at all. Yet it is not impossible to clear out your opponents row completely. However this is not always a good idea.

If you leave your opponent without a stone in his row then all the rest on the board are forfeit to him. Finally, if a movement is made and afterwards captures are possible then they must be made. They cannot be left out for tactical reasons.

Tactics

In Ayo, tactics are usually dependant on situation. Yet there are a few general principles. Cups with 1 and 2 stones are vulnerable, and it is usually good play to think first about defending any of these that are attacked.

Some players aim at developing a cup with more than 11 stones. This is known as an Odu (pronounced: oh do). The advantage of an Odu is that it will pass around the board and then return to an opponents row so that two stones are played into some cups. Thus empty cups become

vulnerable to an Odu.

In the short term try to attack two or more of your opponents vulnerable cups at the same time. Or set traps by attacking empty cups which your opponent must eventually play into.

Running The Program

When you run the program the computer will choose who goes first randomly. The current board position is printed on the screen at each juncture, along with the score and whose move it is. The computer will tell you which move it has made after it has played. Simply enter the letter of the cup you have chosen when it is your move, and press NEWLINE when it is the computer's turn. You may end the game at any time by entering "END". The program will not crash easily or accept illegal moves, so try experimenting to get to know the rules.

The end of the game in Ayo is brought about when neither player can make any more captures because there are too few stones left on the board. Among human players an agreement is made that this is so and each player gets those stones that are left in his row. Program lines 1970 onward end the game on condition that there are less than 9 stones left on the board and neither player has captured for the last 20 moves.

Conclusion

Unless you are already proficient at Ayo you may have to wait a few games before you get a victory from this program. Unlike Chess, Draughts, or Othello, you don't just win or lose at Ayo. Losing by two points is hardly losing at all, whereas getting 12 points or less is known as being in the "idiot house". Beware!

HOW IT RUNS

How It Runs

Wherever possible variable names give an idea of their function. The movemaking subroutine is at the front of the program for speed.

Three arrays have been used as boards. N(1) to N(12) holds the current game position. M(1) to M(12) is used to make moves on, and O(1) to O(12) stores game tree positions. The program is 3K long without the REM statements, 3½K with them. If you are short of memory try replacing lines 720 to 830, 880 to 990, and 1040 to 1150 with FOR NEXT loops like that at line 1570 to 1590. Don't change them unless you need to however, because they reduce the response time by about 10 seconds to a maximum of about 13 seconds.

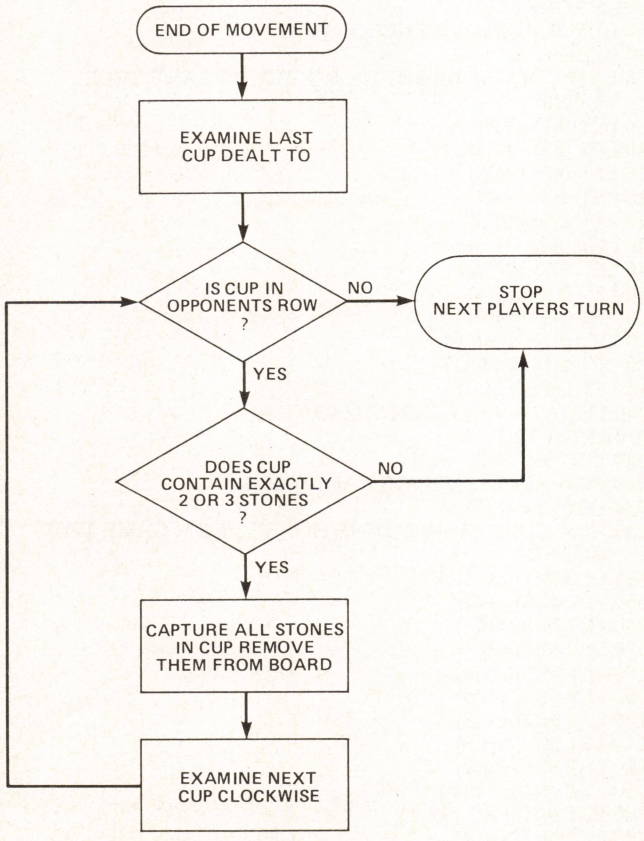


Figure 3.

HINTS ON CONVERSION

Hints On Conversion

Conversion should not be difficult. Only the graphics symbol and the codes within CHR$( )'s are unique to Sinclair. These occur only in the board printing subroutine (lines 1870 to 1960). Figures 1, 2 and 4 illustrate the function of these lines. Lines 510 and 690 use the integer basic of the ZX80 to ensure that NN and X are reduced to a number between 1 and 12 by subtracting the right multiple of 12. If you are using point arithmetic then you may replace the lines with:-

```
505 IF NN<13 THEN GOTO 520
510 LET NN=NN-12
512 GOTO 505
and
685 LET X = I + N(I)
687 IF X<13 THEN GOTO 700
690 LET X = X - 12
695 GOTO 687
```

Here is a list of the variables used in the program:-

Move subroutine variables:-

MOVE	— The move being made
CUP	— The cup being dealt to
STONES	— The number of stones left to deal
CAPTURE	— The number of stones captured this move
IDENT	— The identifying number of the player making this move

Arrays:-

N(1 to 12)	— Game board
M(1 to 12)	— Move subroutine board
O(1 to 12)	— Game tree board
A(7 to 12)	— Assessment of game tree moves
S(1 to 2)	— Players scores

Tactical variables:-

X, NN, Y

For loop variables:-

N, Q

Other variables:-

P	— The player whose move it is
PLAYER1	— The first player to move
Z$	— The letter of the chosen cup
ZS	— The number of the chosen cup
CHOICE	— The computers move choice
OBM	— The computers opponents best move at game tree level 2
BESTMOVE	— The best move from the game tree
COUNT	— The end of game countdown after less than 9 stones are left

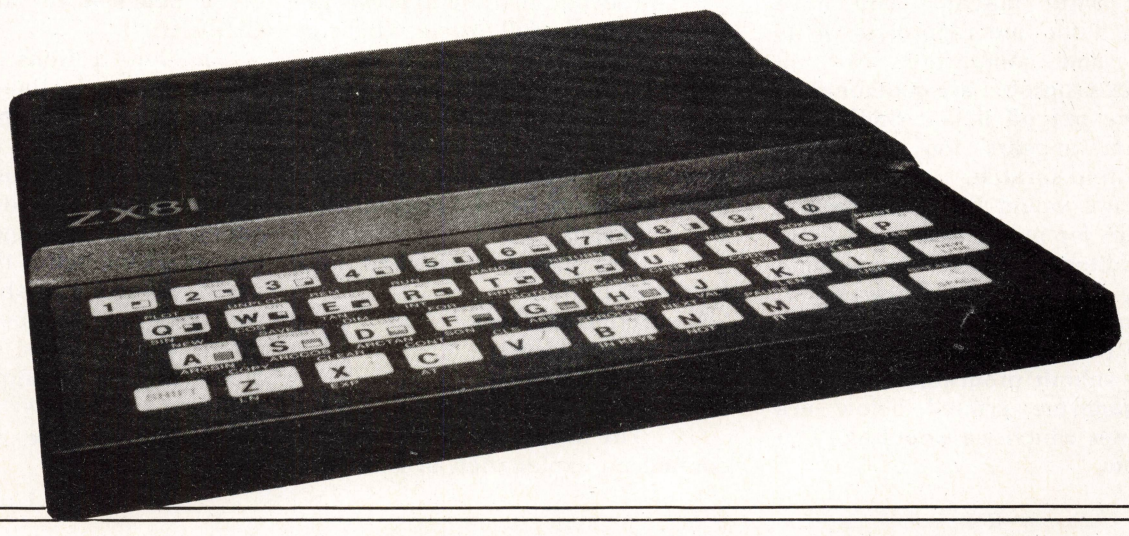
GAMESBOARD

AYO

PROGRAM LISTING

```
10 GOTO 210
15 REM MOVE MAKING SUBROUTINE
20 LET MOVE = CUP
25 REM TAKE STONES OUT OF CUP
30 LET STONES = M(CUP)
40 LET M(CUP) = 0
50 IF STONES = 0 THEN GOTO 130
55 REM DEAL ONE STONE
60 LET STONES = STONES - 1
65 REM MOVE ANTICLOCKWISE ONE CUP
70 LET CUP = CUP + 1
80 IF CUP = 13 THEN LET CUP = 1
85 REM SKIP OVER SOURCE CUP
90 IF CUP = MOVE THEN LET CUP = CUP + 1
100 IF CUP = 13 THEN LET CUP = 1
105 REM PUT STONE IN CUP
110 LET M(CUP) = M(CUP) + 1
120 GOTO 50
125 REM CAPTURE PHASE
130 IF NOT (M(CUP) = 2 or M(CUP) = 3) THEN RETURN
140 IF CUP > 6 AND IDENT = 1 THEN RETURN
150 IF CUP < 7 AND IDENT = 2 THEN RETURN
160 LET CAPTURE = CAPTURE + M(CUP)
170 LET M(CUP) = 0
180 LET CUP = CUP - 1
190 IF CUP = 0 THEN LET CUP = 12
200 GOTO 130
205 REM INITIALISE POGRAM
210 DIM S(2)
220 DIM N(12)
230 DIM M(12)
240 DIM 0(12)
250 DIM A(12)
260 LET S(1) = 0
270 LET S(2) = 0
280 FOR N = 1 TO 12
290 LET M(N) = 4
300 LET N(N) = 4
310 NEXT N
320 RANDOMISE
325 REM CHOOSE 1ST PLAYER
330 LET PLAYER1 = RND(2)
340 FOR P = 1 TO 2
350 IF PLAYER1 = 2 THEN GOTO 1410
360 IF S(1) + S(2) > 39 THEN GOSUB 1970
365 REM CHECK THAT NEXT PLAYER HAS A MOVE TO
    MAKE
370 IF (P = 1 AND NOT (N(7) + N(8) + N(9) + N(10) + N(11) +
    N(12) = 0)) OR (P = 2 AND NOT (N(1) + N(2) + N(3) + N(4) +
    N(5) + N(6) = 0)) THEN GOTO 430
380 LET S(P) = S(P) + (48 - S(1) - S(2))
390 IF P = 2 THEN PRINT "I HAVE LEFT YOU WITH NO
    STONES TO PLAY. ALL THE REST ARE FORFEIT TO
    YOU AND"
400 IF P = 1 THEN PRINT "YOU HAVE LEFT ME WITH NO
    STONES TO PLAY. ALL THE REST ARE FORFEIT TO ME
    AND"
410 PRINT "THE GAME IS ENDED."
420 GOTO 1630
425 REM PRINT BOARD GRAPHICS
430 GOSUB 1870
440 IF P = 2 THEN GOTO 1430
450 PRINT "MY TURN. PRESS NEW/LINE PLEASE."
460 INPUT Z$
470 CLS
480 IF Z$ = "END" THEN GOTO 1850
485 REM TACTICAL ASSESSMENT OF MOVES
490 FOR N = 7 TO 12
500 LET NN = N(N) + N + 1
510 LET NN = NN - 12*((NN - 1)/12)
515 REM RESET GAME TREE MOVE ASSESSMENT
520 LET A(N) = 0
530 IF N(N) + N > 18 OR N(N) + N < 12 THEN GOTO 590
540 IF N = 7 THEN GOTO 590
550 IF N(NN) > 1 THEN GOTO 590
560 FOR Q = 7 TO N - 1
570 IF N(Q) + Q > 12 THEN LET A(Q) = 11
580 NEXT Q
590 NEXT N
600 IF N(2) = 0 AND N(12) > 0 AND N(11) = 1 THEN LET
    A(11) = - 6
610 IF N(1) + N(2) + N(3) + N(4) + N(5) + N(6) = 0 THEN GOSUB
    1710
620 IF N(1) + N(2) + N(3) + N(11) + N(12) = 0 AND N(4) < 6 AND
    N(5) < 5 AND N(6) < 4 THEN GOSUB 1750
625 REM GAME TREE
630 FOR I = 7 TO 12
640 IF NOT N(1) = 0 THEN GOTO 670
650 LET A(1) = - 999
660 GOTO 1220
670 IF NOT N(1) = 0 THEN GOTO 690
680 IF N(1) > 12 - 1 THEN LET A(1) = A(1) - 5
690 LET X = (I + N(I) - ((I - 1 + N(I))/12)*12)
700 IF X < 7 AND N(X) = 0 THEN LET A(I) = A(I) - 2
710 IF N(I) = 1 THEN LET A(I) = A(I) + I - 7
715 REM COPY GAME BOARD TO SUBROUTINE BOARD
720 LET M(1) = N(1)
730 LET M(2) = N(2)
740 LET M(3) = N(3)
750 LET M(4) = N(4)
760 LET M(5) = N(5)
770 LET M(6) = N(6)
780 LET M(7) = N(7)
790 LET M(8) = N(8)
800 LET M(9) = N(9)
810 LET M(10) = N(10)
820 LET M(11) = N(11)
830 LET M(12) = N(12)
835 REM INITIALISE FOR MOVE SUBROUTINE
840 LET CAPTURE = 0
850 LET IDENT = 1
860 LET CUP = I
865 REM CALL MOVE SUBROUTINE
870 GOSUB 20
875 REM COPY SUBROUTINE BOARD TO GAME TREE
    BOARD
880 LET 0(1) = M(1)
890 LET 0(2) = M(2)
900 LET 0(3) = M(3)
910 LET 0(4) = M(4)
920 LET 0(5) = M(5)
930 LET 0(6) = M(6)
940 LET 0(7) = M(7)
950 LET 0(8) = M(8)
960 LET 0(9) = M(9)
970 LET 0(10) = M(10)
980 LET 0(11) = M(11)
990 LET 0(12) = M(12)
1000 LET A(I) = A(I) + CAPTURE*10
1010 LET IDENT = 2
1020 LET OBM = 0
1025 REM NEXT LEVEL OF GAME TREE
1030 FOR G = 1 TO 6
1035 REM COPY SUBROUTINE BOARD FROM GAME TREE
    BOARD
1040 LET M(1) = 0(1)
1050 LET M(2) = 0(2)
1060 LET M(3) = 0(3)
1070 LET M(4) = 0(4)
1080 LET M(5) = 0(5)
1090 LET M(6) = 0(6)
1100 LET M(7) = 0(7)
1110 LET M(8) = 0(8)
1120 LET M(9) = 0(9)
1130 LET M(10) = 0(10)
1140 LET M(11) = 0(11)
1150 LET M(12) = 0(12)
1155 REM INITIALISE FOR MOVE SUBROUTINE
1160 LET CAPTURE = 0
1170 LET CUP = G
```

```
1175 REM CALL MOVE SUBROUTINE
1180 GOSUB 20
1185 REM FIND OPPONENTS BEST REPLY
1190 IF CAPTURE>OBM THEN LET OBM = CAPTURE
1200 NEXT G
1210 LET A(I) = A(I) - 10*OBM
1215 REM FIND BEST MOVE ASSESSMENT
1220 IF I = 7 THEN LET BESTMOVE = A(7)
1230 IF A(I)>BESTMOVE THEN LET BESTMOVE = A(I)
1240 IF A(I) = BESTMOVE THEN LET CHOICE = I
1250 NEXT I
1255 REM CHOOSE BETWEEN EQUAL BEST ASSESSMENTS
1260 FOR N = 7 TO 11
1270 IF A(N) = BESTMOVE AND RND(N - 5) = 2 THEN LET
     CHOICE = N
1280 NEXT N
1285 REM INITIALISE FOR MOVE SUBROUTINE
1290 LET IDENT = 1
1300 LET CAPTURE = 0
1310 LET CUP = CHOICE
1315 REM COPY GAME BOARD TO SUBROUTINE BOARD
1320 FOR N = 1 TO 12
1330 LET M(N) = N(N)
1340 NEXT N
1345 REM MAKE CHOSEN MOVE
1350 GOSUB 20
1355 REM COPY SUBROUTINE BOARD TO GAME BOARD
1360 FOR N = 1 TO 12
1370 LET N(N) = M(N)
1380 NEXT N
1385 REM ADJUST SCORE
1390 LET S(1) = S(1) + CAPTURE
1400 PRINT "I PLAYED CUP---";CHR$(37 + CHOICE)
1410 LET PLAYER1 = 1
1420 NEXT P
1430 PRINT "YOUR MOVE. ENTER THE CUP LETTER
     PLEASE."
1435 REM INPUT OPPONENTS MOVE
1440 INPUT Z$
1450 CLS
1460 IF Z$ = "END" THEN GOTO 1850
1470 LET ZS = CODE(Z$) - 37
1475 REM VERIFY MOVE VALIDITY
1480 IF ZS<7 AND ZS>0 THEN GOTO 1520
1490 PRINT "THE RULES DO NOT ALLOW YOU TO MAKE
     THAT MOVE. PLEASE REENTER."
1500 GOSUB 1870
1510 GOTO 1440
1515 REM INITIALISE FOR MOVE SUBROUTINE
1520 LET IDENT = 2
1530 LET CAPTURE = 0
1540 LET CUP = ZS
1550 IF N(CUP) = 0 THEN GOTO 1490
1555 REM MAKE MOVE
1560 GOSUB 20
1565 REM COPY SUBROUTINE BOARD TO GAME BOARD
1570 FOR N = 1 TO 12
1580 LET N(N) = M(N)
1590 NEXT N
1595 REM ADJUST SCORE
1600 LET S(2) = S(2) + CAPTURE
1610 NEXT P
1620 GOTO 340
1625 REM GAME ENDING SECTION
1630 IF S(1)>S(2) THEN PRINT "I WIN---"
1640 IF S(1) = S(2) THEN PRINT "ITS A DRAW---"
1650 IF S(1)<S(2) THEn PRINT "YOU WIN---"
1660 PRINT
1670 PRINT "YOUR SCORE", "MY SCORE"
1680 PRINT
1690 PRINT S(2)," ",S(1)
1700 STOP
1705 REM TACTICAL SUBROUTINE 1
1710 FOR N = 7 TO 12
1720 IF N(N)>12 - N THEN LET A(N) = A(N) + 50
1730 NEXT N
1740 RETURN
1745 REM TACTICAL SUBROUTINE 2
1750 FOR N = 7 TO 12
1760 LET Y = N + N(N)
1770 IF Y<13 THEN LET A(N) = A(N) + N(N)*5
1780 NEXT N
1790 RETURN
1800 CLS
1805 REM END OF GAME SHARE OUT
1810 FOR N = 1 TO 6
1820 LET S(1) = S(1) + N(N + 6)
1830 LET S(2) = S(2) + N(N)
1840 NEXT N
1850 PRINT"__THE GAME IS ENDED."
1860 GOTO 1630
1865 REM BOARD GRAPHICS SUBROUTINE
1870 PRINT "__@@@@@@@@@@@@@@@@@@"
1880 FOR N = 1 TO 6
1890 PRINT "__@";CHR$(37 + N);"@";N(N),"@@@@@";
     N(13 - N),"@";CHR$(50 - N);"@"
1900 PRINT "__@@@@@@@@@@@@@@@@@@"
1910 NEXT N
1920 PRINT
1930 PRINT "YOUR SCORE", "MY SCORE"
1940 PRINT
1950 PRINT S(2)," ",S(1)
1960 RETURN
1965 REM END GAME SUBROUTINE
1970 IF CAPTURE>0 THEN LET COUNT = 0
1980 IF CAPTURE = 0 THEN LET COUNT = COUNT + 1
1990 IF COUNT>19 THEN GOTO 1800
2000 RETURN
```



AYO

Figure 1.

```
@@@@@@@@@@@@@@@@
@A@4    @@@@@4    @L@
@@@@@@@@@@@@@@@@
@B@4    @@@@@4    @K@
@@@@@@@@@@@@@@@@
@C@4    @@@@@4    @J@
@@@@@@@@@@@@@@@@
@D@4    @@@@@4    @I@
@@@@@@@@@@@@@@@@
@E@4    @@@@@4    @H@
@@@@@@@@@@@@@@@@
@F@4    @@@@@4    @G@
@@@@@@@@@@@@@@@@
```

Relates to page 2 lines 2 and 13.

Figure 2.

```
@@@@@@@@@@@@@@@@
@A@5    @@@@@5    @L@
@@@@@@@@@@@@@@@@
@B@5    @@@@@0    @K@
@@@@@@@@@@@@@@@@
@C@5    @@@@@4    @J@
@@@@@@@@@@@@@@@@
@D@4    @@@@@4    @I@
@@@@@@@@@@@@@@@@
@E@4    @@@@@4    @H@
@@@@@@@@@@@@@@@@
@F@4    @@@@@4    @G@
@@@@@@@@@@@@@@@@
```

Relates to page 2 line 12.

Figure 4.

(A)

```
@@@@@@@@@@@@@@@@
@A@0    @@@@@5    @L@
@@@@@@@@@@@@@@@@
@B@0    @@@@@0    @K@
@@@@@@@@@@@@@@@@
@C@3    @@@@@2    @J@
@@@@@@@@@@@@@@@@
@D@4    @@@@@1    @I@
@@@@@@@@@@@@@@@@
@E@6    @@@@@3    @H@
@@@@@@@@@@@@@@@@
@F@4    @@@@@1    @G@
@@@@@@@@@@@@@@@@
```

Before movement.

(B)

```
@@@@@@@@@@@@@@@@
@A@0    @@@@@5    @L@
@@@@@@@@@@@@@@@@
@B@0    @@@@@0    @K@
@@@@@@@@@@@@@@@@
@C@3    @@@@@3    @J@
@@@@@@@@@@@@@@@@
@D@4    @@@@@2    @I@
@@@@@@@@@@@@@@@@
@E@6    @@@@@4    @H@
@@@@@@@@@@@@@@@@
@F@0    @@@@@2    @G@
@@@@@@@@@@@@@@@@
```

After movement of cup F.

(C)

```
@@@@@@@@@@@@@@@@
@A@0    @@@@@5    @L@
@@@@@@@@@@@@@@@@
@B@0    @@@@@0    @K@
@@@@@@@@@@@@@@@@
@C@3    @@@@@0    @J@
@@@@@@@@@@@@@@@@
@D@4    @@@@@0    @I@
@@@@@@@@@@@@@@@@
@E@6    @@@@@4    @H@
@@@@@@@@@@@@@@@@
@F@0    @@@@@2    @G@
@@@@@@@@@@@@@@@@
```

After captures 5 stones taken.

Relates to page 2 line 24.

I have used a @ symbol to represent a CHR$(9) graphics symbol.

Figures 1 and 2 demonstrate movement.

Figures 4 A, B and C demonstrate capturing.

Submitting Programs to Personal Computing Today

Have you written a program or article and would like to tell the world about it? Everyone likes to have a go at programming and we would love to look at your programming works of art to consider them for publication.

Why not send them to us, no matter what machine you have written it for and regardless of its length and complexity. Not all complex programs are good ones so don't be put off if you think your program appears too simple to come up to scratch.

If you would like to submit a program for publication send it to: The Editor, Personal Computing Today, 145 Charing Cross Road, London WC1.

So that you know how we like you to submit programs for use in the magazine printed below are guidelines which we would like you to follow.

What To Do

There are two kinds of program features carried within our pages. The first is the brief "Micro-Spot": A page in total containing a brief description of the software, notes on its usage and a full listing.

These are designed to be short and to the point and are not primarily intended for the beginner in programming.

The second method of presentation is that of a full article. This can run anywhere in length from two pages to five pages and is formatted to a rigid style of presentation.

Because PCT is aimed at the newcomer to computing, our main software has to be well documented and explained.

1. The article is broken into four parts.

(a) Introductory Text
(b) Program Listing
(c) How It Runs
(d) Hints on Conversion

2. The Introductory Text should contain an explanation of what the program is designed to do, what is to be expected on-screen when it is run, any problems the author overcame in producing the program and any background necessary to enable our readers to use the listing.

3. Programs should preferably be run out on a printer straight from the computer. In this way less errors creep in. Otherwise typed or handwritten is acceptable but must be double-spaced and DOUBLE CHECKED!

4. How it Runs should be as near to a line-by-line, or block-by-block description of the program as is possible.

5. Each computer on the market has its own little foibles and oddities. No one knows those of your machine better than you. How would someone wishing to adapt your program go about untangling them? What special use have you made of your computer's special abilities? Graphics?

Always include a full list of variables, too.

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---

1. A total memory capacity of 64K; 38K directly available to BASIC. When not using BASIC a full 54K is available for machine code programs.

2. Interface adaptors will allow the use of a complete range of hardware peripherals including disk units, plotter, dot matrix and daisy wheel printers, Prestel communications, networking and much, much more.

3. A complete range of business software including word processing, information handling, financial modelling, accounting and many more specific application packages will be available.

4. Other computer languages such as LOGO, UCSD PASCAL, COMAL and ASSEMBLER are being developed. Existing VIC and 40 column PET BASIC programs can be easily converted.

5. The powerful sound chip gives 3 totally independent voices each with a range of 9 octaves. User control over music envelope, pitch and pulse shapes provides the ability to make your Commodore 64 sound like a variety of musical instruments, solo or in harmony.

6. 62 predefined graphic characters plus



full alpha numerics with upper and lower case letters, all available directly from the keyboard and displayable in normal or reverse video in any of 16 colours.

7. 40 column by 25 lines colour display. In high resolution graphics mode, a bit mapped screen gives 320 x 200 individually addressable pixels.

8. The dedicated video chip allows the use of high resolution multi-coloured "Sprites" (moveable object blocks). Sprites can be moved pixel by pixel, independently of anything else on the screen.

9. Sprites can also be set up in 8 "layers" giving full 3 dimensional effects with, if required, automatic collision detection between sprites and any other screen object.

10. Machine bus port will accept ROM cartridges for many applications, including business, educational, home and leisure software.

11. A second processor option using the Z80 gives the Commodore 64 the ability to support CP/M®.

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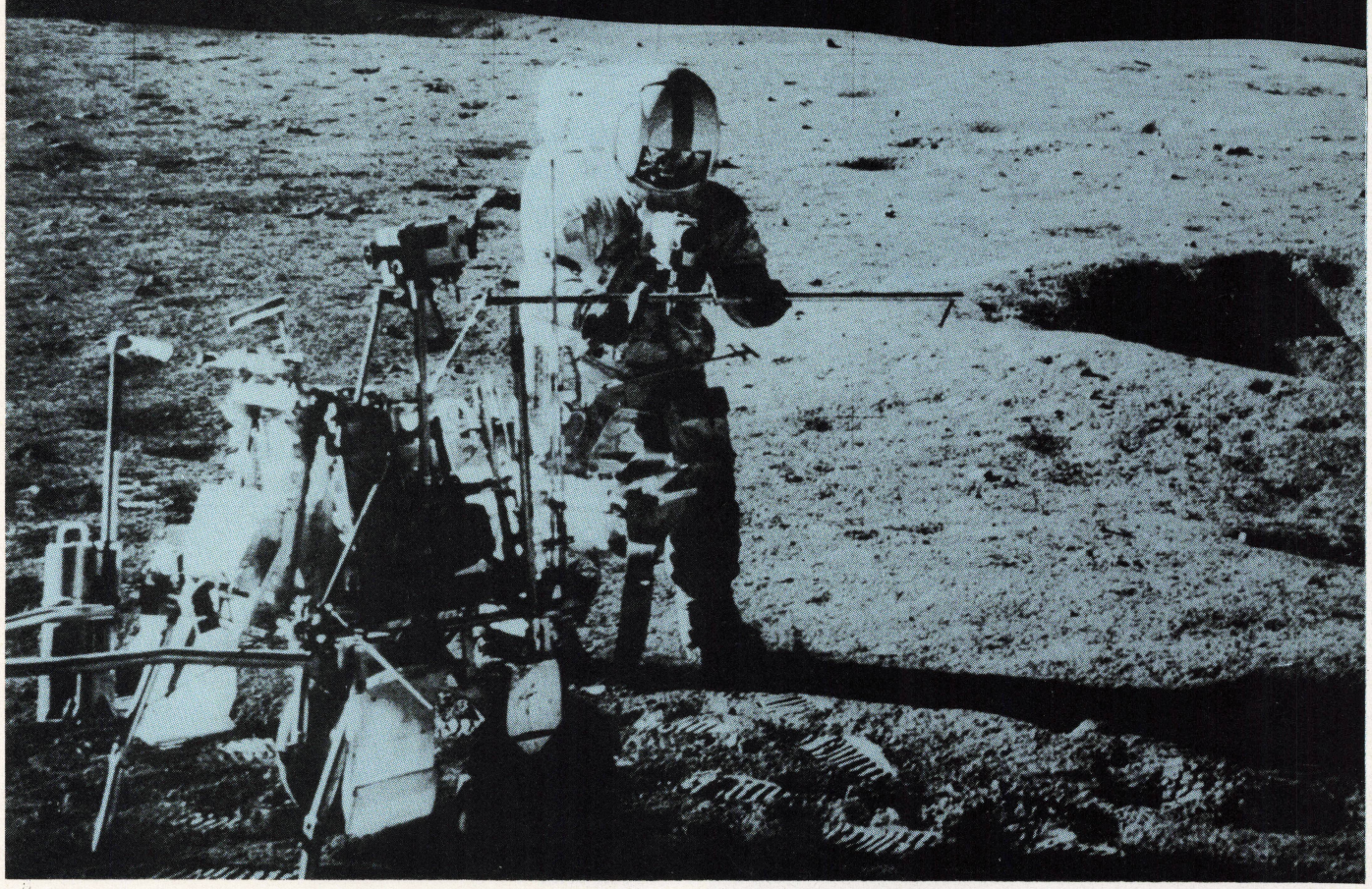
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SATURN ATTACK



Exploring the surface of alien planets is hazardous at the best of times, not least when you have to fight off the native Titans. Simon Goodwin takes you and your TRS-80 into the outer galaxy in search of valuable minerals. Can you survive the tortuous ordeal?

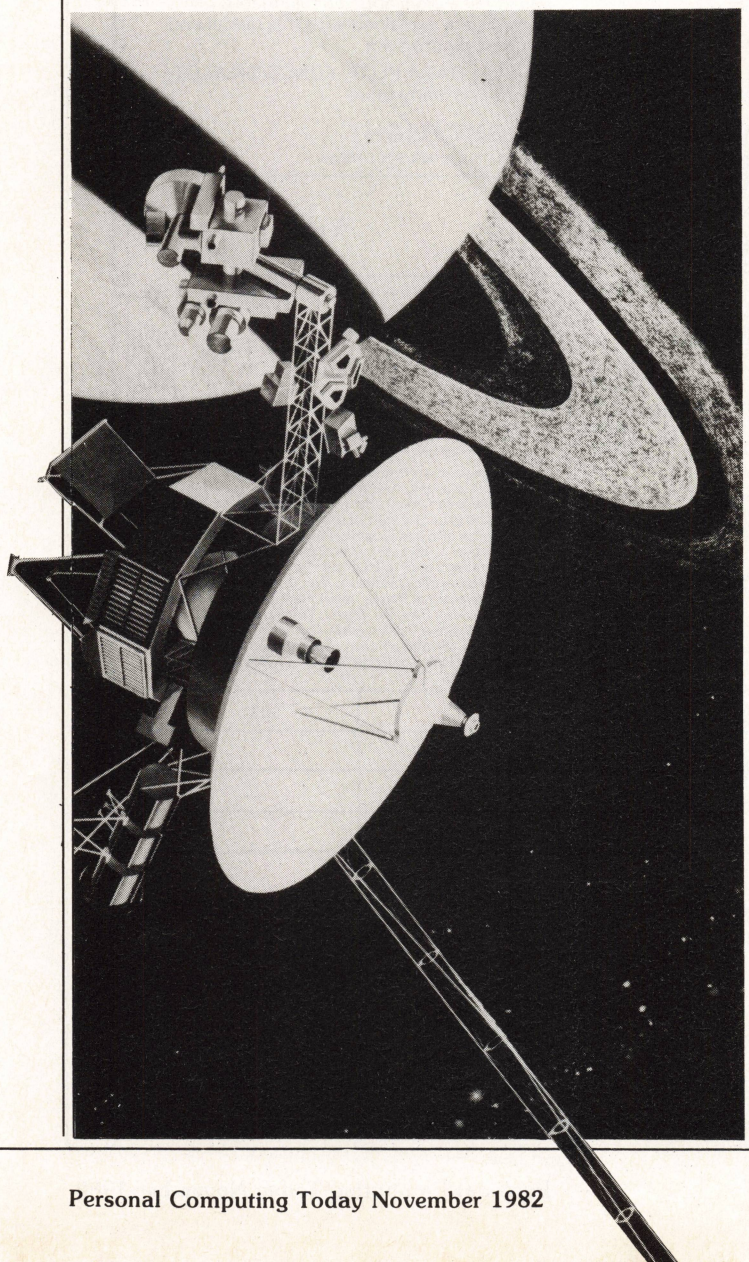
As captain of the probe 'Ringreaper' you aim to collect as many valuable mineraloids as possible in the ramscoop of your craft. The snag is that the hideously alien lifeforms of the moon Titan resent your activities on their 'doorstep' — they have seeded the rings with spacemines in the hope of detecting and destroying your probe. If a robot mine (" *") finds you it will call up a formation of 'Space Sweepers' which will scan along the ring, attempting to destroy you. Only by pinpoint manoeuvring can you avoid the Sweep — but beware, if you run-over another mine as you take avoiding action you'll end up with two Space Sweepers to contend with . . .

To adjust the difficulty of the program type from 4 to 8 spaces in the gap between the words GAME and OVER in line 100. The more spaces you enter the easier it will be to avoid the Sweep.

Saturn Attack is a graphic game for users of the TRS-80 Model 1, Video Genie, PMC-80, or System 80 microcomputers. It runs in less than 4K of memory under Microsoft Level 2 BASIC.

HOW IT RUNS

Lines 100-110	These tell BASIC how much space to reserve for string variables and decare all other variables as 'integer' (whole-number only) for speed.
Lines 120-130	Set up BL as the numeric coordinate of the bottom line of the display and clear the screen.
Line 140	Assembles the graphic display of the probe.
Line 150	Selects the probe starting position.
Line 160	Prints the probe (with the graphic border either side).
Line 170-190	Check for the presence of objects in front of the probe.
Lines 200-220	Scan the keyboard and move the probe left or right if it is not at the screen edge.
Lines 230-240	Randomly print either a mine or a mineraloid on the bottom row of the display, scrolling all the other objects towards the probe.
Line 250	Is only called if the probe has collided with an object. The character code of the object is read.
Line 260	If the object is a mine a formation of Space Sweepers is displayed at a random position.
Line 270	A mineraloid has been found — increase the score.
Lines 280-300	Disaster — the Space Sweepers have captured the probe. Flash the final score.



HINTS ON CONVERSION

Lines 100-110 are not needed in most versions of BASIC. The value of BL will have to be changed to the printing coordinate of the first character on the last line of your display. It is only used in line 230. The STRING$(X,Y) function returns X copies of character Y. If your computer does not have this function a loop could be used to build up the string. MID$(A$,B,C) returns C characters of string A$, starting from character B. PRINT @N causes printing to occur at position N on the display. The PEEK in line 180 relies upon the fact that the Video Genie display is memory-mapped between locations 15360 and 16383 — if your computer display is mapped elsewhere line 170 should be modified so that J scans the addresses of the characters on the line below the probe.

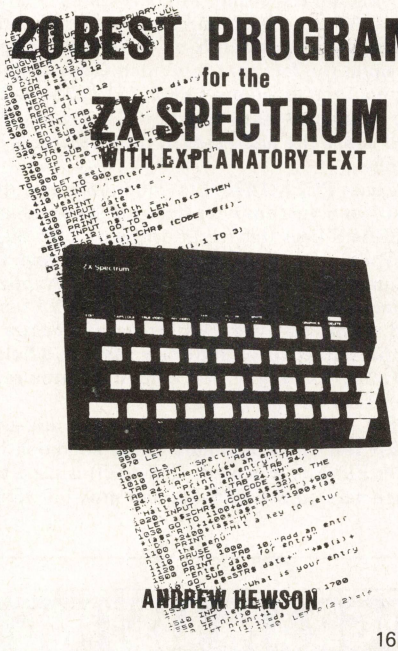
Saturn Attack uses PEEK(14400) to continually test the computer keyboard. If your computer does not have adjacent TAB and BACKSPACE keys (left/right arrow on TRS-80) change if P = 32 . . . to IF P = 2 . . . to manouvre with CLEAR and TAB instead. If your computer does not use a keyboard mapped to this address either change the address or use the INKEY$ function to poll the keyboard. Either way the tests for specific values of P will have to be modified. RND(N) returns a random whole-number value between 1 and N. Other computers may require INT(RND(0) *N + 1) or RND (N) + 1.

The IF . . . THEN . . . ELSE statement works like the standard BASIC IF . . . THEN test but if (and only if) the condition is false the statement after ELSE is executed. CHR$(23) is used to select double-width characters on the TRS-80, and may be omitted if not required.

PROGRAM LISTING

```
10    CLEAR400 : DEFINT A - Z : BL = 960 : CLS :
      A$ = STRING$(60,131) + CHR$(152) + CH
      R$(139) + CHR$(175) + CHR$(159) + CHR$(135)
      + CHR(164) + STRING$(60,131) : I = 30
30    PRINT @0, MID$(A$, I,59); SC; : for J = 15486 - I TO
      15489 - I : IF PEEK (J) < > 32 GOSUB:100
      NEXT ELSE NEXT
50    P = PEEK(14400): IF P = 32 IF I < 60 THEN I = I + 3
60    IF P = 64 IF I > 8 THEN I = I - 2
80    IF RND(2) = 1 THEN PRINT @BL + RND(63), " *"
      ELSE PRINT @BL + RND(63), CHR$(128 + RND(15))
90    GOTO 30
100   CLEAR 400
110   DEFINT A - Z
120   BL = 960
130   CLS
140   A$ = STRING$(60,131) + CHR$(152) + CHR$(139)
      + CHR$(175) + CHR$(159) + CHR$(135) + CHR$(164)
      + STRING$(60,131)
150   I = 30
160   PRINT @0, MID$(A$,I,59);SC;
170   FOR J = 15486 - I TO 15489 - I
180   IF PEEK(J) < > 32 GOSUB 250
190   NEXT J
200   P = PEEK(14400)
210   IF P = 32 THEN IF I < 60 THEN I = I + 3
220   IF P = 64 THEN IF I > 8 THEN I = I - 2
230   IF RND(2) = 1 THEN PRINT @BL + RND(63), " *"
      ELSE PRINT @BL + RND(63), CHR$(128 + RND(15))
240   GOTO 160
250   K = PEEK(J)
260   IF K = 42 THEN W = RND(44) + 2 : PRINT @BL,STR-
      ING$(W,166) + "GAME  OVER?" + STR-
      ING$(47 - W,153) : RETURN
270   IF K > 128 THEN IF K < 153 THEN SC = SC + 1 :
      RETURN
280   CLS
290   PRINT @535,CHR$(23)"BOOM";SC
300   GOTO 280
```

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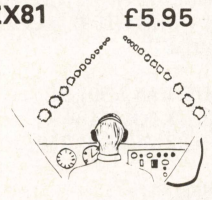
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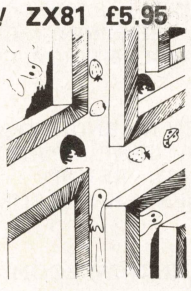
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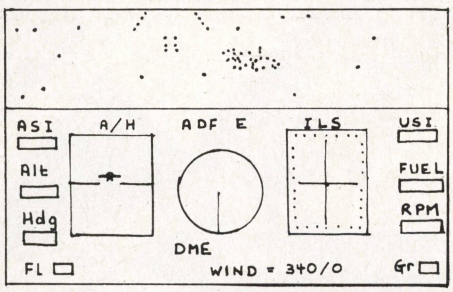
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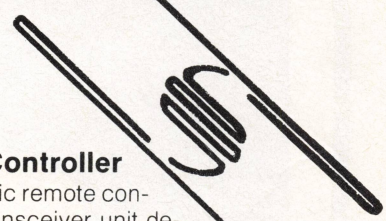
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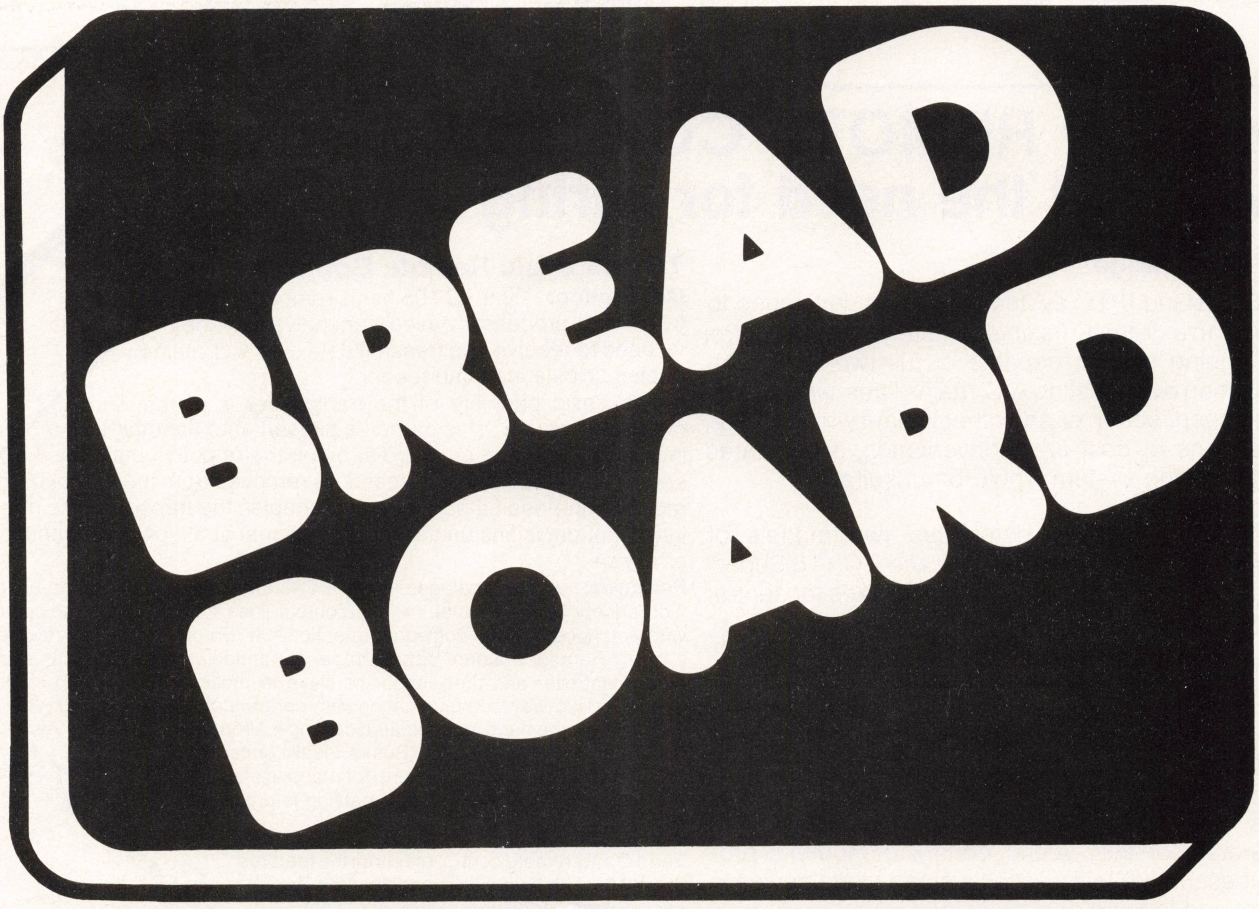
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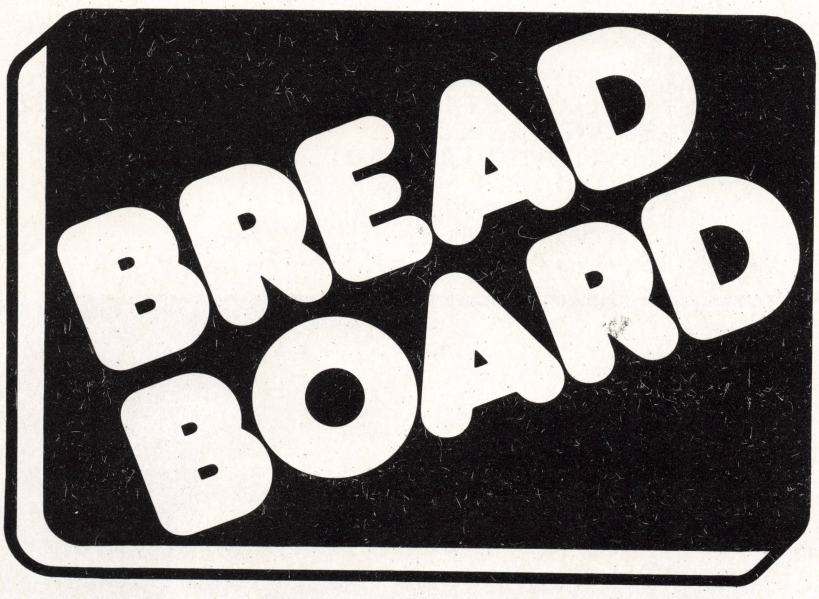
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MICROSPOT

SOUND ENVELOPE

Confusion surrounds the use of the BBC micro computer's 'ENVELOPE' command. Gary Heayes overcomes this problem with his custom routine.

The command 'ENVELOPE' defines the form of the sound produced in the SOUND command of the BBC Micro computer.

ENVELOPE is followed by 14 numbers. The first is the envelope number, or reference number (n). The second determines the size of the lumps in which the sound is executed. (st) 1 is the most common and gives a nice flowing sound. 10 is quite lumpy and, beyond 10 is very tedious. Increasing this number is like putting the sound under a microscope and increasing the power of magnification. Imagine the intensity of it!

The next 12 numbers come in two groups of six. The first group is the 'frequency' or 'pitch' envelope. The first three numbers (fg1,fg2,fg3) define the gradient of the change in pitch (fd1,fd2,fd3) in three segments of the sound. The next three numbers determine the length of each segment.

The second group is the 'amplitude' or 'volume' envelope and determines how the loudness of the sound will change as the sound is played. The first four numbers define attack, decay, sustain and release (ADSR). Attack is the rate at which the volume changes to the next level. Sustain and release are the rates at which the noise dies away. Then follow the two volume levels.

Each of these numbers is separated by a comma thus the syntax is:

ENVELOPE
n,st,fg1,fg2,fg3,fd1,fd2,fd3,a,d,s,r,v1,v2.

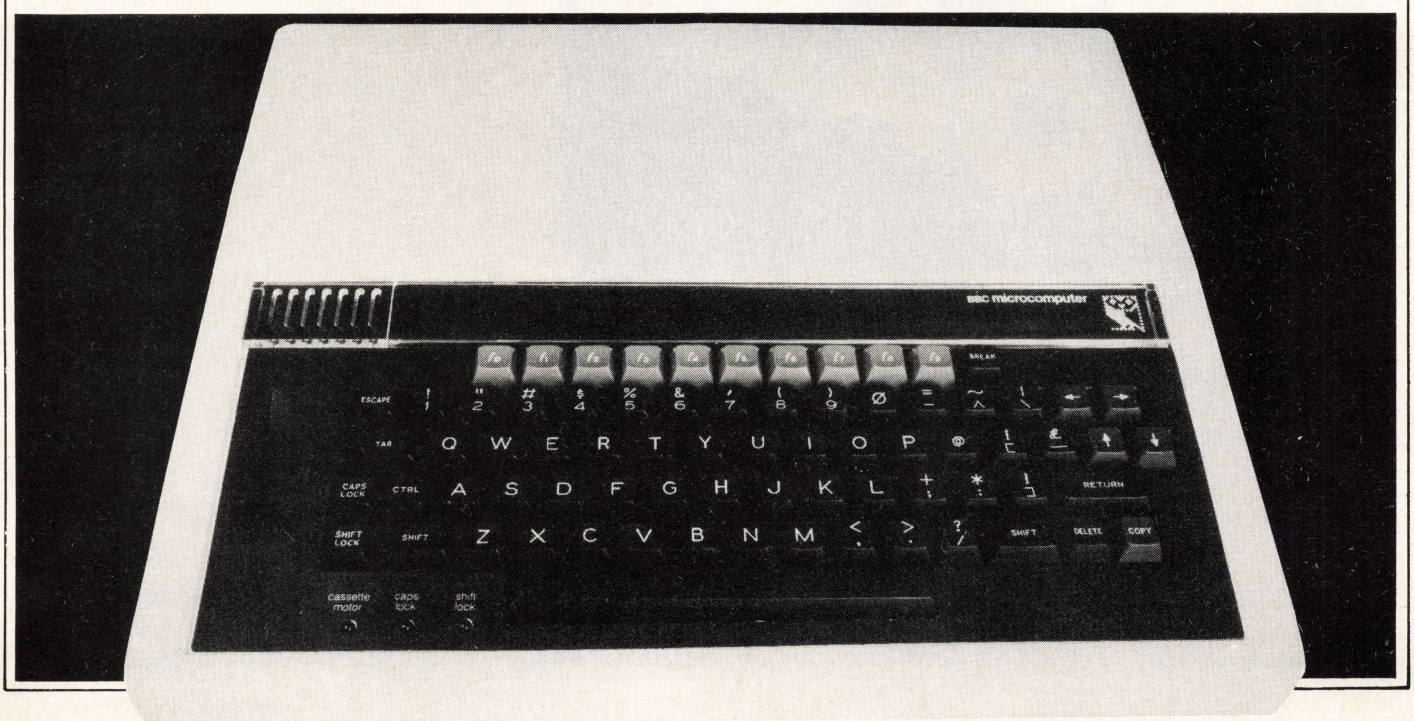
```
10 ENVELOPE 1,1,0,0,0,0,0,0,127, - 1, - 2, - 2,100,50
15 REPEAT
20 A$ = INKEY $ (1) : 1DA$ = "" THEN 20
30 SOUND 1,1, ASC (A$),2
40 UNTIL FALSE
```

In the above program line 10 defines the envelope. As you can see the pitch envelope is left undefined, so in the noises, produced pitch will not vary.

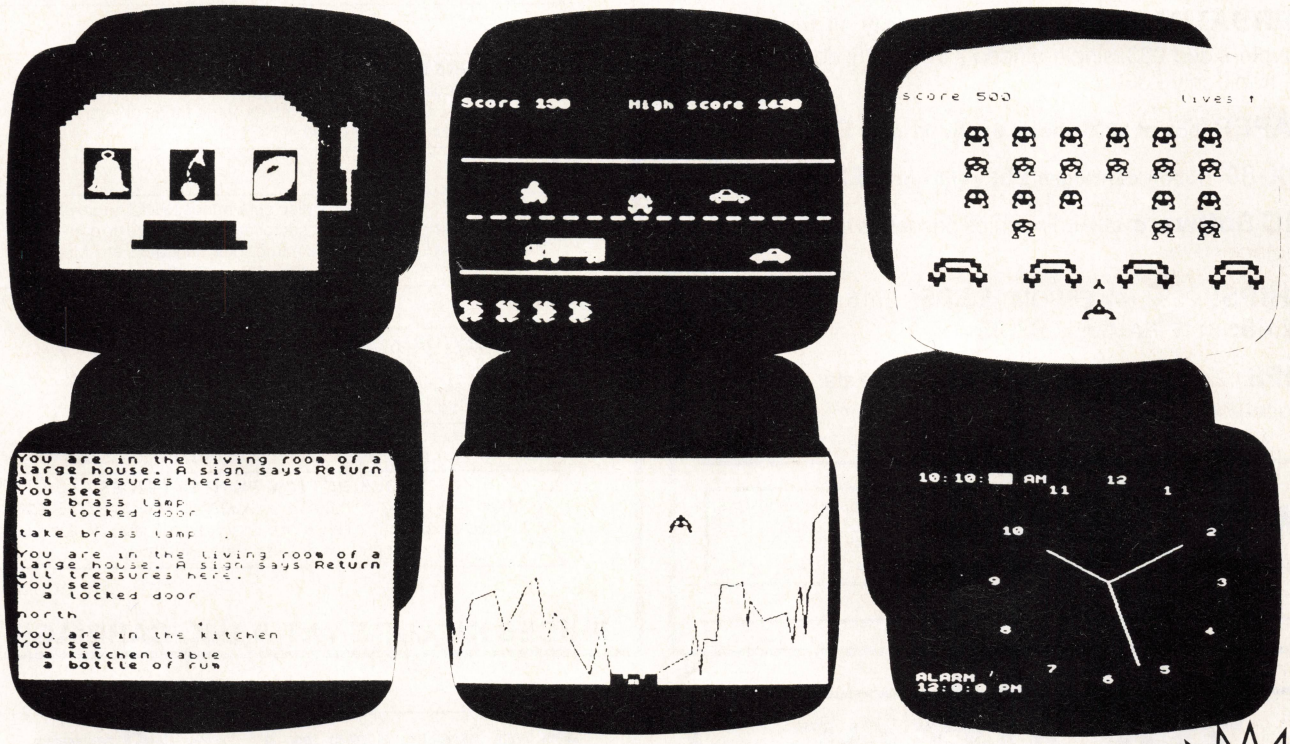
Attack is set at 127 which means the volume will reach the first level (100) immediately a key is pressed. Decay will bring this gradually down to 50, and sustain and release continue to fade the noise out. You will note that the second number in SOUND, which was volume, is now the envelope number. There are 15 possible numbers (1-15).

Try these sounds in your space invader games.

```
ENVELOPE 1,1,20, - 15, - 15,90,90,90,127,100, - 1,
         - 1,126,126
SOUND 1,1,100,10
ENVELOPE 2,1,11, - 6,1,10,30,60,127,0,0, - 127,126,0
SOUND 1,2,100,20
ENVELOPE 3,3,0,0,0,0,0,0,5, - 1, - 5, - 1,100,50
SOUND 1,3,70,60
SOUND 0,3,4,70
SOUND 0,3,3,60
SOUND 0,3,71,60
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FACTFILE

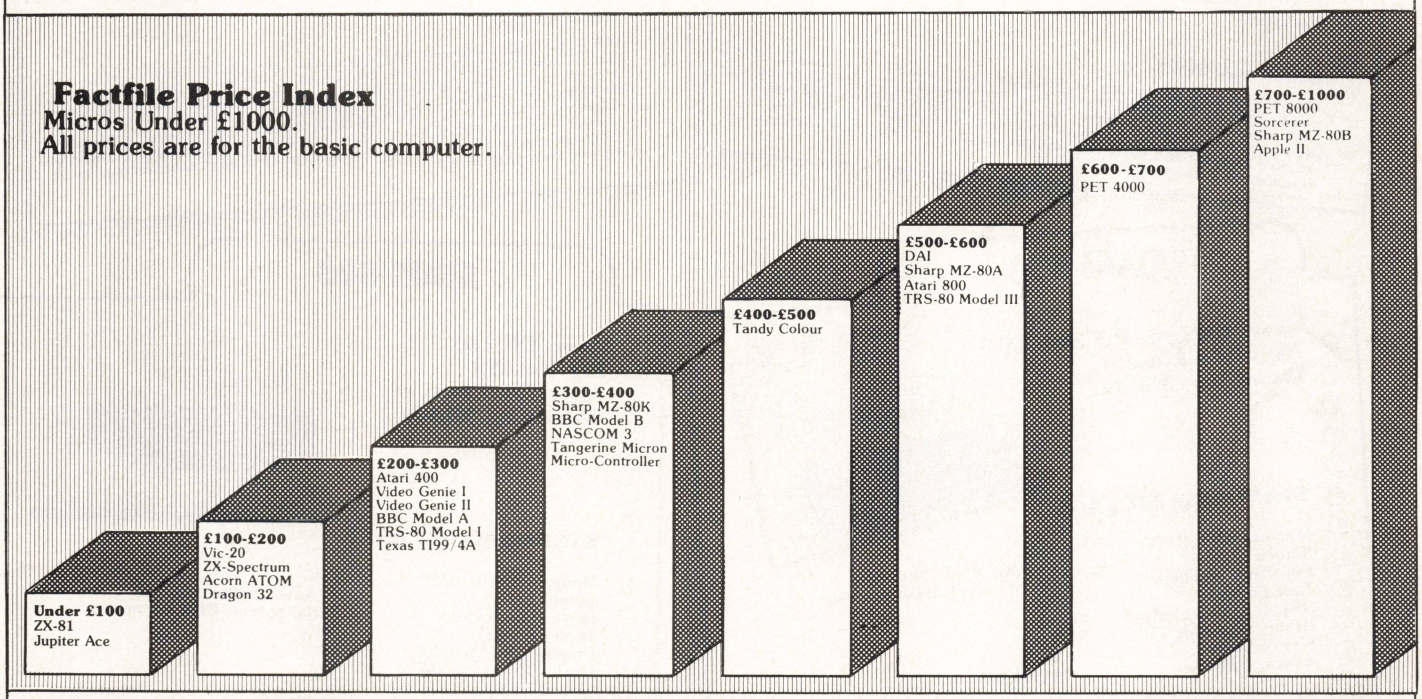
MICRO FACTFILE

Factfile is our regular buyer's guide to microcomputers. Herein you will find all the important facts and figures on 27 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

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 and 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 approximate guide to the BASICs versatility. The more powerful the language, the easier it should be to use.

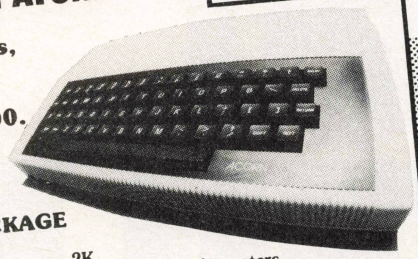
BUS CONNECTION: A socket on the micro which allows it to be linked up to various add-ons. This can take the form of many various items, ie, expansion box, printer, disc drives, plotting device. In short a BUS is an information 'window' through which the micro communicates with the outside world.

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.

FACTFILE

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	£232
Monitor	No	—
Disc Drives	Yes	£299
Other Languages	Yes	£11.50
Multi-user Capabilities	Yes	—
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**

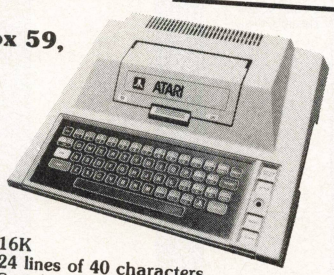
MANUFACTURER'S EXPANSIONS

	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 Microtonics 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, Cheshire, WA2 8PR, £195.

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	**£199.95**

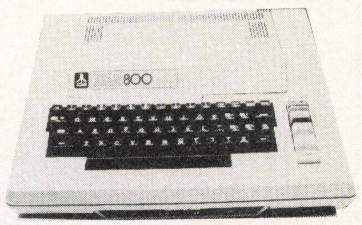
MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£265
Monitor	No	—
Disc Drives	Yes	£345
Other Languages	Yes	£39-79
Multi-user Capabilities	No	
BASIC extensions (Toolkits)	Yes	

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,
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	**£599.95**

MANUFACTURER'S EXPANSIONS

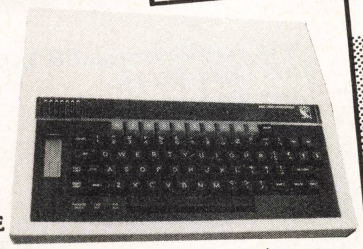
	DETAILS	PRICE
RAM	optional 16K RAM packs (to 48K Max)	£65
Printer	Yes	£265
Monitor	No	—
Disc Drives	Yes	£345
Other Languages	Yes	£39-79
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	TBA

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

BBC MICROCOMPUTER

BBC 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

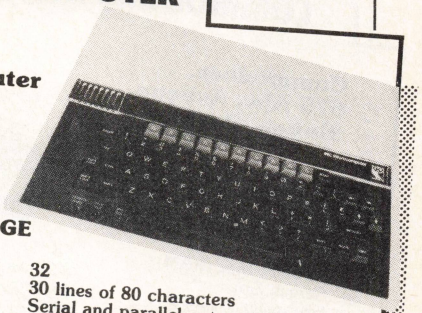
	DETAILS	PRICE
RAM	up to 32K	£100
Printer	TBA	—
Monitor	Yes	£200
Disc Drives	TBA	—
Other Languages	TBA	—
Multi-user		—
Capabilities	Yes	—
BASIC extensions (Toolkits)	TBA	

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

BBC 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	Yes	£200
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, Berks



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, Berks



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	—

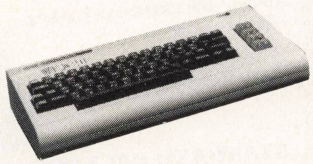
OTHER ADD-ONS:

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.

FACTFILE

COMMODORE VIC20

Commodore,
675 Ajax Avenue,
Slough, Berks



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

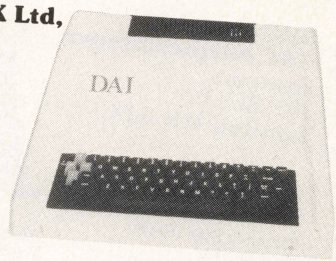
	DETAILS	PRICE
RAM	3K,8K,16K expansion options	£30,£45,£75
Printer	Yes	£270
Monitor	No	—
Disc Drives	Yes	£396
Other Languages	Yes	£38.95
Multi-user		
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

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. Languages: VIC Forth, Adda Computers, 154 Victoria Road, Acton, London, W3.

DAI

Data Applications UK Ltd,
16B Dyer Street,
Cirencester,
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

DRAGON 32

Dragon Data Ltd
Queensway,
Swansea
Industrial Estate,
Swansea, SA5 4EH



STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	16 lines of 32 characters
Expansion Sockets	Yes
Display Unit Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£199**

MANUFACTURER'S EXPANSIONS

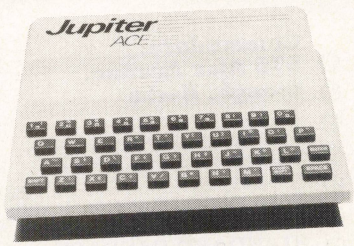
	DETAILS	PRICE
RAM	—	—
Printer	No	—
Monitor	No	—
Disc Drives	No	—
Other Languages	Yes	—
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None reported

JUPITER ACE

Jupiter Cantab
22 Foxhollow
Bar Hill
Cambridge
CB3 8EP



STANDARD PACKAGE

Memory Size (RAM)	3K
Screen Size	24 lines of 32 characters
Expansion Sockets	Not known
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	Resident language is FORTH at 8K
Average Price	**£89.95**

MANUFACTURER'S EXPANSIONS

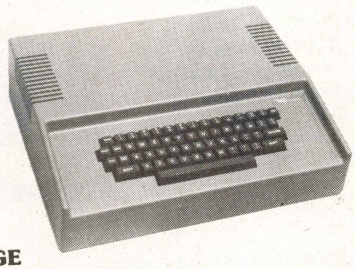
	DETAILS	PRICE
RAM	TBA	—
Printer	TBA	—
Monitor	TBA	—
Disc Drives	TBA	—
Other Languages	TBA	—
Multi-User Capabilities	TBA	—
BASIC extensions (toolkits)	TBA	—
	N/A	—

OTHER ADD-ONS:

None Reported.

MICROCONTROLLER

Midwich Computer Company Ltd, Hewitt House, Northgate Street, Bury St. Edmunds, Suffolk IP33 1HQ. Tel: 0284-701321



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

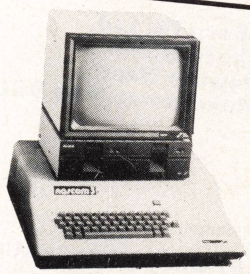
	DETAILS	PRICE
RAM	No	—
Printer	Yes	POA
Monitor	Yes, 9″ or 12″ screen	£135-149
Disc Drives	No	—
Other Languages	No	
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None Reported

NASCOM 3

Lucas Logic, NASCOM Microcomputers Division, Welton Road, Wedgenock Industrial Estate, Warwick, CV34 5PZ. Tel: 0926-497733



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	8-10K
Average Price	**£549**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	up to 48K (max)	£130
Printer	Yes	£215-1285
Monitor	Yes	£99-120
Disc Drives	Yes, single or dual	£470-685
Other Languages	Yes	£50
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.

NEWBRAIN

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



STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	25 lines of 40 or 80 characters
Expansion Sockets	Printer, serial, video, data bus
Tape Included?	No
Display Unit Included?	No (Single line option on model AD)
Usable Domestic TV?	Yes
Size of BASIC	18K
Average Price	**£199 model A, £299 Model AD**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	64 – 512K,	£75 – £445
Printer		
Monitor		
Disc Drives	NYA	
Other Languages	NYA	—
Multi-user	NYA	—
BASIC extensions	NYA	—

OTHER ADD-ONS:

None Reported.

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**

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	—

OTHER ADD-ONS:

None Reported

FACTFILE

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

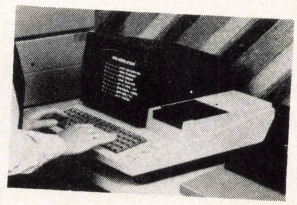
	DETAILS	PRICE
RAM	Yes	£120
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

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	**£350**

MANUFACTURER'S EXPANSIONS

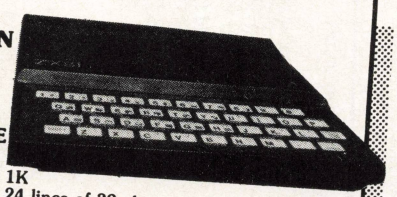
	DETAILS	PRICE
RAM	No	—
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45 upwards
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

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

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**

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	

OTHER ADD-ONS:

None Reported

TANDY TRS 80 I

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



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

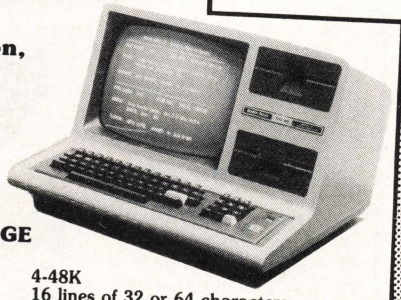
	DETAILS	PRICE
RAM	32K extra in expansion unit	£349
Printer	Yes	
Monitor	Yes	£239-1200
Disc Drives	Yes	£100
Other Languages	Yes	£369
Multi-user Capabilities	No	£100
BASIC extensions (Toolkits)	Yes	—
		£100

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** 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



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	—

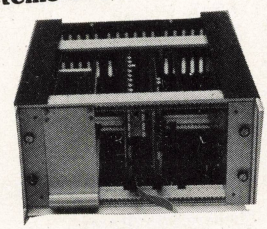
OTHER ADD-ONS:

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

FACTFILE

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	No	—
(Toolkits)		

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	**£199**

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	Yes	£100
(Toolkits)		

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

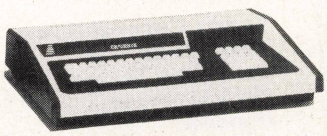
	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user		
Capabilities	No	—
BASIC extensions	No	—
(Toolkits)		

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	No	—
(Toolkits)		

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.

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BBC1	BBC Micro Model A	**£260.00**
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BBC21	Upgrade Model A to B	**£100.00**
BBCxx	Other Upgrades Phone for price	
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BBC35	BBC Cassette Recorder	**£26.00**
BBC36	Casette Lead DIN to Jack	**£4.00**
BBC40	Single 5.25" Disc Drive	**£230.43**
Epson	Printer MX80T type 3	**£325.00**
Epson	Printer MX80FT type 3	**£345.00**
Epson	Printer MX100 type 3	**£445.00**

ATM1	Atom assembled 2Kram	**£140.00**
ATM2	Atom assembled 12Kram	**£160.00**
ATM3	Atom assembled 5Kram colour	**£158.00**
ATM10	Atom kit 2Kram	**£110.00**
ATM11	Atom kit 12Kram	**£130.00**
ATM25	New PAL Colour Encoder	**£38.00**
ATM 26	New 1.8A Power Supply	**£8.40**
ATM53	Atom Cassette lead	**£2.00**
BMC	12A Black/Green Monitor	**£79.00**
BMC	12E Black/Green Monitor	**£99.00**

BBC3 BBC Micro Model A with 32K Ram .. **£294.00**

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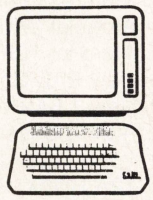
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SOFTWARE LISTING

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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

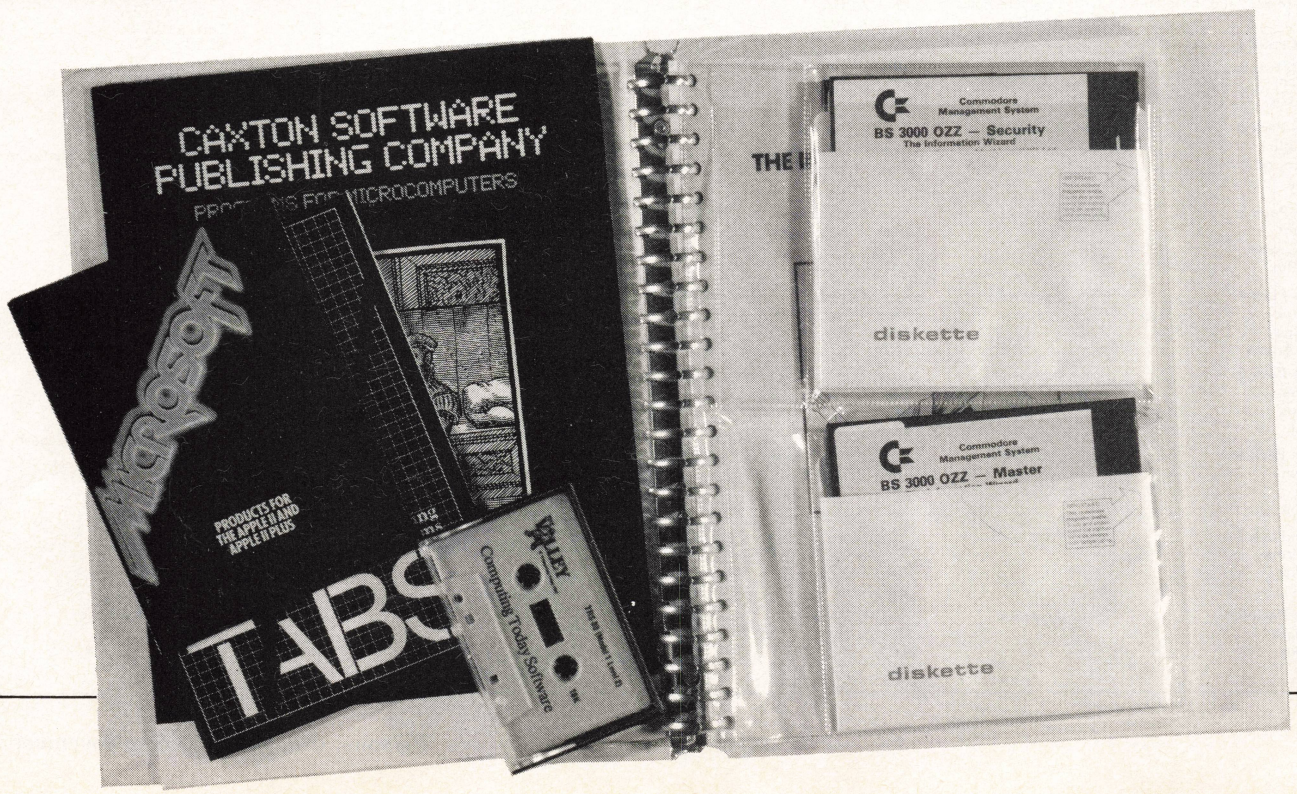
How Sold

R = Cartridge (may include memory)
C = Tape (cassette)
D = Disc (for expanded systems)
L = Listing (sold as print-out)

Due to overwhelming response we have been forced to alternate machines included in our checklist each month. Out this month are the ZX81, Atari and Texas. But don't panic, they will be featured in December for you to make your software selection.

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.



REFERENCE

SOFTWARE LISTING

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
Air Attack	Gm	Program Power	12K	C	GK	£7.95
Alien Maze	Gm	Program Power	8K	C	GK	£5.69
Astrafire	Gm	Program Power	5K	C	GK	£4.54
Astro Birds	Gm	Program Power	12K	C	CH,GK	£9.15
Atom Adventure	Gm	Acornsoft	12K	C	GA,AL	£11.50
Atom Breakout	Gm	Bug Byte	4K	C	HO	£4.00
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 Chess	Gm	Program Power	12K	C	GK	£11.44
Atom Forth	Ut	Acornsoft		C	GA,EJ,AL	£11.50
Atom Invaders	Gm	Bug Byte	12K	C	HO	£8.00
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
Constellation	Ed	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
Derby, Blitz and Rat Race	Gm	Program Power	12K	C	GK	£6.84
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
Fruit Machine	Gm	Bug Byte	8K	C	HO	£4.00
Galactica	Gm	Program Power	12K	C	GK	£5.69
Galaxian	Gm	Bug Byte	12K	C	CH,GA,GB	£8.00
Galaxian War and Invasion	Gm	Program Power	2K	C	GK	£6.84
Golf	Gm	Bug Byte	6K	C	HO	£5.00
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 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			

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AA Micro Centre Ltd
30 Dundas Street
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031 556 7354

AB Micro and Video Palace
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01 937 8587

AC Laskys
7-9 Queensway
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01 200 0444

AD Datarite Terminals Ltd
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01 590 1155

AE Vincelord Ltd
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AF MicroComputerLand
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380 Station Road
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0223 316039

AM Acorn Computers
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AN Microcomputers Products Int.
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8 Cambridge House
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591 6511

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Southampton S01
0703 38740

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01 699 2202

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BF Micro Technology
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0892 32116

BG Elcon Research Ltd
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0954 81825

BH Avalon Hill Games
650 High Street
North Finchley N12
445 3044

BI Call Apple (UK)
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BJ Lifeboat Associates
PO Box 125
London WC2H 9LU
836 9028

BK L & J Computers
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Middx HA7 1EE
204 7525

Games Pack 9:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Snapper			8K		EJ,AL,CH	
Minotaur			12K		FZ	
Babies			8K			
Games Pack 10:	Gm	Acornsoft	2K	C	AY,FA,GA	£11.50
10 Games for minimum					EJ,AL,CH,	
Atom					FZ	
Games Pack 11:	Gm	Acornsoft	12K	C	AY,FA,GA	£11.50
Missile Base					EJ,AL,CH	
Snooker					FZ	
Dominoes						
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
Labyrinth	Gm	Bug Byte	12K	C	HO	£6.95
Last Run	Gm	Bug Byte	7K	C	HO	£3.00
Lunar Lander	Gm	Program Power	12K	C	GK	£7.99
Lunar Lander	Gm	Bug Byte	12K	C	HO	£5.50
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
Maze Ball	Gm	Program Power	12K	C	GK	£5.69
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
Pinball	Gm	Bug Byte	6K	C	HO	£4.50
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
Rhino and Wiggle	Gm	Bug Byte	10K	C	HO	£5.00
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
Space Storm	Gm	Program Power	4K	C	GK	£5.69
Star Trek	Gm	Program Power	5K	C	GK	£6.85
Star Trek	Gm	Bug Byte	12K	C	HO	£5.00
Statistics Pack	Ut	Bug Byte	12K	C	HO	£20.00
Stockbroker	Gm	Program Power	5K	C	£4.54	
Super Race Track	Gm	Program Power	12K	C	GK	£5.69
Squares, Simon and Parachute	Gm	Bug Byte	7K	C	HO	£5.00
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
The Park	Gm	Program Power	12K	C	GK	£5.69
Time Tutor	Ed	A&F S/W	6K	C	GE	£3.95
2K Programs (1)	Gm	Bug Byte	2K	C	HO	£4.50
2K Programs (2)	Gm	Bug Byte	2K	C	HO	£4.50
2K Programs (3)	Gm	Bug Byte	2K	C	HO	£4.50
Typist	Ut	Bug Byte	6K	C	HO	£4.00
UFO Bomber	Gm	Bug Byte	7K	C	HO	£4.00
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
Yan	Gm	Program Power	3K	C	GK	£5.69

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
Asteroid Belt	Gm	Electronics Appplied	32K	C	IF	£4.50
Beebmunch	Gm	I.J.K. S/W	32K	C	IT	£5.95
Bounty Pirates	Gm	Aztec S/W	16K	C	IB	£5.50
Breakout	Gm	I.J.K. S/W	16K	C	IT	£3.95
Characters	Ut	Computer Concepts	16K	C	GJ	£6.67
Characters & Envelope	Ut	Electronics	16K	C	IF	£4.50

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BL Peach Tree Software
International
(Susan Jane)
MSA House
99 King Street
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0628 71011

BM ACT (Microsoft) Ltd
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Birmingham B16 8BR
(David Low)
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BN Personal Computer Palace
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BO Sinclair Software
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BR IBR Microcomputers
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BT The Essential Software Co
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CA Terodec Ltd
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CB Poolsoft
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CC Highlight Software
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SOFTWARE LISTING

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Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Definer		Applied				
Code Race	Gm	Computer Concepts	16K	C	GJ	£6.67
Creative Graphic Pack	Ut	Acornsoft	16K	C	AL,GA	£9.95
Crossed Words	Ed	Aztec S/W	16K	C	IB	£6.50
Database	Bs	Computercat	16K	C	IJ	£11.95
Desk Diary	Bs	Acornsoft	16K	C	AL	£9.95
Early Warning	Gm	A&F Software	16K	C	GE	£6.00
Eldorado Gold	Gm	Program Power	32K	C	GK	£7.99
Graph and Charts Pack	Bs	Acornsoft	16K	C	AL,GA	£9.95
Hangman	Gm	Aztec S/W	16K	C	IB	£5.50
Lisp	Bs	Acornsoft	16K	C	AL,GA	£16.85
Minefield	Gm	A&F Software	16K	C	GE	£6.00
Mixed Games	Gm	I.J.K. S/W	16K	C	IT	£3.95
Multifile	Bs	Bug Byte	16K	C	EA	£25.00
Mutant Invaders	Gm	I.J.K. S/W	16K	C	IT	£5.95
Othello	Gm	Computer Concepts	16K	C	GJ	£8.95
Peeko Computer	Bs	Acornsoft	16K	C	AL,GA	£9.95
Lisp	Ut	Acronsoft	32K	C	AL,GA£16.85	
Mission Impossible	Gm	Aztec S/W	16K	C	IB	£6.50
Model A Invaders	Gm	I.J.K. S/W	16K	C	IT	£4.95
Model B Invaders	Gm	I.J.K. S/W	32K	C	IT	£6.95
Monsters	Gm	Acornsoft	32K	C	AL,GA	£9.95
Othello	Gm	Computer Concepts	32K	C	GJ	£8.95
Othello	Gm	Computercat	16K	C	IJ	£8.95
Peeko Computer	Ut	Acornsoft	32K	C	AL,GA	£9.95
Philosopher's quest	Gm	Acronsoft	32K	C	AL,GA	£9.95
Princess	Gm	Aztec S/W	16K	C	IB	£6.50
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
Squash	Gm	Aztec S/W	16K	C	IB	£5.50
Startrek/Candy Floss	Gm	I.J.K. S/W	16K	C	IT	£5.95
Super Hangman	Gm	I.J.K. S/W	32K	C	IT	£3.95
Teacher's Toolkit	Ed	Wida Software	32K	C	FY	£30.00
3D Maze	Gm	I.J.K. S/W	32K	C	IT	£3.95
Touch Typist	Ed	Computercat	16K	C	IJ	£9.95
Towns of Britain	Ed	Aztec S/W	16K	C	IB	£6.50
Wordwise	Gm	Computer Concepts	32K	C	GJ	£74.75
Valley, The	Gm	CT Software	32K	C	PF	£9.95
Algebraic Manipulation	Ut	Acronsoft	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	Acronsoft	32k	C	AL,GA	£9.95

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

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CX Microdeal
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DP Small Systems Engineering Ltd
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London NW6
01 328 7145

HM Gemini electronics
2-4 Enfield Place
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01-328-7145

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2 Huntsworth Mews
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0344 27317

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0603 26002

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EF Computech Systems
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01 794 0202

EG Electronics Experts
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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

SOFTWARE DEALERS

EH Artic Computing
396 James Reckitt Avenue
Hull HU8 0JA

EI Knights TV & Computers
108 Rosemount Place
Aberdeen
0224 630526

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135 Hale Lane
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01 959 7119

EK Holly Products
Blackthorn House
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01 959 0106

EM Merton Electronics (Dept PW)
85/87 Station Road
W Croydon
680 8606

EN Davinci Computer Shop
65 High Street
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EO Calco Software
Lakeside House
Kingston Hill
Surrey
01 546 7256

EP Richard Francis (Dept PCW)
22 Foxhollow
Barhill
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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
(Room PC)
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
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0895 58111 x 274/269

EY Microsystems Ltd
Summerfield House
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0481 47377

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178 West Street
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0742 755005

FA Control Universal Ltd
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Newnham Road
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FC Zenith Data Systems
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Berks
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FE Logic Computers
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Systems Cons.
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FG Blyth Computers
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FH Taurus Computer Design
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FI HITEC (Austria)
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Holland Park
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Glos GL20 6EB
0386 831020

FL BUG-BYTE
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FM Learning Computer Systems
37 St Andrews Drive
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FN Jentech Services Ltd
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WV16 4SU
07462 5287

FO Dept ZM Work Force
140 Wilsden Avenue
Luton
Beds
LU1 5HR

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)

REFERENCE

SOFTWARE LISTING

SHARP MZ-80K

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
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
Payroll	Bs	Tridata	48K	D	ID	£170.00
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

TRS 80

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
A-Maz-Ing	Gm	Molimerx	4K	C	AJ	£6.33
Acquire	Gm	Avalon Hill	16K	C	IA	£13.95
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
Adventures No I	Gm	Cload Inc	16K	C	IA	£11.95
Advanced Programming Aid	Ut	Kansas	16K	C	IH	£12.50
Adventureland	Gm	Adventure Int.	16K	C	IS	£12.50
					AJ	£18.99
Adventure Mysterious	Gm	Adventure Int.	16K	C	AJ	£10.06

SOFTWARE DEALERS

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
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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
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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

GH Microtanic Software
235 Dulwich Road
London OBD
01 693 7659

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

GL Syrtis Software
23 Quantock Road
Bridgewater
Somerset

GM Lutterworth Software
6 Cromwell Close
Walcote
Lutterworth
LE17 4JJ

GN Collins Computing
The Gatehouse
Whinburgh
Dereham, Norfolk

GO Datafax (Dept CT)
Riviera House
Queens Road
Buckhurst Hill
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GP CCSoft
83 Longfield Street
Southfields
London SW18

GQ Microx
52 The Strand
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Worthing 49584

GR Pro Software
121 Tyn-Y-Twr
Baglan
Port Talbot
West Glamorgan
SA12 8YE

GS Sussex Software
Wallsend House
Pevensey Bay
East Sussex

GT Rose Cassettes
148 Widney Lane
Solihull
West Midlands
B91 3LH

GU Axis (YC2)
71 Brockfield Avenue
Loughborough
Leics
LE11 3LN

GV PR Software
28 the Fairway
South Ruislip
Middx
HA4 0RY

GW Bridge Software
36 Fernwood
Marple Bridge
Stockport
Cheshire
SK6 SBE

GX Video Software Limited
Stone Lane
Kinver
Stourbridge
West Midlands
Kinver 2462

GY J M Steadman
6 Carron Close
Leighton Buzzard
Beds LU7 7XB

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

HB University Computers
5 St Barnabas Road
Cambridge CB1 2BU

HC Educare
139a Sloane Street
London SW1X 9AY

Adventure Mysterious	Gm	Adventure Int.	32K	D	AJ	£13.50
Air Raid	Gm	MA	16K	C	IS	£7.50
Air Traffic Control	Gm	MA	16K	C	IS	£9.50
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
Aladdin	Ed	Bryants S/W	16K	C	HW	£3.75
Alien Armada	Gm	Molimerx	16K	C	IS	£11.50
					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 Attack	Gm	Kansas	16K	C	IH	£9.50
Alien Defence	Gm	Soft Sector Mkting	16K	C	IS	£11.50
					GB	£15.50
Alien Defence	Gm	Soft Sector Mkting	16K	D	IA	£11.95
All Stars	Gm	Instant S/W	16K	D	GB	£26.50
					AB	£28.95
All Turret Gunner	Gm	Instant S/W	16K	C	GB,AB	£8.50
Amateur Log	Ut	Molimerx	32K	D	AJ	£18.40
Amazing Maze						
Touchdown	Gm	Kansas	16K	C	IH	£7.50
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	IS	£7.50
					AJ	£10.06
Arcade Invaders	Gm	Kansas	16K	C	IH	£9.50
Arcade Scramble	Gm	Kansas	16K	C	IH	£9.50
Armoured Patrol	Gm	Adventure Int.	16K	C	IS	£15.00
					GB	£15.00
Armoured Patrol	Gm	Adventure Int.	16K	D	AB	£18.99
Ascertain	Ut	Kansas	16K	C	IH	£6.25
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	16K	C	IS	£9.50
					BT	£12.00
Atlantian Odyssey	Gm	Guild	16K	C	IS	£11.50
					GB	£19.75
Atlantian Odyssey	Gm	Guild		D	GB	£21.50
					GB,BT	£10.95
Attack Force	Gm	Big 5 S/W	16K	C	IS	£11.50
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	IS	£7.50
					AB	£7.99
Backgammon	Gm	Kansas	16K	C	IH	£8.50
Balrog Sampler	Gm	Adventure Int.	16K	D	AB	£33.70
Bandito	Gm	Acorn	16K	C	AJ	£7.49
Barricade	Gm	MA	16K	C	IS	7.50
Bandit/Maze Chase	Gm	Kansas	16K	C	IH	£7.50
Banner	Ut	Kansas	16K	C	IH	£7.50
Basic Bidding	Gm	Bryants S/W	16K	C	HW	£9.00
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 Bastogne	Gm	MA	16K	C	IS	10.50
Battle St. Vith	Gm	MA	16K	C	IS	10.50
Battle of Britain	Gm	Molimerx	16K	C	AJ	£15.55
Battle Ground	Gm	Instant S/W	16K	C	GB,AB	£8.50
Bearings	Ed	Bryants S/W	16K	C	HW	£3.75
Bedchest III	Gm	Adventure Int.	16K	C	AB	£20.95
Beewary	Gm	Molimerx	16K	C	IS	£7.50
					AJ	£10.06
Beginner's Russian	Ed	Instant S/W	16K	C	GB,AB	£8.50
Biorhythm	Ed	Molimerx	16K	C	AJ	£8.63
Biorhythms	Do	Kansas	16K	C	IH	£7.50
B-I Nuclear Bomber	Gm	Avalon Hill	16K	C	IA	£11.95
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
Bradley Estate Mystery	Gm	Ogre	16K	C	IC	£10.00
Bridge Partner	Gm	MA	16K	C	IS	£13.50
Bridge 2.0	Gm	MA	16K	C	IS	£13.50
Bright & Early	Ed	Molimerx	16K	C	AJ	£8.90
Build High						
Knights Tour	Gm	Kansas	16K	C	IH	£7.50
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
Byte Saver	Ut	Kansas	16K	C	IH	£6.25
CTN Stock	Bs	Baust Computing	48K	D	HA	£79.00
Calendar	Ut	Molimerx	16K	C	AJ	£10.29
Car Doctor	Do	Kansas	16K	C	IH	£7.50

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IT I.J.K. Software
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Blackpool
Lancs

PF CT Software
ASP Ltd
145 Charing Cross Road
London
WC2H 0EE
01-437 1002

REFERENCE

SOFTWARE LISTING

TRS 80

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Cash Register	Bs	Molimerx	16K	C	AJ	£10.29
Catalogue	Do	Bryants S/W	16K	C	HW	£3.75
Character and Monster Generator	Gm	Ogre	16K	C	IC	£12.00
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
Chess Partner	Gm	MA	16K	C	IS	£9.50
Claws	Ed	Bryants S/W	16K	C	HW	£3.75
City Encounters	Ut	Molimerx	16K	C	AJ	£17.20
Climate Comp	Bs	Instant S/W	16K		AB	£20.50
Cload Cassette	Gm	Cload Inc	16K	C	IA	£5.75
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	IA	£10.15
Computer Acquire	Gm	Avalon Hill	16K	C	IA	£17.25
Computer Pools	Do	Molimerx	16K	C	AJ	£16.68
Conflict	Gm	MA	16K	C	IS	£10.50
Conflict 2500	Gm	Avalon Hill	16K	C	IA	£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	IA	£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	IA	£10.95
Cosmic Fighter	Gm	MA	16K	C	IS	£11.50
Cosmic Patrol	Gm	Instant S/W	16K	C	GB,AB	£12.50
Cosmic Patrol	Gm	Instant S/W	16K	D	GB,AB	£16.25
Cowboys	Gm	P.C.S.	8K	C	IE	£4.25
Creole Lobster Catcher	Gm	Molimerx	16K	C	AJ	£10.06
Cribbage Player	Gm	MA	16K	C	IS	£9.50
Cribbage	Gm	Molimerx	16K	C	AJ	£14.38
Crocodiles	Ed	Bryants S/W	16K	C	HW	£3.75
Cross Reference	Bs	Molimerx	16K	C	AJ	£8.45
Crowley Manor	Gm	MA	16K	C	IS	£15.00
Crown of CWL IMDRAS part I	Gm	Ogre	16K	C	IC	£10.00
Crown of CWL IMDRAS part 2	Gm	Ogre	16K	C	IC	£10.00
Crusaders	Gm	Molimerx	16K	C	AJ	£13.51
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
D-Day	Gm	MA	16K	C	IS	£10.50
Danger in Orbit	Gm	Instant S/W	16K	C	AB	£12.50
Danger in Orbit	Gm	Instant S/W	16K	D	GB	£15.50
Daredevil	Gm	Instant S/W	16K	C	IA	£8.50
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
Datadisk	Bs	Kansas	32K	D	IH	£24.50
Data File	Bs	Kansas	16K	C	IH	£9.50
Datestone of Ryn	Gm	Automated Simulation	16K	C	GB	£13.50
Datestone of Ryn	Gm	Automated Simulation	16K	C	IS	£14.50
Dataquiz	Ut	Bryants S/W	16K	C	HW	£3.75
Day of the Week	Bs	Molimerx	4K	C	AJ	£5.75
Death Dreadnaught	Gm	MA	16K	C	IS	£10.50
Deathmaze	Gm	MA	16K	C	IS	£10.50
Deathmaze 5000	Gm	Med Systems	16K	C	IA	£10.95
Decision Master	Ut	Sytonic S/W	32K	D	GB	£35.50
Decimal Dan	Ed	Bryants S/W	16K	C	HW	£3.75
Defence Command	Gm	Big 5 S/W	16K	C	IS	£11.50
					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
Delay	Ut	Kansas	16K	C	IH	£6.25
Demo II	Gm	Instant S/W	16K	C	IE	£6.50
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
Disassembler	Ut	Kansas	16K	C	IH	£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	IA	£12.95
Dnieper River Line	Gm	Avalon Hill	32K	D	IA	£17.55
Doctor Chips	Gm	Instant S/W	16K	C	GB	£12.50
Doctor Chips	Gm	Instant S/W	16K	D	GB	£14.75
Domes of Kilgari	Gm	MA	16K	C	IS	£11.50
Dominoes	Gm	Molimerx	16K	C	AJ	£9.15
Dominoes	Gm	Molimerx	32K	D	AJ	£12.65
Doomwatch	Do	Kansas	16K	C	IH	£7.50
Dosort	Ut	Molimerx	32K	C	AJ	£27.60
Double Take 3741	Ut	Molimerx	64K	D	AJ	£44.85
Double Up	Ut	Kansas	16K	C	IH	£6.25
Dragon Quest	Gm	Instant S/W	16K	C	IS	£10.50
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	IS	£9.50
					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
Early Numbers	Ed	Bryants S/W	16K	C	HW	£3.75
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
Editor Assembler and Debugger	Ut	Kansas	16K	C	IH	£19.50
Edjust	Ut	Molimerx	32K	D	AJ	£18.40
Eights	Gm	Emjay	16K	C	IG	£7.00
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	IS	£15.00
Eliminator	Gm	Adventure Int.	16K	D	AB	£18.99
Emperor	Gm	Molimerx	16K	C	AJ	£15.53
Empire	Gm	MA	16K	C	IS	£10.50
Empire of the Overmind	Gm	Avalon Hill	48K	C	IA	£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	C	IS	£15.00
					AB	£18.99
Everest Explorer	Gm	Molimerx	16K	C	AJ	£10.06
Escape	Gm	Kansas	16K	C	IH	£7.50
Everest Explorer	Gm	Molimerx	32K	D	AJ	£13.50
Everyday Russian	Ed	Instant S/W	16K	C	GB,AB	£8.50
F for Freddie	Gm	Kansas	16K	C	IH	£9.50
Facto Bingo	Ed	Bryants S/W	16K	C	HW	£3.75
Facto Finder	Ed	Bryants S/W	16K	C	HW	£3.75
Fairytale Adventure	Gm	Molimerx	16K	C	AJ	£10.06
Fastgammon	Gm	MA	16K	C	IS	£14.00
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
Flippy	Gm	MA	16K	C	IS	£10.50
Flight Simulator	Gm	MA	16K	C	IS	£20.00
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					GB	£25.00
Forbidden City	Gm	Fantastic S/W	16K	D	IA	£24.95
Forbidden Planet	Gm	Fantastic S/W	48K	D	IA	£24.95
Forest of Mordor	Gm	Molimerx	16K	C	AJ	£8.63
Fortran	Ut	Molimerx	32K	D	AJ	£74.75
Fortress	Gm	Soft Sector Mkting	16K	D	IA	£15.50
Fortress	Gm	Soft Sector Mkting	16K	C	IA	£11.95
Fortress	Gm	MA	16K	C	IS	£10.50
Fox and Hounds	Gm	Molimerx	16K	C	AJ	£7.48
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					AJ,AB	£9.78
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Galactic Trader	Gm	Adventure Int.	32K	D	AB	£18.99
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Game Of Life	Gm	MA	16K	C	IS	£6.50
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Gammon Challenger	Gm	Molimerx	16K	C	AJ	£10.06
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Gauntlet of Death	Gm	Programmer's Guild	16K	C	GB	£15.50
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Tape 1	Ed	Bryants S/W	16K	C	HW	£9.00
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					AB	£18.99
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					AB	£18.99
Golf	Gm	Molimerx	32K	D	AJ	£17.19
Good Games No.I	Gm	Cload Inc	16K	C	IA	£11.95
Guns of Fort Defiance	Gm	Avalon Hill	32K	C	IA	£12.95
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Graphics Assembler	Ut	Kansas	16K	C	IH	£7;50
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Graphit	Ut	Molimerx	48K	D	AJ	£19.55
Gridref	Ed	Bryants S/W	16K	C	HW	£3.75
Hellfire Warrior	Gm	MA	16K	C	IS	£21.00
Highway Code	Do	Bryants S/W	16K	C	HW	£3.75
HMS Impetuous	Gm	Adventure Int.	32K	D	AB	£18.99
Home Budget Planner	Bs	Emjay	16K	C	IG	£8.00
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	IS	£16.50
					AB	£20.50
Infinite Startrek	Gm	Kansas	16K	C	IH	£9.50
Inventory Control	Bs	MA	16K	C	IS	£11.00
Inventory Control	Bs	MA	32K	D	IS	£50.00
Inventory'S'	Bs	MA	16K	C	IS	£17.00
Invoicing	Bs	Tridata	48K	D	ID	£140.00
Instant Calculator	Do	MA	16K	C	IS	£8.50
Interlude	Gm	Syntonic S/W		C	GB	£20.25
Interlude	Gm	MA	16K	C	IS	£14.00
Invaders From Space	Gm	MA	16K	C	IS	£10.50
Invasion Orion	Gm	Automated Simulation		C	IS	£18.50
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
Jumbo	Gm	Molimerx	16K	C	AJ	£17.25
Jumbo	Gm	Molimerx	32K	D	AJ	£19.55
Jumbles	Ed	Bryants S/W	16K	C	HW	£3.75
KFS-80	Ut	MA	32K	D	IS	£75.00
Keyboard 80	Do	MA	16K	C	IS	£7.50
KVP	Ut	MA	16K	C	IS	£10.50
KVP Disk	Ut	MA	16K	D	IS	£18.50
Keyspeed	Ut	Kansas	16K	C	IH	£6.25
Kid's Gallery	Gm	Instant S/W	16K	C	AB	£8.50
Kid Venture I	Gm	MA	16K	C	IS	£12.50
Kreigspiel II	Gm	MA	16K	C	IS	£10.50
Label	Gm	Instant S/W	16K	C	GB	£18.75
					AB	£20.50
Labyrinth	Gm	Med Systems	16K	C	IA	£11.75
					BT	£10.95
Labyrinth	Gm	MA	16K	C	IS	£10.50
Laser Defence	Gm	Med Systems	16K	C	GB	£11.95
Laser Defence	Gm	Med Systems	16K	D	GB	£14.50
LED	Ut	Molimerx	48K	D	AJ	£19.55
Life Two	Gm	MA	16K	C	IS	£7.50
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	IA	£14.95
Lord of the Rings	Gm	Kansas	16K	C	IH	£9.50
Lost Dutchmans Gold	Gm	MA	16K	C	IS	£9.50
Lunar Lander	Gm	Adventure Int.	16K	C	IS	£11.50
					AB	£12.50
Lunar Lander	Gm	Adventure Int.	16K	D	AB	£18.99
Lprint	Ut	Kansas	16K	C	IH	£6.25
Level III Basic	Ut	MA	16K	C	IS	£34.00
Magic Paper Calculator	Do	MA	16K	C	IS	£9.50
Mail File	Ut	Instant S/W		D	GB	£75.25
Maillist Mod III	Bs	MA	48K	D	IS	£55.00
Martian Adventure	Gm	Emjay	16K	C	IG	£12.00
Master Cab	Ut	Bryants S/W	16K	C	HW	£3.75
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
Memdump	Ut	MA	16K	C	IS	£6.00
Mean Checkers	Gm	MA	16K	C	IS	£11.50
Merge	Ut	Kansas	16K	C	IH	£6.25
Meteor Mission	Gm	Big 5 S/W	16K	C	IA	£10.95
Meteor Mission II	Gm	MA	16K	C	IS	£11.50
Microcosm I	Gm	Basic & Beyond	16K	C	IA	£11.95
Microcosm 2	Gm	Basics & Beyond	16K	C	IA	£19.95
Microcosm 3	Gm	Basics & Beyond	16K	C	IA	£19.50
Microtype	Do	Kansas	16K	C	IH	£12.50
Midway Campaign	Gm	Avalon Hill	16K	C	IA	£10.95
Minicrossword	Ed	MA	16K	C	IS	£12.50
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.	16K	C	IS	£12.50
					AB	£18.99
Model 1 to 3	Ut	Kansas	16K	C	IH	£8.50
Monopolist	Gm	Baust Computing	4K	C	HA	£7.95
Monopolist	Gm	Baust Computing	4K	D	HA	£10.95
Morloc's Tower	Gm	MA	16K	C	IS	£14.50
Mortgage Calculator	Do	MA	16K	C	IS	£5.00
Mountain Shoot	Gm	Adventure Int.	16K	D	AB	£18.99
Multiple Choice Creation	Ed	Kansas	16K	C	IH	£12.50
Multiprint	Ut	Kansas	16K	C	IH	£8.50
Music Master	Gm	Instant S/W		C	GB,AB	£8.50
Musical Yat-C	Gm	Adventure Int.	16K	C	AB	£12.50
Money Box	Ed	Bryants S/W	16K	C	HW	£3.75
Mystery Funhouse	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
Newdos-80 Ver 2.0	Ut	MA	16K	D	IS	£110.00
Newdos +	Ut	MA	16K	D	IS	£45.00
Newdos + 40 Track	Ut	MA	16K	D	IS	£47.50
News 80	Bs	Baust Computing	48K	D	HA	POA
Night Flight	Gm	Instant S/W	16K	C	GB,AB	£8.50
Nominal	Bs	Tridata	48K	D	ID	£170.00
Norton Forth	Gm	Adventure Int.	32K	D	AB	£33.70
North Atlantic Raiders	Gm	Tridata	16K	C	IA	£11.95
Number Bonds	Ed	Bryants S/W	16K	C	HW	£3.75
Number Series	Ed	MA	16K	C	IS	£12.50
Nuke War	Gm	Avalon Hill	16K	C	IA	£10.95
Office Accouting	Bs	MA	16K	C	IS	£15.00
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
Olympic Decathlon	Gm	MA	16K	C	IS	£15.50
On Guard	Ed	Bryants S/W	16K	C	HW	£3.75
Pascal-80	Gm	MA	48K	D	IS	£75.00
Paraform	Ut	Molimerx	32K	D	AJ	£18.98
Patience	Gm	Bryants S/W	16K	C	HW	£3.75
Payroll	Bs	Tridata	48K	D	ID	£170.00
Perfect Pong	Gm	Instant S/W	16K	C	GB,AB	£12.75
Periodical X-Ref	Do	MA	16K	C	IS	£9.50
Personal Bill Paying	Do	Instant S/W	16K	C	AB	£6.50
Personal Accounts	Do	Kansas	16K	C	IH	£9.50
Personal Finance	Do	MA	16K	C	IS	£8.50
Pinball	Gm	MA	16K	C	IS	£10.50
Pinball Bounce/Robots	Gm	Kansas	16K	C	IH	£7.50
Pirate Adventure	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
Pilot	Ut	MA	16K	C	IS	£23.00
Pits of Angband	Gm	Kansas	16K	C	IH	£9.50
Planet Miners	Gm	Avalon Hill	16K	C	IA	£10.95
Planetoids	Gm	Adventure Int.	16K	C	IS	£15.00
					AB	£12.50
Plus Sound	Ut	Kansas	16K	C	IH	£7.50
Pre Flight	Do	MA	16K	C	IS	£7.50
Programmer and Primer	Ut	Instant S/W	16K	C	AB	£8.50
Programmer's Converter	Ut	Instant S/W	16K	C	AB	£8.50
Pontoon	Gm	Kansas	16K	C	IH	£8.50
Pork Barrel	Gm	MA	16K	C	IS	£6.50
Punctuation	Ed	Bryants S/W	16K	C	HW	£3.75
Purchase	Bs	Tridata	48K	D	ID	£170.00
Pyramids of Doom	Gm	Adventure Int.	16K	C	IS	£12.50
					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
Random Dungeons	Gm	Ogre	16K	C	IC	£10.00
Random Dungeons	Gm	Ogre	4K	C	IC	£5.75
Renumber and Compress	Ut	Instant S/W	16K	C	AB	£8.50
Renumber	Ut	MA	16K	C	IS	£6.50
Re-Number	Ut	Kansas	16K	C	IH	£6.25
Remodel & Proload	Ut	MA	16K	C	IS	£26.00
Repeat	Ut	Kansas	16K	C	IH	£6.25
Rescue	Ut	Kansas	16K	C	IH	£6.25
Rescue At Rigel	Gm	MA	16K	C	IS	£18.50
Robot Attack	Gm	Big 5	16K	C	IS	£11.50
Roots	Do	MA	32K	D	IS	£17.00
RPN Calculator	Do	MA	16K	C	IS	£7.50
RSM 2 Monitor	Ut	MA	16K	C	IS	£16.00
RSM 2D Monitor	Ut	MA	16K	D	IS	£20.00
SDM	Gm	Adventure Int.	16K	C	AB	£20.12
Sales	Bs	Tridata	48K	D	ID	£170.00
Santaparavia	Gm	Instant S/W	16K	C	AB	£8.50
Sargon II	Gm	MA	16K	C	IS	£20.50
Sargon II Disk	Gm	MA	32K	C	IS	£23.50
Savage Island I	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
Savage Island II	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
Scarfman	Gm	Cornsoft	16K	C	IS	£11.50
Scientific Calculator	Ed	MA	16K	C	IS	£14.50
Screen Print	Ut	Kansas	16K	C	IH	£6.25
Screenhold	Ut	MA	16K	C	IS	£6.00

REFERENCE

SOFTWARE LISTING

TRS 80

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Seadragon	Gm	MA	16K	C	IS	£15.00
Sea Wolf	Gm	Kansas	16K	C	IH	£9.50
Sea Wolf	Gm	Molimerx	16K	C	AJ	£10.06
Sea Wolf	Gm	Molimerx	32K	D	AJ	£12.65
Semi Conductor Theory	Ed	MA	16K	C	IS	£9.50
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
Simplify It	Ut	MA	32K	D	IS	£12.00
Six Microstories	Gm	Adventure Int.	32K	D	AB	£14.35
Skirmish 80	Gm	Instant S/W	16K	C	IA	£8.50
Sky Warrior	Gm	Adventure Int.	16K	C	IS	£11.50
					AB	£18.99
Slag	Gm	Adventure Int.	16K	C	IS	£10.50
					AB	£14.35
smal-LDOS	Ut	Molimerx	16K	D	AJ	£43.70
Smartwork	Gm	Instant S/W	16K	C	IA	£8.00
Snake Eggs	Gm	MA	16K	C	IS	£7.50
Space Castle	Gm	Instant S/W	16K	C	IA	£11.95
Space Intruder	Gm	Adventure Int.	16K	C	AB	£14.35
Space Intruders	Gm	MA	16K	C	IS	£15.00
Space Intruders	Gm	MA	32K	C	IS	£18.50
Space Shuttle	Gm	Instant S/W	16K	C	AB	£12.50
Special Sampler	Gm	MA	16K	C	IS	£6.50
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
Space Trek	Gm	Instant S/W	16K	C	IA	£6.50
Speechparts	Ed	Bryants S/W	16K	C	HW	£3.75
Spelling Builder	Ed	MA	32K	C	IS	£15.00
Spellsort	Ed	Bryants S/W	16K	C	HW	£3.75
Spelltest	Ed	Bryants S/W	16K	C	HW	£3.75
Spider Mountain	Gm	MA	16K	C	IS	£9.50
Starfighter	Gm	MA	16K	C	IS	£18.50
Starfleet Orion	Gm	MA	16K	C	IS	£18.50
Starflite	Gm	MA	16K	C	IS	£10.50
Starlord	Gm	Bryants S/W	16K	C	IC	£10.00
Statistics	Ed	MA	16K	C	IS	£6.50
S.T.A.D	Ut	MA	16K	C	IS	£15.00
Storybuilder	Ed	Bryants S/W	16K	C	IS	£12.50
					HW	£3.75
Stock	Bs	Tridata	48K	D	ID	£170.00
Stock or Bonds	Gm	Avalon Hill	16K	C	IA	£12.95
Stone of Sisythus	Gm	Adventure Int.	32K	D	AB	£33.70
ST-80	Ut	MA	16K	C	IS	£34.00
ST-80D	Ut	MA	16K	D	IS	£45.00
Strange Odyssey	Gm	Adventure Int.	16K	C	IS	£12.50
					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
Super Breakthrough	Gm	Kansas	16K	C	IH	£8.50
Super Copy	Ut	Kansas	16K	C	IH	£9.50
Super Nova	Gm	Big 5	16K	C	IS	£11.50
Super Pims Data Base	Do	MA	16K	C	IS	£10.50
Super T-Legs	Ut	MA	16K	C	IS	£7.50
Superscript	Ut	MA	32K	D	IS	£21.00
Superkeys	Ut	MA	32K	D	IS	£35.00
Super Simon	Ut	MA	16K	C	IS	£7.50
Swamp War	Gm	Instant S/W	16K	C	AB	£12.50
Swords and Socery	Gm	Kansas	16K	C	IH	£9.50
Sword Of Zedek	Gm	MA	16K	C	IS	£11.50
System Copy Mod I	Ut	MA	16K	C	IS	£9.50
System Master Monitor	Ut	Kansas	16K	C	IH	£17.00
System to Basic	Ut	Kansas	16K	C	IH	£8.50
Tcopy III Mod III	Ut	MA	16K	C	IS	£10.50
T-Step	Ut	MA	16K	C	IS	£7.50
TL DIS	Ut	Instant S/W	16K	C	AB	£12.50
TRS Test	Ut	Instant S/W	16K	C	AB	£8.50
TRS-80 Opera	Do	MA	16K	C	IS	£7.50
Tables Test	Ed	Bryants S/W	16K	C	HW	£3.75
Tanktics	Gm	Avalon Hill	16K	C	IA	£15.95
Targetsounds	Ed	Bryants S/W	16K	C	HW	£3.75
Teachers Assistant 1	Ed	MA	16K	C	IS	£9.50
Teachers Assistant 2	Ed	MA	16K	C	IS	£9.50
Teachers Assistant 3	Ed	MA	16K	C	IS	£9.50
Teacher's Aid	Ed	Instant S/W	16K		AB	£34.50
Temple Of Apshai	Gm	MA	16K	C	IS	£18.50
Temple of the Sun	Gm	Instant S/W	16K		AB	£16.50
The Count	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
The Mean Checkers Machine	Gm	Adventure Int.	16K	C	AB	£14.35
The Congo Mission	Gm	Bryants S/W	16K	C	IC	£10.00
The Quest	Gm	Bryants S/W	16K	C	IC	£12.00
The Secret Wilderness	Gm	Ogre	16K	C	IC	£6.50
Toolkit	Ut	Kansas	16K	C	IC	£12.00
Time Traveller	Gm	MA	16K	C	IS	£10.50
Time Trek	Gm	MA	16K	C	IS	£10.50
Tiny Pascal	Ut	MA	16K	C	IS	£17.00
Timser	Ed	MA	16K	C	IS	£10.50
Tiny Compiler	Ut	MA	16K	C	IS	£12.50
Towers	Ed	Bryants S/W	16K	C	HW	£3.75
Treasure Quest	Gm	Adventure Int.	16K	C	AB	£14.35
Tunnels of Fahad	Gm	Adventure Int.	16K	C	AB	£12.50
Turret & Track	Gm	MA	16K	C	IS	£7.50
Two Heads of the Coin	Gm	Adventure Int.	32K	D	AB	£18.99
Typing Teacher	Ed	Instant S/W	16K	C	AB	£8.50
Typing Tutor	Do	MA	16K	C	IS	£12.00
Typewriter	Ut	Kansas	16K	C	IH	£6.25
Ultra Man	Ut	Instant S/W	16K		AB	£21.50
Ultra Mon	Ut	MA	16K	C	IS	£17.00
Up Periscope	Gm	MA	16K	C	IS	£10.50
Utility II	Ut	Instant S/W	16K	C	IA	£8.50
Valley	Gm	CT Software	16K	C	PF	£9.95
Valley of the Kings	Gm	Instant S/W	16K	C	IC	£10.00
Venture	Gm	Horizon S/W	16K	C	IA	£11.95
Vocabulary Builder 1	Ed	MA	16K	C	IS	£12.50
Vocabulary Builder 2	Ed	MA	16K	C	IS	£12.50
Voodoo Castle	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
Voyager	Gm	Avalon Hill	16K	C	IA	£12.95
What Next?	Gm	Baust Computing	4K	D	HA	£6.95
What Next?	Gm	Baust Computing	4K	C	HA	£3.95
Word Processor	Bs	Kansas	16K	C	IH	£19.50
Word Watch	Ed	Instant S/W	16K	C	IA	£6.50
X-Wing Fighter II	Gm	MA	16K	C	IS	£7.50
X-Ref	Ut	MA	16K	C	IS	£7.50
Y-Y Bar	Bs	MA	16K	C	IS	£10.50
Yahtzee	Gm	Kansas	16K	C	IH	£8.50
Your Life Score	Do	Bryants S/W	16K	C	HW	£3.75
Zossed in Space	Gm	Adventure Int.	16K	D	AB	£14.35
Zossed in Space	Gm	Adventure Int.	16K	C	CH	£10.00
9 Kid's Games	Ed	MA	16K	C	IS	£12.50
76 Basic Programs	Do	MA	16K	C	IS	£23.00

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 Invasion	Gm	Computermat	3K	C	IP	£8.95
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	HN	£7.95
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	HN	£8.99
Avenger	Gm	Commodore	3K	R	FZ,AB,GF	
					CF,DM,CH	
					FD,FP,AA	£19.95
A.V.I.T.W.	Gm	Bug Byte	5K	C	HN	£8.99
Balloon Bomber	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Bill Sowerbutts Gardening Hints	Do	Micro Computer S/W	16K	C	HK	£4.99
Bill Sowerbutts Gardening Hints	Do	Micro Computer S/W	16K	C	Hk	£4.99
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
Cattle Roundup	Gm	Computermat	3K	C	IP	£8.95
Charset 20	Gm	Adcom	8K	C	AB	£8.00
Charset 20	Gm	Rabbit S/W	3K	C	AH	£4.99
Chase	Gm	Computermat	3K	C	IP	£8.95
Chess	Gm	Commodore	3K	R	HN	£24.95
Cloudburst	Gm	Audiogenic	3K	R	HN	£19.99
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
Defenda	Gm	Llamasoft	5K	C	HN	£9.95

Deflection	Gm	Adcom	5K	C	AB	£7.00
Deflection	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Diggles Kitchen Vol 1	Do	Micro Computer S/W	16K	C	HK	£4.99
Diggles Kitchen Vol 2	Do	Micro Computer S/W	16K	C	HK	£4.99
Diggles Kitchen Vol 3	Do	Micro Computer S/W	16K	C	HK	£4.99
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
Explosion	Gm	Big Softie	3K	C	IQ	£4.50
Fire Trek	Gm	Hi-Tech	3K	C	AY	£7.80
					FZ	£8.30
					CF,AO	£8.62
Fly Snatcher	Gm	PR Software	3K	C	HN	£7.95
Frogger	Gm	Rabbit S/W	8K	C	AH	£7.99
Game Graphics & Graphics Editor	Ut	Soft Toys	3K	C	IG	£8.00
Games Tape I	Gm	Titan	3K	C	HJ	£5.00
Grand Prix	Gm	Hi-Tech	3K	C	FZ, 8.30 AY	£7.80
Graphvics	Ut	Adamsoft	3K	C	IR	£19.00
Graphvics	Ut	Adamsoft	8K	C	IR	£19.00
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
Head On	Gm	Computermat	3K	C	IP	£8.95
Hesdon	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Highways Plot	Gm	Adcom	8K	C	AB	£5.00
Hires/Multicolor Utilities	Ut	Adamsoft	3K	C	IR	£13.00
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 1	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
King	Gm	Big Softie	3K	IR	£13.00	
Life	Gm	Big Softie	3K	C	IO	£4.50
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
Mastermind	Gm	Big Softie	3K	C	IQ	£4.50
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	HN	£24.99
Meteroid	Gm	Adcom	5K	C	AB	£10.00
Missile Command	Gm	Adcom	3K	C	HN	£7.95
Missile Commander	Gm	Hi-Tech	3K	C	CF	£8.62
Moak	Gm	Audiogenic	5K	C	CH	£6.99
Mole Attack	Gm	Hi-Tech	5K	C	CF,AOAB	£8.62
Music Maker	Gm	Adcom	5K	C	AB	£10.00
Music Tutor	Ed	Micro Computers S/W	3K	C	HK	£7.95
Music Tutor de Luxe	Ed	Micro Computer S/W	8K	C	HK	£8.95
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	GZ	£8.30
					AO	£8.62
					AY	£7.80
Piper	Gm	Adamsoft	3K	C	IR	£19.00
Pontoon	Gm	Big Softie	3K	C	IR	£4.50
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
Rat Race	Gm	Commodore	3K	R	HN	£19.95
Renaissance	Gm	Audiogenic	3K	R	HN	£19.99
Reversi	Gm	Big Softie	3K	C	IQ	£4.50
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
Rogue Elephant	Gm	Micro Computer S/W	3K	C	HK	£4.95
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
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Wall Street	Gm	Audiogenic	3K	C	AA,HM	£6.99
3D Xeosy	Gm	Big Softie	3K	C	IQ	£4.50

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Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Adventure	Gm	Abersoft	48K	C	HX	£9.95
Angles	Ed	AVC Software	16K	C	IM	£3.00
Arcade Pack 1	Gm	Ohmega Electronics	16K	C	IO	£4.82
Assembler	Ut	Artic	16K	C	EH	£9.95
Count-down	Ed	AVC Software	16K	C	IM	£3.00
Fortune	Do	AVC Software	16K	C	IM	£3.00
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Galaxian	Gm	Artic	16K	C	EH	£3.95
Gobbleman	Gm	Artic	16K	C	EH	£3.95
Graph	Ed	AVC Software	16K	C	IM	£3.00
Hangperson	Ed	AVC Software	16K	C	IM	£3.00
Learning	Ed	AVC Software	16K	C	IM	£3.00
Mazeman	Gm	Abersoft	16K	C	HX	£4.95
Namitar Raiders	GM	Artic	16K	C	EH	£3.95
Payroll	Bs	V&H Computer	48K	C	IL	£14.65
Physprob	Ed	AVC Software	16K	C	IM	£3.00
Space Inturders	Gm	Quicksilva	16K	C	GD	£5.85
Spectral Invaders	Gm	Bug Byte	16K	C	CH	£5.00
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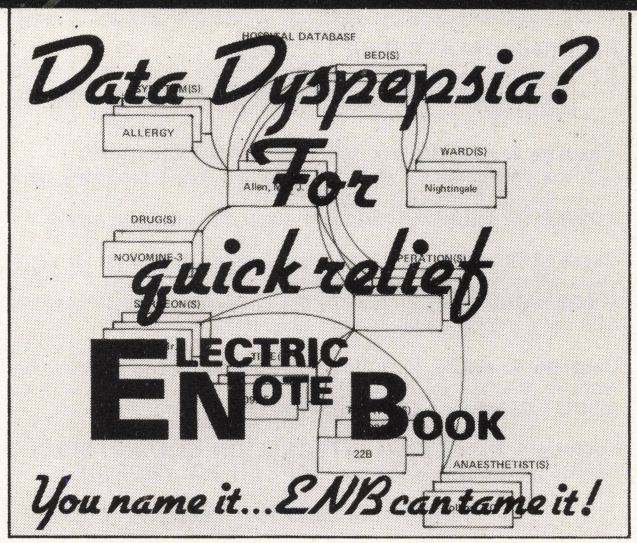
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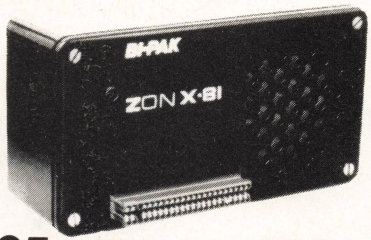
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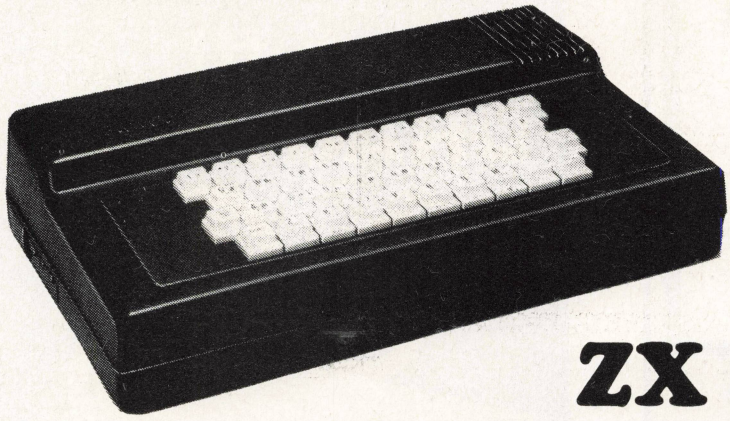
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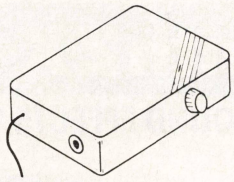
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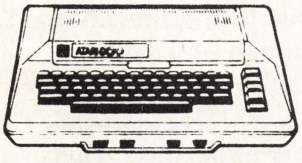
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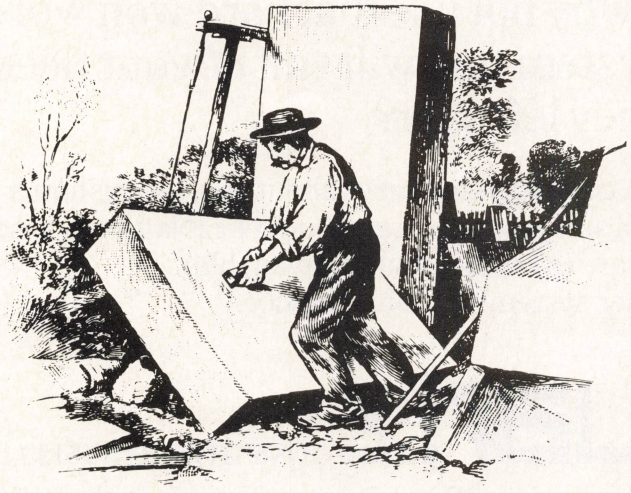
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MICROTERMS

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.

Array
A special variable that is used to hold large amounts of string or numeric information in a row and column format.

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'.

Bug
An error in *software*.

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.

Cartridge
A self-contained unit storing either ROM or RAM which plugs into a computer to expand the memory or provide a program.

Character Set
The list of letters, numbers and symbols that you can use to write programs and display information.

CP/M
A standard disc operating system that in theory allows software packages to be run on different machines. It stands for Control Program for Microcomputers.

Cursor
Character or graphic symbol used by the computer to denote where its printing. Also used as a prompt to input information or a command.

Data
Simply, information. The raw material that the computer processes.

Database
An organised collection of information held either in the computer or on disc that can be accessed by the user.

Debug
To correct the errors in a *program*.

Disc
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.

Dummy Variable
This is a variable that is defined at the beginning of a program that has no use until later on in the program.

Endproc
This is part of a program. PROC stands for PROCEDURE which is part of a program designed to improve the readability, reliability and structure of a program. END speaks for itself and tells the computer to stop that particular procedure and return to the main body of the program.

EPROM
Erasable Programmable Read Only Memory. Writing typically takes one minute and erasing, by ultra-violet light, 10 minutes or longer.

Get
A BASIC command. It tells the computer to search the keyboard and bring back the value of the first key pressed.

Gosub
A BASIC command telling the computer to go to a subroutine within a program.

Gcol
A colour command used in BBC Basic.

Graphics
Literally — drawings; a method of producing graphs or pictorial figures on a suitable output device, usually a video monitor or television set, but sometimes a chart recorder or printer.

Grid
To enable graphics or text to be displayed on a TV screen or monitor the screen has to be divided into a grid. Each point in the grid corresponds to a position in the computer's memory When data is placed in one of these positions it is then transferred to the corresponding position on the screen.

Hard Copy
A computer printout or listing on paper.

Hardware
All the electronic and mechanical components making up a computer 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).

High Resolution
This means that you can pinpoint one dot on a screen rather than one square giving you graphical pictures of much greater detail and accuracy.

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.

Inkey$
Another BASIC command which looks at the keyboard and returns a value assigned to the key pressed. You don't have to use the ENTER key to input values so it is a very quick process. It is often used in video games like space invaders, pacman, or tennis, and is usually part of a loop.

Instruction
A set of *bits* which causes the *CPU* to carry out a particular task in a program.

Interface
Circuit which connects different parts of system together and performs any processing of signals in order to make transfer possible (ie serial-parallel conversion).

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.

Language
A repertory of commands — symbols, expressions etc, used to 'call up' the instructions or procedures a *processor* can execute.

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.

Loop Counter
This is a register used for carrying out high-speed branching (jumping to another sequence in a program).

Machine Language (or 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.

Menu
A set of options displayed on-screen by a computer program from which the computer user can make a selection to implement.

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.

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*.

Octal
Base 8 number system. Character set is decimal 0-7.

Pascal
A very powerful, structured computer language, available on a variety of microcomputers.

Peek
This BASIC command reads a value from a location in the computer memory. It can be used to access either RAM or ROM.

Peripheral
Device attached to a computer, eg *printer, plotter, disc* unit, but not necessarily essential to its use.

Pixel
The single dot that is used to create characters displayed on the VDU. Also the smallest display unit when using high resolution graphics.

Pointer
In the *microprocessor,* or in *memory* external to it, pointers can be *registers* allocated to listing memory *address* — they 'point' to memory locations.

Poke
This command places a value in a location of the computer's memory. It can only be used to access RAM or control registers.

Port
Terminal which the *CPU* uses to communicate with the outside world.

Print At
A BASIC command telling the computer where to begin printing.

Printer
A device for producing typed or printed copy *(hard copy)*.

Print Out
Same as *hardcopy*.

Proc (Procedure)
See ENDPROC.

Program
A set of *instructions,* 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*.

Qwerty
The traditional typewriter keyboard layout adopted by computer designers.

RAM
Random Access Memory. *Data* may be written to or read from any location in this type of memory.

Reset
Simply — go back to the start. 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.

RND
In BASIC it stands for RANDOM and instructs the computer to select random numbers and is often used in games programs. Because the numbers thrown up are mathematically related to the number preceding they are called pseudo-random numbers, not true random-numbers.

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*.

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 used in a program.

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.

Variable
A symbol used in programming which is assigned a numeric memory address. You can change the value of variable at will to suit the program you are writing.

Z80
Widely used microprocessor. It is used in the ZX81, Spectrum and TRS-80.

6502
A widely used microprocessor. It is the heart of the PET, Apple and Atari computers.

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AD INDEX

A B & C COMPUTERS 42
ACORN SOFT 69
ADDA COMPUTERS 11, 15, 19
ADAPTERS ELIMINATIONS LTD 6
A & F SOFTWARE 14
AHKTER INSTRUMENTS 38
ALADDINS CAVE 104
AMBER CONTROLS 108
ANIROG COMPUTERS 17
ARTIC COMPUTING 42
AUDIO GENIE 25, 33
BI-PAK 105
BUFFER MICRO SHOP 12
CAMBRIDGE COMPUTER STORE 47
CAMEL MICROS 80
CASTLE ELECTRONICS 116
COMMODORE ..... 70 & 71
COMPUTER CONCEPTS 52
COMP SHOP 115
CONSERVE 104, 105
CROWN BUSINESS CENTRE 54
CSL MICRODATA 39
CURRIES 10
DATA ASSETTE 58
D. A. COMPUTERS 17
DRG BUSINESS SYSTEMS 20
EAST LONDON ROBOTICS 43
ELECTRONEQUIP 89
ELECTRONICS APPLIED 90
ELTEC SERVICES 43
FULLER MICRO SYSTEMS 32, 106
GAMER 107
GEMINI MARKETING 102
GENERAL NORTHERN MICRO 39
HEWSON 74
IBEK SYSTEMS 11
JADE COMPUTERS 24
JRS SOFTWARE 56
KEMPSTON ELECTRONICS 52
LANSDOWN ELECTRONICS 29
LEISURONIC COMPUTER STORES 75
MACRONICS 47
MARTIN WARD 103
MELBOURNE HOUSE PUB. 79
MICHAEL ORWIN 58
MICROCOMPUTER SOFTWARE 6
MICROWARE 89
MICRO CITY 80
MICROWORD COMPUTER 54
MICROCOMPUTER APP. 46
M. P. SOFTWARE 42
MOLIMEX 37
NORMAN AUDIO LTD 43
ORCHESTRATED COMPUTING 90
PCP 19
PEARL SOFTWARE 2
PERSONAL COMPUTING 29
PERSOFT 12
PHILIP COPLEY 89
PICTURESQUE 52
PIXEL PRODUCTION 17
PRO SOFTWARE 103
QUARTZ COMPUTER SYSTEMS 107
RICHARD ATTWASSER 15, 34
SATURN SOFT 80
SHIVA PUBLISHING 69
SILICA SHOP 28
SINCLAIR RESEARCH ..... 62 & 63
SIR COMPUTERS 39
SOFT TOYS 19
SOUTHERN SOFTWARE 104
STONE CHIP ELECTRONICS 46
STRIPELAND LTD 75
SUMLOCK 7
SUPERIOR SYSTEMS 12
3D COMPUTERS 32
TAURUS COMPUTER DESIGN 47
TEXAS INSTRUMENTS 55
TIMEDATA LTD 105
TITAN 54
VIDEO SOFTWARE 32
WIDA SOFTWARE 90
WINDSOR COMPUTER CENTRE 29, 103
WORDSWORTH 39

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VIC 20



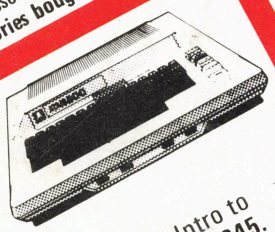
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