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Personal Computing Today

November 1983
75p

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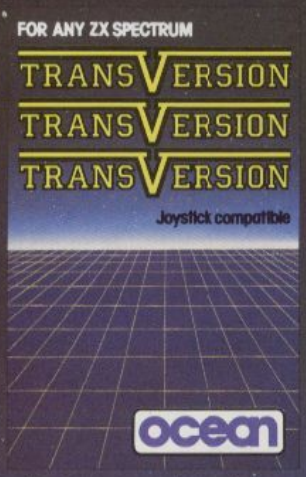
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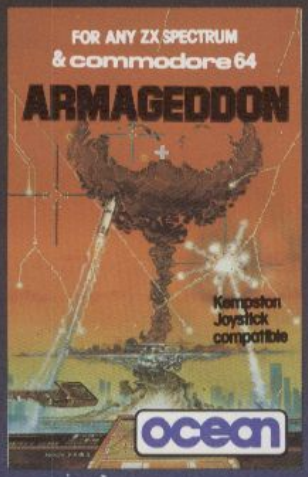
Checklist
100s of games to choose from our software supermarket

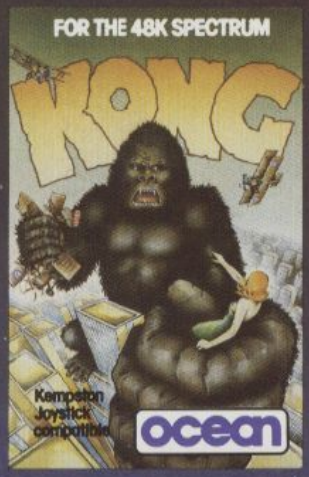


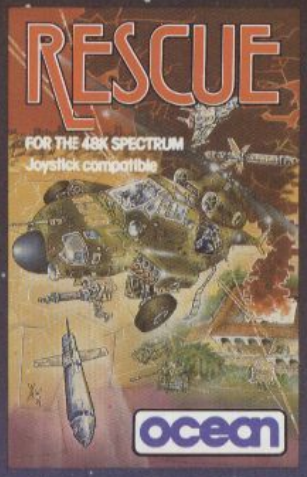
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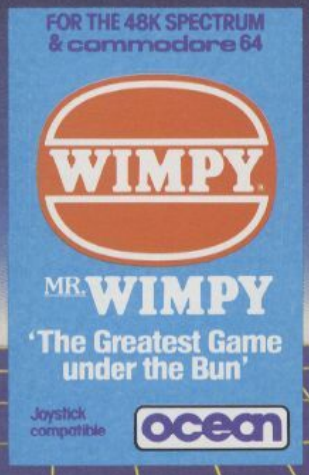


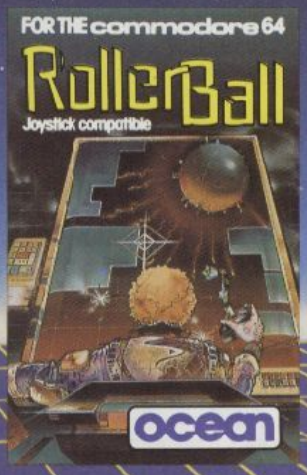






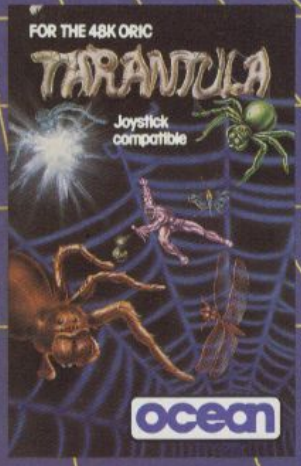












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Personal Computing Today

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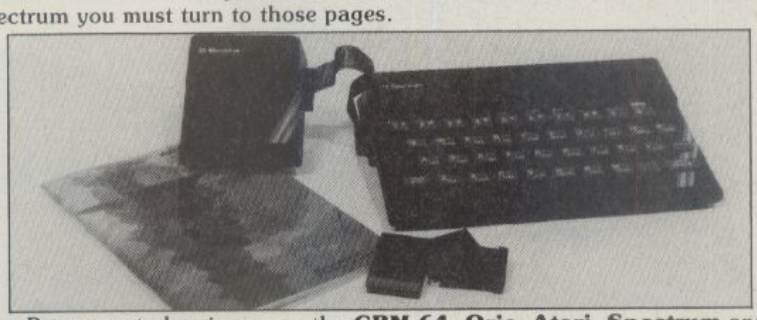
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To find out the latest software and the best to buy for your computer read this month's special software review extra.

In preparation for the Christmas season when many of you will be buying presents not only for your friends but also for your own purposes, we have put together eight pages of software reviews for you to get a thorough look at what's available on the market. We've tried, as far as possible, to include software for as many machines as is feasible but if your own is not catered for this month look out for it in the December issue of *Personal Computing Today*.

Another special report is devoted to the newly released Sinclair Research **Microdrives**. These are the long awaited 3" disc drive units that Sinclair announced at the time of the Spectrum's launch. You'll find a comprehensive review of this new disc system in our **Add-on Action** feature. If you've got a Spectrum you must turn to those pages.



Programs to key in run on the **CBM 64, Oric, Atari, Spectrum** and **VIC-20** to name but a few. Don't forget, if you don't own any of those machines you can too use the programs by adapting them to run on your own computer with the help of our Hints on Conversion section.

And don't forget that we are always on the lookout for new, good programs to publish. We are willing to look at programs for the top selling micros (VIC, Oric, Atari, Spectrum, CBM64), whether the programs are games, useful routines, programming techniques, educational programs or utilities. But please remember to send us a tape of your program so that we can test it quickly, along with all the relevant documentation you can provide, and a clearly printed program listing dumped from a printer. So get your fingers to the keyboard and put your programs in the post.

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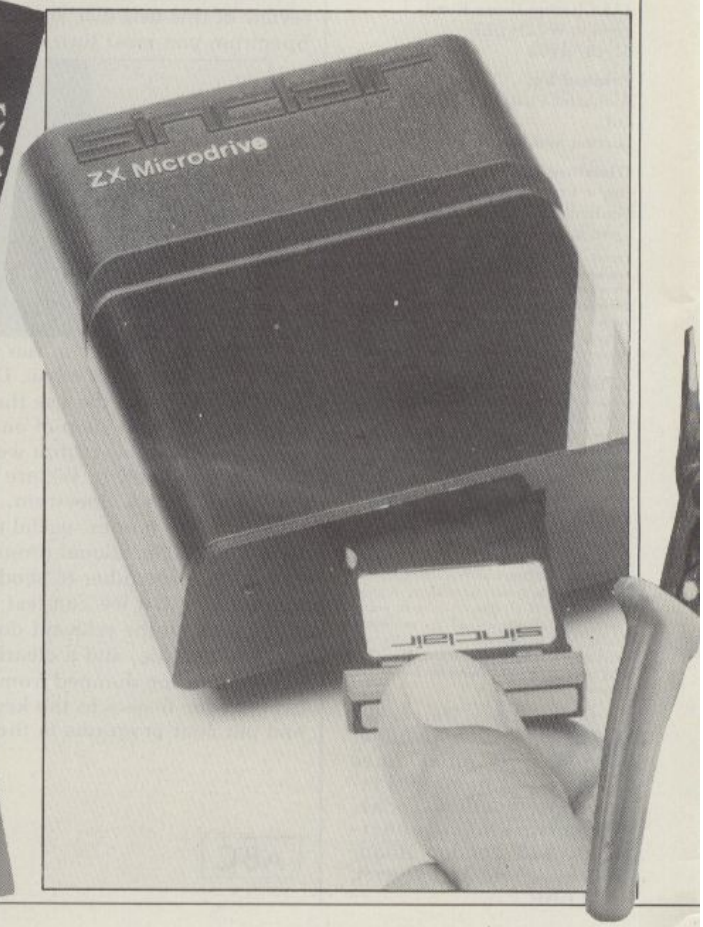
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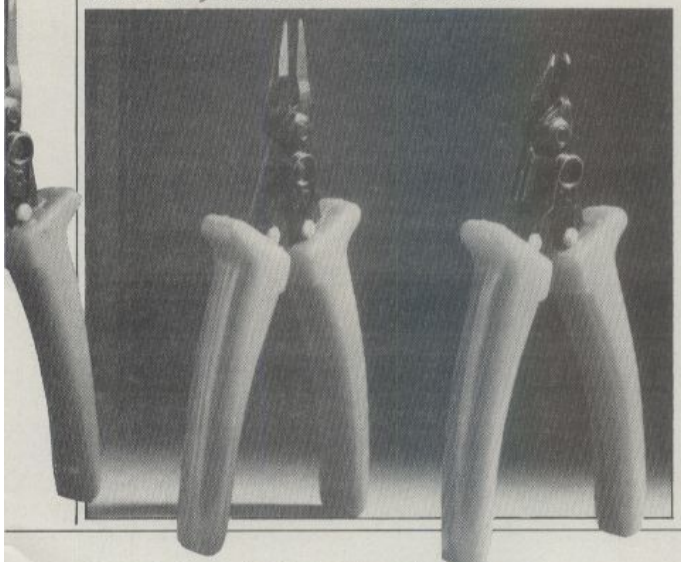
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The Classic, six program adventure game for the 48K Spectrum and 16K ZX81 computers. No software collection is complete without it.
Black Crystal is an excellent graphics adventure and a well thought out package. *Sinclair User, April '83*
Black Crystal has impressed me by its sheer quantity and generally high quality of presentation. I am afraid I have become an addict. *Home Computing Weekly, April '83*
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Alien Intruder/Hieroglyphics — Both programs make good use of graphics and words to make a very entertaining package. *Sinclair User Aug 82*
Alien/Hieroglyphics/Wumpus/Movie — A varied mix from Carnell, all featuring imaginative responses and graphics and all of them good games for all ages (Hieroglyphics is particularly good for children). *Popular Computing Weekly Aug 82*



THE DEVIL RIDES IN

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

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

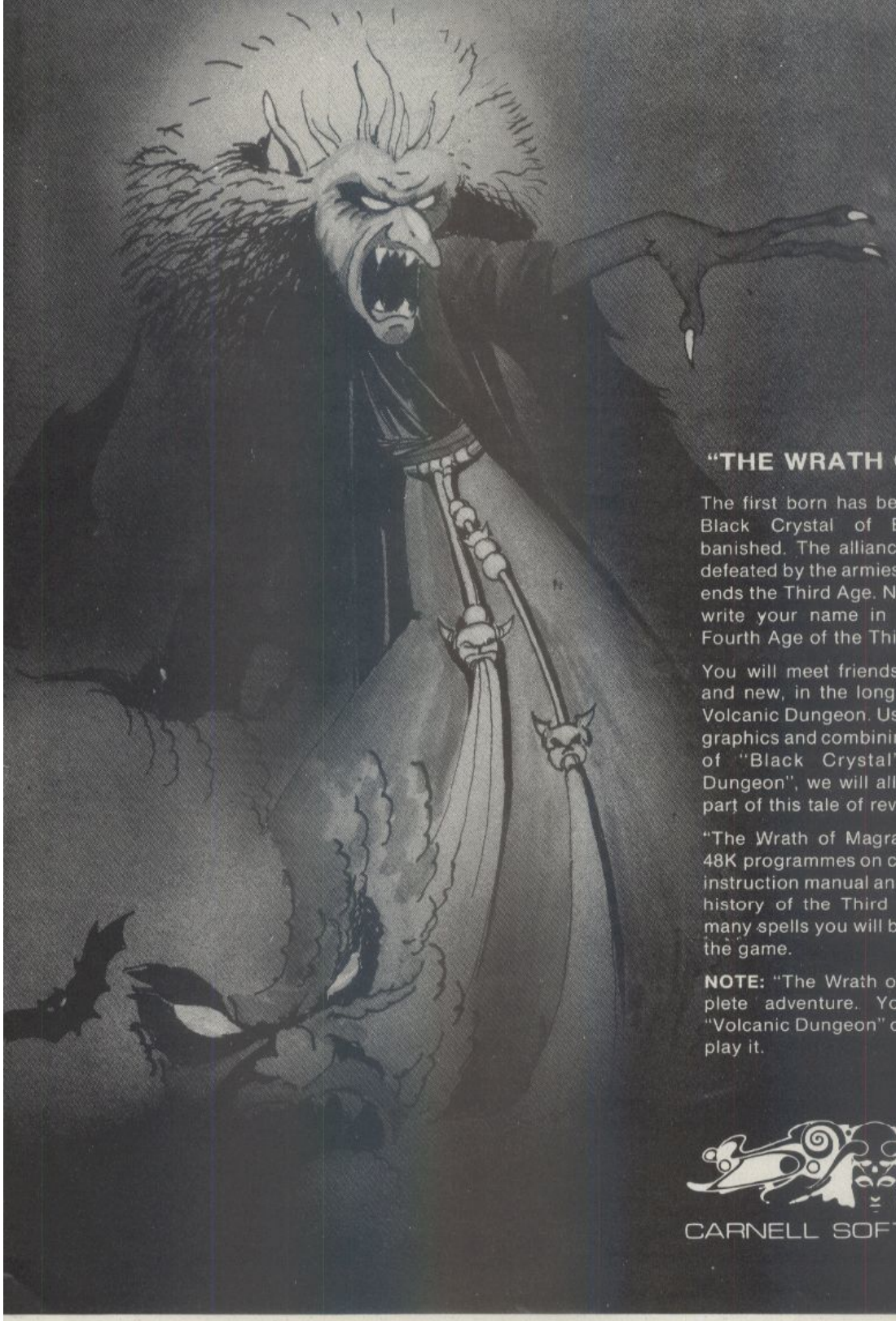
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You will meet friends and enemies, old and new, in the long awaited sequel to Volcanic Dungeon. Using high resolution graphics and combining the best qualities of "Black Crystal" and "Volcanic Dungeon", we will allow you to become part of this tale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

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

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

CARNELL SOFTWARE LTD

NEWS NEWS NEWS



Software Selection

As always there have been many new software releases over the past month.

Terminal Software announce "the first game for the Commodore 64 that two can play simultaneously". Super Dogfight's 100% machine-code fast action sprite graphics with full colour and realistic sound effects enables *simultaneous* two-player action. Another feature is its use of 100% screen wraparound for uninterrupted play. Two more games from Terminal make up their Autumn trilogy for the Commodore 64: Super Skramble and Super Gridder. All three games cost £9.95. Look out for our review of them in the December issue.

A new name has appeared in the software business, operating out of Birmingham. **Express Software** Limited have produced five titles of software for the Oric-1 computer. The titles include Space Quest, Bandit, Breakout, Surround and Brad, who looks set to become a cult hero of the James Bond mould. Brad is an ex-SAS man battling against alien forces and has a happy knack of getting involved in many exciting adventures.

Horace, the popular cartoon character who appears in a series of captivating Spectrum games, will soon be available for Commodore 64 and Dragon 32 microcomputers. The new versions of Horace went on sale in mid-September and other versions will follow soon from **Melbourne House**. Recommended retail price is £5.95 per game. Melbourne House have also announced that The Hobbit is soon to be available for the BBC, Oric and Commodore 64 Computers. This cassette is slightly more expensive at £14.95.

Silly Software – no, it's not a joke, but a new software company to open its doors. With its innovative and interesting marketing techniques, the company promises to produce some exciting software for home computers., Their first release for the Dragon 32, "Movie Producer", involves the player as Peeko Sputburg, the movie producer who after selling his script is plunged into the hallyballoo of the movie world. The packaging, so we are told, is REALLY GOOD – it's in 3D, the first time that this medium has ever been used for software packaging? The cassette comes complete with the special red and green glasses to produce the full 3D effect! The cassette, at £7.95, can be obtained from **Silly Software, 61 Thornhill, North Weald, Epping, Essex; Tel. 0378 82 2171.**

In August, **Longman**, Britain's largest educational publishing firm launched a series of early learning programs on cassette for children aged between four and eight years. The programs have been designed to be usable by children on their own or with parental encouragement, presenting early learning skills to complement their school education. All the programs employ the full graphic and sound resources of the Sinclair ZX Spectrum (16K or 48K models) and retail at £7.95 each.

Youth Training Scheme

News has come to us which might be of interest to some of you leaving school at Christmas. The Computer Insight Youth Training Programme is a scheme to introduce young school leavers to microcomputers. It aims to give them a comprehensive appreciation of their capabilities in order to allow them to make a meaningful contribution to the microcomputer industry generally, and to the microcomputer user in industry and commerce.

Linked with the 13 week course, which is designed in blocks of one to two weeks over a period of 50 weeks, will be a stint of relevant work experience with a sponsor. Places on the course are taken very quickly and anyone interested should contact

Computer Insight, 227 Dartmouth Road, Sydenham, London SE26 4QY, Tel. 01-699 6202/4399.



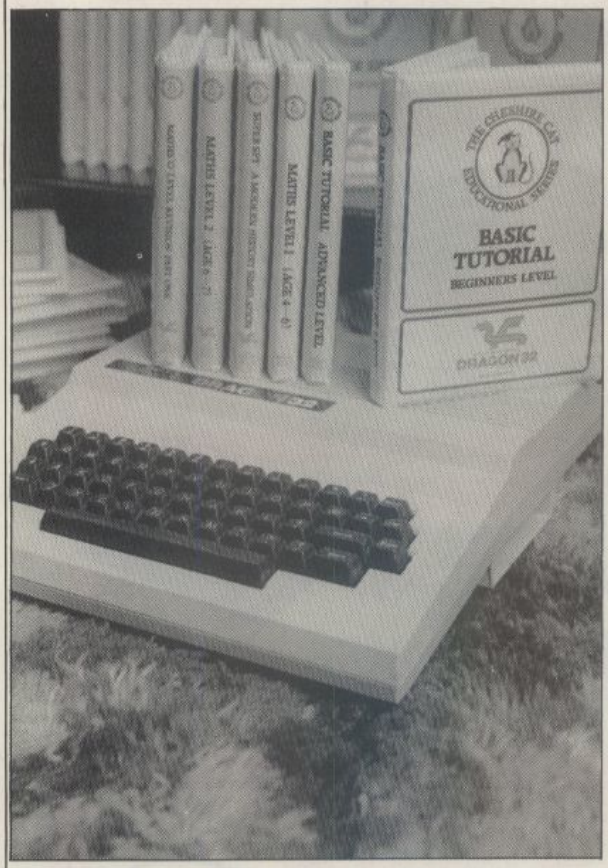
Sord Micro Bus Takes to the Hills

Any readers living or holidaying in Wales may have had sightings in the valleys of a multi-coloured double decker bus bearing the words 'Sord Computers' over the summer.

The bus is the novel and practical idea of Coteglade Ltd, the recently appointed, Swansea based, Sord Computer dealer and is kitted out with the full range of Sord computers and peripherals. Andy Shercliff, general manager of Coteglade's Computer Division sees the bus as being the best method of getting out and demonstrating the computers to potential customers. With the bus shows, exhibitions, markets and shopping centres, to name but a few potential customer traps, can be visited. Andy Shercliff says, "As there is no way that a person in Bangor or Aberystwyth is going to travel to Swansea simply to see us, we must go to them." Service at your doorstep and free refreshments to boot!!

CGU and Sord UK have reduced the retail price of their M5 Computer to £149.95 including VAT but their software prices remain unchanged.

NEWS NEWS NEWS



Housewives Revolutionise Home Computing Industry

The gaping hole in the software range for children is being filled up with an exciting series of entertaining educational products by a group of young, Cheshire housewives who operate under the name of Ampalsoft.

All keen, skilled programmers, they and their husbands bemoaned the lack of good quality educational software for their children, and subsequently realised that they had the expertise between them to produce and market such a range. With a group of top teachers, programmers and other necessary talent they have formed a cooperative and after only 12 months are having phenomenal success.

Their **Cheshire Cat Education Series** of software combines strong educational programs in an entertaining games format using all the full colour, sound and graphics facilities of the top home computers available today.

Already on their stock list is a series of maths programs from pre-school to 'O' Level, history and physics for the Dragon 32, Oric and BBC microcomputers. Having realised the potential of these cassettes and of the many soon to be released programs, Curry's and Boots have started to market them.

Brainwave '83, the Home Computing, Video and Electronics Family Show is to be held in the Birmingham National Exhibition Centre on 4-6 November. This new show promises to be very popular, providing for the whole family with give-aways, pop personalities, games palaces and a spectacular bonfire night party and fireworks outside the exhibition hall. On a more serious note, companies such as Atari, Sinclair, Oric and Ideal Toys are among those who have chosen Brainwave to spearhead their Christmas marketing campaigns, so you can be sure of a well stocked hall and an informative time. Brainwave will feature microcomputers in finished and kit form, electronics kits, video games, electronic toys, software packages, books and electronic gadgets. If you can't make it, look out for an in depth review of the show in our January issue.

Not to be outdone, Scotland too is staging its first Home Computer and Electronics Show, following close on the heels of Brainwave '83 on 11-13 November. This exhibition, in the Anderston Centre, Glasgow, promises to provide an exciting day out with plenty of Home Computers, hardware, software and add-ons, in addition to some Hi-Fi and Video Equipment on display. The Anderston Centre is well sited for vehicle access with good parking and is next to the main bus depot and five minutes from Central Station.

Watchdogs for Hard and Software

Recent information from the **Computer Trade Association** suggests that members feel a need for some grouping of software authors. None of the groups within the C.T.A. is directly representative of such a group and to rectify this, they are launching a membership drive to attract authors into a Society under the auspices of the C.T.A. Such a move is important since the C.T.A. is at present making a number of submissions to H.M. Government which could have effects on software authors, both directly and indirectly. It is also felt that as a body which represents all aspects of the trade, the C.T.A. could act as a mediator in disputes between the software authors and the software houses.

More plans are afoot to form a group representing retailers who deal in the small micro systems and leisure programs. The thinking behind this is to improve the exchange of information and for the design and promotion of retail staff training schemes. All in all, the C.T.A. seem to be helping the consumer towards a brighter and more satisfying future.

However, the Guild of Software Houses has beaten the C.T.A. into existence. This Guild has been set up by a number of leading Software Houses, including Bugbyte, New Generation, Quicksilva, Salamander, Silversoft, Softek and Virgin Games. Not only individual customers will benefit from the Guild – there is a Dealer Charter for the trade as well and a Code of Conduct for Software Houses' dealings with one another, outlawing the poaching of programs and programmers. With all these conditions attached to membership, the Guild Logo will quickly become a sign of quality and service to customers and dealers alike. So look out for it.

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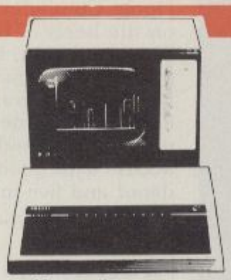
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Also available – BBC Econet system

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ZX Spectrum 48k – £125.95

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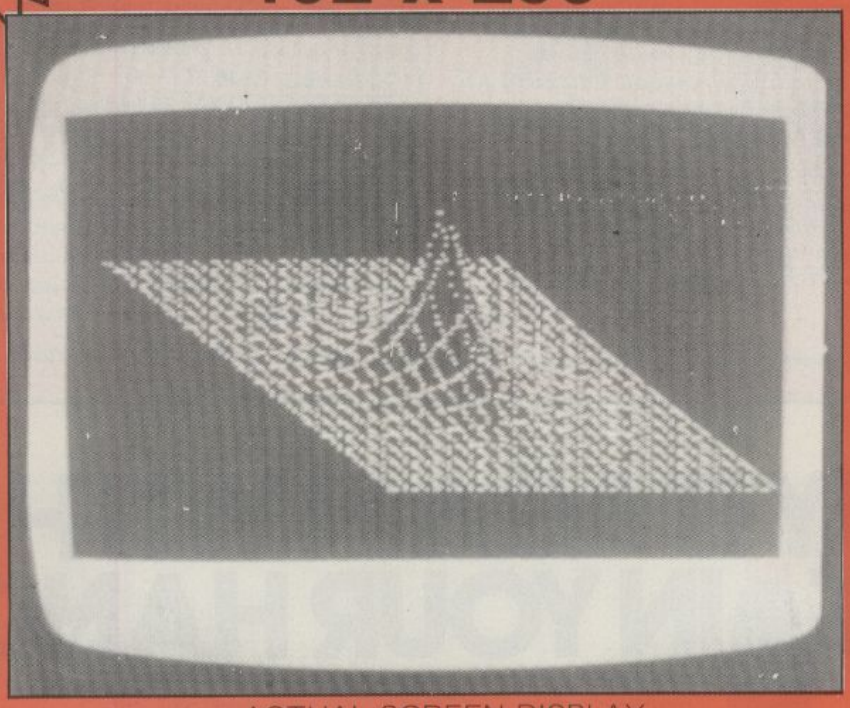
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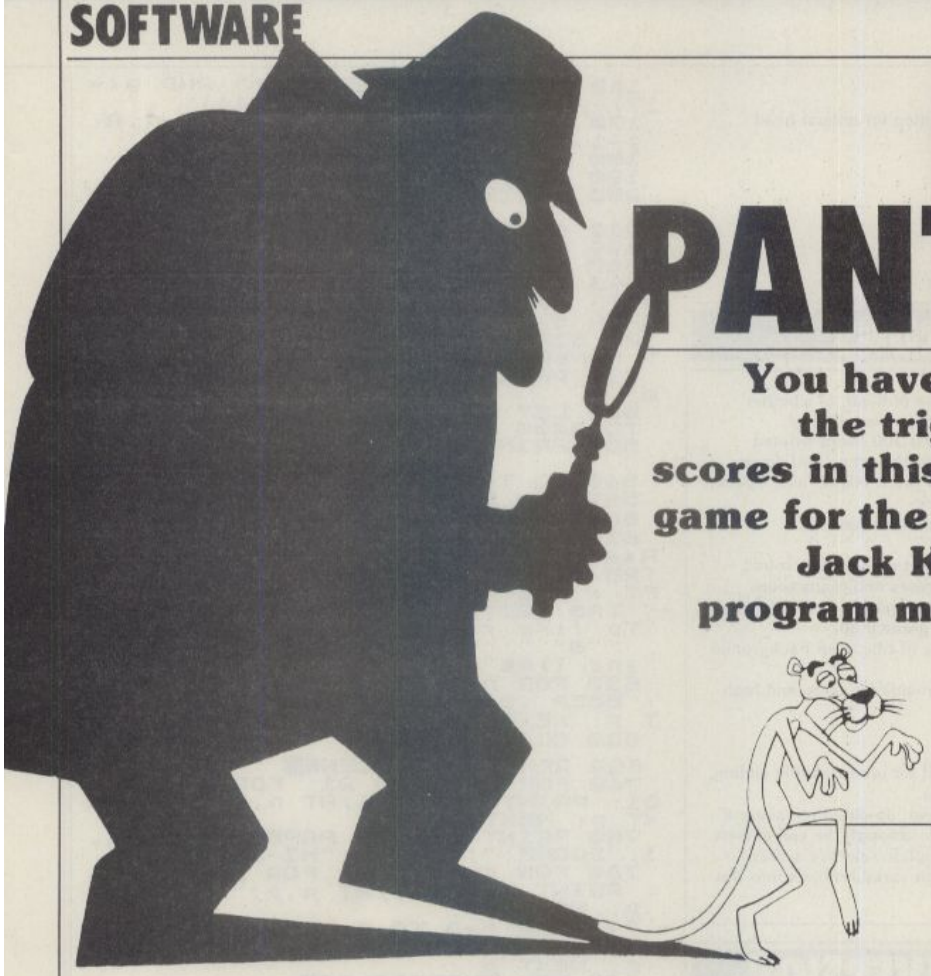
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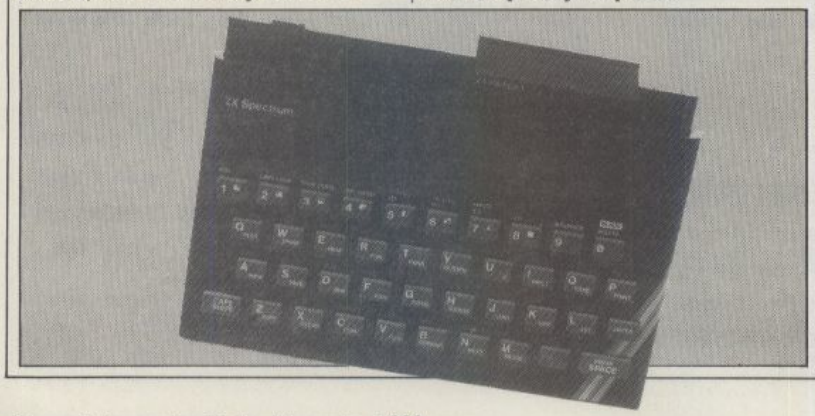
PINK PANTHER



You have to be quick on the trigger to get high scores in this original jungle game for the 16K Spectrum. Jack Knight's exciting program makes full use of the machine's colour and sound capabilities.

Now you see the Pink Panther, now you don't!! The panther, or a wild bore pokes out from the long grass and if you're not quick at aiming and firing, he'll be gone. There is, of course, a time limit for your hunting and you are only allowed a limited number of shots.

The barrel of the rifle is visible in the sand in front of the long grass. As you would expect, it can be moved back and forth across the screen, but the novelty comes in when the gun needs to be lined up or down. In conflict with the demand for haste is the need for fine judgement in aiming. The oblong in which the rifle can move is a duplicate of the area in which the animals' heads appear. To score, the rifle has to be in the character square which corresponds to a square occupied by the target above. At first it may seem impossible to decide, but this skill is quickly acquired.



A shot is registered briefly on the screen and a direct hit is obvious and scores 10 points. The cumulative score is continuously displayed. The animals' heads appear randomly — either panther or boar of varied hues — anywhere in the long grass or even out of the top of it. They disappear equally at random. The 'time limit' is decided by the number of heads to appear.

The control keys for the rifle are:

8 to move right
5 to move left
7 to move up
6 to move down
0 to fire

These instructions are given at the start of the game. The animals' heads are four graphic blocks in size; the two forming the upper part of the head are the same in both animals. When typing in the program, use the GRAPHICS key and press the alpa key(s) printed within inverted commas, e.g. "AB".

SPECTRUM

PINK PANTHER

Variables Used

d,a:	Down and across print position for animal head
g,f:	Ditto, rifle
s,h:	Score, high-score
j,k:	Head and shot counters
b,c,i:	Randomisers (with d,a)
e$:	Panther or boar graphics
n,p:	Loop controllers etc.
l$:	Final word of end message

HOW IT RUNS

Lines 110-140	Randomise a) position of head, b) whether panther or bear c) colour and d) print.
Line 145	Counter to end game if 100 heads printed.
Lines 150-170	Move rifle back and forth and up and down within set limits, and print. NB "I" use: Space, GRAPHICS + I, Space.
Lines 180-190	Cause head to disappear at random.
Line 200	Fires rifle.
Lines 500-540	Sound shot, if on target show effect, sound victory BEEPS, increases and prints score (otherwise shot briefly registered on screen), count shots and end game if 50.
Lines 600-630	Print guidance on use of rifle, with background cords.
Lines 740-770	Paint scenery, and provide for score and high-score.
Lines 1000-1500	Initialise variables.
Lines 2000-2800	Create graphics.
Lines 3000-3800	Use colour and sound for unmistakable ending, provide for new game.
Lines 4100-4400	Selectively clear screen, up-date high-score if necessary, send micro through the end of Sets Scene routine to complete selective screen clearance and through variables back into the game action.

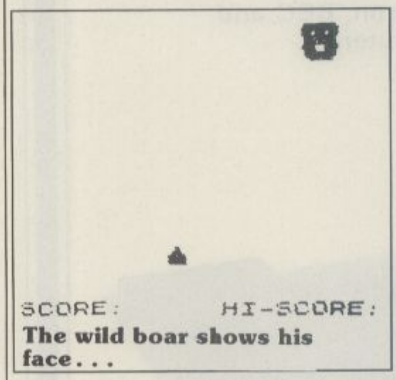
HINTS ON CONVERSION

Pink Panther is written completely in BASIC so there are no problems of POKE conversion. Sinclair BASIC is slightly non-standard mainly in the use of one-key keywords but difficulties should not exist. If USR graphics (animals' heads and rifle) are not available, ingenious use of keyboard graphics should suffice. Line 3000 achieves a flashing BORDER by running quickly through the colours, ending with the original BORDER colour, using the same loop variable to vary the pitch of the BEEPS. INKEY$ equates to GET, GET$.

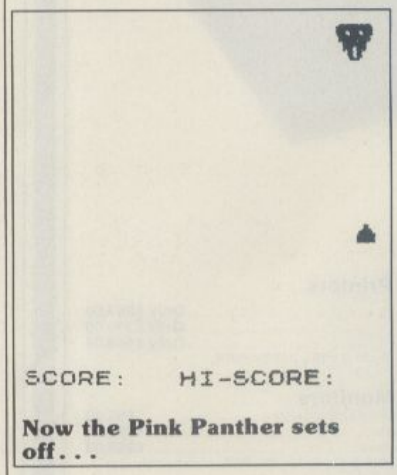
PROGRAM LISTING

```
  10 REM ■Pink Panther■ by Jack
Knight
  20 LET h=0
  30 GO SUB 2000
  40 GO SUB 600
  50 BEEP .5,0
  99 REM ■MAIN LOOP■
 100 PRINT PAPER 8;AT d,a;"  ";A
T d+1,a;"  "
 110 LET a=INT (RND*29)+1: LET b
=INT (RND*3)+1: LET c=INT (RND*2
): LET d=INT (RND*5)+1
 120 IF c=0 THEN LET e$="CD"
 130 IF c=1 THEN LET e$="GH"
 140 PRINT INK b; PAPER 8;AT d,a
;"AB";AT d+1,a;e$
 145 LET j=j+1: IF j>=100 THEN G
O TO 3000
 150 LET f=f+(INKEY$="6" AND f<=
28)-(INKEY$="5" AND f>=1)
 160 LET g=g+(INKEY$="6" AND g<=
17)-(INKEY$="7" AND g>=14)
 170 PRINT INK 1;AT g,f;" I ";AT
 g-1,f+1;" ";AT g+1,f+1;" "
 180 LET i=INT (RND*36)
 190 IF i=30 THEN GO TO 100
 200 IF INKEY$="0" THEN GO TO 50
0
 210 GO TO 150
 499 REM ■SHOTS■
 500 BEEP .05,-10
 510 IF ATTR (g-12,f+1)<>40 AND
ATTR (g-12,f+1)<>32 THEN PRINT P
APER 8;AT g-12,f+1;"0": LET s=s+
10: BEEP .1,1: BEEP .05,15: PRIN
T PAPER 1; INK 7;AT 21,7;s
 515 PRINT PAPER 8;AT g-12,f+1;"
0"
 520 LET k=k+1: IF k>=50 THEN GO
 TO 3000
 530 PRINT PAPER 8;AT g-12,f+1;"
 "
 540 GO TO 100
 599 REM ■OPENING■
 600 BORDER 1: PAPER 6: CLS
 610 PRINT AT 2,8;"**PINK PANTHE
R**"''''TAB 9;"To move rifle:-"''
TAB 12;"RIGHT= ""6""'TAB 12;"LE
FT = ""5""'TAB 12;"UP  = ""7""
"'TAB 12;"DOWN = ""6""'''TAB 9;
"To fire rifle:-"''TAB 12;"PRES
  ""0""'''TAB 5;"Limit on shots
 and time"
 620 FOR n=1 TO 4: FOR p=1 TO 30
: BEEP .02,p: BEEP .02,30-p: NEX
T p: NEXT n
 630 CLS
 699 REM ■SETS SCENE■
 740 FOR n=20 TO 21: FOR p=0 TO
31: PRINT PAPER 1;AT n,p;" ": NE
XT p: NEXT n
 750 PRINT INK 7; PAPER 1;AT 21,
1;"SCORE:";TAB 19;"HI-SCORE:"
 760 FOR n=0 TO 2: FOR p=0 TO 31
: PRINT PAPER 5;AT n,p;" ": NEXT
 p: NEXT n
 770 FOR n=3 TO 6: FOR p=0 TO 31
: PRINT PAPER 4;AT n,p;" ": NEXT
 p: NEXT n
 999 REM ■VARIABLES■
1000 LET d=0: LET a=0
1100 LET f=15: LET g=15
1200 LET s=0: LET k=0: LET j=0
1300 RANDOMIZE
1500 RETURN
1999 REM ■GRAPHICS■
2000 FOR n=1 TO 7
2100 READ n$
2200 FOR p=0 TO 7
2300 READ q: POKE USR n$+p,q
2400 NEXT p: NEXT n
2500 DATA "A",127,255,255,243,24
3,127,127,125,"B",254,255,255,20
7,207,254,254,190,"C",127,252,25
2,124,127,127,63,31,"D",254,63,6
3,62,254,254,252,248,"G",31,31,3
0,22,6,6,6,3,"H",248,248,120,104
,96,96,96,192
2600 DATA "I",24,24,60,126,255,2
55,255,255
2800 RETURN
2999 REM ■END■
3000 FOR n=1 TO 3: FOR p=6 TO 1
STEP -1: BORDER p: BEEP .1,15+p:
 BEEP .1,15-p: NEXT p: NEXT n
3100 IF k>=50 THEN LET l$="SHOTS
"
3200 IF j>=100 THEN LET l$="TIME
"
3300 IF k>=50 AND j>=100 THEN LE
T l$="ALL"
3400 PRINT INK 1;AT 3,4;"YOU'VE
RUN OUT OF ";l$
3500 FOR n=1 TO 200: NEXT n
3600 PRINT INK 1;AT 5,5;"FOR ANO
THER GO PRESS-"; FLASH 1;AT 6,13
;"ENTER"
3700 IF INKEY$=CHR$ 13 THEN GO T
```

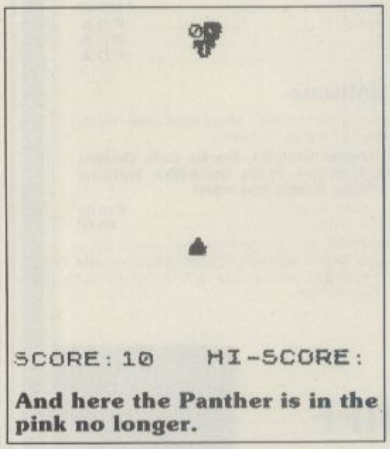
```
0 4000
3500 GO TO 3700
3999 REM ■NEW GAME■
4100 PRINT PAPER 1;AT 21,7;"     "
; PAPER 6;AT 9,f+1;" "
4200 IF s>h THEN LET h=s: PRINT
PAPER 1; INK 7;AT 21,25;h
4300 GO SUB 750
4400 GO TO 50
```



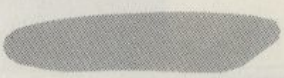
The wild boar shows his face . . .

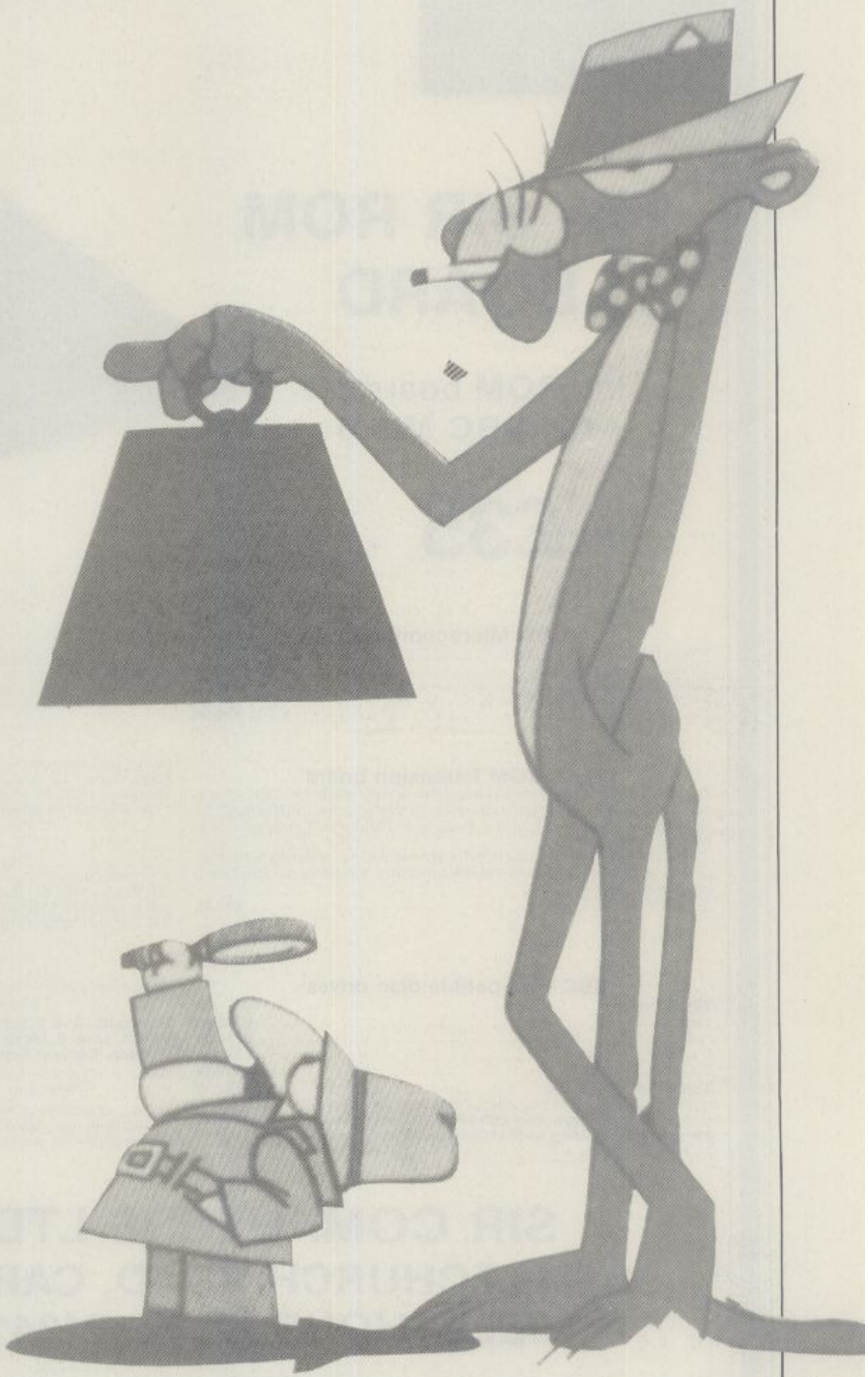


Now the Pink Panther sets off . . .



And here the Panther is in the pink no longer.





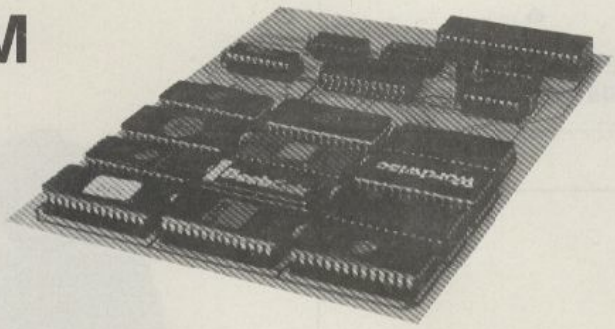


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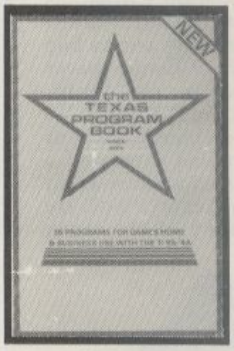
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NEXT MONTH

Laser 200

New on the computer scene is the Laser 200 computer, and we'll be taking the lid off it in the **December** issue of *Personal Computing Today*.

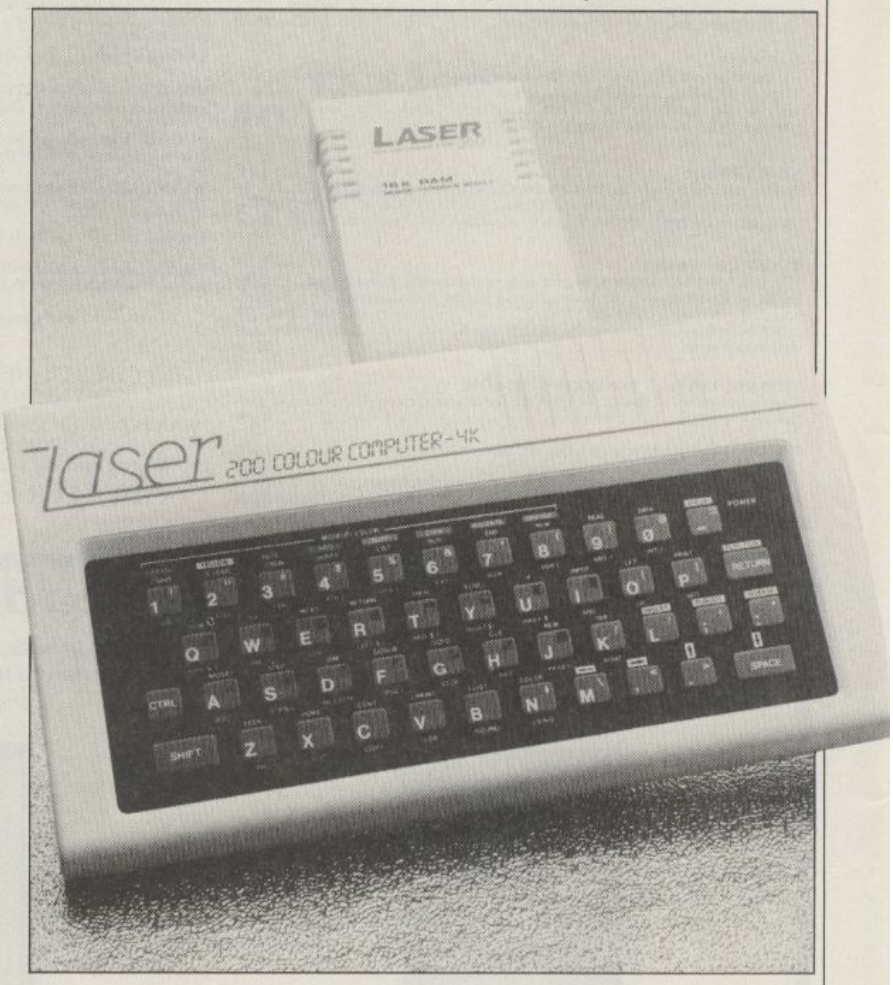
Weighing in price wise at £70 for the basic computer console which has a cream plastic case with a brown keyboard made of the same plastic material as the ZX Spectrum. The **Laser 200** is a colour computer but the main drawback is that it only comes with 4K of memory on board. For £30 you can buy a 16K extension RAM pack which plugs neatly into the back of the main console.

Produced in Hong Kong it is being distributed in Britain by Leisure Zone, an associated company of Video Technology and is on sale through retail outlets. According to our street-wise spys the Laser 200 is selling remarkably well.

Look out for the December *Personal Computing Today* to find out what the Laser 200's rays are really like.

Christmas Software Shopping

With the countdown of shopping days left until Christmas well on the decline no doubt there'll be many of you rushing out to buy software for friends or family (never mind yourself) as a cheap(ish), useful and welcome Christmas present. And to help you make your choice we'll be running extra pages of software reviews as a follow up to this issue's special report. We'll try and include as many of the latest games appearing on shop shelves in the feature – and you can rest assured that the pre-Christmas period will bring a rash of new software for loads of different computers. So make sure you don't miss your **December** copy of *Personal Computing Today* and order it from your newsagents now using the coupon below.



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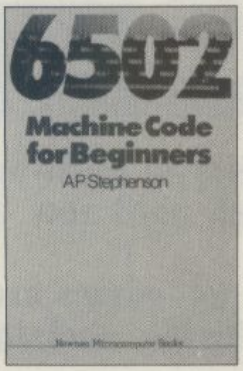
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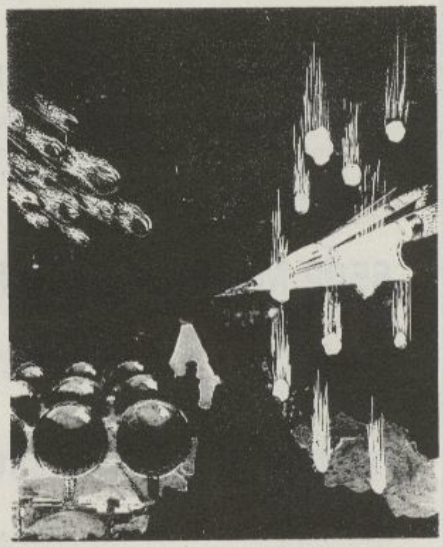
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YOUR LETTERS

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 typed the CBM 64 'Grand Prix' program into my machine and after a while on Level nine I managed to beat 8478. My score was 12114. Do you know whether or not this is a record?

Yours sincerely,
Philip Hall (age 14)
Hull

Editor's reply: As far as I know it's the highest score to date. If anyone else has scored more points in this program how about letting me know if you have topped Philip's record? Thanks for your letter Philip and I'm glad to hear that you have enjoyed playing this game.

Dear PCT

I am writng to complain about the Factfile listing carried in PCT. I note with growing dismay that several good quality micros are excluded. Surely the concept behind such an exercise is to convey as much information as possible to readers. Could it be that you are only narrowing down the field to the most popular micros? If so, why has a machine such as the Lynx been overlooked? For its price I feel that the Lynx range of microcomputers offers much more than other micros such as the BBC. I know that you must publish programs and information for the more popular micros, but spare a thought for users of less popular machines who regularly subscribe to your magazine.

Could I also suggest that the amount of space taken up by the Factfile be reduced in order to make room for reports on up and coming micros, or alternatively, that the Factfile appear bimonthly?

I hope these ideas prove fruitful in the coming months.

Yours faithfully,
Colin McKerr
Lurgan, N. Ireland

Editor's reply: You will be pleased to see that we have already rectified the omission of the Lynx range of micros from our Factfile. As you suggest, we do have to limit our reference sections to the most popular micros on the market or we would be running a complete magazine of specifications. As for the programs we publish, we do try to keep a balance between the most popular micros, but again, this is only possible if we receive a balanced submission from readers – so all you Lynx owners get writing! Your final comment is a good idea, although we do already report on the latest micros to come onto the market. Thanks for your hints and keep sending them in.

Dear PCT

I'm twelve years old and have been using the TI99/4A for the last six months. By now I am getting quite familiar with computing. When I read the letters written to you and see the complaints of the Tandy

TRS-80 and TI99/4A owners about the lack of programs printed for their machines in PCT, I get annoyed. I accept the fact that you have to cater for the more popular computers and think you do a good job in maintaining a balance between programs for all the machines. I wonder, however, if you could give me some information as to which book might contain more programs for the TI99/4A.

As I said earlier, keep up the good work.

Yours faithfully,
David Penny
Cwmbran

Editor's reply: Thank you for realising that we do try to cover as many popular micros as possible and to please all of our readers some of the time. With regards to further programs for the TI99/4A I can only suggest that you visit as many Texas dealers as possible, who should keep a good stock of such books.

Dear PCT

You probably aren't familiar with me because I come from Australia! I buy your computer magazine every month and I think it is excellent. I own a ZX Spectrum and am very excited to key in your programs. However, I prefer games and would be grateful if you would *please* have more of them instead of utilities.

By the way, I thought I might give you a hint that maybe a little more colour would improve the look of the magazine. But all my friends agree with me that PCT is the best magazine out. Just one last thing, because I live so far away, I never get a chance to enter your competitions, since all editions we receive are one month out of date. So, please for Australian readers' sakes could you extend the completion date? I'm *very* sorry if I ask too much of you.

Yours faithfully,
Leonardo Esposito
Australia

Editor's reply: I'm sorry that you can't enter any of our competitions but unfortunately, as you say in your letter, copies of the magazine do not arrive in your country until after the closing date. There is nothing we can do about this I am afraid because there is no way of speeding up worldwide distribution.



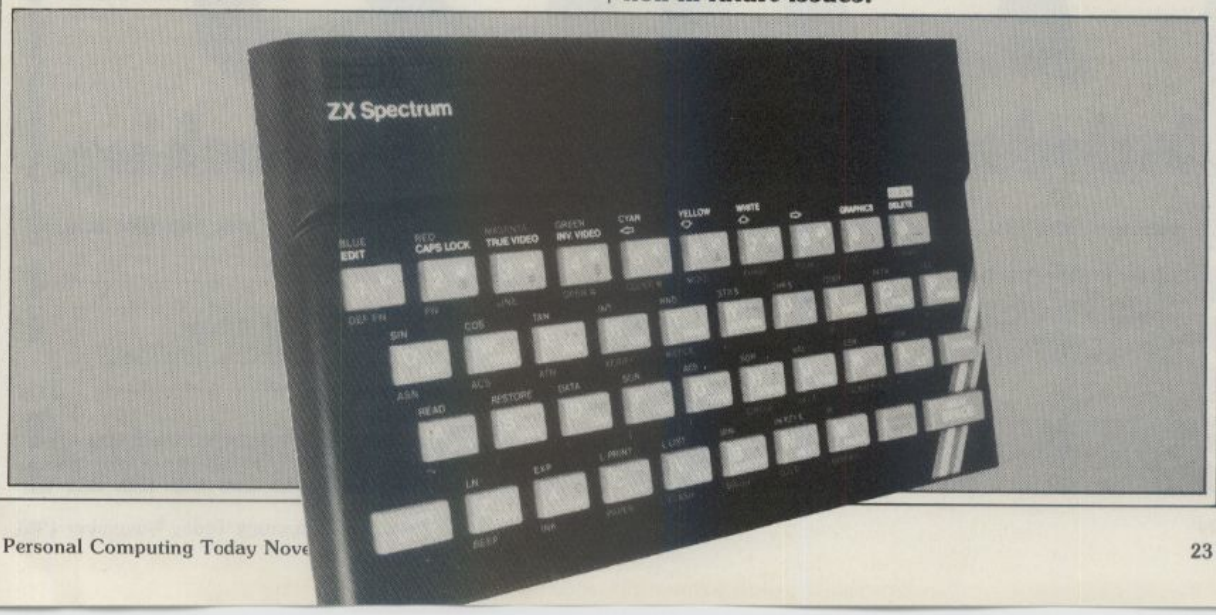
Dear PCT

I find your magazine very good and helpful for beginners (like me) but would like to make a suggestion which might improve it, and this is to have a book review section each month.

Unfortunately, I missed January's issue of PCT, how would I obtain this and finally, I have a game program which I would like to submit to PCT, how do I go about this?

Yours faithfully,
A Kahttri
Coventry

Editor's reply: To take your questions in order. We do review books from time to time, but as you will appreciate, there are so many on the market that it would be difficult for any reviewer to fairly carry out a survey and report on them. Also we are limited to a certain number of pages for each issue and these are already well-filled. Your second problem is easily solved by writing to Distribution and Subscriptions, Harlequin Business Systems, 513 London Road, Thornton Heath, Croyden, Surrey, giving details of the issue you require and they will tell you how to obtain it. Finally, for a program submission, please give full documentation, typed and double spaced, relating to how the program runs, any special features of it, conversion ability, a cassette and a full listing, properly printed out. We are always happy to receive programs for possible publication in future issues.



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SHARP MZ-80K

SOFTWARE

ANY SORT



Here's a useful routine put together by E M de Sylva. It will enable you to sort out terms in relevant programs and put them in numerical or alphabetical order.

Any Sort will be useful to anyone who needs to sort terms in either numerical or alphabetical order or indeed both mixed, in which case priority is given to numeric strings. This does not mean that a line (⅔66 CHARACTERS) will only be checked for the first few alphanumerics in the string. Try ABCDEFGHIJKLMOP against ABCDEFGHIJKLMOP or 123456789123456789123 aginst 12345678912345678912 2.

The program gives five options besides directly entering terms to be sorted. These are as follows:

A. It allows you to view the sorted terms for confirmation on a long list.

B. Allows addition of new items to an existing list without loss of original data.

C. Has the facility to store lists on tape.

D. Has the facility to read an existing list from tape.

E. Incorporates a printer routine for hard copy of list. (Codes in this routine are for a Epsom 80F/T Type 3 with Sharp Graphics.)

As an added feature the sorted list is paged so that the list can be viewed 20 lines at a time.

HOW IT RUNS

Line 8	Sets the number of lines.
Lines 19-25	Display options.
Lines 26-31	Option selection.
Line 36	Title input.
Line 37	Sequences A$ (terms).
Lines 38-41	Terms input routine.
Lines 45-50	Display sorted list.
Lines 56-62	Sort routine.
Line 65	Select next page.
Line 69	Title change option.
Lines 71-75	Write list to tape.
Lines 80-84	Read list from tape.
Lines 87-92	Printer routine.

HINTS ON CONVERSION

The program can be easily converted to run on any machine as the heart of the program consists of only seven lines (56-62 sort routine). The rest of the program is almost all cosmetic in terms of formatting. Contrast inverted arrows are cursor movements and a contrast inverted "C" indicates "clear screen".

The graphic symbol that appears on lines 34 and 47 is the bottom right key on the Sharp MZ-80K keyboard but this can be changed to any symbol desired as its function is purely to end the input sequence. The maximum amount of lines in a list may be set at line 8 which has been set arbitrarily at 100.

PROGRAM LISTING

```
1 REM**********************
2 REM*                     *
3 REM*   E.M. DE SYLVA.    *
4 REM*                     *
5 REM*       1982.         *
6 REM*                     *
7 REM**********************
8 DIMA$(100)
9 PRINT"■■■■
10 PRINT"      ■■■ ■ ■ ■ ■    ■■■ ■■■ ■■■ ■■■
11 PRINT"      ■ ■ ■■■ ■ ■ ■  ■ ■ ■ ■ ■ ■  ■
12 PRINT"      ■ ■ ■ ■■■ ■■■  ■■■ ■ ■ ■■■  ■
13 PRINT"      ■■■ ■ ■ ■  ■   ■ ■ ■ ■ ■ ■  ■
14 PRINT"      ■ ■ ■ ■ ■  ■   ■■■ ■■■ ■ ■  ■  ■
15 PRINT"
16 FORA= 5TO 36:PRINTTAB(A);"■";:NEXTA
17 FORX=1TO4000:NEXT
18 REM**DISPLAY OPTIONS**
19 PRINT"■";"■■■■■■■■■1 ENTER TERMS TO BE SORTED."
20 PRINT"■■■■■■■■■2 VEIW SORTED TERMS."
21 PRINT"■■■■■■■■■3 ADD NEW TERMS TO BE SORTED."
22 PRINT"■■■■■■■■■4 SAVE TERMS ON TAPE."
23 PRINT"■■■■■■■■■5 LOAD TERMS FROM TAPE."
24 PRINT"■■■■■■■■■6 PRINT LIST OF TERMS."
25 PRINT"■■■■■■■■■7 FINISH."
26 REM**OPTION SELECTION**
27 GETZ$:IFZ$=""THEN27
28 Z=VAL(Z$)
29 IF(Z=1)+(Z=2)+(Z=3)+(Z=4)+(Z=5)+(Z=6)+(Z=7)THEN31
30 GOTO27
31 ONZGOTO32,45,33,68,78,87,94
32 Q=0:N=0
33 PRINT"■"
34 PRINT"TO END SEQUENCE ENTER 'X' ON IT'S OWN■"
35 REM**TITLE OPTION**
36 INPUT"LIST TITLE ";D$:PRINT"■"
37 Q=Q+1:N=Q
38 REM**TERMS INPUT ROUTINE**
39 INPUT"ENTER TERM ? ";A$(Q)
40 IFA$(Q)="X"THEN42
41 GOTO37
42 PRINT"■":PRINT
43 GOSUB 56
44 REM**DISPLAY SORTED LIST**
45 PRINT"■";"■■■■■■■■■■■■■■■■";D$;"■"
46 FOR I=1TON
47 IFA$(I)="X"THEN50
48 PRINT I;TAB(5);A$(I)
49 IF(I=20)+(I=40)+(I=60)+(I=80)THENGOSUB63
50 NEXT I
51 PRINT"■■■■■■■■■■■■■FINISHED THANK YOU."
52 PRINT"■■■■■■■■■■■■■■■PRESS ANY KEY"
53 GETE$:IFE$=""THEN53
54 GOTO19
55 REM**SORT ROUTINE**
56 Q1=N
57 O1$=A$(Q1):FOR I=0TO Q1-1
58 IFA$(I)<O1$ THEN 60
59 O2$=O1$:O1$=A$(I):A$(I)=O2$
60 NEXT
61 A$(Q1)=O1$:Q1=Q1-1:IF Q1>1 THEN 57
62 RETURN
63 PRINT"■■■■■■■■■■■■■■■PRESS ANY KEY"
64 REM**SELECT NEW PAGE DISPLAY**
65 GETC$:IFC$=""THEN65
66 PRINT"■":RETURN
67 REM**TITLE CHANGE OPTION**
68 PRINT"■■■■■■■■■■■■■■■■PLEASE ENTER THE LIST TITLE."
69 PRINT"■■":INPUT"TITLE ";D$
70 REM**WRITE TERMS TO TAPE**
71 WOPEND$
72 PRINT/TN,D$
73 FORI=1TON
74 PRINT/TA$(I)
75 NEXTI:CLOSE
76 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■FINISHED":GETE$:
IFE$=""THEN76
77 GOTO19
78 PRINT"■■■■■■■■■■■■■■■■■■LOAD CASSETTE";"■■■■■"
79 REM**READ TERMS FROM TAPE**
80 ROPEN
81 INPUT/TN,D$
82 FORI=1TON
83 INPUT/TA$(I)
84 NEXTI:CLOSE:Q=N
85 GOTO76
86 REM**PRINTER ROUTINE**
87 PRINT/P"■";"■■■■";TAB(25);D$
88 PRINT/P"■■"
89 FORI=1TON
90 IFA$(I)="X"THEN92
91 PRINT/PI;TAB(5);A$(I)
92 NEXTI
93 GOTO19
94 PRINT"■■■■■■■■"
95 PRINT"      ■■■ ■ ■ ■■■    ■ ■ ■■■ ■ ■ ■
96 PRINT"      ■ ■ ■ ■ ■ ■    ■■■ ■ ■ ■ ■ ■
97 PRINT"      ■■■ ■■■ ■■■    ■■■ ■ ■ ■ ■ ■
98 PRINT"      ■ ■  ■  ■ ■    ■ ■ ■ ■ ■ ■ ■
99 PRINT"      ■■■  ■  ■■■    ■ ■ ■■■  ■ ■  ■
100 END
```

What you'll see on the screen.

```
          1 ENTER TERMS TO BE SORTED.

          2 VEIW SORTED TERMS.

          3 ADD NEW TERMS TO BE SORTED.

          4 SAVE TERMS ON TAPE.

          5 LOAD TERMS FROM TAPE.

          6 PRINT LIST OF TERMS.

          7 FINISH.



    TO END SEQUENCE ENTER 'X' ON IT'S OWN

    LIST TITLE PROGRAMS 1


    ENTER TERM ? DIRECTORY          BASIC   000
     008
    ENTER TERM ? BASIC+             M/C     012
     044
    ENTER TERM ? XBASIC V2.2        M/C     048
     072
    ENTER TERM ? SKETCH PAD         BASIC   078
     082
    ENTER TERM ? FAST LOADER        M/C     086
     088
    ENTER TERM ? VALLEY             BASIC   090
     132
    ENTER TERM ? CRIBBAGE           BASIC   135
     192
    ENTER TERM ? DEMO               BASIC   197
     269



                PROGRAMS 1

     1   BASIC+          M/C     012 044
     2   CRIBBAGE        BASIC   135 192
     3   DEMO            BASIC   197 269
     4   DIRECTORY       BASIC   000 008
     5   FAST LOADER     M/C     086 088
     6   SKETCH PAD      BASIC   078 082
     7   VALLEY          BASIC   090 132
     8   XBASIC V2.2     M/C     048 072

          FINISHED THANK YOU.
            PRESS ANY KEY
```

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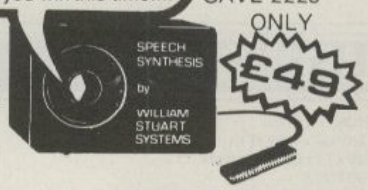
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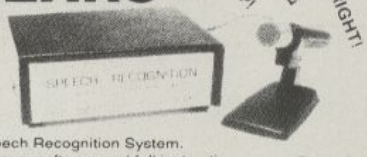
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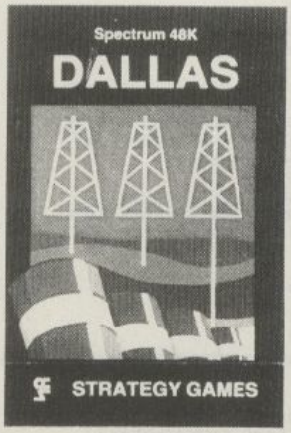
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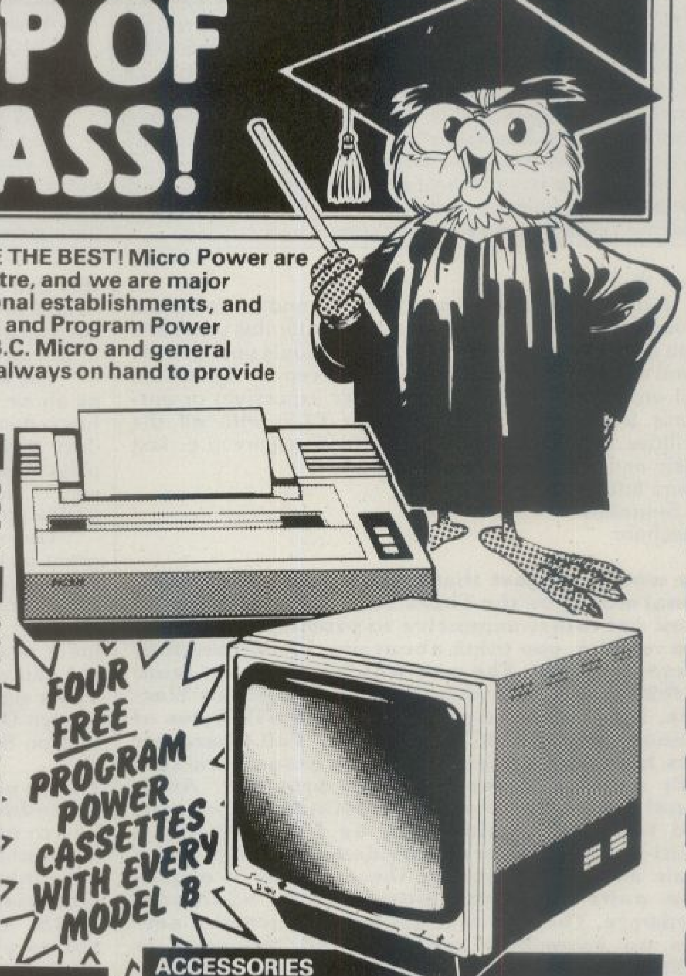
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TECHNICAL ENQUIRIES

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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Dear PCT

I am an owner of a Texas TI99/4A and am fortunate enough to be doing computer studies later this year, and I am also a keen programmer. Please could you give me some advice as to whether I should keep my Texas and add on peripherals (which is rather expensive) or purchase a different computer under £200 with all the facilities and memory capacity I will require (i.e. fast Basic and Machine Code).

Yours faithfully,
A. Simmons
Chesham

We would suggest that rather than spend additional money on the Texas TI99/4A, which would work out rather expensive to provide the system you require, you think about purchasing another microcomputer. The one which springs to mind in this case is the recently released Acorn Electron. This advanced machine offers 64K bytes of memory and BASIC interpreter. Full character sets including upper and lower case characters with genuine descenders are provided. Additional text characters can be defined by the user, and text and graphics can be freely mixed. A multi-way connector is provided at the rear of the basic microcomputer for the addition of expansion units containing interfaces to additional hardware. The new manual has an excellent section on assembler language and the price is £199.99. But do remember that the ultimate choice is up to you. Why not pay a visit to a local computer shop and try out several different computers to see which you prefer?

Dear PCT

With reference to the Billiards program in the September issue of PCT, I wish to point out a few errors/omissions and to suggest a possible improvement.

Firstly, the program as listed does not draw the bottom edge of the table and results in the player being able to knock the ball off the playing area. This is easily amended by the inclusion of the following:

135 FOR I = 48881 TO 48919
137 POKE I,148:POKE I + 640,148:NEXT

Secondly, it is impossible to 'Pot' a ball in the corner pockets as the program does not allow diagonal shots. Therefore, it is necessary to enlarge the corner pockets by the inclusion of the following lines:

165 POKE 48242,126:POKE 48278,126
175 POKE 48882,126:POKE 48918,126

If readers would like to be able to play diagonal shots this can be accomplished by the deletion of line 404. "Tactical" shots can then be re-introduced by amending the value of NC in line 400 e.g. NC = 1 moves one place in the direciton specified, NC = 2, two places etc.

The use of the SHIFT key to play "soft" (or "tactical" as above suggestion) is not allowable unless the player has remembered to press CTRL T before he plays. If he does this, when Oric asks him for another game, the player must remember to use shifted Y or N. A smoother way of accomplishing this would be to include PRINT CHR$ (20) in lines 1015 and 2015.

The sound in line 20 is annoying because the program lacks a PLAY 0,0,0, function. Try:

20 PLAY 1,0,T,375:WAIT 50
22 PLAY 0,0,0,0:RETURN

However, try as I may, I cannot get the program to issue me a new ball once the first has been potted, perhaps you can enlighten me.

Yours sincerely,
Martyn Davies
Weston Super Mare

Thank you for taking the trouble to detail these amendments, Martyn. I'm sure many readers will like to try them. As for your own enquiry, our programming expert tells me that line 2110 needs a little manipulation in order to bring a second ball into play. Thus, part of that line should read, :IFNB ≥ 1ORNB < 10THENRUN. Hope this solves your problem.

Dear PCT

Please could you tell me if it is at all possible to upgrade an Oric 1 (which I have decided to buy) from the 16K version to the 48K. If not please could you tell me if Oric may reduce its prices in the near future (so I can buy the 48K model to start with)?

Andrew Potter
Nottingham

I'm afraid that at the present time it is impossible to upgrade the Oric 1 16K model to the 48K and we are told that Oric have no plans to alter this situation. With regards prices, Oric have recently dropped them for both models and the 48K version now costs £139.95

Dear PCT

I am in the midst of final preparations for emigrating to Australia. I have tried a number of local retailers and cannot find the complete answer as to whether my ZX

Spectrum (or for that matter any other computer) will be compatible with Australian television sets. One retailer suggested that vision will be, whilst the sound will not, and that the only way round this problem would be to play the sound through a video recorder – I would, however, have thought that the video recorder would not be compatible either.

Any comments? If the Spectrum is not compatible, do you know of any easy modifications that I can carry out to solve the problems?

Yours faithfully,
J Calvert
Scunthorpe

Spectrum Customer Services at Camberley (0276 685311) told us that the ZX Spectrum is incompatible for sound and vision with Australian TV sets but that modifications can be carried out in Australia by Spectrum agents, Australian Consolidated Marketing Corporation (Imports), PTY Ltd, 86 Nicholson Street, Abbotsford, Melbourne 3067 (Tel. Melcourne 4193033). This should solve both problems.



Dear PCT

I am contemplating buying a 48K ZX Spectrum as a home computer. Along with this I will need to buy a portable television, which I am hoping to get second hand. I don't want to spend more than £50 on this and would like your advice as to the best TVs available that would be compatible with a ZX Spectrum, as I have been slightly worried over a letter printed in the July issue of PCT concerning the incompatibility of some TVs with the ZX Spectrum.

Thank you very much.

Yours faithfully,
C Chan
Canterbury

We took the advice of Sinclair Research on this one. The only televisions not compatible with the ZX Spectrum are those with Japanese components, the reason for this being to do with the colour quality. Having said that, however, they told us that the portable Sony works perfectly and, indeed if you can find a second hand one for under £50, it would seem to be a good buy.

Dear PCT

I have bought a second hand Sinclair ZX80 as a first computer. Please could you tell me what software, books, and hardware are available for this machine?

Also, I am having problems with loading and saving to my cassette recorder. The cassette machine I am using is a Tandy CTR-37 and the leads are the leads I got with the computer.

Please could you advise me how to correct this?

Yours faithfully,
Timothy Kemp
Huddersfield

The Sinclair ZX80 is now a very dated computer having been superceded by two more models from the same stable. Unfortunately, because of this there are very few firms which now produce software/add-ons to run with the ZX80.

As for your tape recorder, I suggest you get in touch with Sinclair Research of Cambridge to see what they can advise you to do. I am afraid that it may be that your ZX80 has seen better days, but I hope that this isn't the case.

CORRECTIONS

Some people have been having trouble getting the TI-99/4A High Res Editor from our September issue to work. The most common mistake was made by not reading the "How it Runs" section, where it was explained that line 590 uses control characters which cannot be displayed by the printer. However, we have to admit that there may have been an error in the listing for Line 590. Several readers have told us tht they can only get the program to work properly if ON POS "EXSD123456789".CHR (K).1 is substituted for the original line "123456789 EXDS".

Our thanks go to all those who wrote in, not only the letters which we have printed here. We have noted your comments and welcome any advice readers might like to give.

PRIORITY REPLY

November 1983

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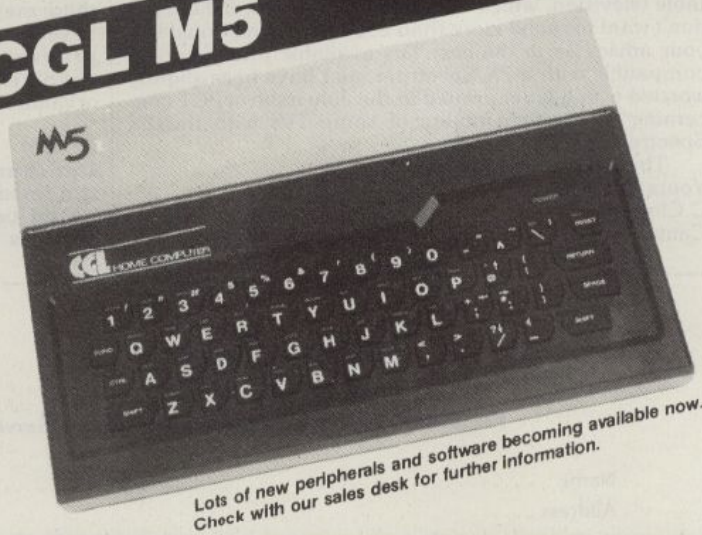
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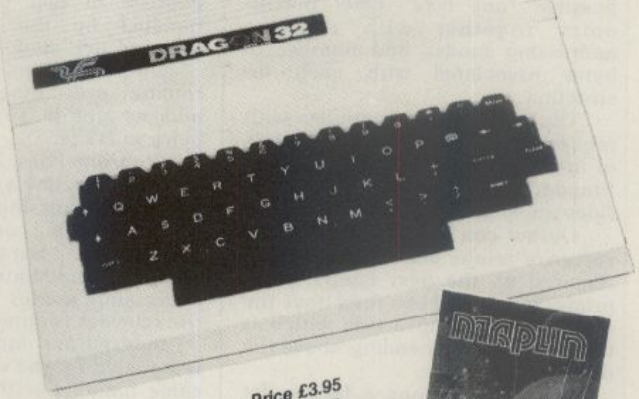
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DYNAMIC DISASSEMBLER

David Berry has assembled an excellent program in the form of a 6809 disassembler for Dragon users.

Dynamic Dragon Disassembler (4D for short) is a comprehensive 6809 disassembler. It not only converts op codes into assembler mnemonics but also correctly handles all 220 post bytes. Written largely in BASIC with a small machine code routine, it is non-the-less fast enough to easily keep ahead of my 30 cps printer.

Using the program

The program starts with an input area. Memory is examined to determine whether the required data file is present and the program loads it from tape if it is not. The data file occupies RAM from 0600h to 0EABh and contains all the possible "one byte" 6809 mnemonics together with relevant addressing modes and number of bytes associated with each instruction.

The input phase continues with requests for start and end addresses of the op code to be disassembled. Standard Dragon number input rules apply so use &H for Hex.

Output can be directed to either screen or printer and this selection is required as the next input. If the printer is selected you then have the option of inputting a title which is then printed as a heading above the disassembled code.

The program has a facility for single stepping. This can be selected by inputting "Y" to the next prompt. Each time "Y" is subsequently pressed a single line of output is produced. Any other keypress will switch the program to continuous output. Pressing "Y" at any stage will then reset single stepping.

If an area of memory is known to contain data rather than code (such as look-up tables, start up data, indirection addresses, etc.) a routine can be selected which provides a column listing of location addresses and their contents. This facility is invoked by entering "D" in response to the next prompt — "C" will select normal code disassembly.

Subroutine "Decode" is called immediately after the input phase and input to the routine is the address of the next location to be examined. The data in RAM is formatted thus:

<cr><MNEMONIC><$\frac{1}{2}$0>
<ADDRESS MODE><$\frac{1}{2}$0>
<No BYTES><cr>

The opcode is used by Decode to index the data file. The search is actually carried out by a machine code routine located at 0E96h. The only exceptions to this search technique are where the op code consists of two bytes; these are handled by the routines called "Second tier" and "Third tier".

Output parameters from the routine are: mnemonic in M$, address type in T$, and number of bytes in BYTE.

Program lines 270 to 330 then select the routine appropriate to the type of addressing mode for the particular op code under consideration. Direct, inherent, relative, immediate, and extended addressing modes are handled by the relevant routine.

Indexed and indirect addressing is handled by the subroutine of the same name. For those of you who are not familiar with 6809 machine code; indexed addressing is provided for by the inclusion of a so called "post byte" which immediately follows the op code and defines the indirection or indexing technique to be used.

There are 220 legal post bytes, but luckily for disassembler writers these fall into two classes. The first class lends itself to simple calcuation; the second class is a repeating sequence modified by the particular bits set in the post byte. Lines 1450 to 1630 handle the simple "five bit" class of post byte, and lines 1640 to 2060 the second class.

Character changes

Of interest here is the use of VARPTR to facilitate character changes within strings. VARPTR (P$), on the Dragon returns the address of the first of four bytes which describe the string. Pointer + 0 has the string length, pointer + 2 and pointer + 3 hold the address of the first byte of the string itself. In other words, VARPTR provides for indirection to the strong first byte.

The data statement in line 1640 contains the basic repeating sequence for class two post bytes. Read the data statement as it stands and add on the appropriate index register name or addresses, substituted for "R" and "MM" and "NN" respectively; all the indexed modes are covered. Enclosing the indexed modes in square brackets then provides representation of the indirect modes. Correct interpretation is provided by this routine.

The print routine at 2170 formats the output correctly and sends it either to the printer or the screen. All numbers are output in Hex. Relative jumps and five-bit indices are converted to positive/negative values. All other output is normal Hex.

Output format is: ADDRESS, MNEMOMIC, MODE, PARAMETER, MACHINE CODE. Mode being indicated by "d" for direct, "*" for relative jumps, "#" for immediate, "i" for indexed or indirect, and "x" for extended. On the screen the machine code appears beneath the disassembled mnemonic.

Parameter changes

Various controls can be input at any time to change the initial para-

meters. "P" will direct the output to the printer; 'S' to the screen. Single stepping can be changed as described elsewhere. "Q" (quit) will end the run prematurely. It is important to end properly as the processor is run at double speed and because the program modifies the data statement in line 1640 this must be reset.

Most of the machine code I write lives above 7000h hence the CLEAR statement in line 40. You may need to change this to suit your own requirements.

PROGRAM LISTING

```
50 PRINT @32,"===DRAGON  6809 DIS-ASSEMBLER==="
60 IF PEEK(&H0600)=13 GOTO 90
70 PRINT"==START TAPE TO LOAD DATA FILE==":CLOADM"DATA"
80 PRINT @96,STRING$(32," ");
90 POKE &HFFD7,0
100 PRINT @95," ";
110 INPUT"ENTER START ADDRESS";ML
120 INPUT"ENTER END ADDRESS";EA
130 IF EA<ML OR ML<0 OR EA<0 OR ML>&HFFFF OR EA>&HFFFF THEN GOTO 40
140 PRINT @224,"SELECT PRTR (P) OR SCRN (S) ? ";
150 Z$=INKEY$:IF Z$="" GOTO 140 ELSE PRINT Z$
160 IF Z$="P" THEN Z=-2:PRINT @224,STRING$(255,"");:PRINT @389,":";:PRINT @389,"
:";:PRINT @469,":";:PRINT @224,"TITLE:";:LINE INPUT H$:PRINT @224,STRING$(255,"
") ELSE Z=0
170 PRINT @256,"SINGLE STEP (Y/N) ? ";
180 X$=INKEY$:IF X$="" GOTO 170 ELSE PRINT X$
190 PRINT @320,"DATA AREA OR CODE ? ";
200 S$=INKEY$:IF S$="" GOTO 190 ELSE PRINT S$
210 PRINT #Z:PRINT #Z,H$;CHR$(13)
220 IF S$="D" GOTO 2290
230 IF S$<>"C" GOTO 200
240 IF X$="Y" THEN X=1 ELSE X=0
250 NL=ML
260 GOSUB 450
270 IF T$="D" GOSUB 1020:GOTO 360
280 IF T$="N" GOSUB 1090:GOTO 360
290 IF T$="R" GOSUB 1140:GOTO 360
300 IF T$="#" GOSUB 1290:GOTO 360
310 IF T$="I" GOSUB 1450:GOTO 360
320 IF T$="E" GOSUB 2070:GOTO 360
330 IF T$="X" GOSUB 2130:GOTO 360
340 CLS:PLAY"T5;AA":PRINT'DATA FILE ERROR"
350 POKE &HFFD6,0
360 GOSUB 2170
370 GOSUB 2440
380 IF G=ASC("Q") GOTO 410
390 IF X=1 THEN X$=INKEY$:IF X$="" GOTO 390
400 IF ML<EA+1 GOTO 240
410 PRINT #Z,"END OF RUN"
420 POKE &HFFD6,0
430 POKE JJ,ASC("R")
440 END: NORMAL END.
450 'SUBROUTINE DECODE.'
460 PT=&H0600
470 OC=PEEK(ML)+1
480 M$=" "
490 IF OC=&H11 GOTO 660
500 IF OC=&H12 GOTO 650
510 IF OC=&H100 THEN M$=" STU":T$="E":BYTE=3:RETURN
520 IF OC>0 THEN POKE &H0E93,OC:EXEC &H0E96:PT=PEEK(&H0E94)*&H100+PEEK(&H0E95)
530 PT=PT-1
540 MT=PT+1
550 PT=PT+1
560 IF PEEK(PT)<>&H0D GOTO 550
570 PT=PT-1
580 BYTE=PEEK(PT)-&H30
590 PT=PT-2
600 TYPE=PEEK(PT)
610 T$=CHR$(TYPE)
620 FOR I=MT TO PT-1
630 M$=M$+CHR$(PEEK(I))
640 NEXT I
650 RETURN
660 'SECOND TIER CODES."
670 ML=ML+1
680 OC=PEEK(ML)
690 IF OC<&H21 THEN PRINT #Z,"ERROR £5 - 2ND TIER CODES"
700 IF OC<&H30 GOSUB 450:M$=" L"+RIGHT$(M$,(LEN(M$)-1)):BYTE=3:RETURN
710 IF OC=&H3F THEN M$=" SWI2":T$="N":BYTE=1:RETURN
720 GOSUB 950
730 TA=OC AND &H0F
740 IF OC>&H8F GOTO 810
750 IF TA=&H03 THEN M$=" CMPD":RETURN
760 IF TA=&H0C THEN M$=" CMPY":RETURN
770 IF TA=&H0E THEN M$=" LDY":RETURN
780 IF TA=&H0F THEN M$=" STY":RETURN
790 PRINT #Z,"ERROR £6B - SECOND TIER CODES"
800 RETURN
810 IF TA=&H0E THEN M$=" LDS":RETURN
820 IF TA=&H0F THEN M$=" STS":RETURN
830 PRINT #Z,"ERROR £6A - SECOND TIER CODES"
840 RETURN
850 'THIRD TIER CODES.'
860 ML=ML+1
870 OC=PEEK(ML)
880 IF OC=&H3F THEN M$=" SWI3":T$="N":BYTE=1:RETURN
890 GOSUB 950
900 TA=OC AND &H0F
910 IF TA=&H03 THEN M$=" CMPU":RETURN
920 IF TA=&H0C THEN M$=" CMPS":RETURN
930 PRINT #Z,"ERROR £7- THIRD TIER CODES"
940 RETURN
950 'MSB SPLITTER FOR 2&3 TIER'
960 TA=OC AND &HF0
970 IF TA=&H80 OR TA=&HC0 THEN T$="#":BYTE=3
980 IF TA=&H90 OR TA=&HD0 THEN T$="D":BYTE=2
990 IF TA=&HA0 OR TA=&HE0 THEN T$="I":BYTE=2
1000 IF TA=&HB0 OR TA=&HF0 THEN T$="E":BYTE=3
1010 RETURN
1020 'SUBROUTINE DIRECT.'
1030 IF BYTE<>2 THEN PRINT #Z,"ERROR £1 - DIRECT ADDRESSING"
1040 A$=HEX$(PEEK(ML+1))
1050 IF LEN(A$)<2 THEN A$="0"+A$
1060 A$="d "+A$
1070 ML=ML+2
1080 RETURN
1090 'SUBROUTINE INHERENT.'
1100 IF BYTE<>1 THEN PRINT #Z,"ERROR £2 - INH ADDRESSING"
1110 A$="  "
1120 ML=ML+1
1130 RETURN
1140 'SUBROUTINE RELATIVE.'
1150 IF BYTE<>2 AND BYTE<>3 THEN PRINT #Z,"ERROR £3 - RELATIVE"
1160 IF BYTE=3 GOTO 1220
1170 ML=ML+1
1180 JM=PEEK(ML)
1190 IF JM>&H7F THEN JM=&H100-JM:A$="x -"+HEX$(JM) ELSE A$="x +"+HEX$(JM)
1200 ML=ML+1
1210 RETURN
1220 ML=ML+1
1230 JM=PEEK(ML)
1240 ML=ML+1
1250 JM=JM*&H100+PEEK(ML)
1260 IF JM>&H7FFF THEN JM=&HFFFF-JM:JM=JM+1:A$="x -"+HEX$(JM) ELSE A$="x +"+HEX$
(JM)
1270 ML=ML+1
1280 RETURN
1290 'SUBROUTINE IMMEDIATE.
1300 IF BYTE<>2 AND BYTE<>3 THEN PRINT #Z,"ERROR £4 - IMMEDIATE"
1310 IF BYTE=3 GOTO 1380
1320 ML=ML+1
1330 A$=HEX$(PEEK(ML))
1340 IF LEN(A$)<2 THEN A$="0"+A$
1350 A$="#"+A$
1360 ML=ML+1
1370 RETURN
1380 ML=ML+1
1390 VA=PEEK(ML)*&H100+PEEK(ML+1)
1400 A$=HEX$(VA)
1410 IF LEN(A$)<4 THEN A$="0"+A$:GOTO 1410
1420 A$="#"+A$
1430 ML=ML+2
1440 RETURN
1450 'SUBROUTINE INDEXED."
1460 ML=ML+1
1470 IF PEEK(ML)>&H7F GOTO 1650
1480 B=PEEK(ML)
1490 IF B<&H20 THEN R$=",X":GOTO 1530
1500 IF B<&H40 THEN R$=",Y":GOTO 1530
1510 IF B<&H60 THEN R$=",U":GOTO 1530
1520 R$=",S"
1530 C=B AND &H10
1540 IF C=&H10 GOTO 1590
1550 C=B AND &H0F
1560 A$="i +"+HEX$(C)+R$
1570 ML=ML+1
1580 RETURN
1590 C=B AND &H0F
1600 C=&H10-C
1610 A$="i -"+HEX$(C)+R$
1620 ML=ML+1
1630 RETURN
1640 DATA ",R+",",R++",",-R",",--R",",R","B,R","A,R","ILL","NN,R","MMNN,R","ILL"
,"D,R","NN,PC","MMNN,PC","ILL","MMNN"
1650 B=PEEK(ML):POKE JJ,ASC("R")
1660 IF B<&HA0 THEN R$="X":GOTO 1700
1670 IF B<&HC0 THEN R$="Y":GOTO 1700
1680 IF B<&HE0 THEN R$="U":GOTO 1700
1690 R$="S"
1700 C=B AND &H0F
1710 RESTORE
1720 I=0
1730 READ P$
1740 IF I<>C THEN I=I+1:GOTO 1730
1750 C=VARPTR(P$)
1760 C=PEEK(C+2)*&H100+PEEK(C+3)
1770 IF C<0 THEN C=65536+C
1780 L=LEN(P$)
1790 FOR I=C TO C+L
1800 IF PEEK(I)=ASC("R") THEN POKE I,ASC(R$):JJ=I
1810 NEXT I
1820 IF PEEK(C)=ASC("M") GOSUB 1920
1830 IF PEEK(C)=ASC("N") GOSUB 2000
1840 C=B AND &H10
1850 IF C=&H10 GOTO 1890
1860 A$="i "+P$
1870 ML=ML+1
1880 RETURN
1890 A$="i ["+P$+"]"
1900 ML=ML+1
```

DYNAMIC DISASSEMBLER

```
1910 RETURN
1920 ML=ML+1
1930 D=PEEK(ML)*&H100+PEEK(ML+1)
1940 D$=HEX$(D)
1950 IF LEN(D$)<4 THEN D$="0"+D$:GOTO 1950
1960 P$=RIGHT$(P$,(LEN(P$)-4))
1970 P$=D$+P$
1980 ML=ML+1
1990 RETURN
2000 ML=ML+1
2010 D=PEEK(ML)
2020 D$=HEX$(D)
2030 IF LEN(D$)<2 THEN D$="0"+D$
2040 P$=RIGHT$(P$,(LEN(P$)-2))
2050 P$=D$+P$
2060 RETURN
2070 'SUBROUTINE EXTENDED.'
2080 IF BYTE(<)3 THEN PRINT £2,"ERROR £5 - EXTENDED"
2090 GOSUB 1380
2100 A$=RIGHT$(A$,(LEN(A$)-1))
2110 A$="x"+A$
2120 RETURN
2130 'SUBROUTINE ILLEGAL.'
2140 A$="<- ERR CODE"
2150 ML=ML+1
2160 RETURN
2170 'PRINT ON PRINTER.'
2180 D$=HEX$(NL)
2190 IF LEN(D$)<4 THEN D$="0"+D$:GOTO 2190 ELSE D$="$ "+D$
2200 PRINT £2,TAB(1);D$;TAB(10);M$;TAB(20);A$;TAB(31),"#";
2210 PRINT CHR$(08);" $";
2220 FOR I=NL TO ML-1
2230 K$=HEX$(PEEK(I))
2240 IF LEN(K$)<2 THEN K$="0"+K$
2250 PRINT £2,K$+" ";
2260 NEXT I
2270 PRINT £2
2280 RETURN
2290 'DATA AREA LISTING.'
2300 FOR K=ML TO ER STEP 16
2310 IF X$="Y" THEN X=1 ELSE X=0
2320 NL=K
2330 ML=K+16
2340 M$=" DATA"
2350 A$="======"
2360 GOSUB 2170
2370 GOSUB 2440
2380 IF G=ASC("Q") GOTO 2410
2390 IF X=1 THEN X$=INKEY$:IF X$="" GOTO 2390
2400 NEXT K
2410 POKE &HFFD6,0
2420 PRINT £2,"END OF DATA RUN"
2430 END
2440 'CONTROLS.'
2450 G=PEEK(135)
2460 IF G=ASC("Y") THEN X=1
2470 IF G=ASC("P") THEN Z=-2
2480 IF G=ASC("S") THEN Z=0
2490 RETURN
```

DATA FILE. 0600h TO 0EA9h.

```
$ 0600   DATA   ======   #0D 4E 45 47 20 44 20 32 0D 45 30 31 20 50 20 31
$ 0610   DATA   ======   #0D 45 30 32 20 58 20 31 0D 43 4F 4D 20 44 20 32
$ 0620   DATA   ======   #0D 4C 53 52 20 44 20 32 0D 45 30 35 20 58 20 31
$ 0630   DATA   ======   #0D 52 4F 52 20 44 20 32 0D 41 53 52 20 44 20 32
$ 0640   DATA   ======   #0D 41 53 4C 2F 4C 53 4C 20 44 20 32 0D 52 4F 4C
$ 0650   DATA   ======   #20 44 20 32 0D 44 45 43 20 44 20 32 0D 45 30 42
$ 0660   DATA   ======   #20 58 20 31 0D 49 4E 43 20 44 20 32 0D 54 53 54
$ 0670   DATA   ======   #20 44 20 32 0D 4A 4D 50 20 44 20 32 0D 43 4C 52
$ 0680   DATA   ======   #20 44 20 32 0D 45 31 30 20 58 20 31 0D 45 31 31
$ 0690   DATA   ======   #20 58 20 31 0D 4E 4F 50 20 4E 20 31 0D 53 59 4E
$ 06A0   DATA   ======   #43 20 4E 20 31 0D 45 31 34 20 58 20 31 0D 45 31
$ 06B0   DATA   ======   #35 20 58 20 31 0D 4C 42 52 41 20 52 20 33 0D 4C
$ 06C0   DATA   ======   #42 53 52 20 52 20 33 0D 45 31 30 20 58 20 31 0D
$ 06D0   DATA   ======   #44 41 41 20 4E 20 31 0D 4F 52 43 43 20 23 20 32
$ 06E0   DATA   ======   #0D 45 31 42 20 58 20 31 0D 41 4E 44 43 43 20 23
$ 06F0   DATA   ======   #20 32 0D 53 45 58 20 4E 20 31 0D 45 58 47 20 23
$ 0700   DATA   ======   #20 32 0D 54 46 52 20 23 20 32 0D 42 52 41 20 52
$ 0710   DATA   ======   #20 32 0D 42 52 4E 20 52 20 32 0D 42 48 49 20 52
$ 0720   DATA   ======   #20 32 0D 42 4C 53 20 52 20 32 0D 42 48 53 2F 42
$ 0730   DATA   ======   #43 43 20 52 20 32 0D 42 4C 4F 2F 42 43 53 20 52
$ 0740   DATA   ======   #20 32 0D 42 4E 45 20 52 20 32 0D 42 45 51 20 52
$ 0750   DATA   ======   #20 32 0D 42 56 43 20 52 20 32 0D 42 56 53 20 52
$ 0760   DATA   ======   #20 32 0D 42 50 4C 20 52 20 32 0D 42 4D 49 20 52
$ 0770   DATA   ======   #20 32 0D 42 47 45 20 52 20 32 0D 42 4C 54 20 52
$ 0780   DATA   ======   #20 32 0D 42 47 54 20 52 20 32 0D 42 4C 45 20 52
$ 0790   DATA   ======   #20 32 0D 4C 45 41 52 20 49 20 32 0D 4C 45 41 59
$ 07A0   DATA   ======   #20 49 20 32 0D 4C 45 41 53 20 49 20 32 0D 4C 45
$ 07B0   DATA   ======   #41 55 20 49 20 32 0D 50 53 48 53 20 23 20 32 0D
$ 07C0   DATA   ======   #50 55 4C 53 20 23 20 32 0D 50 53 48 55 20 23 20
$ 07D0   DATA   ======   #32 0D 50 55 4C 55 20 23 20 32 0D 45 33 36 20 58
$ 07E0   DATA   ======   #20 31 0D 52 54 53 20 4E 20 31 0D 41 42 58 20 4E
$ 07F0   DATA   ======   #20 31 0D 52 54 49 20 4E 20 31 0D 43 57 41 49 20
$ 0800   DATA   ======   #23 20 32 0D 4D 55 4C 20 4E 20 31 0D 45 33 45 20
$ 0810   DATA   ======   #58 20 31 0D 53 57 49 20 4E 20 31 0D 4E 45 47 41
$ 0820   DATA   ======   #20 4E 20 31 0D 45 34 31 20 58 20 31 0D 45 34 32
$ 0830   DATA   ======   #20 58 20 31 0D 43 4F 4D 41 20 4E 20 31 0D 4C 53
$ 0840   DATA   ======   #52 41 20 4E 20 31 0D 45 34 35 20 58 20 31 0D 32
$ 0850   DATA   ======   #4F 52 41 20 4E 20 31 0D 41 53 52 41 20 4E 20 31
$ 0860   DATA   ======   #0D 41 53 4C 41 2F 4C 53 4C 41 20 4E 20 31 0D 52
$ 0870   DATA   ======   #4F 4C 41 20 4E 20 31 0D 44 45 43 41 20 4E 20 31
$ 0880   DATA   ======   #0D 45 34 42 20 58 20 31 0D 49 4E 43 41 20 4E 20
$ 0890   DATA   ======   #31 0D 54 53 54 41 20 4E 20 31 0D 45 34 45 20 58
$ 08A0   DATA   ======   #20 31 0D 43 4C 52 41 20 4E 20 31 0D 4E 45 47 42
$ 08B0   DATA   ======   #20 4E 20 31 0D 45 45 35 31 20 58 20 31 0D 45 35
$ 08C0   DATA   ======   #32 20 4E 20 31 0D 43 4F 4D 42 20 4E 20 31 0D 4C
$ 08D0   DATA   ======   #53 52 42 20 4E 20 31 0D 45 35 35 20 58 20 31 0D
$ 08E0   DATA   ======   #52 4F 52 42 20 4E 20 31 0D 41 53 52 42 20 4E 20
$ 08F0   DATA   ======   #31 0D 41 53 4C 42 2F 4C 53 4C 42 20 4E 20 31 0D
$ 0900   DATA   ======   #52 4F 4C 42 20 4E 20 31 0D 44 45 43 42 20 4E 20
$ 0910   DATA   ======   #31 0D 45 35 42 20 58 20 31 0D 49 4E 43 42 20 4E
$ 0920   DATA   ======   #20 31 0D 54 53 54 42 20 4E 20 31 0D 45 35 45 20
$ 0930   DATA   ======   #58 20 31 0D 43 4C 52 42 20 4E 20 31 0D 4E 45 47
$ 0940   DATA   ======   #20 49 20 32 0D 45 36 31 20 58 20 31 0D 45 36 32
$ 0950   DATA   ======   #20 58 20 31 0D 43 4F 4D 20 49 20 32 0D 4C 53 52
$ 0960   DATA   ======   #20 49 20 32 0D 45 36 35 20 58 20 31 0D 52 4F 52
$ 0970   DATA   ======   #20 49 20 32 0D 41 53 52 20 49 20 32 0D 41 53 4C
$ 0980   DATA   ======   #2F 4C 53 4C 20 49 20 32 0D 52 4F 4C 20 49 20 32
$ 0990   DATA   ======   #0D 44 45 43 20 49 20 32 0D 45 36 42 20 58 20 31
$ 09A0   DATA   ======   #0D 49 4E 43 20 49 20 32 0D 54 53 54 20 49 20 32
$ 09B0   DATA   ======   #0D 4A 4D 50 20 49 20 32 0D 43 4C 52 20 49 20 32
$ 09C0   DATA   ======   #0D 4E 45 47 20 45 20 33 0D 45 37 31 20 58 20 31
$ 09D0   DATA   ======   #0D 45 37 32 20 58 20 31 0D 43 4F 4D 20 45 20 33
$ 09E0   DATA   ======   #0D 4C 53 52 20 45 20 33 0D 45 37 35 20 58 20 31
$ 09F0   DATA   ======   #0D 52 4F 52 20 45 20 33 0D 41 53 52 20 45 20 33
$ 0A00   DATA   ======   #0D 41 53 4C 2F 4C 53 4C 20 45 20 33 0D 52 4F 4C
$ 0A10   DATA   ======   #20 45 20 33 0D 44 45 43 20 45 20 33 0D 45 37 42
$ 0A20   DATA   ======   #20 58 20 31 0D 49 4E 43 20 45 20 33 0D 54 53 54
$ 0A30   DATA   ======   #20 45 20 33 0D 4A 4D 50 20 45 20 33 0D 43 4C 52
$ 0A40   DATA   ======   #20 45 20 33 0D 53 55 42 41 20 23 20 32 0D 43 4D
$ 0A50   DATA   ======   #50 41 20 23 20 32 0D 53 42 43 41 20 23 20 32 0D
$ 0A60   DATA   ======   #53 55 42 44 20 23 20 33 0D 41 4E 44 41 20 23 20
$ 0A70   DATA   ======   #32 0D 42 49 54 41 20 23 20 32 0D 4C 44 41 20 23
$ 0A80   DATA   ======   #20 32 0D 45 45 38 37 20 58 20 31 0D 45 4F 52 41
$ 0A90   DATA   ======   #20 23 20 32 0D 41 44 43 41 20 23 20 32 0D 4F 52
$ 0AA0   DATA   ======   #41 20 23 20 32 0D 41 44 44 41 20 23 20 32 0D 43
$ 0AB0   DATA   ======   #4D 50 58 20 23 20 33 0D 42 53 52 20 52 20 32 0D
$ 0AC0   DATA   ======   #4C 44 58 20 23 20 33 0D 45 38 46 20 58 20 31 0D
$ 0AD0   DATA   ======   #53 55 42 41 20 44 20 32 0D 43 4D 50 41 20 44 20
$ 0AE0   DATA   ======   #32 0D 53 42 43 41 20 44 20 32 0D 53 55 42 44 20
$ 0AF0   DATA   ======   #44 20 32 0D 41 4E 44 41 20 44 20 32 0D 42 49 54
$ 0B00   DATA   ======   #41 20 44 20 32 0D 4C 44 41 20 44 20 32 0D 53 54
$ 0B10   DATA   ======   #41 20 44 20 32 0D 45 4F 52 41 20 44 20 32 0D 41
$ 0B20   DATA   ======   #44 43 41 20 44 20 32 0D 4F 52 41 20 44 20 32 0D
$ 0B30   DATA   ======   #41 44 44 41 20 44 20 32 0D 43 4D 50 58 20 44 20
$ 0B40   DATA   ======   #32 0D 4A 53 52 20 44 20 32 0D 4C 44 58 20 44 20
$ 0B50   DATA   ======   #32 0D 53 54 58 20 44 20 32 0D 53 55 42 41 20 49
$ 0B60   DATA   ======   #20 32 0D 43 4D 50 41 20 49 20 32 0D 53 42 43 41
$ 0B70   DATA   ======   #20 49 20 32 0D 53 55 42 44 20 49 20 32 0D 41 4E
$ 0B80   DATA   ======   #44 41 20 49 20 32 0D 42 49 54 41 20 49 20 32 0D
$ 0B90   DATA   ======   #4C 44 41 20 49 20 32 0D 53 54 41 20 49 20 32 0D
$ 0BA0   DATA   ======   #45 4F 52 41 20 49 20 32 0D 41 44 43 41 20 49 20
$ 0BB0   DATA   ======   #32 0D 4F 52 41 20 49 20 32 0D 41 44 44 41 20 49
$ 0BC0   DATA   ======   #20 32 0D 43 4D 50 58 20 49 20 32 0D 4A 53 52 20
$ 0BD0   DATA   ======   #49 20 32 0D 4C 44 58 20 49 20 32 0D 53 54 58 20
$ 0BE0   DATA   ======   #49 20 32 0D 53 55 42 41 20 45 20 33 0D 43 4D 50
$ 0BF0   DATA   ======   #41 20 45 20 33 0D 53 42 43 41 20 45 20 33 0D 53
$ 0C00   DATA   ======   #55 42 44 20 45 20 33 0D 41 4E 44 41 20 45 20 33
$ 0C10   DATA   ======   #0D 42 49 54 41 20 45 20 33 0D 4C 44 41 20 45 20
$ 0C20   DATA   ======   #33 0D 53 54 41 20 45 20 33 0D 45 4F 52 41 20 45
$ 0C30   DATA   ======   #20 33 0D 41 44 43 41 20 45 20 33 0D 4F 52 41 20
$ 0C40   DATA   ======   #45 20 33 0D 41 44 44 41 20 45 20 33 0D 43 4D 50
$ 0C50   DATA   ======   #58 20 45 20 33 0D 4A 53 52 20 45 20 33 0D 4C 44
$ 0C60   DATA   ======   #58 20 45 20 33 0D 53 54 58 20 45 20 33 0D 53 55
$ 0C70   DATA   ======   #42 42 20 23 20 32 0D 43 4D 50 42 20 23 20 32 0D
$ 0C80   DATA   ======   #53 42 43 42 20 23 20 32 0D 41 44 44 44 20 23 20
$ 0C90   DATA   ======   #33 0D 41 4E 44 42 20 23 20 32 0D 42 49 54 42 20
$ 0CA0   DATA   ======   #23 20 32 0D 4C 44 42 20 23 20 32 0D 45 43 37 20
$ 0CB0   DATA   ======   #58 20 31 0D 45 4F 52 42 20 23 20 32 0D 41 44 43
$ 0CC0   DATA   ======   #42 20 23 20 32 0D 4F 52 42 20 23 20 32 0D 41 44
$ 0CD0   DATA   ======   #44 42 20 23 20 32 0D 4C 44 44 20 23 20 33 0D 45
$ 0CE0   DATA   ======   #43 44 20 58 20 31 0D 4C 44 55 20 23 20 33 0D 45
$ 0CF0   DATA   ======   #43 46 20 58 20 31 0D 53 55 42 42 20 44 20 32 0D
$ 0D00   DATA   ======   #43 4D 50 42 20 44 20 32 0D 53 42 43 42 20 44 20
$ 0D10   DATA   ======   #32 0D 41 44 44 44 20 44 20 32 0D 41 4E 44 42 20
$ 0D20   DATA   ======   #44 20 32 0D 42 49 54 42 20 44 20 32 0D 4C 44 42
$ 0D30   DATA   ======   #20 44 20 32 0D 53 54 42 20 44 20 32 0D 45 4F 52
$ 0D40   DATA   ======   #42 20 44 20 32 0D 41 44 43 42 20 44 20 32 0D 4F
$ 0D50   DATA   ======   #52 42 20 44 20 32 0D 41 44 44 42 20 44 20 32 0D
$ 0D60   DATA   ======   #4D 44 44 20 44 20 32 0D 53 54 44 20 44 20 32 0D
$ 0D70   DATA   ======   #4D 44 55 20 44 20 32 0D 53 54 55 20 44 20 32 0D
$ 0D80   DATA   ======   #53 55 42 42 20 49 20 32 0D 43 4D 50 42 20 49 20
$ 0D90   DATA   ======   #32 0D 53 42 43 42 20 49 20 32 0D 41 44 44 44 20
$ 0DA0   DATA   ======   #49 20 32 0D 41 4E 44 42 20 49 20 32 0D 42 49 54
$ 0DB0   DATA   ======   #42 20 49 20 32 0D 4C 44 42 20 49 20 32 0D 53 54
$ 0DC0   DATA   ======   #42 20 49 20 32 0D 45 4F 52 42 20 49 20 32 0D 41
$ 0DD0   DATA   ======   #44 43 42 20 49 20 32 0D 4F 52 42 20 49 20 32 0D
$ 0DE0   DATA   ======   #41 44 44 42 20 49 20 32 0D 4C 44 44 20 49 20 32
$ 0DF0   DATA   ======   #0D 53 54 44 20 49 20 32 0D 4C 44 55 20 49 20 32
$ 0E00   DATA   ======   #0D 53 54 55 20 49 20 32 0D 53 55 42 42 20 45 20
$ 0E10   DATA   ======   #33 0D 43 4D 50 42 20 45 20 33 0D 53 42 43 42 20
$ 0E20   DATA   ======   #45 20 33 0D 41 44 44 44 20 45 20 33 0D 41 4E 44
$ 0E30   DATA   ======   #42 20 45 20 33 0D 42 49 54 42 20 45 20 33 0D 4C
$ 0E40   DATA   ======   #44 42 20 45 20 33 0D 53 54 42 20 45 20 33 0D 45
$ 0E50   DATA   ======   #4F 52 42 20 45 20 33 0D 41 44 43 42 20 45 20 33
$ 0E60   DATA   ======   #0D 4F 52 42 20 45 20 33 0D 41 44 44 42 20 45 20
$ 0E70   DATA   ======   #33 0D 4C 44 44 20 45 20 33 0D 53 54 44 20 45 20
$ 0E80   DATA   ======   #33 0D 4C 44 55 20 45 20 33 0D 53 54 55 20 45 20
$ 0E90   DATA   ======   #33 0D FF 00 06 41 8E 20 FF 30 01 A6 84 81 0D 26
$ 0EA0   DATA   ======   #F8 7A 0E 93 26 F3 30 01 BF 0E 94 39 74 7A 7E 7E
END OF DATA RUN
```

DIS-ASSEMBLED ROUTINE. 0E96h TO 0EA8h.

```
$ 0E96   LDX    £ 05FF     #8E 05 FF
$ 0E99   LEAX   1 +1,X     #30 01
$ 0E9B   LDA    1 ,X       #A6 84
$ 0E9D   CMPA   £ 0D       #81 0D
$ 0E9F   BNE    % -8       #26 F8
$ 0EA1   DEC    x 0E93     #7A 0E 93
$ 0EA4   BNE    % -D       #26 F3
$ 0EA6   LEAX   1 +1,X     #30 01
$ 0EA8   STX    x 0E94     #BF 0E 94
$ 0EAB   RTS               #39
END OF RUN
```

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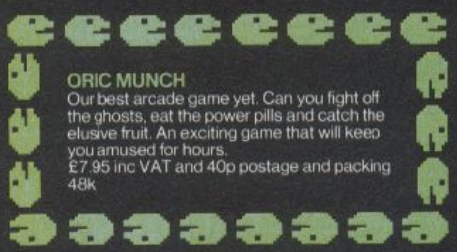
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Price: £14.50 including VAT and 90p postage and packing.

ZODIAC
A traditional adventure game in which the player has to find the 12 cunningly hidden signs of the Zodiac which lead him to greater treasures. The player manipulates objects through simple sentences which the program can understand and can ask for his score at any time. A save game feature is also included. Requires a 48k machine.
Price: £9.99 included VAT and 40p postage and packing.

ORIC-CHESS
Using high resolution graphics to display the chess board this package will play a challenging game of chess with five levels of skill. The computer looks ahead for its own moves plus its opponent's. The skill level dictates how far the computer looks ahead although at the expense of more time. All chess rules including Castling and En Passant are obeyed. Requires a 48k machine.
Price: £9.99 including VAT and 40p postage and packing.

ORIC FORTH
This is a cassette-based implementation of FIG-FORTH, the language distributed by the Forth Interest Group in the United States. It has been extended to utilise the graphics and sound capabilities of the Oric. It is supplied with an editor and a full Forth assembler.
A 96-page manual is included in the package. A demonstration music program is also supplied. Requires a 48k machine.
Price: £15.00 including VAT and 90p postage and packing.

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GAMES

SOFTWARE REVIEWS

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!

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.

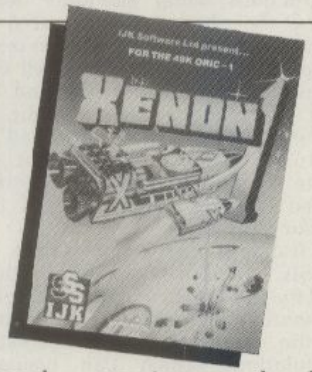
Ratings are done on a "Five stars is excellent, one is hopeless" basis, with the reviewer then scoring the supplied package as a whole on a percentage scale.

This month our software reviews section is bigger than ever, with eight pages in all. Read on for the first part and turn to p89 for the second part.

Title:	**Xenon-1**
Type:	**Tape**
Supplier:	**IJK Software**
Machine:	**Oric -1 48K**
Price:	**£8.50**

This is a must for Oric owners who like fast action arcade style games. With three space ships at your disposal you journey through space to the planet Randon encountering alien Aards that you must destroy. You are then bombarded by meteorites and finally you reach Randon only to be attacked by Paratrons. Having survived all this you must then take on and destroy the Zorgon battle star.

A great fun game liable to promote a nervous breakdown until you learn the techniques and develop your reactions, and then – you've



guessed – you increase the skill level and get blasted out of existence again.

Written almost entirely in machine code the program has very high quality high resolution graphics and all the usual battle type sounds. The instructions are good but omit to tell you how to record your name on the "hall of fame" scoresheet – and it's no good trying to LIST the program to help you. The program itself is crashproof even to the most over excited fingers.

I found the game so compelling that I didn't care about the "hall of fame" or the score I achieved, I just wanted to get past those Paratons to have a go at the battle star.

P.W.

Ratings Table

Program Quality	★ ★ ★ ★ ★
Value for Money	★ ★ ★ ★ ★
Presentation On-screen	★ ★ ★ ★ ★
Ease of Use	★ ★ ★ ★
Crashproofing	★ ★ ★ ★ ★
Supplied Instructions	★ ★ ★
Overall	90%

SOFTWARE REVIEWS

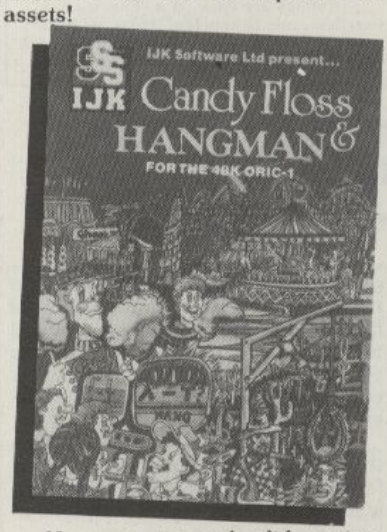
Title:	Candyfloss – Hangman
Type:	Tape
Supplier:	IJK Software
Machine:	Oric -1 48K
Price:	£7.50

Another tape from IJK Software with two games; this one making use of Oric's sound and graphics capabilities to good effect.

Candyfloss is a selling game in which you run your own business making and selling candyfloss on Blackpool's Golden Mile. There are the comforting sounds of the sea breaking on the beach and tunes to accompany the weather forecast as you battle to make enough money to buy another cassette! But be wary for there are also several disasters to trap you.

The program is written entirely in BASIC, is easy to use and is crashproof. Up to 15 people can play though I think for such a large group the progress of the game would be too slow.

The screen presentation uses low resolution graphics and is colourful and appropriate to the game. The only trouble is that having played it a few times I quickly lost interest – as well as capital and assets!



Hangman is a splendid version of the favourite game and again combines the best of Oric's musical and graphic abilities. The rules and progression of the game are well known and need no explanation here. The program contains seven categories each of 60 words with the facility for you to add your own category and words if you wish. The instructions are adequate and the game provides good fun for all ages. The low resolution graphics mode draws the victim and you can watch his expression change as the game progresses.

P.W.

Ratings Table

Program Quality	• • • •
Value for Money	• • •
Presentation On-screen	• • • •
Ease of Use	• • • •
Crashproofing	• • • • •
Supplied Instructions	• • •
Overall	65%

Title:	Maze 3D – Breakout
Type:	Tape
Supplier:	IJK Software
Machine:	Oric-1 48K
Price:	£7.50

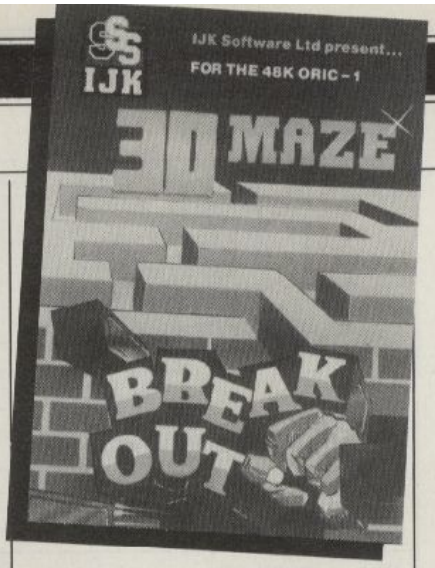
With two games on this cassette you are sure of variety from the outset.

Maze-3D follows the traditional line of random maze generation with predetermined start and finish cells, the object being to make your way through the maze with the minimum number of moves and the shortest thinking time. The program is written in BASIC and utilises one short machine code subroutine in conjunction with Oric's high resolution graphics to produce the 3D display of up to eight cells with walls or gaps to left and right as and when they occur. The exit is marked with two large Xs filling the end wall. A map is available on request, the map display being made up of redefined lower case characters.

The program was easy to use, instructions being adequate but I found the choice of keys used to move through the maze rather inappropriate. The instructions tell you to use "L" to move forward and " " and " " to move left and right. In fact you have to use the unshifted "," and "●" to move left and right. As there is minimal need for reaction speed I would have preferred the cursor shift keys.

Random maze generation in BASIC can take a considerable time and for the larger mazes the display reassuringly provides an indication of the progress of the necessary calculations which can typically take about three minutes to complete.

Breakout is an entertaining version of the arcade game with several options for both the construction of the walls and the speed of play to demolish them. At its fastest it was far too much for me, the occasional



hit of the 'square' ball being more attributable to luck than skill. At moderate speeds I found the game compelling and liked the refinement of automatically progressing the difficulty rating to match acquired skill. Paddle motion is provided through left and right cursor shift keys and "Z" and "C" keys allowing single or double handed operation. Instructions and screen presentation were both good.

P.W.

Ratings Table

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

Title:	Star Trek
Type:	Tape
Supplier:	Program Power
Machine:	BBC A or B
Price:	£5.50

Of course, nearly everyone who has played a game on one of the well-established micros has probably played one version or other of 'Star Trek', a game inspired by the TV series.

Basically Star Trek (the game) consists of a network of sectors and quadrants which contain stars, planets, bases and klingons in varying quantities. Time is usually counted by each move the player makes, although there are real-time versions. Most often, the objective is to kill Klingons. Although never having achieved the highest accolade in the Lance Micklus version, I sometimes suspect that the unmentioned objective is the authentic one – To Boldly Go Where No Man Has Gone Before –

using weapons only when necessary.

Be that as it may, this version of the game quite definitely tells you that 20 Klingons must be destroyed. I blundered into the game with the expertise of a Blake's 7 fan, and was somewhat peeved to find that my ship's computer had bombed out without having suffered a single attack. As I traversed the Galaxy (with difficulty) I found that the Klingons seemed to be diminishing in number without my having fired a single phaser or photon torpedo. Was this a 2-player game on 2 computers, I wondered – I had heard such wonderful things about the BBC micro! I looked for the tell-tale sign of leads disappearing under the door, but nothing! In frustration I pressed RETURN and found even fewer Klingons around. Having decided the computer was definitely on my side I tried releasing a photon torpedo towards the nearest star. Now in all the other versions I have played that would have meant at least a court-martial! But no, the star obligingly absorbed the energy. This is a game for cissies, I thought, and reached for the ON/OFF switch.

I cannot conceal my disappointment in this game. The BBC has much to offer in colour graphics and sound. A wealth of Star Trek versions exist to be enhanced. This game gave minimal sound 'blips', coarse graphics, and very little colour. And as a version of Star Trek it is just not good enough! Rushed through to cash in on the BBC market? As yet I've not seen a game that caused me to regret that I didn't rush out to buy a BBC machine – and this one serves to reinforce my view!

K.C.

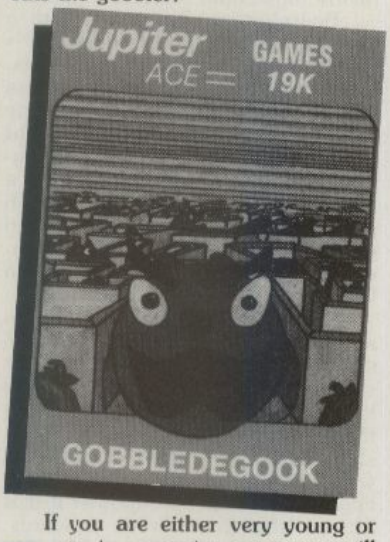
Ratings Table

Program Quality	• •
Value for Money	•
Presentation On-screen	•
Ease of Use	• • •
Crashproofing	• • •
Supplied Instructions	• • •
Overall	20%

Title:	**Gobbledegook**
Type:	**Tape**
Supplier:	**Jupiter Cantab**
Machine:	**Ace 19K**
Price:	**£7.95**

This version of the game is not particularly user-friendly and suffers from a profound identity crisis. It is first of all the game that dares not speak its name, which of course should really be P--man. And in fact this is just a FOURTH re-hash of that tired old arcade game, but on the body of the cassette it proclaims itself as GOBBLE*DE*GOOK and tells you to load and run it under that name. You could waste a lot of time trying, but eventually a close study of the cassette case will reveal that the magic word is NOT as you were told but in fact GOBBLEGOOK – that is, without the central 'DE'.

Even then your troubles may not be over, since the volume level for loading is very critical. But persevere, and you will be rewarded with a maze full of dots, a voracious mobile mouth to consume them, 'gooks' to eat the mouth if it is insufficiently nimble, and 'powerpacks' which if consumed enable the gobbler to eat gooks for seven seconds. You have two levels of cannibalistic difficulty and three lives, one of which the on-screen instructions say you "lose" every time a gook eats the gobbler.



If you are either very young or very new to computer-games you will be struck by the marvellous originality and ingenuity of all this and delighted by the continuous noise emission which accompanies it. The game makes up with speed what it lacks in colour and the players' scores are recorded on screen. Even experienced arcade players will be kept hard at it manipulating the Ace's rubber keys to improve their scores.

A good implementation, once you have it running, but pricey for what you get.

G.M.

Ratings Table

Program Quality	• • •
Value for Money	• •
Presentation On-screen	• • • •
Ease of Use	• • •
Crashproofing	• • • •
Supplied Instructions	• • •
Overall	65%

Title:	**The Castle**
Type:	**Tape**
Supplier:	**Bug-Byte**
Machine:	**Spectrum 16/48K**
Price:	**£6.95**

This 16K adventure takes place in a musty old castle, which seems to belong to a rather anti-social wizard, who on finding out he has visitors, promptly sets them the task of obtaining six treasures he has hidden in one of the rooms. Failure to collect these articles will result in your having to wander through the castle ad infinitum. An excellent inlay card provides an entertaining storyline as well as above average hints and instructions, but missing the usual LOAD " " note.

The game turns out to be pure text adventure (in 16K what do you expect), which unfortunately suffers from an unresponsive and soggy keyboard. This causes numerous spelling mistakes and rather odd spacings when normal typing pressure is applied, but the technique soon becomes obvious. The program will accept the occasional spelling error, but it is annoying having to keep deleting words and retyping them. The choice of words has to be thought hard about due to the obviously limited vocabulary, but there are hints given to help. Also some of the programmer's humour is conveyed in some of the witty replies given. As adventure games are not exactly my forte I was a little stumped at first, but with perseverence and a little HELP from my friends, I achieved quite a respectable score.

In comparison with other 16K adventure games, I suppose this one from Bug-Byte is par for the course, but obviously the idea is to continually improve the standards and I feel that with this one they are on the right track, even if it is a little expensive.

G.W.

Ratings Table

Program Quality	• • • •
Value for Money	• • •
Presentation On-screen	• • •
Ease of Use	• • •
Crashproofing	• • • •
Supplied Instructions	• • • •
Overall	65%

SOFTWARE REVIEW

Title:	**Bonka**
Type:	**Tape**
Supplier:	**J. Morrison**
Machine:	**Dragon 32**
Price:	**£7.95**

On loading this game an impressive title page scrolls up the screen. The instructions then follow 15 seconds later.

A little man is controlled with the cursor control keys and no joystick is needed. You can make him run up and down ladders and across different levels, with the objective of making 'Meanies' fall and break their necks. To do this you dig holes everywhere possible and wait for a meanie to fall into one. You then race to a hole and 'Bonk' (push) him through. You have to be quick however, for as soon as the meanies turn yellow they can escape out of the holes. Points are awarded on how far a meanie falls.

There are two ways you can die: (a) Your oxygen runs out or (b) You collide with a meanie. You have three lives in all and can select the difficulty of the game. It has four speeds and you can select from one to nine meanies. As the game progresses, difficulty increases. It logs the top five high scores with the players' names.

The graphics and colour are very good and the man especially is very realistic. However, there was no sound during the game, which was a bit disappointing. Unfortunately the game required too high a degree of accuracy making it infuriatingly hard to go up ladders or 'Bonk' a meanie down a hole. A slight bug in the program was that you couldn't dig holes near ladders.

Definitely good value for money, despite the bugs, as you soon got addicted to it.

S.F.

Ratings Table

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

Title:	**Scorpion**
Type:	**Tape**
Supplier:	**Sumlock**
Machine:	**Unexpanded VIC-20**
Price:	**£7.95**



Scorpion is Sumlock's version of the Arcade game 'Centipede'. When the game is loaded the computer plays a short burst of the "Star Wars" theme music and starts the game.

Scorpion can be played with a joystick or using the computer's keyboard. You start with three lives. Cacti are randomly strewn across the screen and a centipede-type creature starts to descend from right to left. Whenever it is hit the centipede splits from the spot where a segment was destroyed and each part finds its way through the cacti in opposite directions. The centipede also changes direction when it hits a cactus.

Every so often a spider bounces across the lower portion of the screen gobbling up cacti, but if your ship comes into contact with it you lose one life. Every few games, on the 2nd and 3rd screens, an object shaped like a piece of seaweed wends its way across the cacti field. High points can be obtained if it is hit on the 2nd screen upwards. Rocks fall from the top and leave a trail of new cacti.

After a whole centipede has been destroyed a new screen is generated and everything has a different colour. The only drawback is that no further instructions are given after those shown at the beginning of the game.

J.G.

Ratings Table

Program Quality	• • • • •
Value for Money	• • • • •
Presentation On-screen	• • • • •
Ease of Use	• • • • •
Crashproofing	• • • •
Supplied Instructions	• • • •
Overall	90%

Title:	**Franklins Tomb**
Type:	**Tape**
Supplier:	**Salamander Software**
Machine:	**Dragon 32**
Price:	**£9.95**

This arrived in novel, colourful packaging which immediately caught my eye and my interest.

When run it displays a black and white title page and plays the Pink Panther Theme. You are Dan Diamond, an ex-cop, and a letter in the morning post says "Please come you are our only hope!". You go to the address stated and there you find a large stone crypt looming out of the darkness. You slowly walk in and start falling further and further down, eventually landing in the entrance room. You light your candle with one of the burning torches and you set off on an exploration of a network of rooms (i.e. the aquarium and embalming room) and passages. Your final goal is to find and unlock the secret of the tomb. Throughout the game you find and use many objects which help you to explore and discover the catacomb of rooms.

In all the game has a vocabulary of 50 verbs and 80 nouns. The solutions to the problems require lateral thinking and sometimes the odd silly conclusion. Franklins Tomb is a hundred percent BASIC program and I would have preferred it if it had been machine code, as response was about 3 - 5 seconds. It is one of the traditional text only adventures and comes complete with a 20 page booklet containing 24 well drawn illustrations of various unusual locations in the adventure.

It uses a formatted screen which constantly tells you the objects you are carrying (a maximum of six), the room descriptions and available exits. The save game facility is available and very useful.

If I had solved the puzzle quickly I would have considered £10 a lot of money to pay, but as it is I might be writing off to Salamander for extra clues.

S.F.

Ratings Table

Program Quality	• • • • •
Value for Money	• • • •
Presentation On-screen	• • • •
Ease of Use	• • • •
Crashproofing	• • • •
Supplied Instructions	• • • •
Overall	87%

Soon, English won't be the only common language of British school children.

Today a staggering 83% of all microcomputers being bought under the Government's Micros in Schools project, are BBC Micros.

This overwhelming vote for one machine is, naturally, very flattering to us. But it is also, coincidentally, very useful for everyone interested in the expansion of computer literacy in schools and beyond.



Because now most children are learning the same computer language – BBC Basic. And it goes without saying that a common language will help everyone move ahead that much faster.

It is of course no coincidence that the BBC Micro is being consistently chosen by schools (and by universities, scientific institutions and business). Nor that it has become one of the top selling computers for the home.

The magazine Which Micro put it rather succinctly in its February issue this year: "The BBC Micro (has) an unrivalled potential for business, educational and serious home applications."

It is, in effect, a home computer with the capacity to do a lot more than you'd expect from a home computer.

It can play games; it can help the children with their homework (there's a huge range of educational software available); it can help with everything from gardening to book keeping.

In fact, it has been called the ultimate home help. But it's a home help with a degree in business administration.

It can, for example, become a word processor and even has the facility to link economically with other BBC Micro's for more sophisticated business use.

With suitable adaptors, it can turn your TV into a Teletext receiver. Programs can also be downloaded from Teletext and Micronet/Prestel transmissions.

Perhaps we can let the reviewer in Video World (Feb '83) have the last persuasive word: "BBC Microcomputers are the limousines of home computers... that would not disgrace the home of a professional."

The BBC Micro costs £399. It is simple to set up (virtually any TV set and cassette player is all you need) and simple to use.

It comes with a comprehensive, step-by-step User Guide which introduces the Micro and shows you how to construct useful programs of your own.

You will also receive a free "Welcome" cassette which contains 15 different programs to experiment with.



It is available from W H Smith Computer shops, Boots, John Lewis and local Acorn stockists.

If you would like to order one with your credit card or if you want the address of your nearest supplier, just phone 01-200 0200 anytime or 0933-79300 during office hours.

The BBC Microcomputer System.

The new boy from Acorn already has a gang of playmates.

The Acorn Electron, Britain's most exciting new home micro, already has a range of software programs specially designed for it by Acornsoft, makers of software for the BBC Micro.

There are six mind-boggling games, two programming languages, two exciting graphics cassettes, a home educational program and a personal money management program.

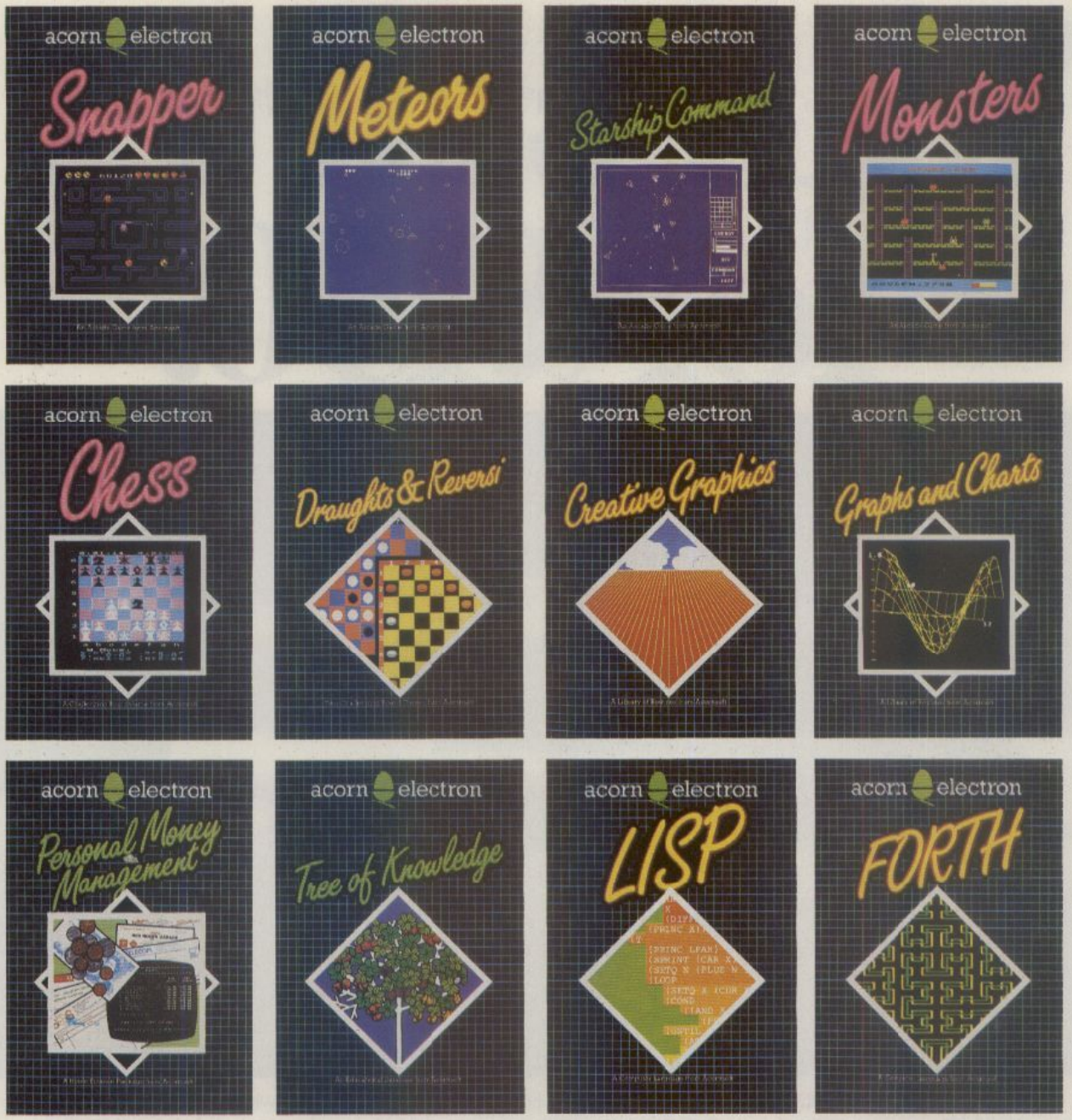
All of which will soon help familiarize you with the Electron and show you how to get the maximum enjoyment out of it straight from the word go.

Of course, we'll be constantly designing new software to help you fully realise the Electron's limitless potential.

You'll find all the programs featured here, plus the full



The Electron. The new boy from Acorn.



range of programs for the BBC Micro, available at selected W.H. Smith branches and at your local Acorn stockist. (To find out where they are call 01-200 0200.)

Alternatively, you can send off for the Acornsoft Electron or BBC Micro catalogue, by writing to: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.

ACORNSOFT

Your starter for £150.



This complete starter pack for the price you'd expect to pay for a computer alone.

It's a complete computer system: the Commodore VIC 20 computer, a cassette unit, a simple explanation of computer programming (called "Introduction to Basic Part 1"), plus an exclusive compilation tape of four computer programs (Blitz, Type-a-Tune, Race, and Hoppit).

And all for just £149.99 or less.

It's a terrific opportunity to introduce yourself, and all your family, to the exciting world of home computers – and with what has been described as the best home computer in the world.

The VIC 20 has educational programs for all ages (spelling, physics, arithmetic, etc.), plus music, typing, chess and home accounts. There are special programs like Robert Carrier's menu planner and BBC 'Mastermind', and not forgetting, of course, lots and lots of wonderful arcade games.

You'll very soon be exploring new worlds of colour, animation, and sound. Not just with a vast choice of programs, but with unlimited scope for expansion in the future.

The VIC 20 is the perfect computer to start with because you can keep adding to it, and so get even more enjoyment out of it.

There are printers, disk drives, memory expansion packs and many other peripherals to choose from.

Which means, as your confidence grows, so can your VIC 20.

Get the VIC 20 starter pack today, and we promise you'll never look back.

commodore

VIC 20

The best home computer in the world.

YOU CAN SEE THE VIC 20 STARTER PACK AT ALL BRANCHES OF DIXONS AND WALLACE HEATON, AND AT SELECTED BRANCHES OF BOOTS, RUMBELOWS, LASKYS, CURRYS, GREENS, ORBIT, MENZIES, LEWIS'S, MAKRO, TESCO, FINE FARE, WIGFALLS, SPECTRUM, COMET, JOHN LEWIS, WOOLWORTH, REDIFFUSION, CO-OP AND OTHER GOOD RETAILERS. ALSO AT BRANCHES OF A NATIONAL NETWORK OF COMMODORE COMPUTER DEALERS.

SPECTRUM MICRODRIVES

ADD ONS

David Harwood critically reviews the long-awaited Microdrives for the Sinclair Spectrum

At last the elusive Microdrives are available (to all?) and in celebration I purchased a new pen to write this review. Why a new pen? The old one had long since dried up during the months of expectancy. Was the waiting worthwhile? I'll leave you to be the judge. When the Spectrum was announced in April 1982, these Microdrives were eagerly awaited. With a promised 100K of storage, a transfer rate of 16K bytes a second and an average access time of 3.5 seconds, who would not have been excited. Also promised was an RS232 Interface, which, when connected to your computer, would allow you to add a good quality printer to your Spectrum set up. Well, after these early anticipations many owners recently ended their period of waiting.

Originally, the Interface unit was promised for £20 and the Microdrive for £50. The interface unit is priced at £49.95 (£29.95 if purchased with a Microdrive) and the Microdrive is priced at £49.95. So in order to have one Microdrive it would cost you (for those who are now running for your calculators) a total of £79.90, which is somewhat above the earlier price structure. However, the Interface 1 unit does allow connection of up to eight microdrives, a network facility and also an RS232 interface, which is an improvement on the original specification. But is this worth it and is the Microdrive as fast as is wanted and expected?

From The Outside

The Microdrive is 90mm x 85mm x 40mm in size. Situated on the right is an edge connector, which is attachable to the Interface 1 unit by a cable. On the left is a further edge connector, which can be used to add additional Microdrives to your configuration by



means of a 2-way electrical connector. The Microdrives must also be joined together by a fitted bracket, which is screwed to the underside of both. Up to a maximum of eight Microdrives is allowed, each one being numbered. Number one nearest to the computer, two the next one and so on, to the left hand end of line.

At the front of the microdrive is an LED red light, which comes on whenever the microdrive is accessed. Only one may be accessed at any one time.

On the right of the LED light is an opening into which the cartridge is placed. You are warned not to remove the cartridge when the red light is on. I refrained from temptation as the Microdrive was only lent to me and I didn't want to ruin it at best, or blow up the remainder of my gear at worst.

According to the manual you can, as soon as the Interface unit is fixed, switch on and then attach your Microdrive(s). I found that unless the Microdrives were added before power-on, the error message 'Microdrives Not Present' arose on the screen. I also discovered that the plugs of the ribbon cable, which allows communication between the computer and Microdrive, needed to be connected in a particular manner or else 'Microdrives Not Present' was printed again. I had to ensure that the ribbon cable was on top of the plugs and not below. Is this an idiosyncrasy of my review unit or an omission from the instruction manual? So take care and look at the illustration.

The Cartridges

Regrettably only one cartridge is supplied with the Microdrive, which is not really sufficient as most users would, I feel, want to use their Microdrives to their maximum potential and would not wish all the demonstration programs, which Sinclair very kindly supplied, as they take up a lot of storage space.

There is a limit of 50 files, as stated earlier, but if a lot of data storage and program storage is used, it is unlikely you will ever reach the 50 before you run out of cartridge memory.

Data can be sent to and come from various parts of the computer system. Such parts are known as channels e.g. Keyboard, Microdrive, Screen etc. The routes along which data flows to and from these channels are known as streams. In the computer system, the number of these streams can be from 0 to 15, and the stream number is always preceded by a hash symbol. Four streams come already linked, but the streams from four to 15 are there for your own use. In the programs listed I have used stream four, which the com- ▶

ADD-ONS

puter attaches to the new channel "numbers" on the microdrive.

Interface 1

As mentioned above the interface has three functions, an RS232 interface, of which an additional lead is needed for £14.95 to run a printer. I feel this is a little too steep just for a cable. The spectrum can operate at all the standard baud rates, from 50-19,200, and operate on two printer channels. Channel t allows only ASCII codes to be sent and channel b allows the full spectrum character set, without the keywords, but including the control codes for use with your printer.

The interface 1 also allows the added commands to handle the Microdrive, Network and RS232 interface and also new error codes.

The interface also allows programs and data to be sent or received from a ZX Microdrive and to or from a spectrum local network. The network facility enables up to 64 spectrums to be connected up to 100 metres apart. Each Interface 1 is supplied with a 2-meter lead which plugs into the left hand socket of your Interface 1 to output to the network, while the right hand socket is available for input from the network. A Spectrum is not allowed to be switched on or off on the Network while communication is in progress, but may be switched off on the net provided communication is not in progress.

Each computer on the net needs to be given an identification number — and when done you enter FORMAT "n"; number with only two computers in the network, there is no need to use this statement as both automatically become station one.

To send a program along the network to say, station two, you need to type in SAVE *"n";2. Meanwhile station two should prepare his computer by typing LOAD *"n";x1 (you being station 1). Station two should then verify the program , by typing VERIFY *"n";x1, and station one should repeat his sending of the program.

You can send data along the network, provided all stations are ready. There is also a special channel called broadcast, with which you can pick up any program or data that is being sent along the network. This facility will be very useful — classrooms, where the teacher sends out a message, which is received by all pupils.

The network opens up the possibility of great interface games between many users, and of doubling the software — houses will soon cotton on to this new section of industry.

Below is a summary of the commands to control the Microdrive, network system and RS232 interface.

CAT * Lists all the files in the cartridge cassette placed in Microdrive X. (X can be from 1-8)
CAT # Y;Z sends the catalogue of cartridge placed in Microdrive X to stream Y (Y can be 0-8)
CLOSE # Y Close the channel and leaves the stream four with no channels attached.
ERASE "n";y;"name" Erases the file, called name, from the cartridge in microdrive Y
FORMAT "m"; y; "name" Formats the cartridge in microdrive Y and gives it a name
FORMAT "n"; Z gives your computer an identification number 2.
FORMAT "t"; baudrate) sets the baudrate
FORMAT "b"; baudrate) and appropriate channel to be used by the interface
PRINT INKEY$ FFY Immediately returns a string from channel Y, be it from a file, network, or RS232 Interface providing stream four has been opened. If no character is available, returns the null string
INPUT #Y; a Inputs the variable from stream Y, provided stream # Y has been opened from file, network or RS232 Interface.
LOAD # "m";x; "name" — loads the program from cartridge in Microdrive X called — name.
LOAD # "n";X — loads the program sent from station number X, off the network.
LOAD # "b" — loads the program sent over the RS"/" Interface.
MERGE and VERIFY can be used the same as LOAD.
MOVE # Y TO # Y1 MOVES Data stream #Y to stream #Y 1
MOVE "m"; X; "Name" to # Y1 moves data stored on cartridge in microdrive X, called Name to stream Y1
MOVE "m"; X; "Name" to "m"; X1; "Name 1" — Moves file called name, stored on cartridge in microdrive X and stores 4 on cartridge in microdrive X1 and calls it Name X 1.

MOVE only works with data and not programs

OPEN #Y, channel — links specified channel to stream # Y in order to allow BASIC INPUT/OUTPUT to that channel. Stream must be "K", "S" "P"
OPEN #Y; "n"; X — opens a channel on station X on the network, and a Heecnes stream Y to it.
OPEN #Y; "m"; Y1; "name" — opens up a new channel to Microdrive Y1 called by name, and attaches this channel to stream # Y.
PRINT # Y; data — Output data to stream # Y, which must have been previously opened.
SAVE # "m";x; "name" — stores the program in memory to the cartridge in Microdrive X and calls it name.
SAVE #"n"; X — sends the program memory along the network to station number X
SAVE #"b" — sends the program over the RS232 Interface
SCREEN $ and LINE can be used in the above SAVE statements.

The manual is intended for use with the microdrive and Interface 1, and takes you step-by-step from setting up your interface, then your Microdrive, and then starting straight away. I feel the manual was lacking in many respects. Each statement was touched upon too lightly and non too clearly, especially if you have not experienced any file handling.

The manual is available for £5 incl VAT and P&P as a separate item. This again is far too high. I would pay £2 maximum for such a pamplet.

Final Conclusions

Yes, the Microdrives are useful, but their speed is not as fast as one would have hoped. It is by far easier and quicker to use a Microdrive to store your programs than the usual cassette-recorder method. Also the Microdrives do open up file-handling, although at a slow speed, but if you cannot afford a "proper" disc set-up, then slow file-handling is better than no file handling at all.

The interface also allows Network — systems to be set up, enabling attractive games to take place between other Spectrum users.

The interface and Microdrive do open up many possibilities to the commercial industry. As well as the usual games, they can now persue serious applications programs, using the much needed data storage, made available by the ZX Microdrives and the RS232 interface which can be landed to a top quality printer. ■

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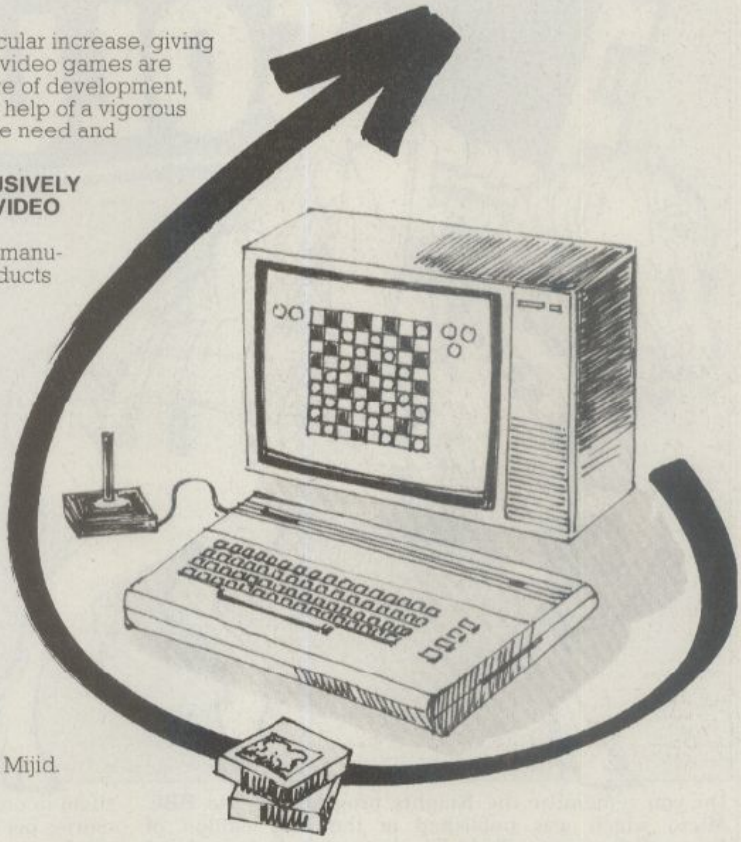
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SOFTWARE

KNIGHTS SOLUTION



Freda Perrow provides the answer to a puzzle posed in May's edition of Personal Computing Today.

Do you remember the Knights program for the BBC Micro which was published in the May edition of *Personal Computing Today*? I admitted at the time that I hadn't succeeded in completing the puzzle and I must confess that I still haven't, but a colleague has. He assures me that there are many ways in which the puzzle can be completed. I finally persuaded him to part with one solution so that I could incorporate it into the program as an example and also to prove (especially to myself!) that it could be done.

By adding the listing given here the program will give the player the option of playing the game as it was originally presented or of watching the computer show off just how it can be done.

For those of you that can boast of having solved the puzzle you can incorporate your own solution in the data statements. Just log down your moves and then enter them in order with eight moves per line. That is 16 data entries per data line. When entered you should have 128 entries.

Second chance

If you missed the original article in the May edition and you would like a listing of the program I will happily send you one providing you send me a couple of first class stamps to cover the cost. My address is given below. Alternatively you can obtain the May edition from the back issues department of Argus Specialist Publications at 513 London Road, Thornton Heath, Croydon, Surrey.

If you would like me to send you a copy of the original listing write to me, Mrs Perrow, enclosing a stamped addressed envelope, at: 17 Maidstone Drive, Marton, Cleveland TS7 8QW.

PROGRAM LISTING

```
611 PRINTTAB(0,28)"WOULD YOU LIKE TO SEE"/"HOW THE MICRO DOES IT?"
612 PLAY$=GET$
613 IF PLAY$<>"Y" AND PLAY$<>"N" THEN 612
614 IF PLAY$="Y" THEN PLAY=1:PRINTTAB(0,28)"PRESS SPACE-BAR TO MOVE
 KNIGHT" '"SPC(24)"WITH 630 ELSE PLAY=0
905 IF PLAY=1 THEN PROCCOMPPLAY:ENDPROC
1110 DEFPROCCOMPPLAY
1120 READX:READY
1130 W=INKEY(100):SOUND1,-15,100+RND(100),1
1140 PRINTTAB(30,12);X
1150 PRINTTAB(30,14);Y
1160 ENDPROC
1200 DATA8,1,7,3,8,5,7,7,5,8,3,7,1,8,2,6
1210 DATA1,4,2,2,4,1,6,2,8,3,7,5,8,7,6,7
1220 DATA7,8,5,7,3,8,1,7,3,6,2,8,1,6,2,4
1230 DATA1,2,3,3,2,1,4,2,6,1,8,2,7,4,8,6
1240 DATA6,7,8,7,6,6,8,5,6,4,8,2,7,1,5,3
1250 DATA2,3,1,1,3,2,5,1,7,2,6,4,4,5,5,3
1260 DATA4,5,8,4,6,3,7,1,5,2,3,1,4,3,5,5
1270 DATA4,7,3,3,5,4,4,6,3,4,1,3,2,5,4,4
```

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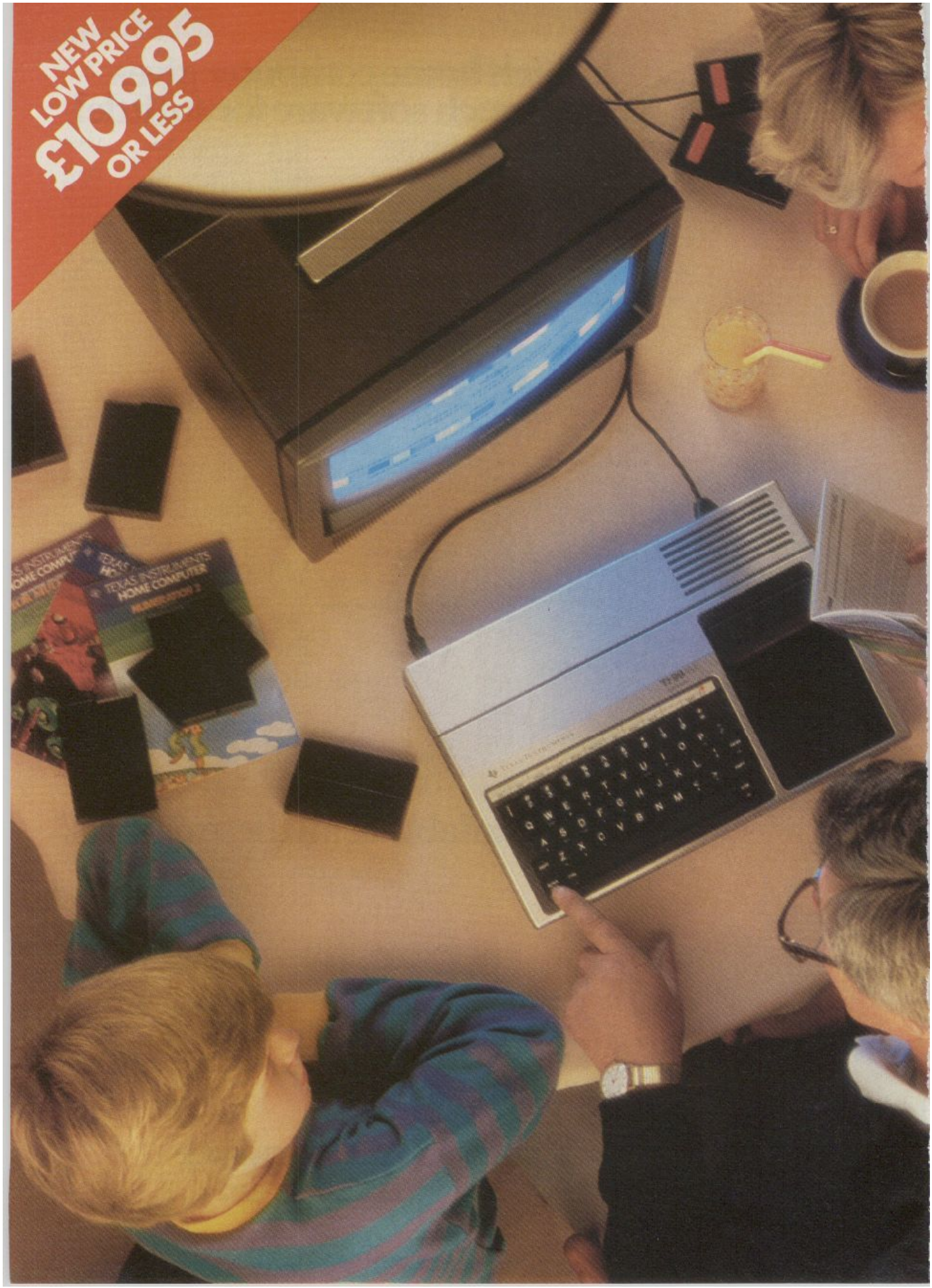
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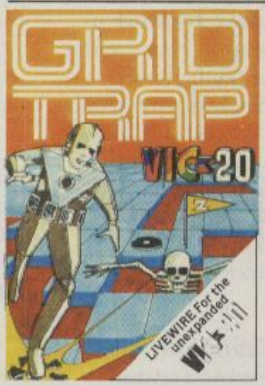
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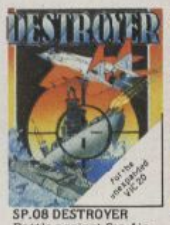
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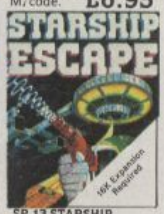
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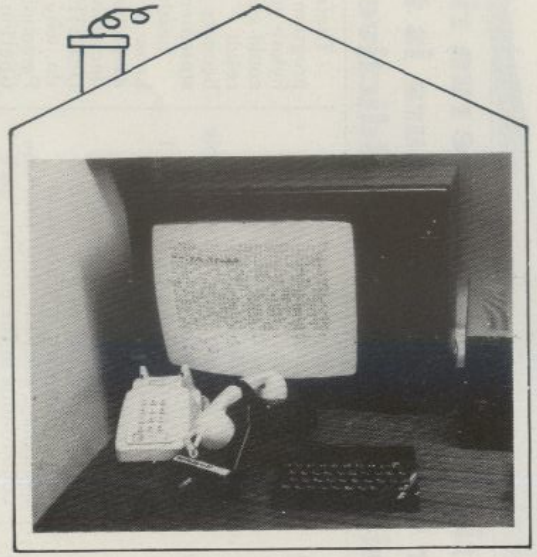
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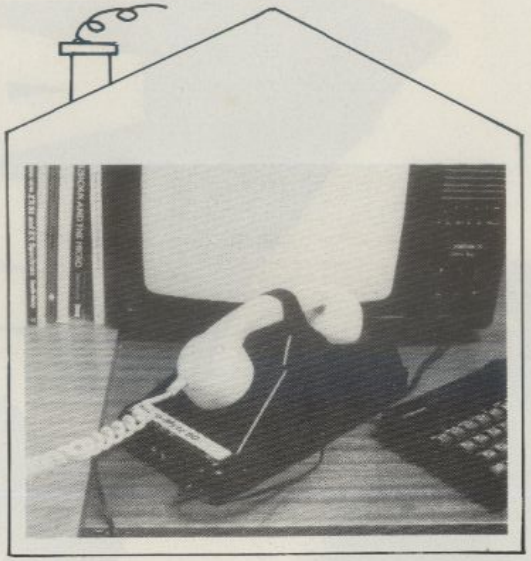
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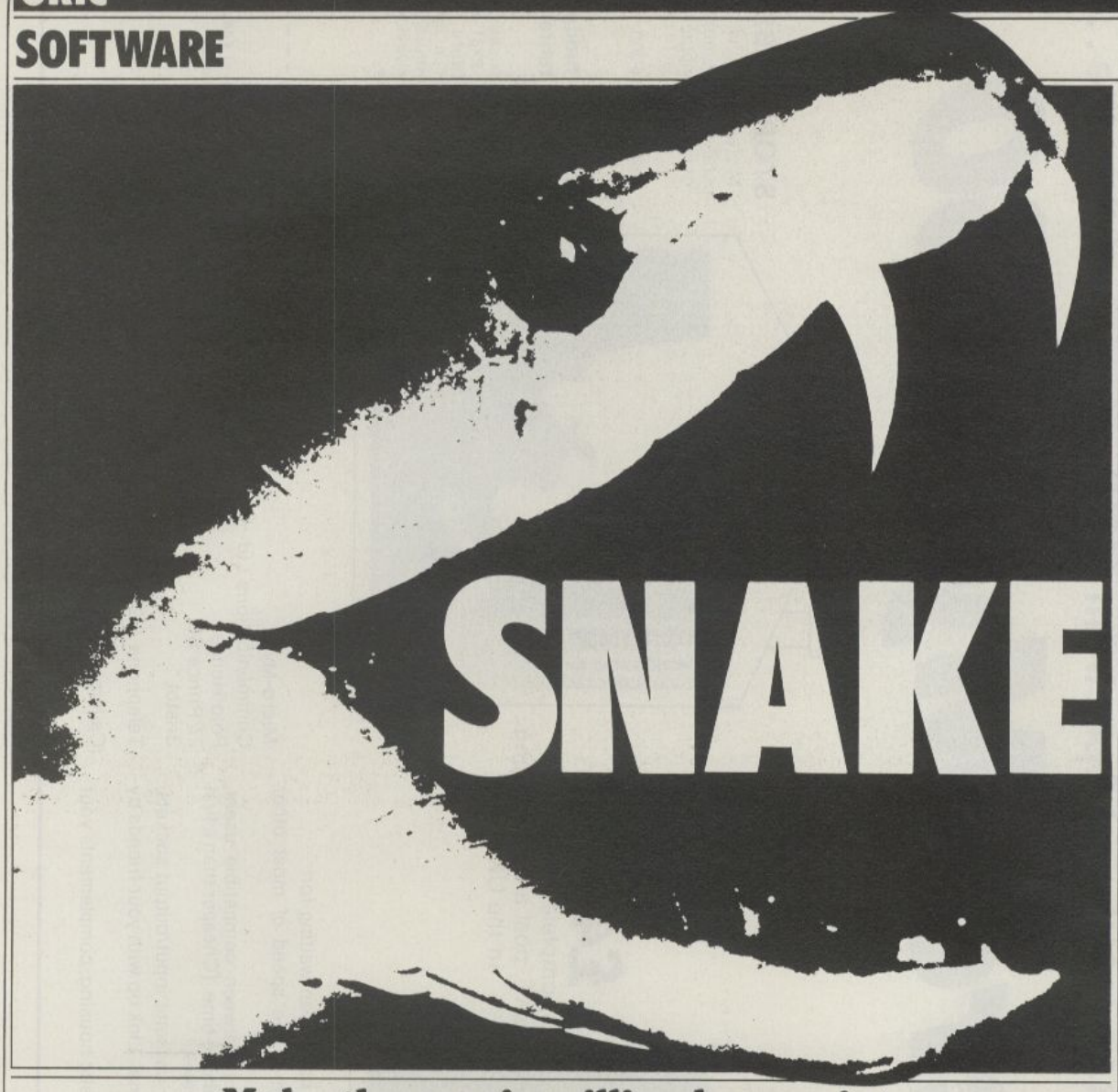
Name..... Telephone.....

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.....

.....

ORIC SOFTWARE



Make the manic millipede run riot in your Oric. Shingo Sugiura is the brains behind this fun and addictive game.

This game is the 48k Oric version of a popular snake chase game. In this version you are in control of a baby millipede and must let him eat the fruits littered around the field he is in while avoiding rocks and a wall. If your young millipede grows to the full adult size of 40 segments you will progress to a new field with more rocks and to control another baby millipede. The game is very simple yet addictive.

The program basically sets up the X and Y co-ordinates of the 40 segments at the beginning of the program, scans the keyboard takes appropriate action and recalculates the 40 segments' co-ordinates. The original program, which was written entirely in BASIC, was too slow to be playable so I wrote a short machine code routine to do all the calculations. I could have speeded up the program even more if I had written the key scanning etc. in machine code as well, but as I am used to using Assembler and not hand compiling, even the short machine code routine in the program gave me a headache!

There are a lot of pokes in the program so make sure you save it before you run it, otherwise you could end up with a very surprising result – such a crash! Also, because the gosubs branch to REM statements they must by typed in.

Lastly does any one out there know of a good Assembler/Disassembler or a utility package (including RENUM, AUTO, DELETE etc) for the Oric? If you do, why not write to Your Letters, Personal Computing Today, 145 Charing Cross Road, London WC2H 0EE.

HINTS ON CONVERSION

The program contains plenty of REM statements and is reasonably well structured so you should not have many difficulties converting it to run on other machines. Nevertheless, here are a few hints.

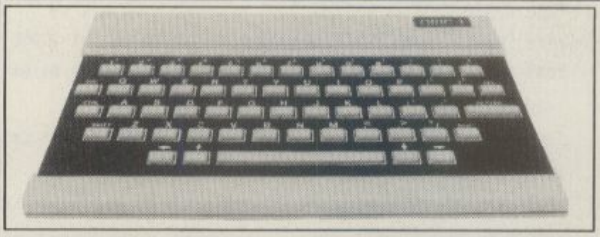
Remember that the Oric's screen is 40 x 25 so if you have a machine like the VIC 20 or the Spectrum take the smaller screen into account. If you have the Sord you could use TEXT mode perhaps and on the BBC you could use MODE1.

PLOT X,Y,A$ is equivalent to PRINT TAB(X,Y):A$.
REPEAT-UNTIL loops should be replaced with GOTO loops unless you have a BBC in which case you can replace all the GOSUBs with PROCs.
SHOOT is a command to make a gunshot sound.
ZAP is a command to make a zapping (!?) sound.

The machine code routine has to be rewritten but that should not be too difficult.

HOW IT RUNS

Lines 30-260	Main loop.
Lines 1450-1490	Initialise variables.
Lines 1500-1570	Assemble machine code.
Lines 1579-1590	Redefine various character.
Lines 1600-1790	Instructions.
Lines 1800-2000	Set up the screen.
Lines 2010-2040	Find the character in front of the millipede's head and take appropriate action.
Lines 2100-2140	Die.
Lines 2200-2220	New screen.
Lines 2300-2380	Procedure called after three lives have been used.



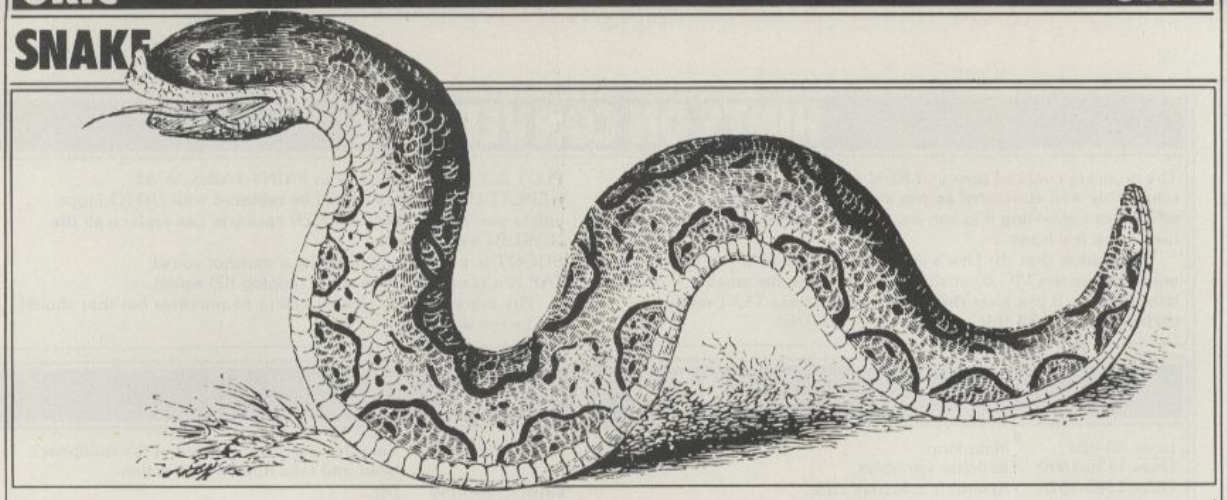
VARIABLES

SC%	Score.
LI%	Lives left.
LE%	Screen.
K$	Key pressed.
LG%	Length of millipede.
A$	Direction of millipede.
CH%	ASCH code of the character in front to millipede's head.
HI%	HI score.
DIE	Flag to indicate whether the millipede is dead or not.

PROGRAM LISTING

```
10 TEXT:GRAB:HIMEM #B400
20 GOSUB1500:GOSUB1600
30 SC%=0:LI%=2:LE%=1
40 GOSUB1800:GOSUB1450
60 REPEAT:K$=KEY$
70 IF K$="Z" THEN A$="LEFT"
80 IF K$="X" THEN A$="RIGHT"
90 IF K$="/" THEN A$="UP"
100 IF K$="/" THEN A$="DOWN"
110 PLOT PEEK(47730+LG%),PEEK(47780+LG%)," "
120 IF A$="LEFT" THEN POKE47730,PEEK(47730)-1
130 IF A$="RIGHT" THEN POKE47730,PEEK(47730)+1
140 IF A$="UP" THEN POKE47780,PEEK(47780)-1
150 IF A$="DOWN" THEN POKE47780,PEEK(47780)+1
160 CH%=SCRN(PEEK(47730),PEEK(47780))
170 IF CH%<>32 THEN GOSUB2010
180 S$=RIGHT$(STR$(SC%),LEN(STR$(SC%))-1):PLOT10,24,S$
190 CALL 47700
200 PLOT PEEK(47730),PEEK(47780),"&"
210 PLOT PEEK(47730+LG%),PEEK(47780+LG%),"&"
220 PLOT PEEK(47729+LG%),PEEK(47779+LG%),"&"
230 UNTIL DIE OR LG%>38
240 IF DIE THEN GOSUB2100:IF LI%>=0 THEN GOTO40
250 IF LG%>38 THEN GOSUB2200:GOTO40
260 GOSUB2300:GOTO30
1450 REM Initialise
1460 FOR X=0TO40:POKE(47730+X),X+15:NEXTX
1470 FOR Y=0TO40:POKE(47780+Y),15:NEXT
1480 A$="RIGHT":LG%=2:DIE=FALSE
1490 RETURN
1500 REM Assemble machine code
1510 FORA=0TO17:READB
1520 POKE47700+A,B:NEXTA
1530 HI%=20
1540 DATA#A0,#28,#B9,#71,#BA
1550 DATA#99,#72,#BA,#B9,#A3,#BA
1560 DATA#99,#A4,#BA
1570 DATA#88,#D0,#F1,#60
1579 REM Define wall
1580 FORA=46344TO46351:READB:POKEA,B:NEXT
1581 DATA63,25,63,38,63,25,63,38
1582 REM Define food
1583 FORA=46360TO46367:READB:POKEA,B:NEXT
1584 DATA12,33,0,45,45,0,33,12
1585 REM Define segment
```

SNAKE



```
1586 FORA=46984TO46991:READB:POKEA,B:NEXT
1587 DATA12,18,30,45,45,30,18,12
1588 REM Define rock
1589 FORA=46592TO46599:READB:POKEA,B:NEXT
1590 DATA12,14,31,15,29,61,63,30
1595 POKE#26A,10
1599 RETURN
1600 REM Instructions
1610 CLS:PRINT
1620 PRINTCHR$(4)SPC(13)"MILLIPEDE":PRINTCHR$(4)
1630 PLOT1,1,10:PLOT1,2,10:PLOT0,1,CHR$(6) PLOT0,2,CHR$(5)
1640 PRINT:PRINTSPC(10)"By Shingo Sugiura" PLOT1,4,CHR$(1)
1650 PRINT:PRINT" You must guide the growing millipede"
1660 PRINT"towards the ripe fruits while avoiding";
1670 PRINT"the rocks and the wall."
1680 PRINT:PRINT" If you try to guide him backwards he
will bite himself and die."
1690 PRINT:PRINT"CONTROLS:-":PLOT0,13,CHR$(2)
1700 PRINT:PRINT"'Z' ---------- left.."
1710 PRINT"'X' ---------- right.."
1720 PRINT"';' ---------- up.."
1730 PRINT"'/' ---------- down.."
1740 PRINT:PRINT"@ ---- Rock..."
1750 PRINT:PRINT"# ---- Food..."
1760 PRINT:PRINTCHR$(140);"     Press SPACE BAR to play."
1770 PLOT0,24,CHR$(4)
1780 REPEAT:UNTILKEY$=" "
1790 RETURN
1800 REM Form screen
1810 CLS:PRINTSPC(13)"MILLIPEDE":PLOT1,0,CHR$(6)
1820 FOR H=2TO36
1830 PLOT H,2,"!":PLOT H,22,"!":NEXT
1840 FOR V=2 TO 21
1850 PLOT2,V,"!":PLOT36,V,"!":NEXT
1860 PLOT3,24,CHR$(1):PLOT4,24,"SCORE:"
:S$=RIGHT$(STR$(SC%),LEN(STR
$(SC%))-1)
1870 PLOT10,24,S$:PLOT19,24,CHR$(2):PLOT20,24,"HI-SCORE:"
1880 H$=RIGHT$(STR$(HI%),LEN(STR$(HI%))-1):PLOT29,24,H$
1890 PLOT3,25,CHR$(4):PLOT4,25,"Lives left:"
1900 L$=RIGHT$(STR$(LI%),LEN(STR$(LI%))-1):PLOT15,25,L$
1910 PLOT19,25,CHR$(5):PLOT20,25,"SCREEN:"
1920 LE$=RIGHT$(STR$(LE%),LEN(STR$(LE%))-1):PLOT27,25,LE$
1930 FOR OB=1 TO LE%*3+10
1940 X=RND(1)*32+3:Y=RND(1)*17+3
1950 PLOTX,Y,"@":NEXT:REM ROCKS
1960 FOR FO=1 TO 30
1970 X=RND(1)*32+3:Y=RND(1)*17+3
1980 PLOTX,Y,"#":NEXT:REM FOOD
2000 RETURN
2010 REM Check what's in front
2020 IF CH%=35 THEN SC%=SC%+1:LG%=LG%+2:ZAP:RETURN
2030 DIE=TRUE
2040 RETURN
2100 REM Death
2110 SHOOT:LI%=LI%-1
2130 WAIT100
2140 RETURN
2200 REM New screen
2210 LE%=LE%+1:WAIT100
2220 CLS:RETURN
2300 REM Finale
2310 FORA=1TO12
2320 MUSIC2,3,A,0:PLAY3,0,7,2000
2330 WAIT50:PLAY0,0,0,0
2340 NEXT
2350 PRINT"Press SPACE BAR to replay."
2360 REPEAT:UNTIL KEY$=" "
2370 IF SC%>HI% THEN HI%=SC%
2380 RETURN
```


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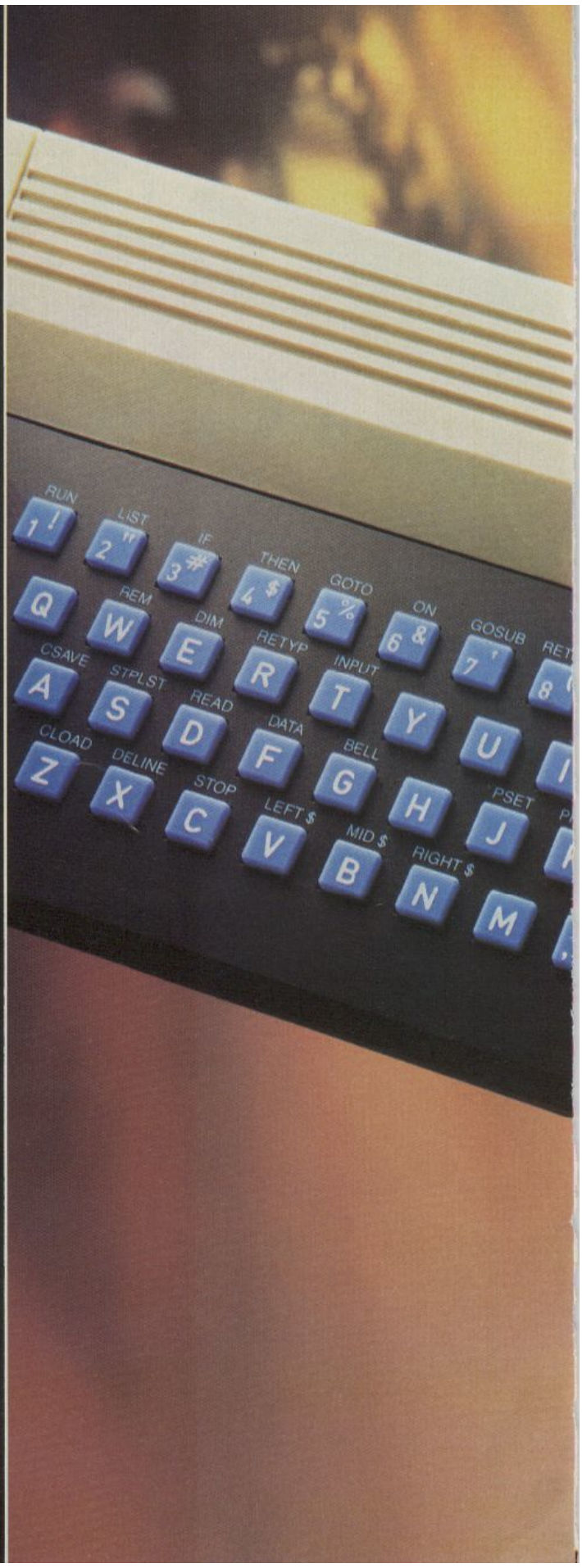
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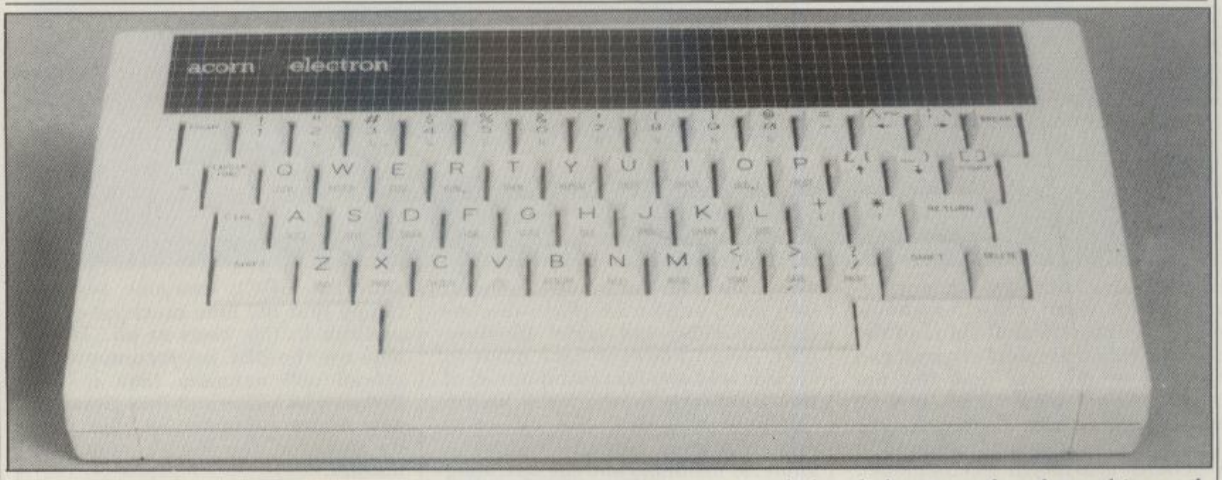
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HARDWARE REVIEW

ELECTRON ACTION

We take a look at Acorn's bright new star and assess its potential.



Atom, Proton and now Electron. From the beginning there has been a consistency and individuality in Acorn's hardware, software and styling. The Proton of course became the BBC Microcomputer. The series now continues with the launch of Acorn's 'home' computer, a stylish machine, an excellent package but inevitably some compromises. The Electron is packed with BBC based facilities e.g. BBC BASIC, Assembler, Modes 0-6 and sound. There are also many differences and some disappointments.

New Dimensions

The Electron is an exciting micro. There is a lot of performance packed into the tough cream plastic shell – at least that is what the adverts say and it is what we would expect from the BBC stable. The size feels right, about the length and breadth of a BBC keyboard. We are told that the casing has withstood the rigours of the British Aerospace testing laboratories.

The mains transformer comes separately as part of the mains plug. It is quite a weighty object but appears not to put any strain on the wall socket and sits comfortably beside other plugs on a double socket. The power supply lead is sensibly long enough to reach a desktop or table. The Electron manages without an on/off switch.

The UHF connection and cassette DIN plug are likely to be the most frequently used connections but there are also VIDEO (for monochrome monitor) and RGB (for colour monitor) outputs.

The underside of the computer reveals an edge connector – sensibly protected with a polythene cover and some threaded mouldings which will take the strain of future Acorn add-ons. The credits state: "Designed in Great Britain" but "Constructed in Malaysia".

Taking off the lid reveals a beautifully laid out board with the outstanding feature the flat pack ULA, which has been custom designed by Acorn to carry out many of the functions of the Electron.

What You Get

The total Electron package which retails at £199 consists of the computer hardware, an excellent manual, Welcome cassette and introductory book entitled "Start Programming With the Electron" by Masoud Yazdani. Newcomers to computing will find the manual helpful as they proceed but might well benefit from carefully going through the "Start Programming" book which introduces procedures and structured programming from the very beginning. The book introduces all the main interest areas including sound and graphics and does so in a very helpful manner with exercises, summary charts and examples. Turtle graphics are also utilised to demonstrate some of the programming capabilities of the Electron. There are cassette versions of the longer programs included on the Welcome tape.

The new owner of the Electron is also going to be interested in seeing immediately what the Electron can do. The Welcome tape fulfills this purpose.

The programs ideas are lifted from the BBC Welcome tape but adapted to show off the Electron. The Keyboard demonstration reveals the slightly different positioning of some keys, like the square brackets on the COPY key which itself has moved up beneath the BREAK key (so watch out). These are all differences from the BBC keyboard and will not affect newcomers. They will presumably take to the single key entry of BASIC keywords immediately while seasoned BBC typists naturally opt for the full word or abbreviated input – both of which are still catered for. Single key entry remains a big plus on the Electron especially since both RUN and OLD also include a carriage return for instant action.

Sound and Graphics

The sound capabilities of the ▶

ELECTRON ACTION



Electron are excellent when compared with most other machines although they fall well short of the BBC's. Only one sound channel can be used at any one time but the noise channel remains for games' enhancement. The Welcome tape has a simple demonstration of a keyboard instrument accompanied by the appropriate notes displayed on the screen.

The Electron makes do with six of the seven modes which the BBC possesses. Mode 7, the teletext mode, is missing and software incorporating Mode 7 is treated as though it were Mode 6. This can lead to some amusing displays of control characters and lines of text printed twice as the Electron interprets the Mode 7 commands literally.

Hardware compromises mean that the high resolution modes 0,1,and 2 perform graphics drawing functions considerably slower than the BBC. Compared with other machines (including the Commodore 64) the speed is acceptable and the colour and resolution far superior. The excellent software control of BBC BASIC remains, and there are commands for sidways and righthand fill. The Welcome tape has a neat drawing utility which fully exploits all these points. The high resolution graphics are also demonstrated with two programs that build up pictures of an island complete with swaying palms and some planets whose motion is brilliantly simulated.

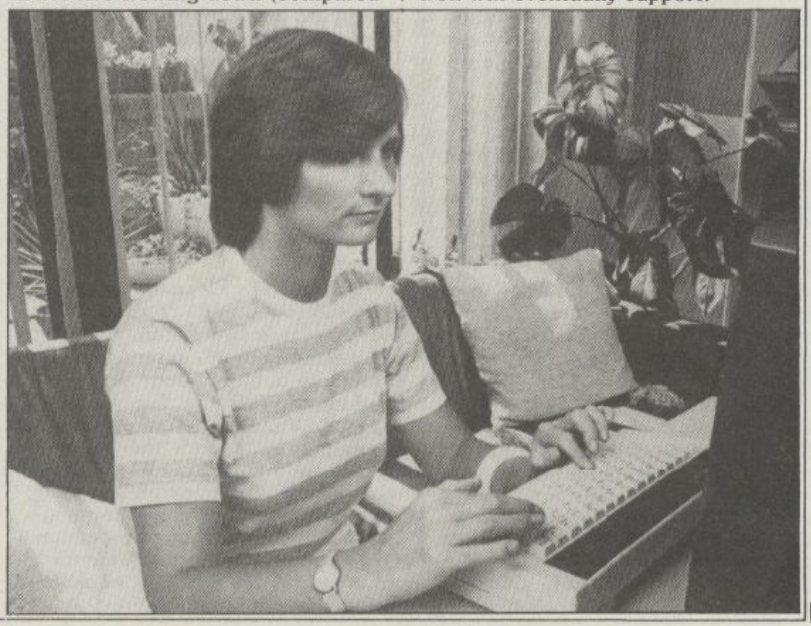
Missing

Of course some things have gone missing from the Electron when compared with the BBC. These include the analogue input, user port, printer interface, disc interface, Tube and serial interface port. Acorn however have plans to provide add-ons for most if not all of this hardware in the near future. Certainly the BBC BASIC commands remain (ADVAL returns a value for instance) and the operating system calls are all documented for these future additions.

Filling the Gap

At the Acorn User Show back in August there was much testing going on in the first three graphics modes. Everyone had their own favourite routine learned off by heart to try out the newcomer. Despite the noticeable slowing down (compared with the BBC), everyone seemed happy that the little machine could perform in this class at all. Those who use the BBC microcomputer in school will naturally take to the Electron at home and this gives the new Acorn computer an edge over its rivals in the 'home' computer market.

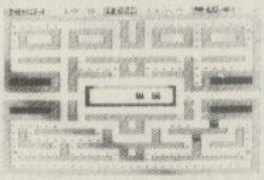
The advanced BASIC, so positively stressed in the accompanying package and the instant availability of some excellent software make the Electron very attractive to the computer novice. Those who already own computers could well look to the Electron as a passport to more advanced performance and to the use of peripherals like disc and printer which the Electron will eventually support.



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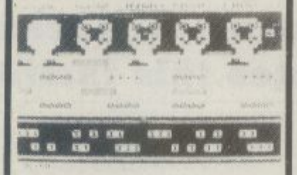


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Please state machine type _____

MICROSPOT

ARRAY ARRAY!

One of the shortcomings of ATARI BASIC is the absence of the string array. N. Jackson's neat program simulates this facility.



HINTS ON CONVERSION

There should be no problem with machines that can split strings up easily by putting the appropriate number positions of the part of the string required into brackets. The machine must have the words READ, DATA and DIM.

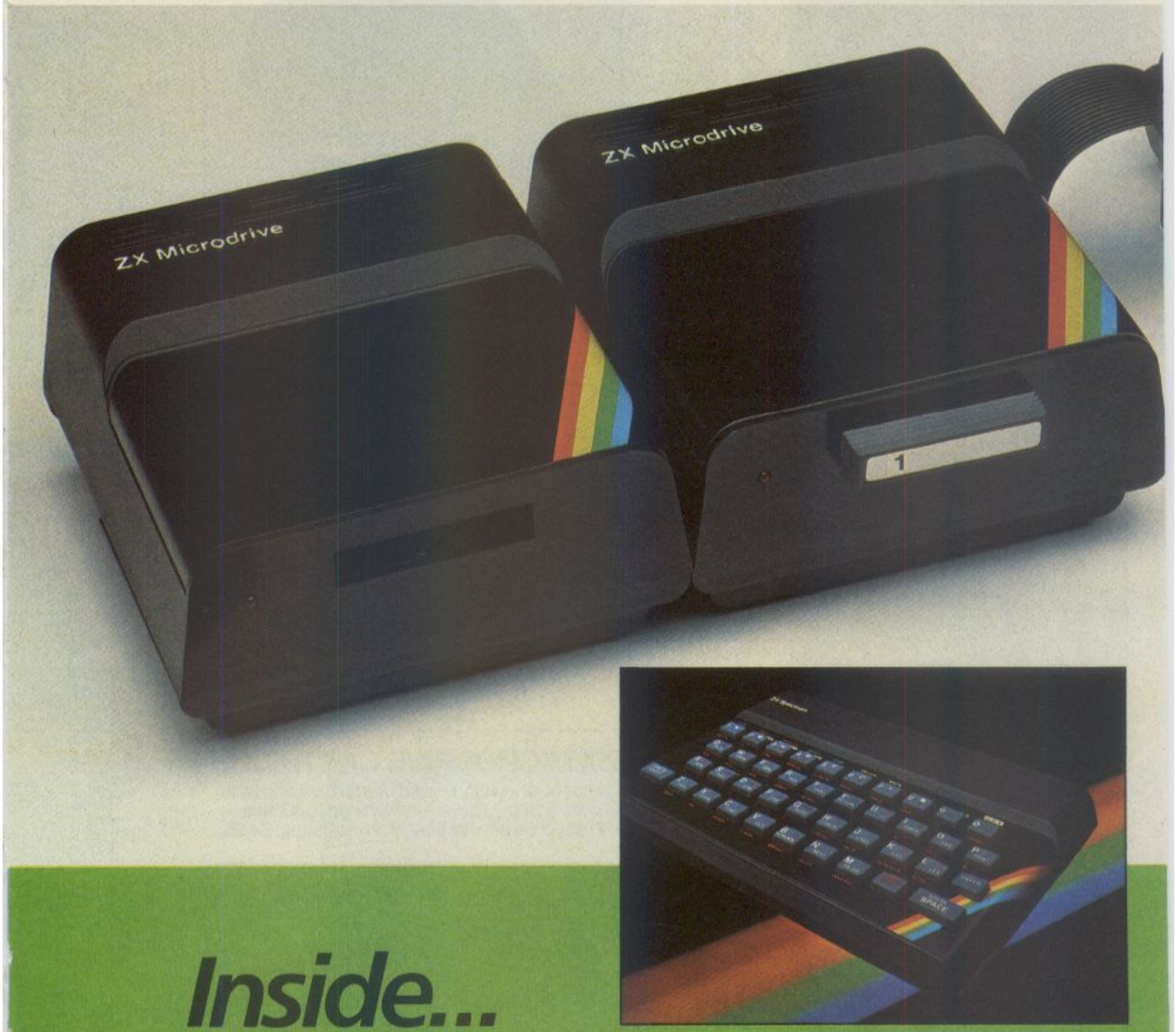
HOW IT RUNS

All the necessary arrays are set up in Line 10. All data to be used later on is put into Line 20, whilst Line 30 contains all the words put together in one string, i.e. without spaces. Line 40 fills the two arrays with the data from line 20. It is important here, to note that the first number is 1 and not zero. Line 50 lets you see the results of your efforts. When you enter a number from 1 to 10 the appropriate word will appear.

PROGRAM LISTING

```
10  DATA 1,4,5,7,8,10,11,19,20,24,25,29,30,33,34,38,39,43,
    44,47
20  DIM WORDS$(47),START(10),FINISH(10)
30  WORDS$ = "COINKEYBOXHAMBURGERFLUTEMONEY
    DOORCHAIRTABLELAMP"
40  FOR I = 1 TO 10:READ S,F:START(I) = S:FINISH(I) = F:
    NEXT I
50  INPUT A:PRINT WORDS$(START(A),FINISH(A)):GOTO 50
```

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Something for everyone, from Sinclair!

Welcome to another Sinclair Special. Even if you're not yet a Sinclair owner, I believe you'll find something of interest in this latest issue.

For instance, if you're looking for the best way to begin computing, turn to our back page. You'll see that leading Sinclair retailers are now offering the popular ZX81, complete with a 16K RAM Pack *and* a free software cassette, all for £45. That means savings of at least £29 on one of the world's all-time best-selling computers.

Those same retailers are also offering the ZX Printer at its regular price of £39.95, but accompanied by a *free* 5-roll Paper Pack, worth £11.95.

If you want to add even more speed and versatility to your ZX Spectrum system, you'll be pleased to hear that the new ZX Microdrive has now been officially announced.

Microdrives are being released on an order of priority basis. Spectrum owners who purchased direct from us will be sent order forms, in a series of mailings that begin with the earliest names on our list of Spectrum owners. If you didn't buy direct from us by mail order, send us your name and address (use the coupon in this Sinclair Special). We'll add your name to the list, and send you a colour brochure and details on how to order.

Finally, if you're looking for more ways to use your ZX system, take a look at the software opposite. There are programs for programmers, a space-chase and car race for arcade-game players, a brand new logic game for those who've exhausted 'the cube.'

The Cattell IQ Test is based on the definitive professional psychologists' test – and forms an accurate but easy way of measuring your own IQ. All the new programs are available direct from us, through the order form in this issue.

You'll see what I mean about Sinclair having something for everyone. And we'll have even more to show you at two forthcoming exhibitions: the PCW Show at the Barbican Centre, from September 28th to October 2nd, and the Great Home Entertainment Spectacular at Olympia, from September 17th to 25th.

Nigel Searle

Nigel Searle, Managing Director
Sinclair Research Ltd.

ZX Microdrive System preview!



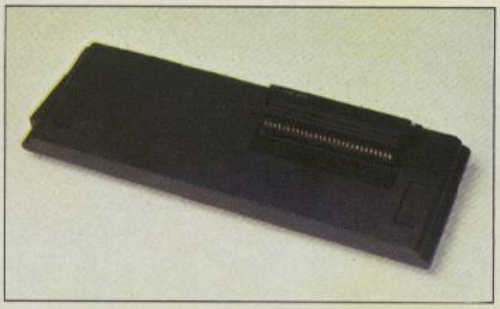
ZX MICRODRIVE

At least 85K bytes storage, loads a typical 48K program in as little as 9 seconds: £49.95.



ZX MICRODRIVE CARTRIDGE

Compact, erasable, revolutionary. Complete with its own storage sleeve. Contains up to 50 files, with a typical access time of 3.5 seconds: £4.95.

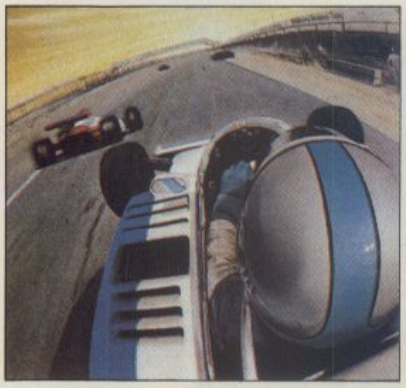


ZX INTERFACE 1

Necessary for sending and receiving information from ZX Microdrive. Includes RS232 interface and local area network facility for 2 to 64 Spectrums. Attaches to the underside of your Spectrum. Purchased with ZX Microdrive, just £29.95. As separate item, £49.95.

PSYCHOLOGY, GRAND PRIX RACING, BRAIN TEASING, PROGRAMMING, SPACE-BLASTING!

Sinclair have it all taped with six brand-new programs for ZX Computers!



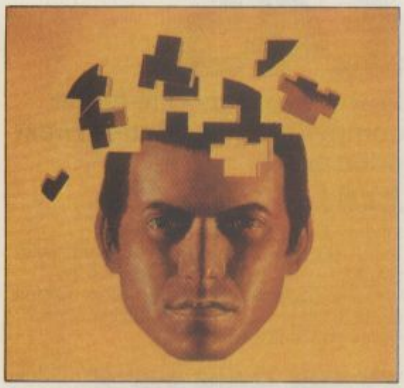
Chequered Flag
For 48K RAM Spectrum. **£6.95**

Have you ever wanted to drive a Formula One car flat-out round a Grand Prix circuit? With Chequered Flag you'll need one eye on the road and one eye on the instruments, as you steer and brake to avoid hazards, and work through the gears in search of the lap or race record. This outstanding new program puts you in the driver's seat with stunning realism, and gives you a choice of three cars and ten different circuits. Don't crash!



Mothership
For ZX81 with 16K RAM. **£4.95**

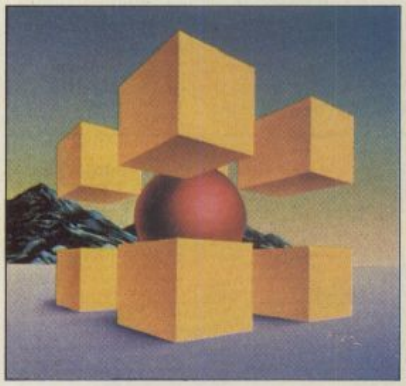
Scream down the claustrophobic confines of the Zarway. Engage suicidal drone fighters in deadly laser combat. Dodge, duck and dive in a high-speed 3-D race to attack the evil Mothership before she claims your home planet. Mothership is a truly tough challenge, and fast, furious fun!



Cattell IQ Test
For 48K RAM Spectrum. **£12.95**

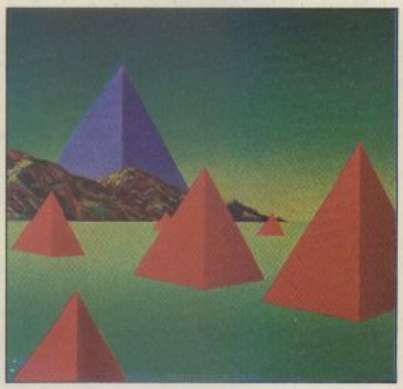
Although there are a number of so-called self-administered IQ tests on the market, the only reliable way of finding your IQ has – until now – been to visit a qualified psychologist and take a battery of tests – for a fee. Now Victor Serebriakoff, International President of Mensa, has produced Professor Cattell's test in a form which enables you to use your ZX Spectrum to test your IQ.

The Cattell Scale IIIA test is timed by the computer, marked immediately, and the marks standardised against your age. This is the first time that an accredited, standardised test has been available to the general public.



Zeus Assembler
For 48K RAM Spectrum. **£12.95**

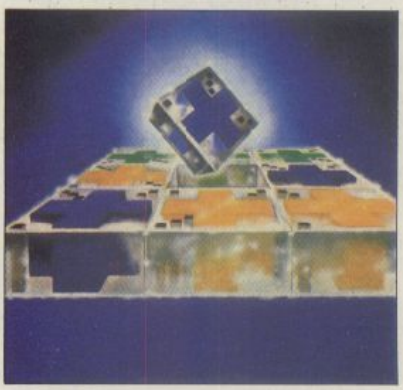
A powerful and easy-to-use programming aid, designed to simplify the entire process of producing machine code programs, enabling you to write in assembly language instructions. Comes complete with comprehensive range of support facilities.



Monitor and Disassembler
For 16K & 48K RAM Spectrums. **£12.95**

This powerful Disassembler translates machine code into comprehensible assembly language instructions, allowing you to examine the BASIC ROM, to investigate the workings of the Spectrum or to analyse your own machine code routines.

With the highly versatile Monitor, you get an extensive set of facilities to aid the entry, inspection, modification and debugging of your own machine code programs.



Flippit
For 16K or 48K RAM Spectrums. **£9.95**

Like those cube games, Flippit looks simple. But its fiendish ingenuity results in the ultimate game of logic and patience. Twist, turn and swap the nine Flippit pieces in search of the elusive magic square. But be warned, those pieces can be arranged in *millions* of combinations...

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Powerful passport to home computing – now at the lowest price ever!

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Sinclair ZX81 – 900,000 sold so far. Touch-sensitive keyboard... black and white graphics... just plugs into most TV sets. With 212-page BASIC manual – step-by-step guide to the world of personal computing. Normal price £39.95.

ZX 16K RAM PACK

Gives the ZX81 more power – the power to run sophisticated software like Flight Simulation and Chess. Normal price £29.95.

CASSETTE

Worth £4.95 or more. In every starter pack, there's a top-flight 16K cassette – like Chess or Fantasy Games or one of the valuable education series. Actual title varies with availability. And once you own your starter pack, there are 37 other Sinclair cassettes available (plus dozens from other manufacturers).

Look for the special packs at WH Smith, Boots, John Menzies, Currys and other leading Sinclair stockists. Not available by mail order.

Offers subject to availability while stocks last.



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ZX PRINTER

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ORDER FORM

Section A: hardware purchase

Qty	Item	Code	Item Price £	Total £
	ZX Spectrum – 48K	3000	129.95	
	ZX Spectrum – 16K	3002	99.95	
	Postage and packing:	0029	4.95	
			TOTAL £	

ZX81 Starter Pack and Printer and Paper offers are not available by mail order.

Section B: software purchase

Qty	Cassette	Code	Item Price £	Total £
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	L4/S Monitor & Disassembler	4403	12.95	
	L3/S Zeus Assembler	4402	12.95	
	G26/S Flippit	4025	9.95	
	P1/S Cattell IQ Test	4500	12.95	
	G31/S Chequered Flag	4030	6.95	
	FOR ZX81			
	G26 Mothership	2·25	4.95	
			TOTAL £	

Signature

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Please add my name to the Microdrive Mailing List, *and* send me a colour brochure with full specifications of ZX Microdrive/Interface 1 ☐ *(tick here)*. You can use the above form to send us your name and address.

SOFTWARE

OXO OXO OXO

Test your forward thinking in this new version of the classic noughts and crosses game for the Vic 20

This game is played exactly like the traditional game of noughts and crosses. The first person to put three crosses or noughts in a row either horizontally, vertically or diagonally wins the game. Oxo just fits on an unexpanded VIC 20 so no 'REMS' are given.

HOW IT RUNS

Lines 2-5	Puts title on screen
Lines 13-14	Selects background and foreground colours
Lines 70-76	Sets up OXO grid and puts numbers in grid
Line 100	"First go" variable
Lines 101-111	W sets character X or O
Lines 112-121	Asks X or O to move
Lines 200-4050	Variable K selects square number on grid
Lines 7000-7066	Causes a character to walk to selected square
Lines 9000-10006	Generates hi-resolution for characters
Lines 20000-30111	Counts number of goes (maximum of nine) and tells if two players have drawn; if so then asks for another game.
Lines 40000-40008	Tests for complete horizontal or diagonal line if all Xs or Os
Lines 40500-40503	Declares the winner

Subroutine 9000 causes the upper case characters ROM to be copied into the top 1K of the user RAM. Lines 9070-10004 define eight new high-res characters by overwriting uppercase set characters that are not wanted. Any conversion must replace the high-res characters from subroutine 9000 as follows:

Line 9070 
Line 9080  } walking "O"
Line 9090 space

Line 10000 
Line 10001  } walking "X"

Line 10002 
Line 10003  } characters for grid
Line 10004 

The rest of the program uses straightforward BASIC using the Vic 20 unexpanded memory mapped screen.

PROGRAM LISTING

```
2 PRINT"Ⓒ":V=36878
3 PRINT:PRINT:PRINT:PRINT:PRINTTAB(4);"■O'S■ AND ■X'S■":PRINT:PRINT:PRINT:PRINT:PRINTTAB(9);"BY"
4 PRINT:PRINT:PRINTTAB(3);"■STEPHEN MEREDITH.■"
5 FORQ=1TO9:PRINT:NEXT:PRINT"SETTING UP CHARACTERS"
12 GOSUB 9000
13 PF.INT"Ⓒ":POKE36879, 47
14 SC=0:PRINT"Ⓒ"
70 POKE7865,40:POKE7867,40:POKE7885,39:POKE7887,38:POKE7889,39
71 POKE 7909,38:POKE7890,39:POKE 7911,40:POKE7911,40:POKE7930,39
72 POKE7931,38:POKE7932,39:POKE7933,38:POKE7934,39
73 POKE7953,40:POKE7955,40
74 POKE7864,49:POKE7866,50:POKE7868,51:POKE7908,52
75 POKE 7910,53:POKE7912,54:POKE7952,55
76 POKE7954,56:POKE7956,57
99 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
90 PRINT:PRINT:PRINT"■WHO GOES FIRST,X OR O"
100 INPUT"■
101 FORW=7900TO8164:POKE W,32:NEXT
110 IF A■="O"THENW=15
111 IFA■="X"THENW=24
112 POKE8124,W
115 POKE8126,25:POKE8127,15:POKE8128,21
120 POKE8129,10:POKE8130,32:POKE8131,13
121 POKE 8132,15:POKE8133,22:POKE8134,5
 20 GET K:IFK=0THEN 200
210 IFW=15THENO1=36
211 IFW=15THENO2=37
220 IFW=24THENO1=34
221 IFW=24 HENO2=33
223 GOSUB7000
230 ON K GOTO 1000,1100,1200,1300,,400,1500,1600,1700,1800
1000 POKE7864,W
1001 GOTO 20000
1100 POKE7866,W
1101 GOTO 20000
1200 POKE7868,W
1201 GOTO20000
1300 POKE 7908,W
1301 GOTO20000
1400 POKE7910,W:GOTO20000
1500 POKE7912,W:GOTO2 000
1600 POI :7952,W:GOTO20000
1700 POKE7954,W:GOTO20000
1800 POKE7956,W:GOTO20000
4050 V=36879:S1=36876
7000 IFW=24THENV1=8075
7002 IFW=24THENV2=8064
7003 IFW=24THENS1=-1
7005 IF W=15THENV1=7724
7006 IFW=15THENV2=7734
7007 IFW=15THENS1=1
7009 FORW=V1TOV2STEPS1
7010 POKEW,0
7011 POKE36878,15:POKE36877,221:FORT=1TO45:NEXT:POKE36878,0:POKE36877,0
7020 FORD=1TO95:NEXT
7030 POKEW,35
7032 POKEW1,02
7033 POKE36878,15:POKE36877,159:FORD=1TO45:NEXT :POKE36878,0:POKE36877,0
7034 FORD=1TO95:NEXT
7040 POKEW1,35
7050 NEXT
7051 IFW=24THENV3=7776
7052 IFW=24THENS2=-22
7053 IFW=15THENV3=7864
7054 IFW=15THENS2=22
7061 FORD1=V2TOV3STEPS2
7062 POKED1,01
7063 POKE36878,15:POKE36877,151:POKE36878,0:FORD=1TO200:NEXT
7064 POKED1,35:FORD=1TO200:NEXT
7065 POKED1,02:FORD=1TO200:NEXT:POKED1,35
7066 NEXT:RETURN
8999 END
9000 POKE 56879,122
9010 POKE 51,255:POKE52,27
9020 POKE55,255:POKE56,27
9030 FORI=0TO511
9040 POKE7168+I,PEEK(32768+I):NEXTI
9050 FORI=0TO(8*8-1):READA:IFA=-1THEN10005
9060 POKE7168+I+(3*8),A:NEXT
9065 POKE36869,255
9070 DATA65,34,20,8,20,34,65,0
9080 DATA 65,34,20,8,20,34,20,0
9090 DATA0,0,0,0,0,0,0,0
10000 DATA 24,36,66,66,36,24,36,102
10001 DATA 24,36,66,66,36,24,36,195
10002 DATA 0,0,0,0,255,0,0,0
10003 DATA 0,0,0,0,255,0,0,0
10004 DATA 0,0,0,0,0,0,0,0
10005 DATA-1
10006 RETURN
20000 IFW=15THENGOTO20100
20010 IFW=24THENW=15:POKE36878,15:POKE36876,241:FORD=1TO100:NEXT:POKE36878,0:POK
E36876,0
20011 GOSUB40000
20012 SC=SC+1:IFSC=9THENGOTO30000
20030 GOTO112
20070 IFB=2418+24LTO3818"EP-2
20100 W=2":POKE36879,15:POKE36876,241:FORD=1TO100:NEXT:POKE36878,0:POKE36876,0
20101 GOSUB40000
20102 SC=SC+1:IFSC=9THENGOTO30000
20190 GOTO112
30000 PRINT"Ⓒ":POKE36879,220
30010 PRINT"END OF GAME"
30020 PRINT"NO ONE WON"
30030 POKE36878,15:FORA=128TO250:POKE36876,QW:NEXTQW
30040 "ORL=241TO220STEP-1:POKE36876,L:NEXTL
30050 POKE36876,L:POKE36878,0:POKE36876,0
30070 PRINT" "
30080 PRINT"PRESS 0 TO PLAY OR B    TO FINISH"
30090 GETA■:IFA■="O"THEN13
30100 IFA■="B"THEN END
30110 GOTO30090
30111 END
40000 IFPEEK(7864)=PEEK(7866)=NDPEEK(7868)=PEEK(7956)THEN40500
40001 IFPEEK(7908)=PEEK(7910)ANDPEEK(7912)=PEEK(79 0)THEN40500
40002 IFPEEK(7952) PEEK(7954)ANDPEEK(7956)=PEEK(7954)THEN40500
40003 IFPEEK(7864)=PEEK(7908)ANDPEEK(7952)=PEEK(7908)THEN40500
40004 IFPEEK(7956)=PEEK(7910)ANDPEEK(7954)=PEEK(7910)THEN40500
40005 IFPEEK(7868)=PEEK(7912)ANDPEEK(7956)=PEEK(7912)THEN40 00
40006 IFPEEK(7864)=PEEK(7910)ANDPEEK(7956)=PEEK(7910)THEN40500
40007 IFPEEK(7868)=PEEK(7910)ANDPEEK(7952)=PEEK(7910)THEN40500
40008 RETURN
40500 PRINT"Ⓒ":POKE36879,253:PRINT:IFW=15THENPRINTTAB(5),"X WINS"
40501 IFW=24THENPRINTTAB(5),"O WINS"
40502 FORD=1TO4000:NEXT
40503 GOTO13
```

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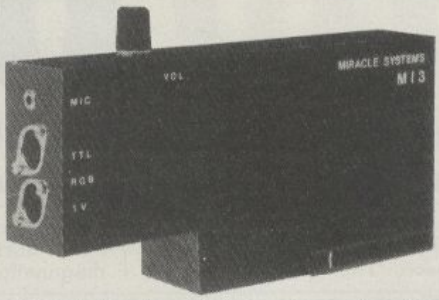
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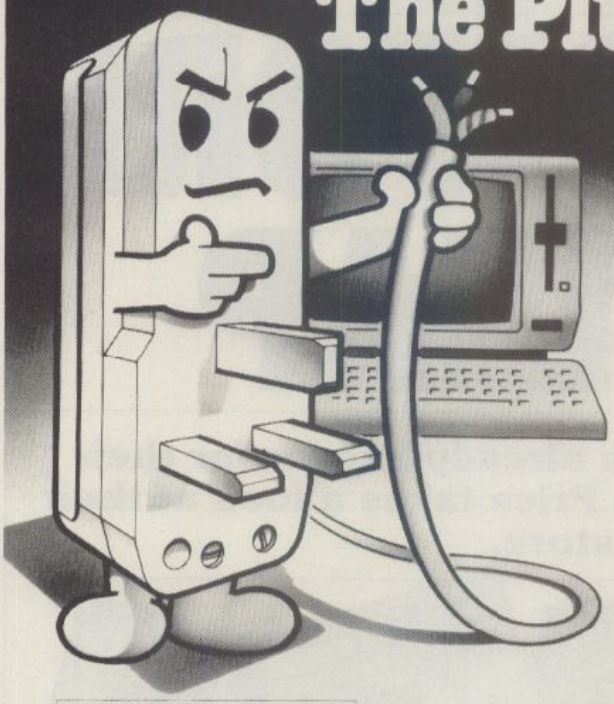
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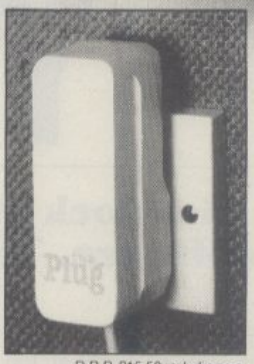
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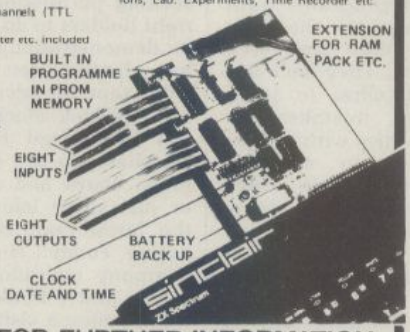
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SUMLOCK ELECTRONIC SERVICES

LOOK BEFORE YOU LEAP

Sumlock (Manchester) are already known for their software. This month Jane Price takes a look at their retail store.



Although readers may have seen or heard of several Sumlock stores around the country, they are independent. The Manchester store, at **198 Deansgate**, has a light, bright uncluttered showroom, displaying microcomputers, peripherals and software, unimpinged upon by run of the mill electrical goods.

All the systems stocked are on display and ready to be activated for demonstrations. The systems stocked are: Atari, Spectrum, Vic 20, Commodore 64, Dragon 32, BBC micro and for the business user, the Sharp M8-B0A.

Sumlock's aim is to provide a complete and comprehensive service to all their customers. Their way of accomplishing this is simple and common sense. They employ young, enthusiastic and knowledgeable staff, whose advice is supplemented by the more expert and very approachable Directors, all of whom have a background in electronic engineering. Any problem can be exhaustingly discussed with the member of staff most knowledgeable on the subject.

Sumlock are rightly proud of their after sales service. The Directors are concerned that their customers should be happy with the machine they buy and consequently offer a very comprehensive repair service, from guarantee work to problems arising at a later date, and including printer and disc drive repairs.

Software Sense

Since Sumlock Manchester produce their own very exciting range of software (they currently employ two programmers on the premises as well as marketing programs from freelance programmers) they are obviously up to date and well stocked in this area. They have few problems deciding what to stock and rarely make mistakes. In addition to taking titles with proven popularity from other software houses, they will obtain titles requested by a customer. New titles and products are viewed and tested in the shop by the staff, and if popular, a larger stock will be ordered.

Most of the software will be demonstrated by the staff before purchase and because of the heavy demand for this facility at peak times (Saturdays in particular) and long tape loading times slowing down demonstrations still further, they are considering putting several demonstration programs together on disc and are in the process of seeking permission from the copyright holders to do so. This would be for demonstration purposes only and has already been tried out with a video tape for advertising purposes.

Sumlock stock everything you will ever need for your system, whether you are searching for the latest death and destruction game or just some information, or even the latest copy of *Personal Computing Today*! They are a friendly company operating at competitive prices and I think, like I did, you would enjoy a visit.

STOP PRESS: Sumlock are constantly looking for exceptional programs so if you think you have the next PAC MAN in your chips, drop in to see Alan Lee.



TOP TEN

Available in all good software stockists. Dealer enquiries contact **MATTHEW THOMAS** on **051-709 7071**

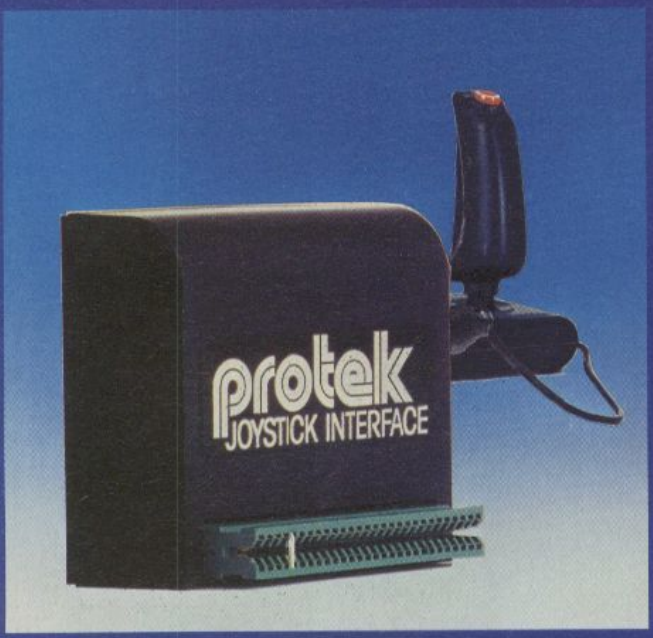
BUG-BYTE SOFTWARE™

Mulberry House, Canning Place, Liverpool L1 8JB.

PLAY TH

Arcade Action For The ZX Spectrum

SPECTRAVISION JOYSTICK £9.95 (arcade action, pistol grip, ATARI® Compatible)



If you want Arcade quality control for your Sinclair ZX Spectrum, you'll find the Protek combination hard to beat. The interface is compatible with a range of software including a number of titles from: ULTIMATE, SILVERSOFT, RABBIT SOFTWARE, QUICKSILVER, QUEST, PSION, NEW GENERATION SOFTWARE, IMAGINE, OCEAN, plus many more.

The protek joystick interface is simple to use. It just plugs in at the back of your Spectrum and is compatible with any "Atari type" Joystick Connector. We recommend the Spectravision Joystick at only £9.95 for Pistol Grip Joystick with a top and base fire button plus specially contoured shape and rubber suction cup footing for single hand operation.

Protek JOYSTICK INTERFACE £14.95



IE GAME

HUNTER-KILLER

For the 48K ZX Spectrum

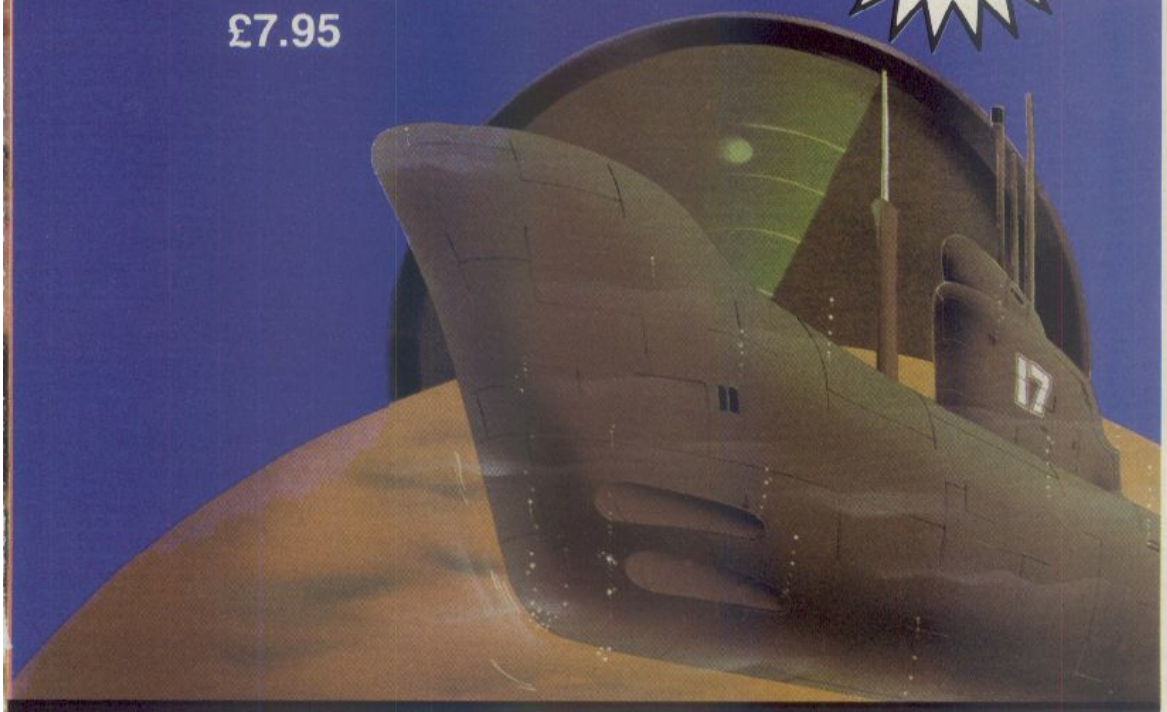
Can you Captain a World War II submarine, hunt the enemy then destroy him with your torpedoes?
Realistic simulation including:

(a) 4 separate screen displays
(Control Room, Chart Room, View through Periscope, Navigation Chart)
(b) 18 control functions
(c) Quick kill option

Written by Rod Hopkins

£7.95

Sensational new two-computer option. Additional hardware required, available soon



TRADE ENQUIRIES WELCOME

Protek
COMPUTING LTD.
1A Young Square, Brucefield Industrial Estate,
Livingston, W. Lothian.

Subject to availability. Prices correct at time of going to press.

The Electron. Now, it's easier to catch up with your children.

At £199 the Electron is the first home computer in its price range to speak the same language most children learn at school, BBC Basic.

Which is not surprising. For the Electron comes from Acorn Computers who make the much acclaimed Micro chosen by over 80% of schools participating in the Government's Micros in Schools project. As well as using the same language, the Electron has a similar keyboard and many of the



functions of its famous, but naturally more expensive, relation.

So now it's more practical for children to continue their computer studies at home. They'll be able to use the same educational programs they use at school. And if asked nicely, they'll be able to help willing adults take their first steps into computing.

But the Electron is a lot more than a teaching aid. It has been designed and built to be a permanent part of the family year in and year out.

With its fast growing range of software and its ease of use, it should become as essential to the home as the washing machine and the vacuum cleaner. Except, of course, that the number of things the Electron can be trained to do around the house is as limitless as your own interest and imagination.

It can be your book keeper; keep your diary; help in the kitchen – the sort of patient gastronomic expert you've always wanted at your elbow. And of course, it is always willing to play games – from blood and thunder entertainments like Monsters to more intellectual diversions like chess.



The Electron is neat and compact. It produces high quality sound and offers colour graphics with the highest resolution of any home computer on the market. And that's not just opinion – it's measurable.

It has been built to last with a robust electric typewriter style keyboard that will take a lot of beating. (Just compare it with the standard calculator type keyboard.)

And it will grow with you via expansion modules to take additions like printers and disc drives.

The Electron plugs straight into virtually any TV set and cassette player. It comes with a user guide, a manual on basic programming and an "Introductory" cassette which will show you a little of what it can do with its 64k of memory (32 ROM; 32 RAM).

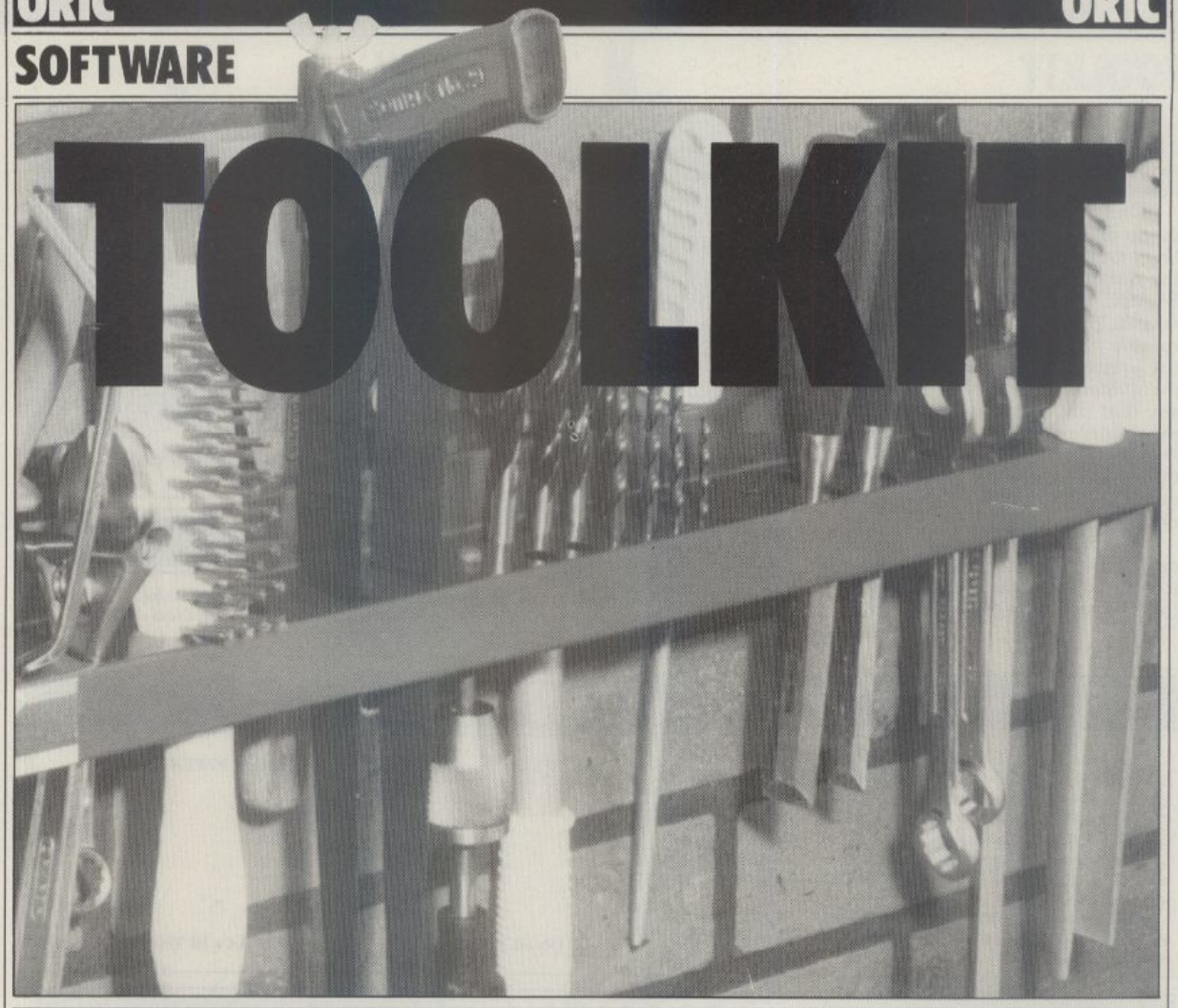
You can buy your Electron from selected W H Smith and local Acorn stockists. However, if you would like to order one with your credit card, or if you would like the address of your nearest supplier, just phone 01-200 0200 anytime or 0933-79300 during office hours.



The Acorn Electron.

SOFTWARE

TOOLKIT



Machine code causes untold problems for programmers but C Hamilton has put together some facilities to make writing and de-bugging it easier.

Here I have written about half a dozen facilities intended to make the task of writing and de-bugging machine code much easier.

The program is driven from a menu and using it I hope you will all find a few problems you may have come across when machine code programming solved, as I did.

The first facility is a dissembler to convert the code in memory back to assembly language. A few points to note: immediate operands are displayed in hexadecimal, binary and ASCII where appropriate. Relative branches are shown as destination addresses and signed decimal offsets. The display from the disassembler uses the following pattern:

Address: hex. codes mnemonic operand

The second facility is a memory dump which simply displays the contents of memory as follows:

Address: memory as hex.
memory as ASCII

If the content of a memory location isn't a printable character, eg. codes less than 32, they are represented in the ADCII section by a '.'.

The third facility is a search routine which will search through memory for a particular sequence of bytes. The sequence to be searched for can be entered either as a list of numbers, Hex or decimal, or as a string of characters. The routine is not particularly fast but it can search through at about 1Kper minute, no matter how long the sequence is, up to a maximum of 255 bytes.

Next comes a facility for changing the contents of memory. An address and its contents are displayed and you have the following options: to change the contents, to set the address, to increment or decrement the address, to pad a block of memory with a value or, finally, to copy a block of memory from one location to another.

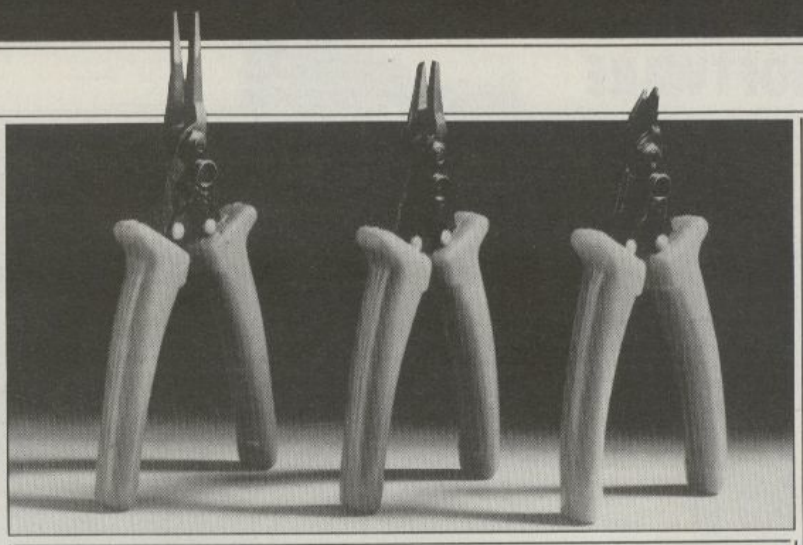
The fifth facility is simply a Hex to decimal (and vica versa) converter. The sixth however takes a two digit Hex number and returns the associated mnemonic, if there ▶

ORIC TOOLKIT

is one, or if you enter a mnemonic it will return the Hex codes associated with the addressing modes it uses.

On the disassembler, memory dump and sequence search routines there is an option to pause the output at any time by pressing SPACE. Pressing it again will restart, pressing ESC will abort the routine and pressing P will toggle the printer on and off. Having mentioned the printer I had better say that the output of the disassembler and memory dump can be directed to a printer and further, that the length of the printer line can be set from 10 to 255 characters.

Any time an address is requested it can be entered either as a decimal or hexadecimal number the Hex numbers preceded by a "#".



HOW IT RUNS

The running of the program together with a description of the important variables is explained in the REM statements so I feel it is unnecessary to duplicate them here.

HINTS ON CONVERSION

Any Oric specific POKEs or PEEKs have been explained in the REMs so that equivalents can be found. The only other Oric specific commands used are the MUSIC, PLAY and PING commands, these are used only to signal input errors and are not essential, but error indications are more noticeable with them.

Obviously the disassembler and opcode/mnemonic converter work only for the 6502 but the other facilities apply equally well to all other processors.

Those machines which don't have REPEAT UNTIL can imitate it by changing the REPEAT and UNTIL lines as in the following example:

```
100 REPEAT          becomes   100 REM REPEAT
  .                               .
  .                               .
  .                               .
  .                               .
  .                               .
  .                               .
  .                               .
  .                               .
190 UNTIL A>10                  190 IF A<=10 THEN GOTO 100
```

PROGRAM LISTING

```
1 REM ************************
2 REM ** 6502 M/C Tool Kit **
3 REM **   © C Hamilton    **
4 REM **  Documented Copy  **
5 REM ************************
6 REM
7 REM
9 REM ** Jump to Preliminaries **
10 GOSUB10000:GOTO9000
999 REM ** Disassembler **
1000 CLS:PRINT:PRINTTAB(27)"Disassemble":PRINT:PRINT
1009 REM ** AD = address , ST = start address
1010 AD=ST
1020 REPEAT
1029 REM ** D$ = data , BY = number of bytes in operand
1030 D$=D$(PEEK(AD)):BY=VAL(D$):TY=VAL(MID$(D$,5))
1038 REM ** TY = addressing mode , OU$ = output string
1039 REM ** Address
1040 OU$=RIGHT$("0000"+MID$(HEX$(AD),2),4)+":  "
1049 REM ** Hex
1050 FORI=0TOBY
1060 OU$=OU$+RIGHT$("00"+MID$(HEX$(PEEK(AD+I)),2),2)+" "
1070 NEXTI
1079 REM ** Pad with spaces
1080 FORI=LEN(OU$)TO16:OU$=OU$+" ":NEXTI
1089 REM ** Mnemonic
1090 AD=AD+1:OU$=OU$+" "+MID$(D$,2,3)+" "
1099 REM ** Branch according to addressing mode
1100 IFTYTHENGOSUB1900+200*TY
1109 REM ** Move to next instruction
1110 AD=AD+BY
1119 REM ** Display string, to printer if set
1120 PRINTOU$:IFPRTHENLPRINTOU$:GOSUB9400
1129 REM ** Check for interrupt
1130 GOSUB9700
1140 UNTIL AD>FH
1149 REM ** Wait until ready
1150 GOSUB9900
1159 REM ** Return to main menu
1160 RETURN
1997 REM ** Addressing Modes and Operands**
1998 REM ** Immediate **
1999 REM ** Get operand
2000 IMM=PEEK(AD):X=IMM:Y%=128
2009 REM ** Hex
2010 OU$=OU$+"#"+RIGHT$("00"+MID$(HEX$(IMM),2),2)+"
2019 REM ** Binary
2020 FORI=1TO3
2030 IFY%>XTHENOU$=OU$+"0"ELSEOU$=OU$+"1":X=X-Y%
2040 Y%=Y%/2
2050 NEXTI
2059 REM ** ASCII, if appropriate
2060 IFIMM>31ANDIMM<127THENOU$=OU$+" '"+CHR$(IMM)+"'"
2070 RETURN
2199 REM ** Absolute **
2200 OU$=OU$+RIGHT$("0000"+MID$(HEX$(DEEK(AD)),2),4):RETURN
2399 REM ** Absolute,X **
2400 GOSUB2200:OU$=OU$+",X":RETURN
2599 REM ** Absolute,Y **
2600 GOSUB2200:OU$=OU$+",Y":RETURN
2798 REM ** Relative **
2799 REM ** OS = offset , check for negative
2800 OS=PEEK(AD)+1:IFOS>127THENOS=OS-256
2809 REM ** BR = destination address
2810 BR=AD+OS:OU$=OU$+RIGHT$("0000"+MID$(HEX$(BR),2),4)+"  ["
2819 REM ** Offset in signed decimal
2820 IFOS<0THENOU$=OU$+"-"ELSEOU$=OU$+"+"
2830 OU$=OU$+MID$(STR$(OS-1),2)+"]"
2840 RETURN
2999 REM ** Zero Page **
3000 OU$=OU$+RIGHT$("00"+MID$(HEX$(PEEK(AD)),2),2):RETURN
3129 REM ** 3 chars implies mnemonic
3199 REM ** Zero Page,X **
3200 GOSUB3000:OU$=OU$+",X":RETURN
3399 REM ** Zero Page,Y **
3400 GOSUB3000:OU$=OU$+",Y":RETURN
3599 REM ** Accumulator **
3600 OU$=OU$+"A":RETURN
3799 REM ** (Absolute Indexed) **
3800 OU$=OU$+"(":GOSUB2200:OU$=OU$+")":RETURN
3999 REM ** (Pre-indexed Indirect,X) **
4000 OU$=OU$+"(":GOSUB3000:OU$=OU$+",X)":RETURN
```

```
4199 REM ** (Post-indexed Indirect),Y **
4200 OU$=OU$+")":GOSUB3000:OU$=OU$+",Y":RETURN
4999 REM ** Opcode/Mnemonics **
5000 CLS:PRINT:PRINTTAB(25)"Opcode Mnemonics":PRINT:PRINT
5010 PRINT"  Enter either:":PRINT:PRINT
5020 PRINT"       a two digit hex number, No. '#'":PRINT
5030 PRINT"       not required or":PRINT:PRINT
5040 PRINT"       a three character mnemonic.":PRINT:PRINT
5050 PRINT"  Enter FF to finish.":PRINT:PRINT:PRINT
5100 REPEAT
5109 REM ** Get input, remove leading '#'s
5110 INPUT">:  "iA$:PRINT:IFASC(A$)=35THENA$=MID$(A$,2)
5119 REM ** Only allow 2 or 3 characters
5120 IFLEN(A$)<2ORLEN(A$)>3THENPRINT"Invalid.":PRINT:GOTO5110
5129 REM ** 3 characters implies mnemonic
5130 IFLEN(A$)=3THENGOSUB5200:GOTO5160
5138 REM ** Opcode given
5139 REM ** Check for legal value
5140 IFVAL("#"+A$)=0ANDA$<>"00"THENPRINT"Invalid.":PRINT:GOTO5110
5149 REM ** Reinstate leading '#'
5150 N$="#"+A$:GOSUB5300
5160 PRINT:PRINT
5170 UNTIL A$="FF"
5179 REM ** Return to main menu
5180 GOTO9005
5198 REM ** Mnemonic given
5199 REM ** Search for matches within opcode data
5200 FORN=0TO255
5209 REM ** AM$ = addressing mode , BY$ = number
of bytes in operand
5210 GOSUB5500:IFOP$=A$THENPRINTN$"   "AM$"   "BY$
5220 NEXTN
5230 RETURN
5299 REM ** Opcode given
5300 N=VAL(N$):GOSUB5500
5309 REM ** Check for unassigned
5310 IFOP$="???"THENPRINT"Unassigned."ELSEPRINTOP$"   "AM$"   "BY$
5320 RETURN
5498 REM ** Convert opcode / mnemonic
5499 REM ** D$ = data , OP$ = mnemonic ,H$ = opcode
5500 D$=D$(N):OP$=MID$(D$,2,3):H$=RIGHT$("00"+MID$(HEX$(N),2),2)
5509 REM ** AM$ = addressing mode
5510 IFOP$="???"THENAM$=""ELSEAM$=AM$(VAL(MID$(D$,5)))
5519 REM ** BY$ = number of bytes in operand
5520 IFOP$="???"THENBY$=""ELSEBY$=CHR$(ASC(D$)+1)+" bytes"
5530 RETURN
5999 REM **-Memory Dump **
6000 CLS:PRINT:PRINTTAB(28)"Memory Dump":PRINT:PRINT
6009 REM ** UP = number of bytes per line, depends on line length
6010 IFPRTHENUP=8*INT((PL-8)/32)ELSEUP=8
6015 IFUP>32THENUP=32
6019 REM ** AD = start address, multiple of UP
6020 AD=INT(ST/UP)*UP
6030 REPEAT
6040 A$="":OU$=RIGHT$("0000"+MID$(HEX$(AD),2),4)+": '
6050 FORI=1TOUP
6059 REM ** D = code
6060 D=PEEK(AD):AD=AD+1
6069 REM ** Bytes in hex
6070 OU$=OU$+RIGHT$("0"+MID$(HEX$(D),2),2)+" "
6079 REM ** A$ = bytes in ASCII, where appropriate
6080 IFD>31ANDD<127THENA$=A$+CHR$(D)ELSEA$=A$+"."
6090 NEXTI
6099 REM ** Hex followed by ASCII
6100 OU$=OU$+" "+A$
6109 REM ** Display, to printer if set
6110 PRINTOU$:IFPRTHENLPRINTOU$:GOSUB9400
6119 REM ** Check for interrupt
6120 GOSUB9700
6130 UNTIL AD>FH
6139 REM ** Wait until ready
6140 GOSUB9900
6149 REM ** Return to main menu
6150 RETURN
6499 REM ** Poke Memory **
6500 CLS:PRINT:PRINTTAB(27)"Poke Memory":PRINT:PRINT
6510 PRINT"  An address is shown, enter:":PRINT:PRINT
6520 PRINT"       two digit hex number to be poked":PRINT
6530 PRINT"       S, set address":PRINT
6540 PRINT"       cursor left, decrement address":PRINT
6550 PRINT"       cursor right, increment address":PRINT
6555 PRINT"       P, pad memory with value":PRINT
6560 PRINT"       M, move block of memory":PRINT
6565 PRINT"       ESC, return to main menu":PRINT:PRINT:PRINT
6569 REM ** I0$,I1$ = strings of allowed input characters
6570 I0$="0123456789ABCDEFSPM"+CHR$(8)+CHR$(9)+CHR$(27)
6580 I1$=LEFT$(I0$,16)+CHR$(127)+CHR$(13)
6600 REPEAT
6609 REM ** Display address
6610 PRINTRIGHT$("0000"+MID$(HEX$(PA),2),4)" = ";
6614 REM ** Display current contents
6615 PRINTRIGHT$("00"+MID$(HEX$(PEEK(PA)),2),2)"  >  ";
6619 REM ** Get command, check for ESC
6620 IN$=IO$:GOSUB6900:IFIN=27GOTO6750
6629 REM ** S, set address
6630 IFIN=17THENGOSUB6800:GOTO6740
6634 REM ** P, pad memory
6635 IFIN=18THENGOSUB6850:GOTO6740
6639 REM ** M, move block of memory
6640 IFIN=19THENGOSUB6870:GOTO6740
6644 REM ** cursor left/right decrement/increment address
6645 IFIN>19THENPA=PA-(IN=20)*(PA>0)+(IN=21)*(PA<#FFFF):PRINT:
GOTO6740
6649 REM ** Add leading '#'
6650 N$="#"+A$:PRINTN$;:IN$=I1$
6659 REM ** Get another hex digit
6660 REPEAT
6669 REM ** Get character, check for RETURN
6670 GOSUB6900:IFIN=13GOTO6720
6679 REM ** Limit to '#' + two digits
6680 IFLEN(N$)=3ANDIN<17THENMUSIC1,1,1,0:PLAY:,0,1,8^0:GOTO6670
6689 REM ** Only delete if at least one digit there
6690 IFIN=17ANDLEN(N$)>1THENN$=LEFT$(N$,LEN(N$)-1):PRINTA$;
6699 REM ** Add on next digit
6700 IFIN<17THENN$=N$+A$:PRINTA$;
6719 REM ** Repeat until RETURN pressed
6720 UNTILA$=CHR$(13)
6730 PRINT:N=VAL(N$):POKEPA,N:PA=PA-(PA< FFFF)
6740 PRINT:PRINT
6749 REM ** Repeat until ESC pressed
6750 UNTILA$=CHR$(27)
6759 REM ** Return to main menu
6760 GOTO9005
6798 REM ** Change address
6799 REM ** Get input, force leading '#'
6800 INPUT"address = ";N$:IFASC(N$)<>35THENN$="#"+N$
6809 REM ** Set new address
6810 PA=VAL(N$)
6819 REM ** Only allow character if it is in IN$
6820 RETURN
6848 REM ** Pad memory
6849 REM ** Get start, finish addresses and value
6850 PRINT"PAD":GOSUB9800:INPUT"          value = "IN$
6854 REM ** Force leading '#' on value
6855 IFASC(N$)<>35THENN$="#"+N$
6859 REM ** Pad memory between limits
6860 N=VAL(N$):FORAD=ST TOFH:POKEAD,N:NEXTAD
6865 RETURN
6868 REM ** Move block of memory
6869 REM ** Get addresses of block to be moved
6870 PRINT"MOVE BLOCK":PRINT:PRINT"From:":GOSUB9800:PRINT:PRINT
"To:":PRINT
6874 REM ** Get destination addresses
6875 INPUT" Start address = ";DS$:DS=VAL(DS$)
6879 REM ** Check for valid address
6880 IFDS<OORDS>#FFFFTHENMUSIC1,1,1,0:PLAY1,0,1,800:GOTO6875
6884 REM ** Transfere block byte by byte
6885 FORAD=ST TOFH:POKEDS,PEEK(AD):DS=DS+1:NEXTAD
6890 RETURN
6899 REM ** Get character
6900 REPEAT
6910 GETA$:IN=0
6920 FORI=1TOLEN(IN$)
6930 IFA$=MID$(IN$,I,1)THENIN=I
6940 NEXTI
6950 UNTILIN>0
6960 RETURN
6999 REM ** Find Sequence **
7000 CLS:PRINT:PRINTTAB(27)"Find Sequence":PRINT:PRINT
7010 PRINT"  To find a sequence of bytes in memory":PRINT
7020 PRINT"type in the sequence as one of these :-":PRINT:PRINT
7030 PRINT"    a list of Decimal numbers,":PRINT
7040 PRINT"    a list of Hex. numbers, # not needed,"
7050 PRINT"    a String of characters, max. 255":PRINT:PRINT
7060 PRINT"Which option D,H or S ? ";
7069 REM ** Get sequence format option
7070 REPEAT:GE^A$:UNTILA$="D"ORA$="H"ORA$="S"
7079 REM ** S$ = source sequence
7080 PRINTA$:S$="":IFA$="S"THENGOSUB8500ELSEGOSUB8000
7089 REM ** Get start, finish addresses
7090 GOSUB9800:AD=ST
7099 REM ** Just the first occurence or all of them ?
7100 PRINT:PRINT:PRINT"First or all occurences (F/A) ? ";
7110 REPEAT:GETA$:UNTILA$="F"ORA$="A"
7119 REM ** F0 = flag, 0 = all, 1 = first only
7120 IFA$="F"THENF0=1ELSEF0=0
7130 CLS:PRINT:PRINT"Searching . . . . . .":PRINT:PRINT
7139 REM ** TB$ = cursor control string
7140 TB$=CHR$(11):FORI=1TO16:TB$=TB$+CHR$(9):NEXTI
7498 REM ** Build string from memory
7499 REM ** AF = address of next byte after current string
7500 F$="":AF=AD+LEN(S$)-1
7510 FORI=ADTOAF:F$=F$+CHR$(PEEK(I)):NEXTI
7514 REM ** Switch off cursor
7515 POKE#26A,PEEK(#26A)AND254
7519 REM ** For each match
7520 REPEAT
7529 REM ** Step through memory
7530 REPEAT
7539 REM ** FF = found flag
7540 PRINT"Match found at":FF=FALSE
7550 REPEAT
7559 REM ** Display address of start of current string
7560 PRINTTB$RIGHT$("0000"+MID$(HEX$(AD),2),4)
7569 REM ** If matched then set flag
7570 IFF$=S$THENFF=TRUE
7579 REM ** Increment addresses and update string
7580 AD=AD+1:AF=AF+1:F$=MID$(F$,2)+CHR$(PEEK(AF))
7589 REM ** Check for interrupt
7590 GOSUB9700
7600 UNTIL FF OR AD>FH OR AF=#FFFF
7606 REM ** Stop searching if:
7607 REM ** 1: only looking for first and found it
7608 REM ** 2: past given finish address
7609 REM ** 3: run out of memory to search !
7610 UNTIL (FFANDF0) OR AD>FH OR AF=#FFFF
7614 REM ** Switch cursor back on
7615 POKE#26A,PEEK(#26A)OR1
7619 REM ** Blank out last display if not a match
7620 IFNOTFFTHENPRINTCHR$(11);"
7629 REM ** Wait until ready
7630 GOSUB9900
7639 REM ** Return to main menu
7640 GOTO9005
7999 REM ** Get sequence as a list of numbers
8000 CLS:PRINT:PRINT"Type in sequence, ** to finish, press":PRINT
8010 PRINT"RETURN after each:":PRINT:PRINT
8020 REPEAT
8029 REM ** Get number, check for last
```

TOOLKIT

```
8030 INPUT">:  ";N$:IFN$="**"GOTO8080
8039 REM ** If hex chosen as default then force leading '#'
8040 IFA$="H"ANDASC(N$)<>35THENN$="#"+N$
8050 N=VAL(N$)
8059 REM ** Check for legal value
8060 IFN<0ORN>255THENMUSIC1,1,1,0:PLAY1,0,1,800:GOTO8030
8069 REM ** Add onto source string
8070 S$=S$+CHR$(N)
8079 REM ** Stop when '**' entered
8080 UNTIL N$="**"
8090 RETURN
8499 REM ** Get sequence as a string
8500 CLS:PRINT:PRINT"Type in string (Max. length = 255)":PRINT
:PRINT
8510 REPEAT
8519 REM ** Get character, check for RETURN
8520 GETA$:IFA$=CHR$(13)GOTO8570
8524 REM ** Check for CTRL/T and toggle CAPS
8525 IFA$=CHR$(20)THENPRINTA$:GOTO8520
8529 REM ** Refuse to accept more than 255 characters
8530 IFLEN(S$)=255ANDA$<>CHR$(13)THENFING:GOTO8520
8534 REM ** If string is empty and DEL pressed then ignore
8535 IFLEN(S$)=0ANDA$=CHR$(127)GOTO8520
8539 REM ** Remove last character from string if DEL pressed
8540 IFA$=CHR$(127)ANDLEN(S$)>1THENS$=LEFT$(S$,LEN(S$)-1):GOTO8560
8545 IFA$=CHR$(127)ANDLEN(S$)=1THENS$="":GOTO8560
8548 REM ** Add character onto source string
8549 REM ** If character is a control then display space instead
8550 S$=S$+A$:IFASC(A$)<32THENA$=" "
8560 PRINTA$;
8569 REM ** Stop when RETURN pressed
8570 UNTIL A$=CHR$(13)
8580 RETURN
8999 REM ** Main Menu **
9000 REPEAT
9005 CLS:PRINT:PRINT
9010 PRINT:PRINT"The following options are available:":PRINT:PRINT
9020 PRINTSPC(10)"1  Disassemble":PRINT:PRINTSPC(10)"2
Dump memory":PRINT
9030 PRINTSPC(10)"3  Find sequence":PRINT:PRINTSPC(10)"4
Poke memory":PRINT
9040 PRINTSPC(10)"5  Convert hex/dec":PRINT:PRINTSPC(10)"6
Opcode/mnemonic":PRINT
9045 PRINTSPC(10)"7  Select printer":PRINT:PRINTSPC(10)"8
Goodbye":PRINT
9050 PRINT:PRINT"Which do you want ? ";
9059 REM ** Get option, BOOP if illegal
9060 REPEAT:GETD$:D=VAL(D$):IFD<1ORD>8THENMUSIC1,1,1,0:PLAY1,0,
1,800
9065 UNTILD>0ANDD<9:PRINTD$
9069 REM ** Branch to choice
9070 ONDGOTO9100,9200,7000,6500,9500,5000,9300
9079 REM ** Check for Goodbye
9080 UNTIL D=8
9084 REM ** Clear top line
9085 FORI=#BB80TO#BBA0:POKEI,32:NEXTI
9089 REM ** Reset keyboard/VDU vector and END
9090 CLS:POKE#26A,3:END
9099 REM ** Get start, finish addresses and branch to disassembler
9100 GOSUB9800:GOSUB1000:GOTO9005
9199 REM ** Get start, finish addresses and branch to memory dump
9200 GOSUB9800:GOSUB6000:GOTO9005
9299 REM ** Set up printer
9300 CLS:PRINT:PRINT"Press:":PRINT:PRINT"      P to toggle printer,"
:PRINT
9302 PRINT"      L to change line length,":PRINT:PRINT"
RETURN to return to
 menu":PRINT
9304 PRINT:PRINT"  Nb. pressing P resets top of page.":PRINT:PRINT
9306 PRINT"Which do you want ? ";
9309 REM ** Get command
9310 REPEAT:GETA$:UNTILA$="P"ORA$="L"ORA$=CHR$(13):PRINTA$
:PRINT:PRINT
9319 REM ** Return to main menu if RETURN pressed
9320 IFA$=CHR$(13)GOTO9005
9329 REM ** Toggle printer on/off if P pressed and reset line count
9330 IFA$="P"THENPR=ABS(PR-1):LL=1
9339 REM ** Get new line length if L pressed
9340 IFA$="L"THENREPEAT:INPUT"Length = "!PL$:PL=VAL(PL$):UNTILPL>
10ANDPL<256
9344 REM ** Display printer status
9345 GOSUB9350:GOTO9300
9349 REM ** Set new LPRINT line length
9350 POKE#31,PL:D$="Printer ":IFPRTHEND$=D$+"ON"ELSED$=D$+"OFF"
9360 D$=D$+"/"+MID$(STR$(PL),2)+"    "
9369 REM ** Display printer status on top line
9370 FORI=1TOLEN(D$):POKE#BB81+I,ASC(MID$(D$,I,1)):NEXTI
9380 RETURN
9399 REM ** Printer paging routine
9400 LL=LL+1
9409 REM ** Move paper over perforations
9410 IFLL>64THENLPRINT:LPRINT:LL=1
9420 RETURN
9499 REM ** Dec/Hex Converter **
9500 CLS:PRINT:PRINTTAB(24)"Dec/Hex Converter":PRINT:PRINT
9510 PRINT"  To use simply type in the number to be"
9520 PRINT"converted, all hexadecimal numbers must":PRINT
9530 PRINT"begin with a '#'.":PRINT
9540 PRINT"  Entering 0 will cause a return to the":PRINT
9550 PRINT"main menu.":PRINT:PRINT:PRINT
9559 REM ** TB$ = cursor control string
9560 TB$=CHR$(11):FORI=1TO15:TB$=TB$+CHR$(9):NEXTI
9600 REPEAT
9609 REM ** Get number
9610 INPUT":  ";N$:N=VAL(N$):PRINTTB$;
9614 REM ** Check for valid input
9615 IFN=0ANDLEFT$(N$,2)<>"#0"ANDASC(N$)<>48THENPRINT"Invalid."
:PRINT:GOTO9610
9620 IFN>#FFFFTHENPRINT"Too large.":PRINT:GOTO9610
9625 IFN<-32767THENPRINT"Too small.":PRINT:GOTO9610
9629 REM ** If negative decimal then complement with #FFFF
9630 IFN<0THENN=#FFFF+N+1
9634 REM ** If hex then display +ve and -ve decimal equivalents
9635 IFASC(N$)=35ANDN>#80ANDN<#100THENPRINTN;"or ";-(#100-N);
:GOTO9660
9640 IFASC(N$)=35THENPRINTN;:IFN>#8000THENPRINT"or ";-(#FFFF-N+1);
9649 REM ** If decimal then display hex equivalent
9650 IFASC(N$)<>35THENPRINT"#"RIGHT$("0000"+MID$(HEX$(N),2),4);
9660 PRINT:PRINT
9669 REM ** Stop when 0 is input
9670 UNTIL N=0
9679 REM ** Return to main menu
9680 GOTO9005
9699 REM ** Check for interrupt
9700 K$=KEY$:IFK$=""THENRETURN
9709 REM ** If ESC pressed then abort
9710 IFK$=CHR$(27)THENAD=FH+1:RETURN
9719 REM ** If P pressed then toggle printer and reset line count
9720 IFK$="P"THENPR=ABS(PR-1):LL=1:GOSUB9350:RETURN
9729 REM ** Wait until SPACE or ESC pressed
9730 REPEAT:GETK$:UNTILK$=" "ORK$=CHR$(27)
9739 REM ** If ESC pressed then abort
9740 IFK$=CHR$(27)THENAD=FH+1
9750 RETURN
9799 REM ** Get start and finish address
9800 PRINT:PRINT
9809 REM ** Get start address
9810 INPUT" Start address = ";ST$:ST=VAL(ST$)
9814 REM ** Check if valid, 0 <= start <= #FFFF (65535)
9815 IFST<0ORST>#FFFFTHENMUSIC1,1,1,0:PLAY1,0,1,800:PRINT
"Invalid." :GOTO9810
9819 REM ** Get finish address
9820 INPUT"Finish address = ";FH$:FH=VAL(FH$)
9824 REM ** Check if valid, start <= finish <= #FFFF (65535)
9825 IFST>FHORFH>#FFFFTHENMUSIC1,1,1,0:PLAY1,0,1,800:PRINT
"Invalid." :GOTO9820
9830 RETURN
9899 REM ** wailLEFT$ until SPACE pressed
9900 PRINT:PRINT:PRINTTAB(21)"Press SPACE to continue.";
9910 REPEAT:GETA$:UNTILA$=" "
9920 RETURN
9996 REM ** Preliminaries
9997 REM ** Preliminaries
9998 REM ** Location #26A = keyboard/VDU vector
9999 REM ** Set 40 column white/black
10000 CLS:POKE#26A,39:PAPER0:INK7
10004 REM ** Clear top line and make it white/red
10005 FORI=#BB80TO#BBA0:POKE1,32:NEXTI:DOKE#BB80,#711
10008 REM ** PR = printer on/off flag , PL = printer line length
10009 REM ** Location #268 holds Y co-ord of cursor, set to line 9
10010 PR=0:PL=80:GOSUB9350:POKE#268,9
10020 PRINT:PRINTTAB(25)"6502 M/C TOOL KIT":PRINTTAB(25)"---------
---------":PRINT
10030 PRINTTAB(24)CHR$(96)" C Hamilton 1:6:83":PRINTTAB(24)"------
---------------"

10034 REM ** Switch off cursor
10035 PRINTCHR$(17)
10040 DIM D$(255),AM$(12)
10049 REM ** D$() = opcode data
10050 FORI=0TO255:READ D$(I):NEXTI
10059 REM ** AM$() = addressing modes
10060 FORI=0TO12:READ AM$(I):NEXTI
10070 WAIT200
10074 REM ** Switch cursor back on
10075 PRINTCHR$(17)
10080 RETURN
10995 REM ** Opcode data
10996 REM ** Chars  Meaning
10997 REM **    1    number of bytes in operand
10998 REM **  2-4    mnemonic
10999 REM **  5-6    addressing mode
11000 DATA 0BRK0 ,1ORA11,0???  ,0???  ,0???  ,1ORA6 ,1ASL6 ,0???
11010 DATA 0PHP0 ,1ORA1 ,0ASL9 ,0???  ,0???  ,2ORA2 ,2ASL2 ,0???
11020 DATA 1BPL5 ,1ORA12,0???  ,0???  ,0???  ,1ORA7 ,1ASL7 ,0???
11030 DATA 0CLC0 ,2ORA4 ,0???  ,0???  ,0???  ,2ORA3 ,2ASL3 ,0???
11040 DATA 2JSR2 ,1AND11,0???  ,0???  ,1BIT6 ,1AND6 ,1ROL6 ,0???
11050 DATA 0PLP0 ,1AND1 ,0ROL9 ,0???  ,2BIT2 ,2AND2 ,2ROL2 ,0???
11060 DATA 1BMI5 ,1AND12,0???  ,0???  ,0???  ,1AND7 ,1ROL7 ,0???
11070 DATA 0SEC0 ,2AND4 ,0???  ,0???  ,0???  ,2AND3 ,2ROL3 ,0???
11080 DATA 0RTI0 ,1EOR11,0???  ,0???  ,0???  ,1EOR6 ,1LSR6 ,0???
11090 DATA 0PHA0 ,1EOR1 ,0LSR9 ,0???  ,2JMP2 ,2EOR2 ,2LSR2 ,0???
11100 DATA 1EVC5 ,1EOR12,0???  ,0???  ,0???  ,1EOR7 ,1LSR7 ,0???
11110 DATA 0CLI0 ,2EOR4 ,0???  ,0???  ,0???  ,2EOR3 ,2LSR3 ,0???
11120 DATA 0RTS0 ,1ADC11,0???  ,0???  ,0???  ,1ADC6 ,1ROR6 ,0???
11130 DATA 0PLA0 ,1ADC1 ,0ROR9 ,0???  ,2JMP10,2ADC2 ,2ROR2 ,0???
11140 DATA 1EVS5 ,1ADC12,0???  ,0???  ,0???  ,1ADC7 ,1ROR7 ,0???
11150 DATA 0SEI0 ,2ADC4 ,0???  ,0???  ,0???  ,2ADC3 ,2ROR3 ,0???
11160 DATA 0???  ,1STA11,0???  ,0???  ,1STY6 ,1STA6 ,1STX6 ,0???
11170 DATA 0DEY0 ,0???  ,0TXA0 ,0???  ,2STY2 ,2STA2 ,2STX2 ,0???
11180 DATA 1BCC5 ,1STA12,0???  ,0???  ,1STY7 ,1STA7 ,1STXB ,0???
11190 DATA 0TYA0 ,2STA4 ,0TXS0 ,0???  ,0???  ,2STA3 ,0???  ,0???
11200 DATA 1LDY1 ,1LDA11,1LDX1 ,0???  ,1LDY6 ,1LDA6 ,1LDX6 ,0???
11210 DATA 0TAY0 ,1LDA1 ,0TAX0 ,0???  ,2LDY2 ,2LDA2 ,2LDX2 ,0???
11220 DATA 1BCS5 ,1LDA12,0???  ,0???  ,1LDY7 ,1LDA7 ,1LDXB ,0???
11230 DATA 0CLV0 ,2LDA4 ,0TSX0 ,0???  ,2LDY3 ,2LDA3 ,2LDX4 ,0???
11240 DATA 1CPY1 ,1CPM11,0???  ,0???  ,1CPY6 ,1CPM6 ,1DEC6 ,0???
11250 DATA 0INY0 ,1CPM1 ,0DEX0 ,0???  ,2CPY2 ,2CPM2 ,2DEC2 ,0???
11260 DATA 1BNE5 ,1CPM12,0???  ,0???  ,0???  ,1CPM7 ,1DEC7 ,0???
11270 DATA 0CLD0 ,1CPM4 ,0???  ,0???  ,0???  ,2CPM3 ,2DEC3 ,0???
11280 DATA 1CPX1 ,1SBC11,0???  ,0???  ,1CPX6 ,1SBC6 ,1INC6 ,0???
11290 DATA 0INX0 ,1SBC1 ,0NOP0 ,0???  ,2CPX2 ,2SBC2 ,2INC2 ,0???
11300 DATA 1BED5 ,1SBC12,0???  ,0???  ,0???  ,1SBC7 ,1INC7 ,0???
11310 DATA 0SED0 ,2SBC4 ,0???  ,0???  ,0???  ,2SBC3 ,2INC3 ,0???
11319 REM ** Addressing modes
11320 DATA Implied,Immediate,Absolute,"Absolute,X","Absolute,Y"
11330 DATA Relative,Zero page,"Zero page,X","Zero page,Y"
11340 DATA Accumulator,(Absolute indexed)
11350 DATA "(Pre-indexed indirect,X)","(Post-indexed indirect),Y"
0 REM ** © C Hamilton  1:6:83 **
```





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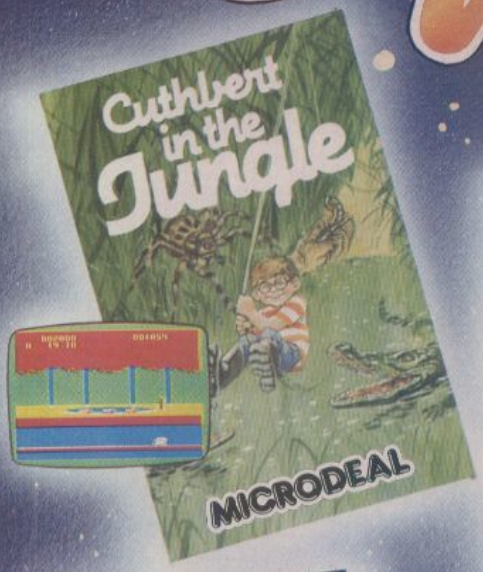
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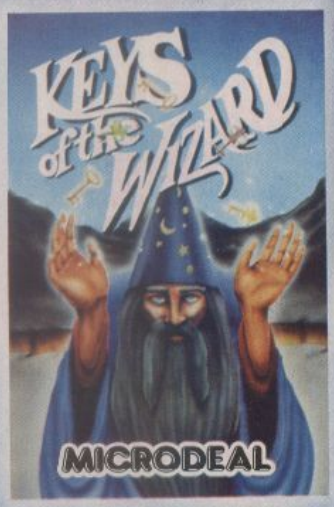
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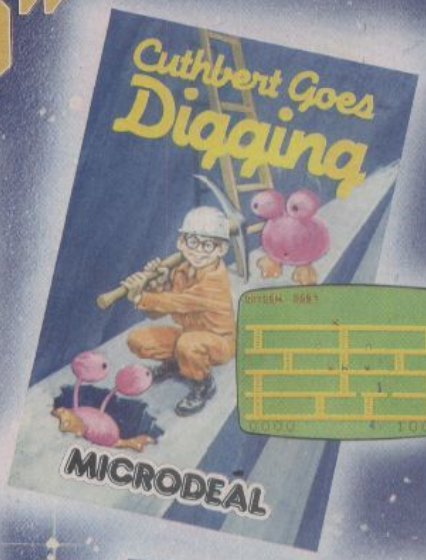
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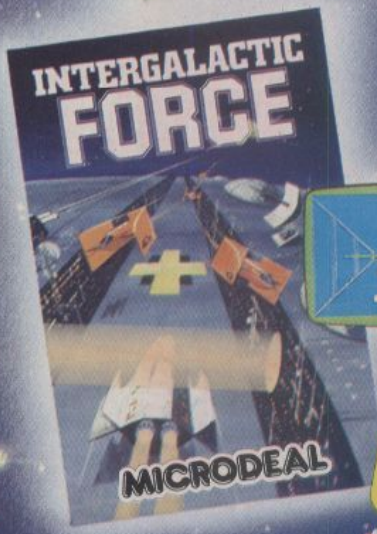
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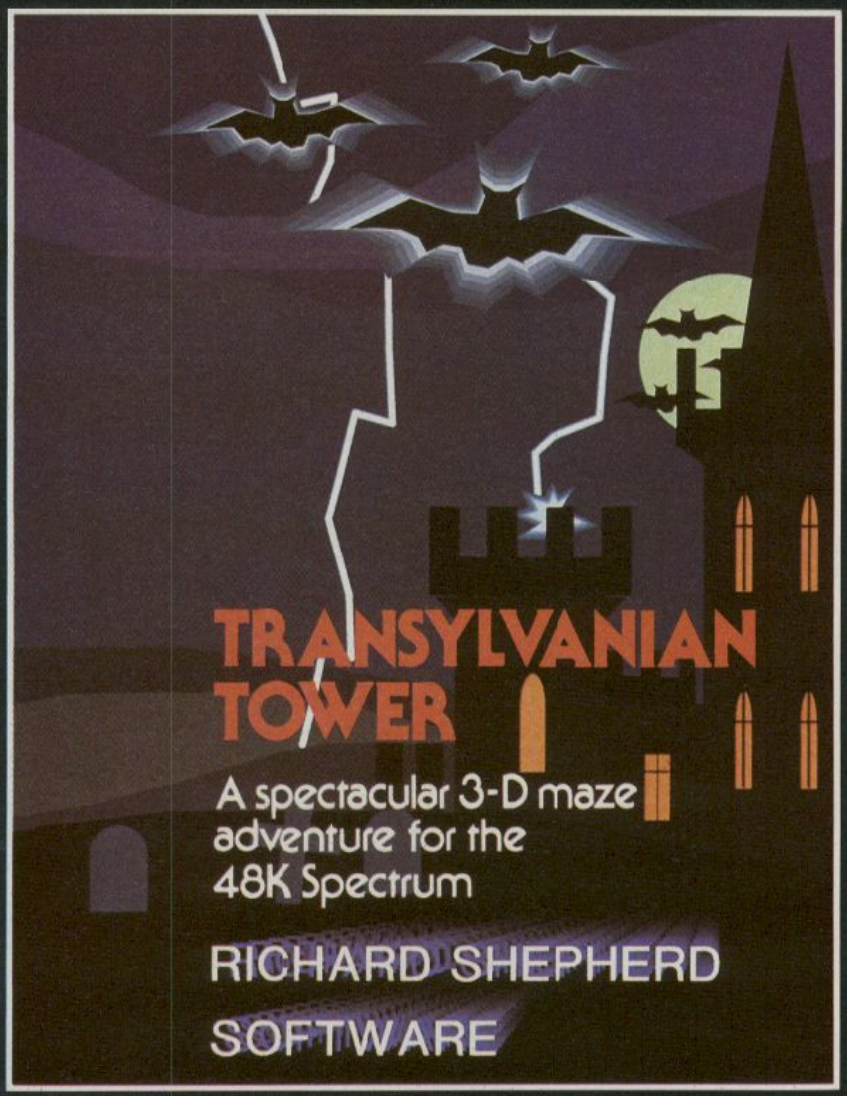
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GAMES

SOFTWARE REVIEWS

More software for you to peruse in the second part of our special report.

Title:	**Harrier Attack**
Type:	**Tape**
Supplier:	**Durell Software**
Machine:	**Oric 16K/48K**
Price:	**£5.95**

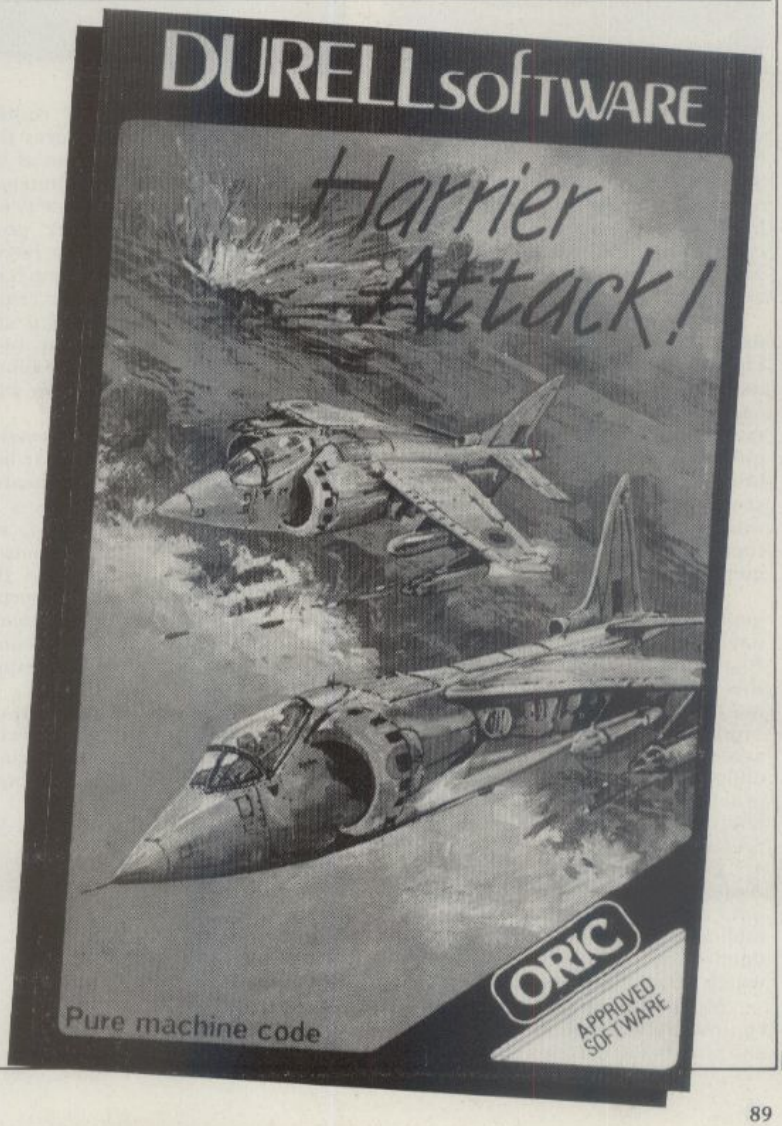
This sky battle game called Harrier Attack is graphically quite eye-catching once you have lasted the duration of the loading process.

Although the long loading time is not the fault of the software supplier, Durell, nevertheless it is definiitely offputting for the eager user.

The game itself consists of an aircraft carrier carrying two Harrier jump jets. Using the keyboard you control the craft positioned at the rear of the carrier. As soon as the carrier comes into view on the screen from the left hand side you must launch the harrier into the sky. There are lots of small black clumps of dots which are supposed to represent flak released from enemy landguns which come into view once your harrier has flown over the landscape. On skill level one you aren't damaged by this ammunition, but as you become more adept at the game and progress to more difficult levels this flak will prove lethal to your harrier.

On Level five the going really gets tough. The screen action hots up and takes place at supersonic speed. You must have your wits about you and fingers on the keys throughout in order to avoid being blown up the instant the game gets going.

Graphically the game is good,



SOFTWARE REVIEWS

but it is difficult to play mainly because there are too many keys to press — a joystick would improve the game no end. Altogether you have to use five keys, up, down, left and right (for fast and slow speeds) as well as the space bar which you use to fire missiles.

A brave attempt from Durell in Harrier Attack.

Ratings Table

Program Quality	* * *
Value for Money	* * *
Presentation On-screen	* * * *
Ease of Use	* * *
Crashproofing	* * * *
Overall	65%

Title:	**Krazy Kong**
Type:	**Tape**
Supplier:	**Anirog Software**
Machine:	**VIC 20 + 16K**
Price:	**£7.90**

A crazed gorilla strikes again in this version of the popular arcade game. I had never played this type of game before, and therefore found the lack of detail in the instructions very frustrating. However, a young friend came to the rescue, instantly putting my high scores of 100 and 150 to shame.

After watching the 'technique' for a few minutes, I was away.... On the first stage, ladder climbing and collecting objects is hampered only by the occasional barrel plummeting down the scaffolding. I quickly learned to ignore the umbrellas and handbags as these scored only 50 points each, and this was not commensurate with the time saved by reaching the top quickly.

The second stage consisted of gaps in the path which could only be navigated by a nifty forward jump. Again, instructions on how to do this were lacking, but trial and error made this aspect more demanding. Thirdly came the lifts. Timing here was essential (and at first I found it difficult to get here often enough to practise) as jumping on and off the lifts, while dodging barrels, is a precise art.

On the fourth and final stage, roofing supports have to be knocked out, and when complete the scaffolding collapses, bringing about the demise of the unkindly ape. But watch out for the deadly fireballs!

My first attempts with keyboard control were ungainly, with p . l ; and shift being used for UP, DOWN,



LEFT, RIGHT, and JUMP respectively. I did obtain high scores this way, but after the frustration of being belted by a barrel, I was annoyed at losing my hard-won chance to see my name in lights. ***Enter your name AAA*** prompted the screen. I typed in my initials and nothing happened. After thumping the return key several times (to see if it still worked, you understand) my high score was put down to one Albert Algernon Andrews, or someone with similar prefixes.

Further trials with the joystick solved the problem. I think it bad that this game is obviously geared to a joystick user, when hours of hard experience have proved to my satisfaction that keyboard control, particularly when jumping on the lifts, is by far superior. A few instructions on how to claim your reward would have cost nothing, but would certainly have added to my enjoyment.

But don't let these minor criticisms put you off an otherwise excellent game. It is challenging, fun, at times irritating, and above all, very good entertainment.

N.C.M.W.

Ratings Table

Program Quality	* * * * *
Value for Money	* * * *
Presentation On-screen	* * * * *
Ease of Use	* * *
Crashproofing	* * * *
Supplied Instructions	* *
Overall	85%

Title:	**Enter the Dragon**
Type:	**Tape**
Supplier:	**Melbourne House**
Machine:	**Dragon 32**
Price:	**£5.95**

This is a compendium of fourteen games taken from the book "Enter the Dragon". Firstly I will review each one individually and then give my overall view at the end.

REACT. In this game the computer awards points on how quickly you press the key displayed on the screen. The main disadvantage is that it only uses keys 0, 1, 2, and 9. Definitely room for development as it only uses 2K.

NUMBER CRUNCH. In this game you have to numerically order the digits one to nine from a tumbled sequence. To do this you are allowed to reverse groups of digits. It is very boring once you learn a simple sequence.

FROG. This is a game where you have to swap two groups of frogs around by making them jump over each other. The graphics and colour were very good. The solution again required a very simple sequence.

SIMULATION. This simulates fishing fleets and the random geographical forces they undergo. There is no participation by a player – pointless rubbish.

FRUIT MACHINE. This program shows the revolving reels of a fruit machine and there is no participation by the player. The graphics are good and clear, but there is no game.

BUBBLESORT. This is a program which sorts a maximum of fifteen numbers – I could sort them quicker myself!!

INVADER. This slow, simple invader type game with bad graphics had a too sensitive joystick and unresponsive fire button.

ROADRACE. You have to manoeuvre a car between a series of posts which are far too close together. Bad graphics again.

ALIEN. Here you have to kill the flying aliens. It has reasonable graphics, but *NO* scoring system.

ELIMINATOR. This is a simple version of scramble except you have to shoot the saucer which comes and kills your humanoids. The graphics were again reasonable.

METEOR. Here you have to hit the meteors coming towards you. Mediocre graphics again.

TALKING. This inputs your

speech and outputs it at a later time. Fascinating except for an unfortunate amount of crackling.

DRAUGHTS. This game plays draughts well and it has good graphics. However, I don't like the way the pieces are moved.

ADVENTURE. The descriptions of the rooms in this all text adventure are poor and its vocabulary is limited.

Overall this tape was very poor. The programs were slow and the keyboard unresponsive. I would have been very disappointed if I had bought it.

S.F.

Ratings Table

Program Quality	*
Value for Money	*
Presentation On-screen	* *
Ease of Use	*
Crashproofing	* *
Supplied Instructions	* *
Overall	20%

Title:	**Holy Grail**
Type:	**Tape**
Supplier:	**Severn Software**
Machine:	**Oric 1 48K**
Price:	**£5.95**

The name of this program conjures up all sorts of pictures in the mind's eye particularly those to do with the notorious Monty Python Comic team.



Unfortunately, it's nowhere near as entertaining. This is an adventure game with both text and graphics. The graphics consists of a square containing blocks within it whcih is supposed to represent a castle in which the Holy Grail has been hidden. You control a little man who is in search of the grail and you have to manoeuvre him around the castle.

Directly underneath the grid is some data telling you what floor level of the castle your man is on, what number move your are on, and whose turn it is. Unfortunately the text is very difficult to read and is therefore very taxing on the eyes if looking at it for a long time.

Graphically the game is very uninspiring, the user defined characters are so small that it is difficult to see exactly what they are. Most of the action takes place within the blue grid and you soon get tired of staring at it.

But despite that I am sure there are many adventure lovers who will find this game an interesting challenge and fun to play.

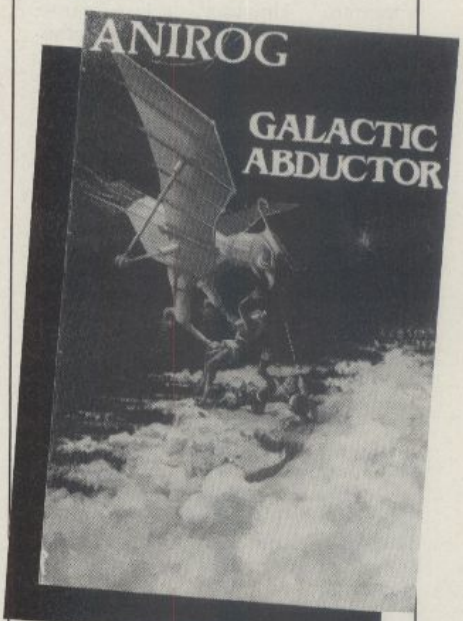
Ratings Table

Program Quality	* * *
Value for Money	* *
Presentation On-screen	* *
Ease of Use	* * *
Crashproofing	* * * *
Overall	45%

Title:	**Galactic Abductor**
Type:	**Tape**
Supplier:	**Anirog Software**
Machine:	**VIC 20 + 16K**
Price:	**£6.00**

Swarms of armoured space-hawks, intent only on the kidnap of your little stick-men, are the target in this second-generation invaders game. In this one however prepare to pound your joystick!

The space-hawks attack from varying places around the screen and I was particularly impressed with the phase where they rise over the horizon to regroup for the next attack. Just to make the game a little more difficult, it takes many shots to penetrate the armour casing and to finally dispose of a single hawk. During the attack, eggs are dropped which promptly turn into bombs. There is no escape, other than left and right firing missiles, which seem useless in a rapid fire situation. From time to time a man



is 'abducted' and the message ***Got Me!*** accompanies the sight of a little human being grabbed by the talons of the predator and being carried off the screen.

The graphics in this program are imaginative, and the sound effects unusual. Control is by joystick only, and I would plead with all software manufacturers to make sure that this fact is clearly shown on the *outside* of the package. Not everyone owns a joystick.... Instructions for use were concise and clear. Mastering the controls is a matter for hours of practice.

Generally, this was a fast and challenging game which should be included in your collection.

N.C.M.W.

Ratings Table

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

Title:	**Xerus**
Type:	**Tape**
Supplier:	**Electronic Leisure**
Machine:	**Unexpanded Vic 20**
Price:	**£6.00**

This game is a variation on the Invaders theme, described as "a ▶

SOFTWARE REVIEWS

creative fast action game with excitement". However, it is a game with which one soon becomes bored.

An increasing number of aliens which closely resemble diagramatical representations of fallopian tubes zigzag their way down the screen and, if allowed to land, turn into flying saucer shapes which explode after a short delay.

Tiny arrows are expelled from the bellies of the aliens and have to be avoided. All that is left for the player to do is dodge left and right, firing the laser, which is blessed with a repeat facility.

The game is programmed for either joystick or keyboard operation, the Z, C and Commodore keys producing LEFT, RIGHT and FIRE. In view of the lack of choice of movement in this game, there is no advantage in joystick control. The display is jerky, and laser bots are easily confused with the attackers' missiles.

One pleasing feature of the program is that while it is written for the unexpanded machine, RAM packs do not have to be removed before loading. The pack for review contained an information sheet that was more detailed than the instructions printed on the cassette sleeve, and I hope that the information sheet will be included with the retail package as at least it gives a brief resumé of the object of the game.

I worried that I was missing some important point about this game, but in reality it is just another shoot the invaders escapade. A disappointment.

N.C.M.W.

Ratings Table

Program Quality	* * *
Value for Money	* *
Presentation On-screen	*
Ease of Use	* * * * *
Crashproofing	* * * *
Supplied Instructions	* * * *
Overall	40%

Title:	**Backgammon**
Type:	**Tape**
Supplier:	**Microdeal**
Machine:	**Dragon 32**
Price:	**£8.00**

Unfortunately the tape is not supplied with specific instructions on play, so you have to be a backgammon player to appreciate it. On loading you choose the number of players. Zero means the computer plays itself, one you play the computer, and two you play a friend. A level of difficulty is then selected (0 -easy, to 9 - impossible) and the option of whether to use Microdeal's light pen, which would make the game a lot easier to play. Sound and dice roll input are then selected and the screen changes to high resolution graphics, which are nowhere near as good as the standard of graphics I have come to expect. Generally there were too many numbers flashing on and off.

The main advantage of the tape is that you haven't got to persuade a friend to play with you – the computer will, and it has a good error trapping system.

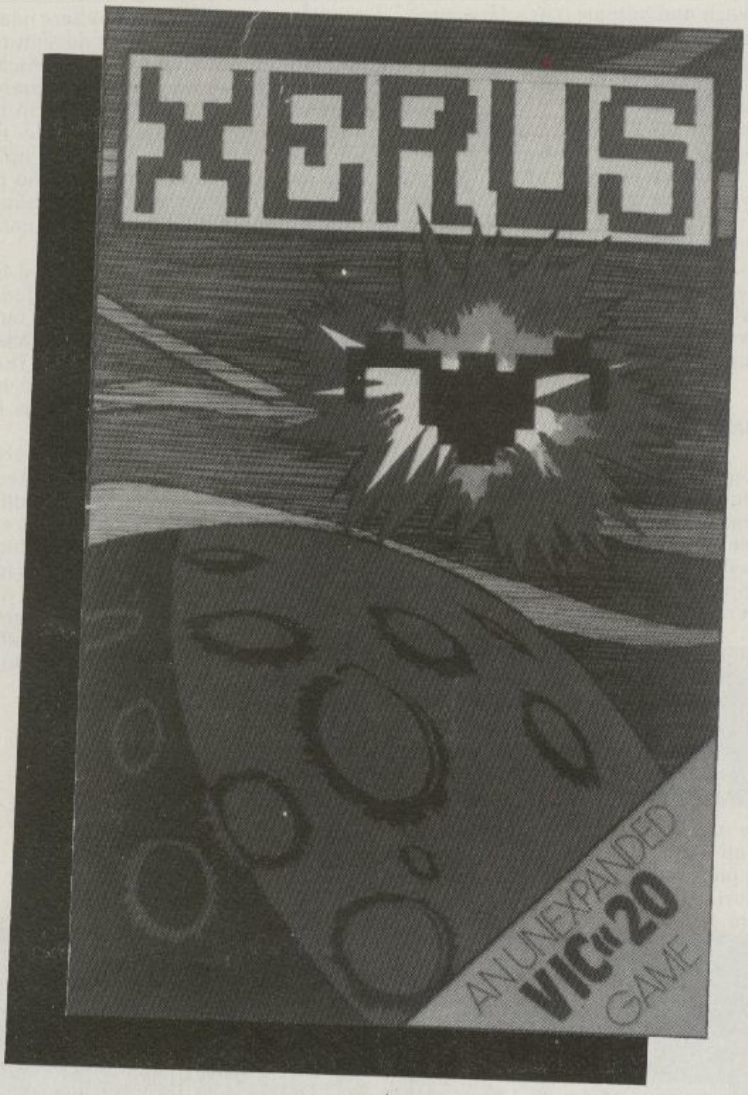
A disadvantage is there are too many numbers to remember. To make a move, not only do you have to remember your dice throws and work out your move, but you have to work out the reference numbers of the points you are moving to and from. This is nothing at first but later in the game it gets taxing. I enjoyed watching the computer play itself at level nine, except the speed made it impossible to assimilate the computer's tactics.

Overall, it is not a game I would pick as I would prefer to play the game on one of the traditional boards.

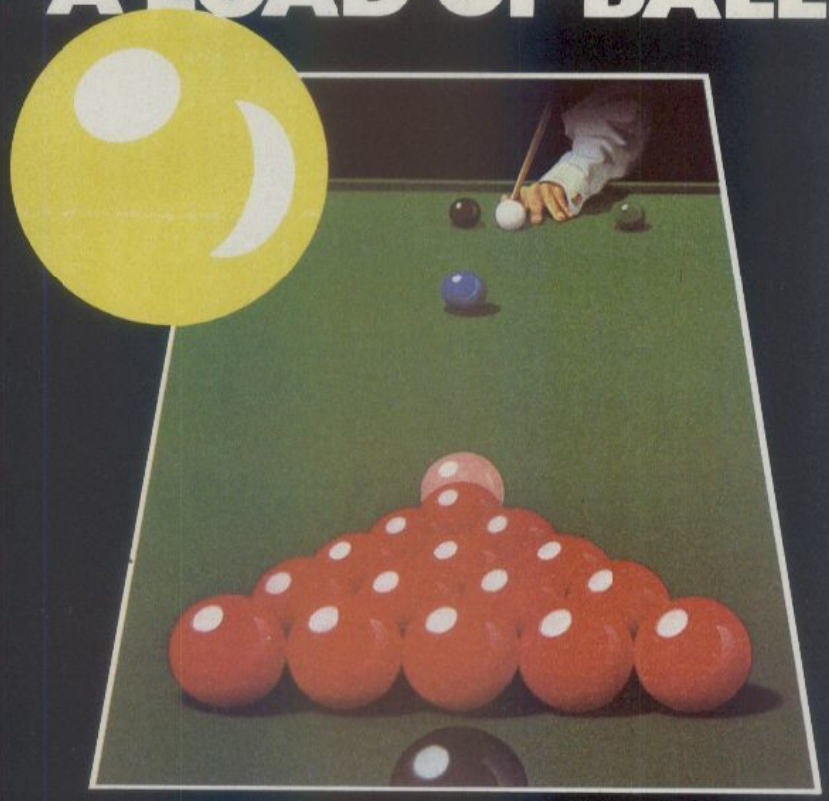
S.F.

Ratings Table

Program Quality	* * *
Value for Money	* *
Presentation On-screen	* *
Ease of Use	* *
Crashproofing	* * * *
Overall	40%



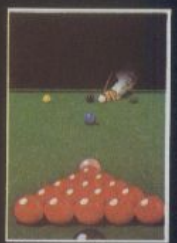
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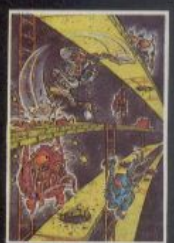
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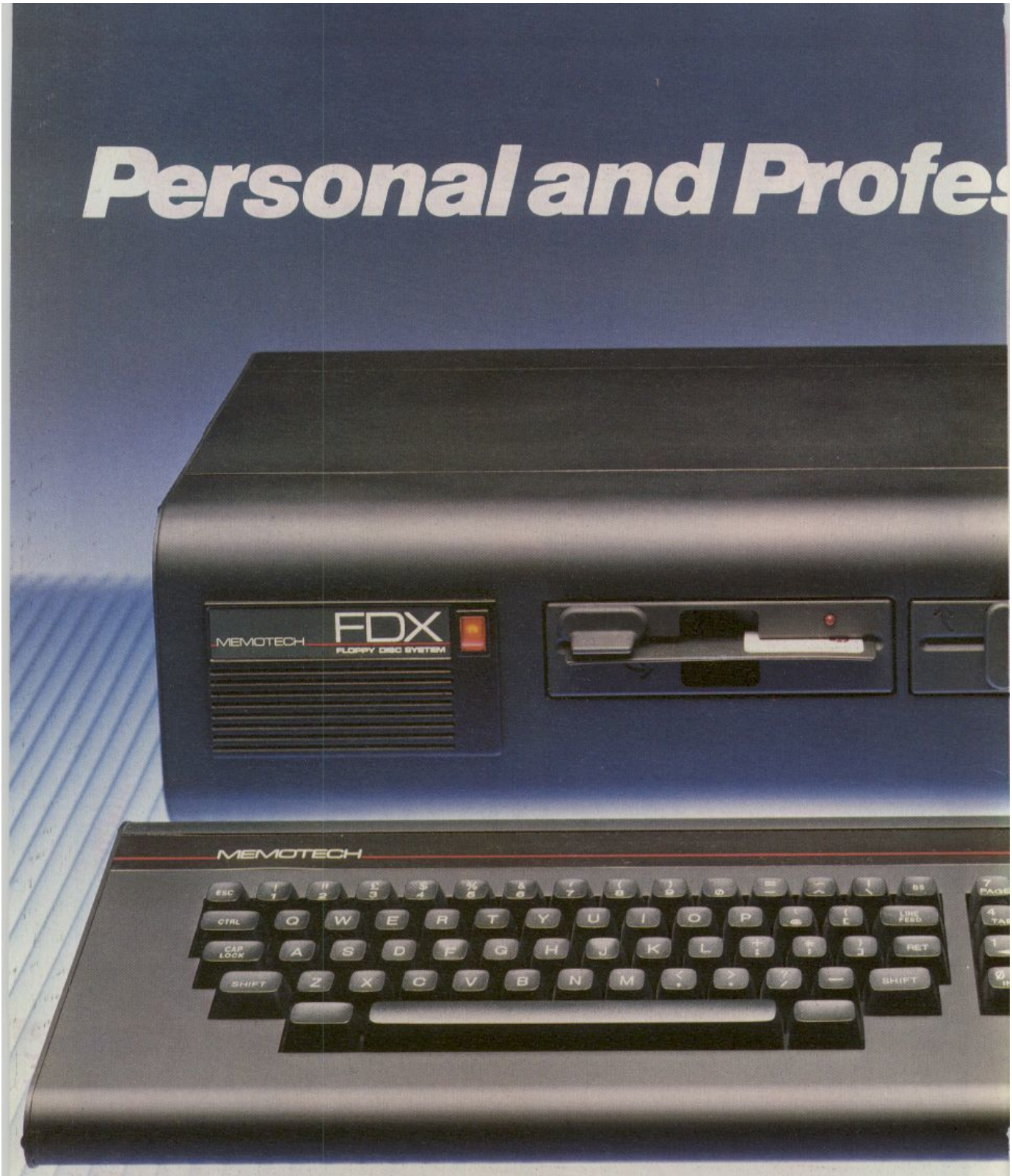


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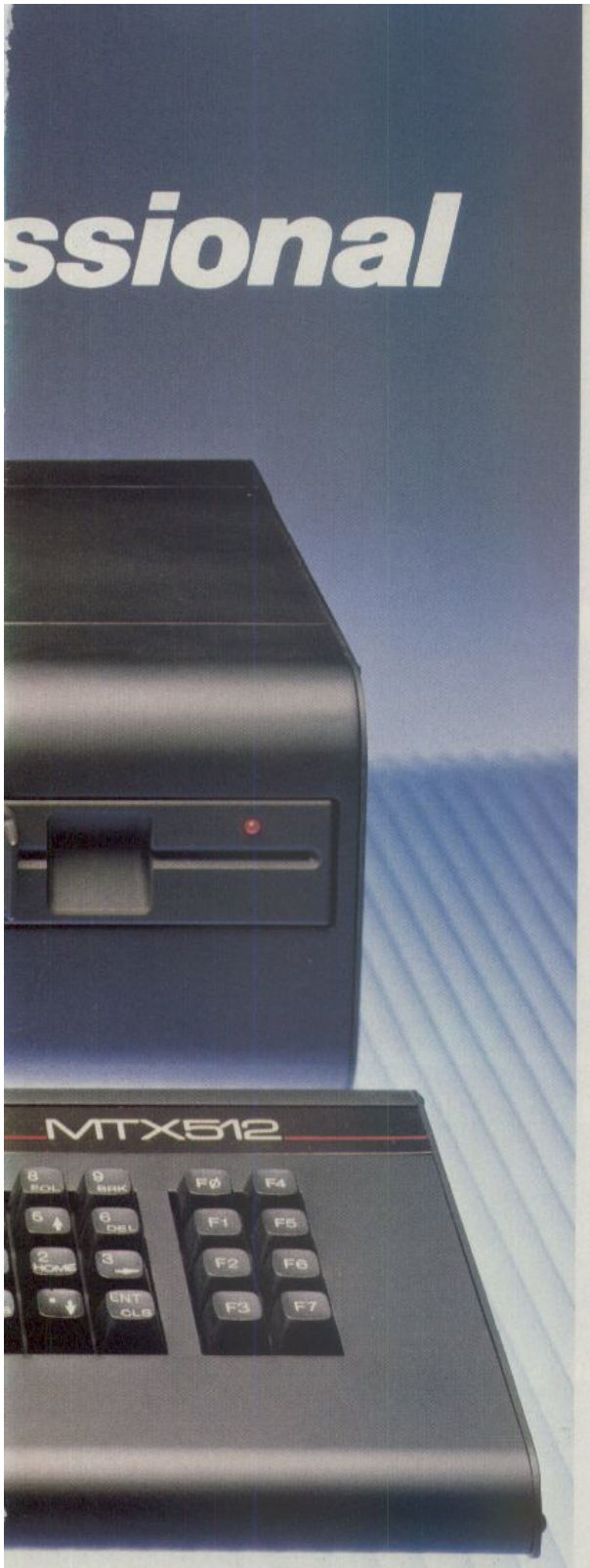
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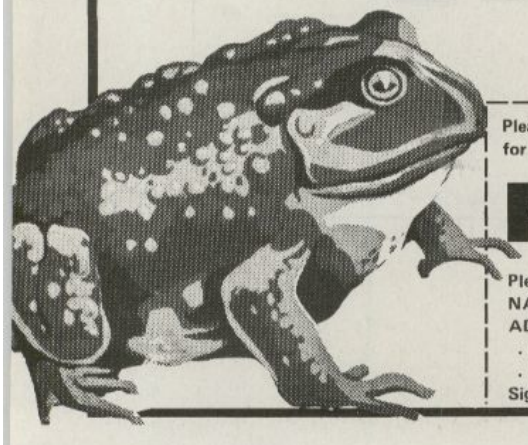
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48 Linby Road, Hucknall, Notts NG15 7TS.
TEL: Notts (0602) 640377



ORIC AND SINCLAIR COMPUTERS
Oric1 computer 48K £143 (£141) £151. Oric1 16K £110 (£112) £122. Oric colour printer £165 (£159) £169. Sinclair Spectrum 48K £131 (£133) £143. Spectrum 16K £101 (£107) £17. 32K memory upgrade kit for 16K Spectrum (issue 2 only) £31 (£28) £30. Fuller master unit for the spectrum including speech synthesizer, amplifier and joystick ports £56 (£56) £62. Keyboards with proper spacebars for the ZX81 and spectrum £43 (£41) £47. ZX printer with 5 free rolls paper £41. ZX printer alone £36 (£45) £50. 5 printer rolls £13 (£16) £21. Special offer pack ZX81 computer + 16K ram pack + game tape £49 (£55) £65. ZX81 16K ram packs £31 (£28) £30. New luxury spectrum computers 48K with full sized typewriter keyboards complete with normal space bar enclosed in a larger plastic case which also house the computer pcb £160 (£174) £190.

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Commodore 64 £237 (£209) £229. Vic 20 with free cassette recorder, basic course and games £143 (£149) £179. Convertor to allow most ordinary mono cassette recorders to be used with the Vic 20 and Commodore 64 - built £9.78 (£9) £11, kit £7.40 (£7) £9. Commodore cassette recorder £43 (£44) £50. 1541 Disc drive £232.87 (£209) £234. 1525 Printer £235 (£220) £245. 1526 Printer £350 (£330) £360.

OTHER COMPUTERS
32K expanded Colour Genie £172 (£166) £196. BBC Model B £492 (£440) £480. Dragon 32 £212 (£202) £225.



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Epson RX80 £326 (£309) £340. Shinwa CTI CP80 £293 (£271) £312. Epson FX80 £440 (£408) £438. Epson MX100/3 £494 (£465) £495. Seikosha GP100A £234 (£219) £254. Oki Microline 80 £243 (£227) £268. The Silver Reed, the latest miracle a combined daisy wheel and electric typewriter for only £448 £425) £455. Juki 6100 proportional daisy wheel printer £423 (£404) £434. MCP40 colour printer £165 (£159) £169. Star STX80 thermal printer £165 (£159) £169. We can supply interfaces to run all the above from Sharp computers £59 (£52) £55.

SWANLEY ELECTRONICS
Dept. PCT, 32 Goldsel Road, Swanley, Kent BR18 8EZ, England.
TEL: Swanley (0322) 64851

Nothing extra to pay. All prices are inclusive. UK prices are shown first and include post and VAT. The second price in brackets is for export customers in Europe and includes insured air mail postage. The third price is for export customers outside Europe (include Australia etc) and includes insured airmail postage. Official orders welcome.

FACTFILE

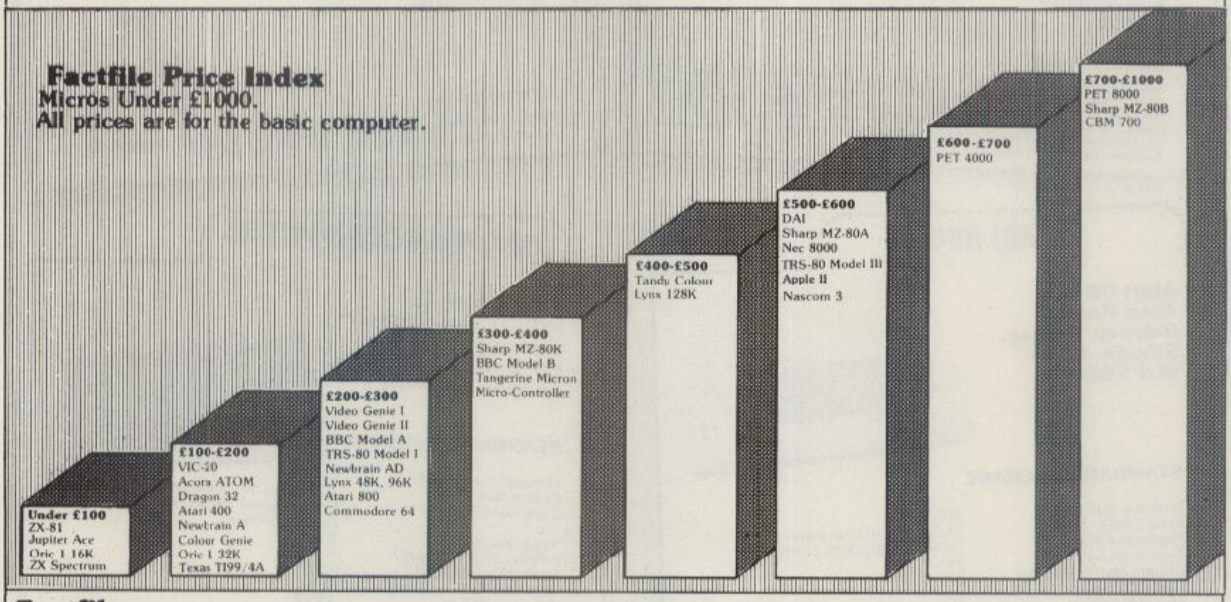
MICRO FACTFILE

Factfile is our regular buyer's guide to microcomputers. Herein you will find all the important facts and figures on 28 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.

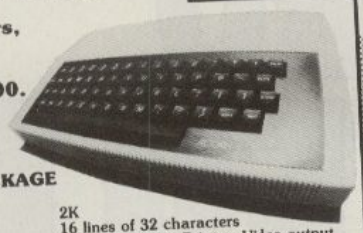
SERIAL/PARALLEL OUTPUT: This refers to the manner in which the micro transmits data to other units. If it puts out information in a long string, one bit after another, down a single wire or connector, it is a serial output. Parallel output is where pins or wires carry information simultaneously and are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

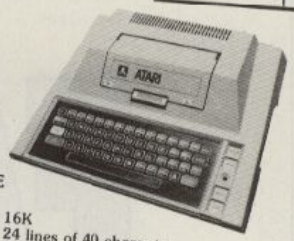
	DETAILS	PRICE
RAM	12K internal, 32K external options	£45-149
Printer	Yes	£232
Monitor	No	—
Disc Drives	Yes	£299
Other Languages	Yes	£11.50
Multi-user Capabilities	Yes	—
BASIC extensions (Toolkits)	Yes, BBC BASIC	£50

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.

ATARI 400

Atari UK Ltd,
Atari House,
Railway Terrace,
Slough, Berks
SL2 5BZ.



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	**£149.99**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£199.90
Monitor	No	—
Disc Drives	Yes	£299.99
Other Languages	Yes	£39-79
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	TBA

OTHER ADD-ONS:

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

ATARI 800

Atari UK Ltd,
Atari House,
Railway Terrace,
Slough, Berks
SL2 5BZ.



STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£299.99**

MANUFACTURER'S EXPANSIONS

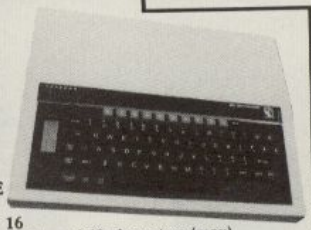
	DETAILS	PRICE
RAM	Yes	£199.99
Printer	No	—
Monitor	Yes	£299.99
Disc Drives	Yes	£39.79
Other Languages	No	—
Multi-user Capabilities	Yes	TBA
BASIC extensions (Toolkits)		

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, £95.00; **Analogue Joystick, Light Pen,** Stack Computers, 290-298 Derby Road, Bootle, Liverpool.

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	No	—
Disc Drives	TBA	TBA
Other Languages	TBA	TBA
Multi-user Capabilities	Yes	—
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, £95.00; **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.

COMMODORE VIC20 STARTER PACK

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	**£139.99**

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	—

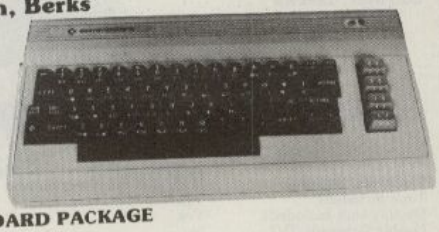
OTHER ADD-ONS:

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.

FACTFILE

COMMODORE 64

Commodore,
675 Ajax Avenue,
Slough, Berks



STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS, Serial, Video
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£229.**

MANUFACTURER'S EXPANSIONS

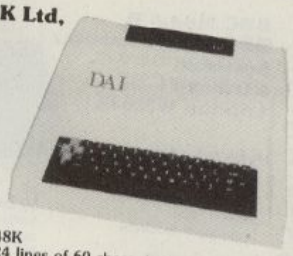
	DETAILS	PRICE
RAM	No	–
Printer	Yes	£230-276
Monitor	No	–
Disc Drives	Yes	£229
Other Languages	Yes	–
Multi-user Capabilities	Yes	–
BASIC Extensions	Yes	–

OTHER ADD-ONS:

Light Pen, 4 slot motherboard, Joystick, RS232 Interface. Stack Computers, 290-298 Derby Road, Bootley Liverpool. 051-933 5511.

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 Capabilities	No	–
BASIC extensions (Toolkits)	No	–
	No	–

OTHER ADD-ONS:

Joystick, Light Pen, 4 slot motherboard, Stack Computers 290-298 Derby Road, Bootle, Liverpool. 051-933 5511.

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)	N/A	–

OTHER ADD-ONS:

None Reported.

LYNX



Camputers
33a Bridge Street,
Cambridge CB2 1UW

STANDARD PACKAGE

Memory Size (RAM)	48K,96K,128K
Screen Size	24 lines of 40 characters
Expansion Sockets	BUS connections
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	1.5K
Average Price	**£225, £299, £445**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	96K for 48K version	£89.95
Printer	Yes	–
Monitor	Yes	–
Disc Drives	Yes	–
Other Languages	Yes	–
Multi-user	Yes	
Capabilities		
BASIC extensions (Toolkits)	Yes	–

OTHER ADD-ONS:

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**

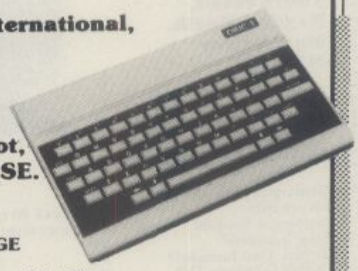
MANUFACTURER'S EXPANSIONS

	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.

ORIC 1



Oric Products International,
Coworth
Mansion,
Coworth Park,
London Road,
Sunninghill, Ascot,
Berkshire, SL5 7SE.

STANDARD PACKAGE

Memory Size (RAM)	16K, 48K
Screen Size	28 X 40
Expansion Sockets	Yes
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£99.95, £139.95**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	N/A	–
Printer	TBA	–
Monitor	No	–
Disc Drives	TBA	–
Other Languages	N/A	–
Multi-user		
Capabilities	No	–
BASIC extensions	TBA	–

OTHER ADD-ONS:

FACTFILE

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

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

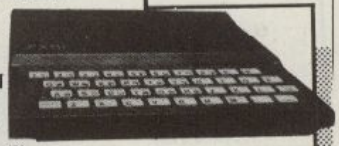
	DETAILS	PRICE
RAM	No	—
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45 upwards
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

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 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; Memory Expansion 64K, Downsway Electronics (UK) Ltd, Dept M, Downsway House, Epsom Road, Ashtead, Surrey; £59.95; **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, Billicay 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:

Memory Expansion 32K, Downsway Electronics (UK) Ltd, Dept M, Downsway House, Epsom Road, Ashtead, Surrey; £42.50

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	£239-1200
Monitor	Yes	£100
Disc Drives	Yes	£369
Other Languages	Yes	£100
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

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

TANDY TRS 80 III

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



STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

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

TANDY COLOUR

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



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	—

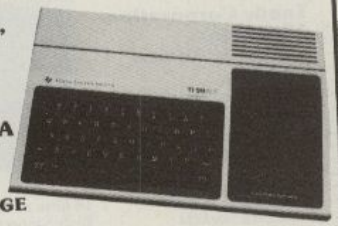
OTHER ADD-ONS:

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

FACTFILE

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	Yes	£50-£100
Multi-user Capabilities	No	–
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

Speech Synthesiser, Texas Instruments, £46.60; **Terminal Emulator II,** Texas Instruments, £37.80; **RS232 Interface,** Texas Instruments.

COLOUR GENIE

Lowe Computers, Bently Bridge, Chesterfield Road, Matlock Derbyshire DE4 5LE Tel: 0629 4995/4057



STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	24 lines of 40 characters
Expansion Sockets	Parallel & serial output, expansion BUS
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£168**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	16K	£38.56
Printer	Yes	£220
Monitor	No	–
Disc Drives	No	–
Other Languages	No	–
Multi-user Capabilities	No	–
BASIC extensions (Toolkits)	No	–

OTHER ADD-ONS:

VIDEO GENIE I

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



STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

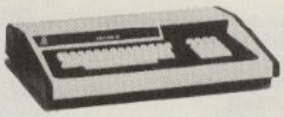
	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	–
Multi-user Capabilities	No	–
BASIC extensions (Toolkits)	No	–

OTHER ADD-ONS:

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

VIDEO GENIE II

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



STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

Disc drives, single and dual, Cumana Ltd, 35, Walnut Tree Close, Guildford, Surrey, Gul 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17 Highcross St, Leiceste: 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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MICROSPOT

SPRITE 64



Graphically speaking the Commodore 64 has some extremely interesting features, including sprites which produce high quality screen graphics. Andrew Thomson has written an invader program demonstrating the use of this facility.

When I first bought my Commodore 64 computer I was very impressed with the facility to use sprites in programs. For the uninitiated these are user-defined characters written into the machine's memory by the manufacturer. Other computers have this facility, but the Commodore 64's, I believe, are of particularly high quality.

In the listing you'll notice that there are a few symbols used in the program which could not be reproduced by the printer. To help you sort out which they are here is an explanation:

In line 0 there should be **CLEAR HOME** symbol between the quotes.

In line 11 there should be **FUNCTION 1** symbol between the quotes.

In line 100 there should be a **CLEAR HOME** symbol between the quotes.

In line 105 there should be a **CRSR HOME** symbol before the printed text.

In line 125 there should be a **CLEAR HOME** symbol before the printed text.

Program breakdown

In order to help you sort out just what parts of the program do here is a line breakdown of the program.

0-3	Initiates the program.
4-20	Contain the main loop which moves the player and the invaders.
30-37	Contain the data for sprites.
50-60	These see if the player has hit an invader and if so increases the score.
100-130	End of game routine.

Use the following keys to control the game:

Moving the laser base to the left is achieved by pressing the < key, and to the right by pressing the > key. To fire at the invader with an invisible laser press the **FUNCTION 1** key.

Happy hunting and make the most of these spritely sprites!

PROGRAM LISTING

```
0 PRINT"";POKE53280,0:POKE53281,0:TI$="000000":HI=100
1 FORQ=0TO126:READQQ:POKE8256+Q,QQ:NEXTQ:POKE2040,129:POKEV+40,5:POKE2041,130
2 V=53248:POKEV+21,15:A=88:POKE2042,130:POKEV+39,12:POKEV+40,1:POKEV+41,9
3 POKE54296,15:POKE54277,240:POKE54278,128:POKE2043,130:POKE54276,17
4 FORX=88TO230STEP2.5
5 Y=SIN(X)*50+100:Y1=COS(X)*30+110:Y2=TAN(X-88)+120:POKE54273,Q:POKE54272,Q
6 POKEV+2,X:POKEV+4,X-25:POKEV+6,X+25
7 POKEV+3,Y+POKEV+5,Y1:POKEV+7,Y2
8 GETA$
9 IFA$=","THENA=A-3
10 IFA$="."THENA=A+3
11 IFA$=""THEN50
12 IFA>255THENA=A-3
13 IFA<88THENA=A+3
14 POKEV,A:IFTI$>="000200"THEN100
15 POKEV+1,220
17 PRINT"SCORE :"INT(SC)"  TIME: "MID$(TI$,4,1);":"RIGHT$(TI$,2)"  HI-SCORE"HI
18 IFTI/60=INT(TI/60)THENPOKE54273,34:POKE54272,75
19 IFTI/120=INT(120)ANDINT(X/16)=INT(A/16)THENPOKE54273,34:POKE54272,75
20 NEXTX
21 GOTO4
30 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,24,0,0,90,0,0,161,0,1,110,128,2,247
31 DATA64,5,239,160,11,247,208,23,239,232,47,247,244,95,239,250,191,247,253,85
32 DATA85,85,170,170,170,85,85,85,170,170,170,0
35 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,56,0,0,116,0,0,127,0,0,124,0,2,56
36 DATA128,7,211,192,15,255,208,15,255,208,15,255,208,14,56,208,12,56,96,8,40
37 DATA32,0,68,0,0,198,0,0,0,0,0
50 IFINT(A/2)=INT(X/2)ORINT(A/2)=INT((X-25)/2)ORINT(A/2)=INT((X+25)/2)THEN60
51 POKE54273,34:POKE54272,75
52 GOTO17
60 SC=SC+.1*X:GOTO51
100 PRINT""
105 PRINT"YOU SCORED ";INT(SC);" IN 2 MINUTES "
106 IFSC>HITHENHI=SC:PRINT"YOU HAVE GOT THE HIGHEST SCORE SO FAR"
110 PRINT"TRY AGAIN ?"
115 GETA$:IFA$=""THEN115
120 IFA$="Y"THENRESTORE:TI$="000000":PRINT"":SC=0:GOTO1
125 IFA$="N"THENPRINT"BYE BYE":POKEV+21,0:END
130 GOTO115
```

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Com. 64

CALIFORNIA

GOLD RUSH



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

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

YIPPEE . . . Git yer Picks an' Shovels and join the CALIFORNIA GOLD RUSH . . . NOW

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BELLINGE, NORTHAMPTON

Name.....
Address.....
.....
.....

SOFTWARE LISTING

Looking for a program to buy? Look no further! If it's available, it's listed here in our exclusive and comprehensive software checklists.

Looking through any computer magazine can be a bewildering experience if you're in search of a program. Count the hundreds of ads and thousands of titles on sale and it would be easy to lose heart!

We've tried to sort out the confusion, and the sheer numbers, to present an easily understood list for each machine. Where possible, we have eliminated duplications, so that the same tape with a different label is not listed twice. Rather it should be credited once, with as many suppliers as we could find.

Table Codes

In order to fit as many programs as possible into our pages, we have had to use codes for some columns, considerably shortening the wording.

The information given for each program is: Title, memory required to run it, company producing it, whether tape/cartridge or disk, type and supplier and price.

The codes we have used are:

Program Type

GM = Game
BS = Business routine
UT = Utility (ie. programming aid)
DO = Domestic
ED = Educational

How Sold

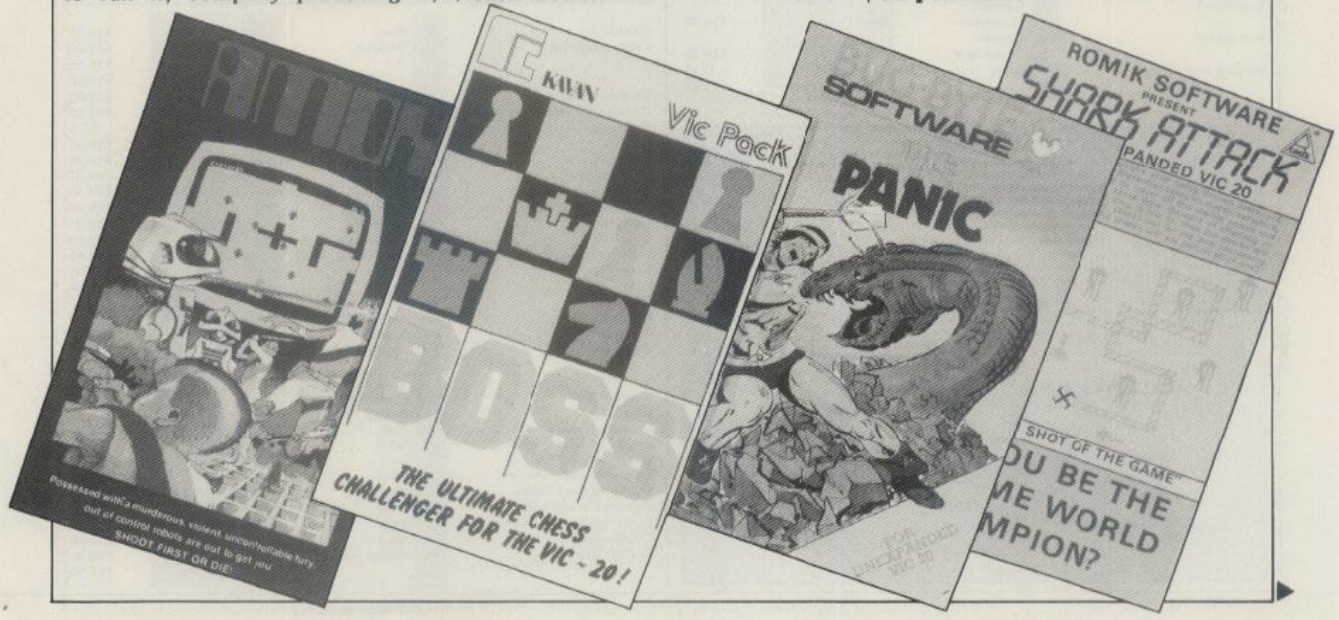
R = Cartridge (may include memory)
C = Tape (cassette)
D = Disc (for expanded systems)
L = Listing (sold as print-out)

Due to overwhelming response we have been forced to alternate machines included in our checklist each month.

This month, we have recoded all the dealers, and their names and addresses will now appear in the section to which they refer. This should lead to clearer referencing and help your search.

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 Jane Price on 01-437 1002 as soon as possible.



SOFTWARE LISTING

ATARI

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Air Strike	Gm	English S/W	16K	C	BR,GE	£15.95
Ali Baba	Gm	Quality S/W	32K	D	GE	£22.95
Alien Hell	Gm	Syncro	24K	D	CRs	£16.95
Alien Hell	Gm	Syncro	16K	C	CRs	£13.95
Alpha Fighter	Gm	Dinacomp	24K	C	MI,SI	£11.99
Analog Adventure	Gm		32K	D	MA	£34.95
Angle Worms	Gm	Adventure Int.	8K	C	MI,SI	£12.50
Ants Hill	Gm	Atari	8K	C	CA,MI	POA
						£11.25
Armoured Patrol	Gm	Adventure Int.	16K	C	MI	£16.50
Arcade Baseball	Gm	Arcade Plus	16K	C	CRs	£18.95
Arcade Baseball	Gm	Arcade Plus	16K	D	CRs	£20.95
Assembler Editor	Ut	Atari		R	MI,GE	£39.95
Assembler	Ut	Quality S/W	16K	C	MA	£14.95
Assembler Editor	Ut	United S/W of America	16K	R	MA	£34.50
Asteroids	Gm	Atari	16K	R	LA,MA,BR, GE,SI,BC	£29.95 £18.95
Atari Word Processor	Bs	Atari	32K	C	MI	£95.95
Atari Word Processor	Bs	Atari	32K	C	MA	£85.00
Atari Word Processor	Bs	Atari	32K	D	GE	£99.95
Atari World Graphics	Ut	United S/W of America	48K	D	MA	£43.95
Avalanche	Gm	Atari	16K	C	CA	POA
					BR	£13.95
					MI	£16.75
Babel	Gm	Atari	16K	C	CE	POA
					MI,SI	£16.75
Balrog Sampler	Gm	Adventure Int.	32K	C	MI	£24.95
Basic A Plus	Ut	OSS S/W	48K	D	MA	£52.50
Basic A Plus and Operating System A	Ut	OSS S/W	48K	D	MA	£99.50
Basic Program Compress.	Ut	Atari	32K	D	MI	£16.75
Basic Utility/Renumber	Ut	Atari	16K	C	MI	£16.75
Basics of Animation	Ed	Santa Cruz	24K	D	MA	£10.95
Basics of Animation	Ed	Atari	16K	C	MA	£9.95
Basics of Animation	Ed	Santa Cruz	16K	C	MI	£13.95
Basketball	Gm	Atari	16K	C	LA,GE,SI	£24.50
Basketball	Gm	Atari	16K	R	MI,MA,SI	£29.95
Beta Fighter	Gm	Allrian	16K	C	AL	£15.50
Beneath the Pyramids	Gm	Chrystal	48K	C	BR,MI,SI	£19.99
Beta Fighter	Gm	Artworx	16K	C	CRs	£13.95
Beta Fighter	Gm	Artworx	16K	D	CRs	£16.50
Black Jack	Gm	Atari	16K	C	CE,LA,MA	POA
					MI,GE,SI	£8.95
						£9.95
Black Jack Shooter	Ed	Atari	16K	C	MI	£16.75
Bob's Business	Bs	Santa Cruz	16K	C	MI	£9.95
Bridge 2.0	Gm	Allrian	24K	C	AL	£16.00
British Heritage Jigsaw Puzzle	Gm	Thorn EMI	16K	C	MA,GE,SI	£19.95
Bug Attack	Gm	Cavalier Computers	16K	C	CRs	£19.25
Bug Attack	Gm	Cavalier Computers	16K	D	CRs	£19.25
Bumper Pool	Gm	Atari	16K	C	CE,SI	POA
					MI	£11.25



ATARI DEALERS

Supplier Code

AL Allrian Data Services
100a Uxbridge Road
Hayes
Middlesex
UB4 0RL

AN Anglo American Software
138a Stratford Court
Sparkhill
Birmingham
021 771 2995

AV Avalon Hil Games
650 High Street
North Finchley N12
01 445 3044

BR Brighton Gamer
24 Gloucester Road
Brighton
Sussex
0273 698424

CA Castle Electronics
15 Castle Street
Hastings
East Sussex
0424 43875

CH Channel 8 Software Ltd
51 Fishergate
Preston
Lancs PR1 8BH
0772 53057

CR Cream Computer Shop
Rabbit Software
380 Station Road
Harrow
Middx
01 863 0833

CRs Creative Software
48 Hartlip Hill
Newington
Sittingbourne
Kent ME9 7NZ

DA Datarite Terminals Ltd
Caldare House
144-146 High Street
Chadwell Heath
Essex RM6 6NT
01 590 1155

GE Gemini Electronics
50 Newton Street
Manchester M1
061 236 3083

HI Highlight Software
3 Nether Court
Halsted
Essex
0787 475714

LA Laskys
7-9 Queensway
London W2 3RX
01 200 0444

MA Maplin
PO Box 3
Rayleigh
Essex
0702 552911

MI Micro & Video Palace
62-64 Kensington High Street
London W8
01 937 8587

SI Silica Shop
1-4 The Mews
Hatherly Road
Sidcup
Kent DA14 4DX

TH The Vic Centre
154 Victoria Road
Acton
London W3 6UI
01 992 9904

THe Thorn EMI Video LTd
Upper St Martin's Lane
London WC2H 9ED
01 836 2444

UP Up, Up & Away
Starcade Software
15 Moorfields
Liverpool L2 2BQ

Calculator	Bs	Atari	24K	D	MA,SI	£16.95
Canyon Climber	Gm	Datasoft	16K	D	GE	£20.00
				C	CRs	£18.95
				D	CRs	£19.25
Caverns of Mars	Gm	Atari	16K	C	MA,GE,SI	£24.50
Caverns of Mars	Gm	Atari	16K	C	MA,GE,SI	£24.50
Centipede	Gm	Atari	16K	R	CE,MA, GE,SI	POA £29.95
Champelo	Gm	Dinacomp	16K	C	MI,SI	£10.99
Character Generator	Ut	Data Soft	16K	C	MA	£9.97
Character Generator	Ut	Data Soft	16K	D	MA	£12.50
Checker Kim	Gm	Personal S/W	16K	C	MA	£15.95
Chicken	Gm	Synapse	16K	C	GE	£19.95
Chrystals	Gm	Dinacomp	24K	C	MI,SI	£9.99
Close Encounter	Gm	Concom	16K	C	CRs	£13.95
Code Cracker	Gm	Atari	8K	C	CE,MI	POA
						£11.25
Commbat	Gm	Adventure Int	24K	C	CRs	£12.95
Commbat	Gm	Adventure Int	24K	D	CRs	£16.95
Computer Acquire	Gm	Avalon Hill	16K	C	AN	£17.25
Computer Chess	Gm	Atari	16K	R	CE,BR LA,GE MI,MA	POA £24.95
Conflict 2500	Gm	Avalon Hill		C	MI,AN	£12.50
Controller	Gm	Avalon Hill	32K	D	AV	£17.95
Conversational French	Ed	Atari	16K	C	LA,MI,SI	£32.50
Conversational French	Ed	Atari	16K	R	MI,GE,SI	£39.95
Conversational German	Ed	Atari	16K	C	LA,MA,SI	£32.50
Conversational German	Ed	Atari	16K	R	MI,GE,SI	£39.95
Conversational Italian	Ed	Atari	16K	R	MI,GE,SI	£39.95
Conversational Italian	Ed	Atari	16K	C	LA,MA,SI	£32.50
Conversational Spanish	Ed	Atari	16K	R	MI,GE,SI	£39.95
Conversational Spanish	Ed	Atari	16K	C	LA,MA,SI	£32.50
Convoy Raider	Gm	Avalon Hill	16K	C	AV	£10.95
					MI,AN	£12.50

Crazitack	Gm	Allrian	16K	C	AL	£16.00
Cribbage and Dominoes	Gm	Thorn EMI	16K	C	GB,MA, GE,SI	£14.95
Cross Fire	Gm	On Line	16K	C	GE	£19.95
Cross Fire	Gm	On Line	32K	D	GE	£19.95
Crush, Crumble, Chomp	Gm	Avalon Hill	16K	C	AN,SI	£15.50
Crush, Crumble, Chomp	Gm	Avalon Hill	16K	D	AN,SI	£17.95
Crypts of Terror	Gm	In Home S/W	16K	C	BR,GE	£19.95
Curse of Rah	Gm	Auto Simulations	32K	C	CRs	£13.80
Curse of Rah	Gm	Auto Simulations	32K	D	CRs	£13.80
Curse of Crawley Manor	Gm	Adventure Int.	16K	C	MA	£16.50
Cyclod	Gm	Sirius Software	32K	D	CRs	£19.25
Cypher Bowl	Gm	Artsci Inc.	32K	D	MA	£22.45



DI Nuclear Bomber	Gm	Avalon Hill	16K	C	AV	£10.95
Darts	Gm	Thorn EMI	16K	C	BR,MA, GE,SI	£19.95
Data Management S/W	Bs	C E S/W	48K	D	MI	£101.00
Data Management System	Do	Atari	32K	D	MI	£20.50
Datestone of Ryn	Gm	Avalon Hill		D	AN,SI	£15.50
Datestone of Ryn	Gm	Avalon Hill		C	MA,AN, SI	£14.95 £13.50
Deadline	Gm	Infocom	32K	C	CRs	£34.50
Deflections	Gm	Adventure Int.	8K	C	MI,SI	£12.50
DeLuxe Invaders	Gm	Rocklan	32K	D	CRs	£22.99
Disc Fixer	Ut	Atari	16K	D	MI	£22.50
Diskassembler	Ut	Allrian	32K	D	AL	£27.95
Display List	Ed	Santa Cruz	16K	C	MA	£9.95
Display List	Ed	Santa Cruz	16K	D	MA	£10.95
Dnieper River	Gm	Avalon Hill	48K	C	AV BR	£15.95 £14.50
Doctor Goodcodes Cavern	Gm	Gebelli Software	32K	D	CRs	£18.95
Domination	Gm	Atari	24K	C	CE MI	POA £16.75
		Allrian	24K	C	AL	£16.00
Dos 2	Ut	Atari	32K	D	MI	£21.95
Dragon of Hong Kong	Gm	Adventure Int.	32K	C	MI	£16.50
Drawpic	Ut	Artworx	16K	C	CRs	£22.75
Drawpic	Ut	Allrian	16K	C	AL	£24.50
Drawpic	Ut	Artworx	16K	D	CRs	£25.00
Eastern Front	Gm	Atari	16K	C	BR	£24.95
Eastern Front	Gm	Atari	16K	D	MI	£30.25
Empire of the Overmind	Gm	Avalon Hill		C	AV BR	£17.95 £18.95
Empire of the Overmind	Gm	Avalon Hill		D	MI,AN	£24.95
Encounter at Questar IV	Gm	Allrian	24K	C	AL	£19.50
Escape from Tramm	Gm	Adventure Int.	16K	C	MI	£16.50
European Capitals	Ed	Atari	16K	C	LA,MA MI,SI,GE	£8.95 £9.95
European Scene Jigsaw Puzzle	Gm	Thorn EMI	16K	C	MA,GE,SI	£19.95
Extended WSNA	Ut	Atari	16K	C	MI	£19.00
Fantasy land 2041	Gm	Chrystal	48K	C	BR,MI,SI	£34.99
Fastgammon	Gm	Quality S/W	16K	C	MA	£9.95
Forest Fire	Gm	Dinacomp	24K	C	MI,SI	£15.99
Frog	Gm	C E S/W	16K	C	MI	£9.95
Frogger	Gm	On Line	16K	C	TH	£22.95
Frogger	Gm	On Line	32K	D	TH	£22.95
Galactic Chase	Gm	Spectrum	16K	C	MI,MA,GE	£15.99
Galactic Chase	Gm	Spectrum	16K	D	MI	£20.25
Galactic Chase	Gm	Spectrum	16K	D	MA,GE	£17.95
Galactic Empire	Gm	Adventure Int.	32K	C	MA MI,SI	£14.95 £16.50
Galactic Guest	Gm	Chrystal	48K	C	BR,MI,SI	£19.99
Galactic Trader	Gm	Adventure Int.	32K	C	MI,BR,SI	£16.50
Galaxy	Gm	Avalon Hill	16K	C	AV	£12.95
Galaxy	Gm	Avalon Hill	16K	D	AV	£14.95
Ghost Hunter	Gm	Arcade Plus	16K	C	GE	£19.95
Ghost Hunter	Gm	Arcade Plus	16K	D	GE	£22.95
Ghost Town	Gm	Adventure Int.	24K	C	MA MI,SI	£14.95 £16.50
Giant Slalem	Gm	Dinacomp	16K	C	MI	£11.99
Golden Voyage	Gm	Adventure Int.	24K	C	MA MI	£14.95 £16.50
Gomoku	Gm	Artsci Inc	16K	C	MA	£14.95
Graph it	Ut	Atari	16K	C	LA,MA,SI MI,GE	£11.95 £13.95
Graphic Sound Demo	Gm	Atari	16K	D	CE MI	POA £16.75
Graphics Machine	Ut	Santa Cruz	16K	C	MI	£13.50
Guns of Fort Defiance	Gm	Avalon Hill	32K	C	AV	£12.95
HMS Impetuous	Gm	Adventure Int.	32K	C	MI	£16.50
Hangman	Gm	Atari	16K	C	LA,MA MI,GE,SI	£8.95 £9.95
Hickory Dickory Dock	Gm	Thorn EMI	16K	C	MA,GE,SI	£19.95
Home Financial Mg'ment	Dm	Thorn EMI	16K	D	GE	£29.95
Horizontal/Vertical Scrolling	Ed	Santa Cruz	16K	C	MI	£13.95
House of Usher	Gm	Chrystal	48K	C	MI,BR,SI	£19.99
Humpty Dumpty/Jack & Jill	Gm	Thorn EMI	16K	C	MA,GE,SI	£19.95
Intruder Alert	Gm	Dinacomp	16K	C	MI,SI	£15.99
Invasion Orion	Gm	Avalon Hill		C	AN,SI	£13.25
Invasion Orion	Gm	Avalon Hill		D	AN,SI	£15.75
Invitation to Prog I	Ed	Atari	16K	C	MI,GE,SI	£15.95
Invitation to Prog. II	Ed	Atari	16K	C	CE,SI,MI MA,GE	POA £22.95
Invitation to Prog. III	Ed	Atari	16K	C	MI,MA,GE IK	£22.95
Nautilus	Gm	Synapse	32K	C	GE	£20.00
Nomino's Jigsaw	Gm	Dinacomp	24K	C	MI,SI	£15.99
Norton Forth	Gm	Adventure Int.	32K	C	MI	£24.95
Nuke War	Gm	Avalon Hill	16K	C	AV	£10.95
Old McDonald's Farm	Gm	Adventure Int.	16K	C	MI	£12.50
Operating System A Plus	Ut	OSS S/W	48K	D	MA	£52.50
Outlaw Howitzer	Gm	Atari	24K	C	CE MI	POA £16.75
Pacific Coast Highway	Gm	Datasoft	16K	C	TH	£20.00
Pacific Coast Highway	Gm	Datasoft	16K	D	TH	£20.00
Pac-Man	Gm	Atari	16K	R	CE,SI MA,GE	POA £29.95
Page Flipping	Ed	Santa Cruz	16K	C	MA	£9.95
Page Flipping	Ed	Santa Cruz	16K	D	MA	£10.95
Personal Finance	Gm	Atari		R	MA	£49.00
Pilot (Educator)	Ut	Atari	16K	C/R	MI,MA,GE	£79.95
Pirate Adventure	Gm	Adventure Int.	24K	C	MA MI,SI	£14.95 £16.50
Planet Miners	Gm	Avalon Hill	24K	C	AV	£10.95
Player Missile Graphics	Ed	Santa Cruz	24K	D	MA	£19.95
Player Missile Graphics	Ed	Santa Cruz	24K	C	MA,MI	£18.95 £19.95
Poker & Solitaire	Gm	Artsci Inc.	16K	C	MA	£10.95
Program Pack I	Ut	Avalon Hill	16K	C	AN	£3.50
Protector	Gm	Synapse	32K	C	TH	£19.95
Purchase Ledger	Bs	Atari	48K	C	MI,SI	£149.95
Pyramid of Doom	Gm	Adventure Int.	24K	C	MA MI,SI	£14.95 £16.50
QS Forth	Ut	Quality S/W	24K	D	MA	£44.90
Quest for Power	Gm	Chrystal	48K	C	BR,MI	£26.99
Race in Space	Gm	Analog S/W	16K	C	MA	£14.95
Race in Space	Gm	Analog S/W	16K	C	TH	£15.95
Race in Space	Gm	Analog S/W	16K	D	TH	£15.95
Raster Blaster	Gm	Budgeco	32K	C	TH	£22.95
Rescue at Rigel	Gm		32K	C	MA,SI	£22.45
Reversi	Gm	Artsci Inc	16K	C	MA	£14.95
Rings of the Empire	Gm	Dinacomp	16K	C	MI,SI	£15.99
Rotate and Tilt	Gm	Thorn EMI	16K	C	MA,GE	£14.95
Sales Ledger	Bs	Atari	48K	C	MI,SI	149.95
Sands of Mars	Gm	Chrystal	48K	C	BR,MI,SI	£26.99
Savage Island I	Gm	Adventure Int.	24K	C	MA,SI	£14.95
Scram	Gm	Atari	16K	C	CE,SI MI,BR,GE	POA £17.50
Shooting Arcade	Gm	Datasoft	16K	C	GE	£20.00
Shooting Arcade	Gm	Datasoft	16K	D	GE	£20.00
Shooting Gallery	Gm	Analog S/W	16K	C	MA	£15.95
Shooting Gallery	Gm	Analog S/W	16K	D	MA	£15.95
Six Microstories	Gm	Adventure Int.	32K	C	MI	£12.50
Sky Warrior	Gm	Adventure Int.	16K	C	MI	£16.50
Snake Byte	Gm	Sirius Software	32K	D	CRs	£19.25
Snooker and Billards	Gm	Thorn EMI	16K	C	MA,GE,SI	£19.95
Sound Editor	Gm	Atari	16K	C	CE MI	POA £16.75
Sound Tutorial	Ed	Santa Cruz	16K	C	DA	£13.95
Space Ace	Gm	London S/W	16K	C	GE	£19.95
Space Ace	Gm	London S/W	16K	D	GE	£19.95
Space Invaders	Gm	Atari	16K	R	MI,BR,GE MA,SI	
Space Tilt	Gm	Dinacomp	16K	C	MA,SI	£29.95
Space Trap	Gm	Allrian	16K	C	AL	£15.50
Space Trap	Gm	Dinacomp	24K	C	MI,SI	£9.99
Space Trek	Gm	Atari	24K	C	HI CR	POA £13.50

REFERENCE

SOFTWARE LISTING

ATARI

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Star Raiders	Gm	Atari	16K	R	GE,LA,MA BR,SI	£29.95
Star Trek 3.5	Gm	Adventure Int.	32K	C	MA	£14.95
					MI	£16.50
Star Warrior	Gm	Epyx	32K	C	MA,SI	£28.95
States and Capitals	Ed	Atari	16K	C	LA,MA,SI	£8.95
					MI,GE	£9.95
Statistics 1	Fm	Atari		C	LA,MA,SI	£11.95
Stock and Bonds	Gm	Avalon Hill	32K	C	AV	£12.95
Stone of Sisyphus	Gm	Adventure Int.	24K	C	AV	£12.95
Strange Odyssey	Gm	Adventure Int.	24K	C	MA,SI	£14.95
					MI	£16.50
Stud Poker	Gm	Dinacomp	16K	C	MI,SI	£10.99
Stud Poker	Gm	Allrian	16K	C	AL	£14.00
Submarine Commander	Gm	Thorn EMI	16K	C	MA,GE,SI	£24.50
Summer	Gm	Chrystal	16K	C	MI	£11.99
Sunday Golf	Gm	Adventure Int.	16K	C	MI,SI	£16.50
Super Breakout	Gm	Atari	16K	C	LA,GE,SI	£24.50
Super Breakout	Gm	Atari	16K	R	MI,SI	£35,95
T:A Text Display Device	Do	Allrian	16K	C	AL	£16.00
Tack Trek	Gm	Atari	24K	C	CE	POA
					M	£13.50
Tank Trap	Gm	Quality S/W	16K	C	MA	£8.95
Tank Trap	Gm	Quality S/W	16K	D	MA	£11.95
Tanktics	Gm	Avalon Hill	32K	C	BR	£16.95
Tari Trek	Gm	Quality S/W	16K	C	MA	£8.95
Teachers Pet	Ed	Allrian	16K	C	AL	£14.00
Tari Trek	Gm	Quality S/W	16K	D	MA	£11.95
Tele Link	Gm	Atari	16K	R	GE,SI	£21.50
Tele Link	Ut	Atari	16K	R	MI,SI	£19.95
Telelink	Ut	Data Soft	16K	R	MA,SI	£14.95
Terrie	Gm	Atari	32K	C	CE	POA
					MI	£16.75
Text Editor	Bs	Allrian	32K	D	AL	£30.00
Text Wizard	Ut	Data Soft	16K	D	MI	£99.95
The Count	Gm	Adventure Int.	24K	C	MA,SI	£14.95
					MI	£16.50
The Cranston Manor Adventure	Gm	Allrian	32K	D	AL	£30.00
The Vaults of Zurich	Gm	Allrian	24K	C	AL	£19.50
The Predictor	Bs	Allrian	32K	D	AL	£27.95
The Rings of the Empire	Gm	Allrian	16K	C	AL	£15.50
Threshold	Gm	On-Line	32K	C	GE,SI	£24.95
Thunder Island	Gm	Analog S/W	16K	C	MA	£10.95
Touch Typing	Ed	Atari	16K	C	LA,MA,SI	£14.95
					MI,GE	£15.95
Tournament Pool and 8 Ball Pool	Gm	Thorn EMI	16K	C	BR,MA,GE SI	£19.95
Track Attack	Gm	Broada Bond	32K	D	GE	£32.95
Triple Blockade	Gm	Dinacomp	16K	C	MI,SI	£12.99
Tumble Bugs	Gm	Datasoft	24K	D	GE	£19.95
Two Heads of the Coin	Gm	Adventure Int.	32K	C	MI	£16.50
Ulysses	Gm	On-Line	40K	D	GE	£24.95
Video Easel	Gm	Atari	16K	R	CE,SI	POA
					MI,MA,GE	£24.50
Visicalc	Bs	Personal S/W	32K	D	MA,SI	£119.95
Voodoo Castle	Gm	Adventure Int.	24K	C	MA,SI	£14.95
					MI	£16.50
Voyager	Gm	Avalon Hill	32K	C	BR,AV	£12.95
Waterloo	Gm	Chrystal	48K	C	BR,SI	£32.99
Wizard and the Princess	Gm	On Line	48K	D	BR,SI	£22.95
World War III	Gm	Chrystal	48K	C	BR,MI,SI	£19.99

BBC

Action of the Heart	Ed	Garland Comp.	32K	C	GA	£11.76
Adventure	Gm	Micro Power	32K	C	PRo	£6.95
Adventure	GM	Program Direct	32K	C	P	£5.99
Adventure Quest	Gm	Level 9 Computing	32K	C	LE	£9.90
Algebraic Manipulation	Ut	Acornsoft	16K	C	EL,AC	£9.95
Algebraic Manipulation	Ut	Acornsoft	32K	C	EL,AC	£9.95
Alien Destroyers	Gm	Micro Power	32K	C	PRo	£6.95
Alien Dropout	Gm	Superior Software	32K	C	SUp	£6.50
Arcade Action	Gm	Acornsoft	16K	C	EL	£11.90
Arrow of Death (1)	Gm	Digital Fantasia	16K	C	IJ	£6.95
Arrow of Death (2)	Gm	Digital Fantasia	16K	C	DI	£8.95
Airlift	Gm	Bug Byte	32K	C	IJ	£5.50
Angle(4)	Ed	Chalksoft	32K	C	CHa	£6.95
Append It	Ut	Aztec S/W	16K	C	AZ	£3.00
Asteroids/Frong	Gm	Aardvark Software	16K	C	AAs	£4.00
Asteroid Belt	Gm	Electronics Appplied	32K	C	ELe	£11.50

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Supplier Code

AA A&F Software
10 Wilpshire Avenue
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AAs Aardvark Software
15 Queensbury Avenue
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Cleveland
TS26 9NW

AB ABC Primary Software
19 Crumstone Court
Longmeadows Estate
Killingworth
Newcastle upon Tyne
NE12 0SZ

AC Acornsoft Ltd
4a Market Hill
Cambridge
CB2 3NJ
0223 316039

ALa A Lane (Software)
312/316 Seaside
Eastbourne
E Susex BN22 7RH

BRy Bryants (Educational) S/W
1 The Hollies
Chalcroft Lane
North Berstead
Bognor Regis
W Sussex PO21 5ZX

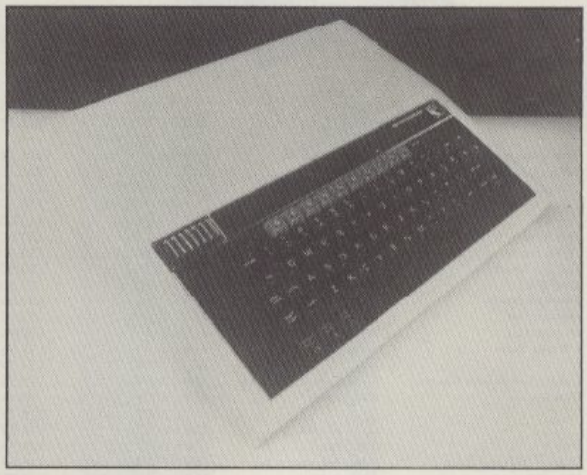
BU Bug-Byte
98-100 The Albany
Old Hall Street
Liverpool

CA Carswell Computers
Carswell Barn
Faringdon
Oxon SN7 8JN

CHa Chalksoft Ltd
Lowmoor Cottage
Tonedale
Wellington
Somerset TA21 0AL

CJ CJE Microcomputers
25 Henry Avenue
Rustington
W Sussex BN16 2PA

COc Computercat
224 Chapel Street
Leigh
Lancs
0942 605730



AN Anglia Computer Centre
88 St Benedict's Street
Norwich NR24 AB
0603 26002

ANi Anirog Computers
26 Balcombe Gardens
Horley
Sussex

AS ASP Software
145 Charing Cross Road
London WC2H 0EE
01 437 1002

AZ Aztec Software
25 St Marks Road
Deepcar
Sheffield S30 5TS

BB BBC Publications
The British Broadcasting Corporation
35 Marylebone High Street
London W1M 4AA

BR Bridge Software
36 Fernwood
Marple Bridge
Stockport SK6 5BE

COe Computer Concepts
16 Wayside
Chipperfield
Herts
09277 62955

COm Computersmith
40 Greensfields Avenue
Bromborough
Wirral L62 6DD

COr Corona Software
73 High Road
South Woodford
London

DAt Database
27 City Road
Stoke
Staffs

DAv Davansoft
1 Delapoer Drive
Haverfordwest
Dyfed SA61 1HX

DI Digital Fantasia
24 Norbreck Road
Norbreck
Blackpool
Lancs

Asteroid Belt	Gm	Computer Concepts	16K	C	COe	£7.80
Astro Navigator	Gm	Micro Power	32K	C	FO,PRo	£6.95
Atlantis	Gm	IJK Software	32K	C	IT	£6.95
Awari	Gm	Foilkade	16K	C	FO	£5.95
Backgammon	Ut	Bug Byte	32K	C	AN,LI	£8.00
Balloons	Gm	C J E Microcomputers	32K	C	CJ	£6.00
Basic Maths	Ed	Aztec S/W	16K	C	AZ	£3.00
Battlefield	Gm	Micro-Aid	32K	C	MIa	£2.50
Banner	Do	Micro-Aid	16K	C	MIa	£2.95
Beeb-Chase	Gm	Database Software	32K	C	DAt	£7.50
Beebmunch	Gm	I.J.K. S/W	32K	C	IJ	£5.95
Beebtrek	Gm	Software for All	16K	C	SO	£7.95
BEEP-BEEB	Gm	IJK	32K	C	IJ	£3.95
Bounty Pirates	Gm	Aztec S/W	16K	C	AZ	£5.50
Break-Up	Gm	Miking S/W	32K	C	Mlk	£3.95
Breakout	Gm	I.J.K. S/W	16K	C	IJ	£3.95
Breakout	Gm	Bryants S/W	32K	C	BRy	£3.75
Bridgeman	Gm	Bridge S/W	32K	C	BR	£7.90



Call Your Bluff	Gm	Square Software	16K	C	SQ	£6.00
Capitol Cities	Ed	Square Software	16K	C	SQ	£6.00
Carbohydrate Metabolism	Ed	Garland Comp.	32K	C	GA	£18.24
Cashbook A	Do	Micro-Aid	16K	C	MIa	£3.95
Cashbook B	Do	Micro-aid	16K	C	MIa	£3.95
Caves of Anoron	Gm	FBC Systems	32K	C	PRo	£7.00
Cat & Mouse	Gm	Micro Power	16K	C	PRo	£4.95
Cells and Serpents/ Stockmarket	Gm	ASP Software	16K	C	AS	£11.45
Cells & Serpent	Gm	Hexagon S/W	16K	C	HE	£5.00
Centipede	Gm	Superior S/W	32K	C	SUp	£7.00
CESCIL	Ed	Eduquest	16K	C	ED	£19.95
Character Builder	Ut	Davensoft	16K	C	DAv	£4.95
Characters	Ut	Computer Concepts	32K	C	COe	£6.67
Character Generator	Ut	MP S/W	32K	C	MP	£3.00
Character Generator	Ut	Software for All	32K	C	SO	£4.95
Characters	Ut	Computer Concepts	16K	C	COe	£6.67
Characters & Envelope Definer	Ut	Electronics Applied	32K	C	ELe	£5.50
Chess	Gm	Bug Byte	32K	C	AN	£11.50
Chess	Gm	Micro Power	32K	C	PRo	£6.95
Circus	Gm	Digital Fantasia	32K	C	DI	£8.95
Claws	Ed	Bryants S/W	16K	C	BRy	£3.75
Cards	Gm	Micro-Aid	16K	C	MP	£2.95
Cobra/Robo-Swamp	Gm	Software for All	16K	C	SO	£6.95
Cobra/Robo-Swamp	Gm	Software for All	32K	C	SO	£6.95
Code Race	Gm	Computer Concepts	16K	C	COe	£6.67
Code Race	Ut	Computer Concepts	32K	C	COe	£6.67
Colossal Adventure	Gm	Level 9 Computing	32K	C	LE	£9.90
Connect 4	Gm	Database Software	32K	C	DAt	£5.90
Constellation	Ed	Micro Power	32K	C	PRo	£5.95
Cookbook Wizardry	Do	Database Software	32K	C	DAt	£7.50
Cowboy Shoot-out	Gm	Micro Power	32K	C	PRo	£5.95
Creative Graphic Pack	Ut	Acornsoft	16K	C	EL,AC	£9.95
Creative Graphics	Ut	Acornsoft	32K	C	EL,AC	£9.95
Crossed Words	Ed	Aztec S/W	16K	C	AZ	£6.50

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26 Avondale Avenue
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0784 58771

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181 Portland Crescent
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MEd MED
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0533 704492

MIa Micro-Aid
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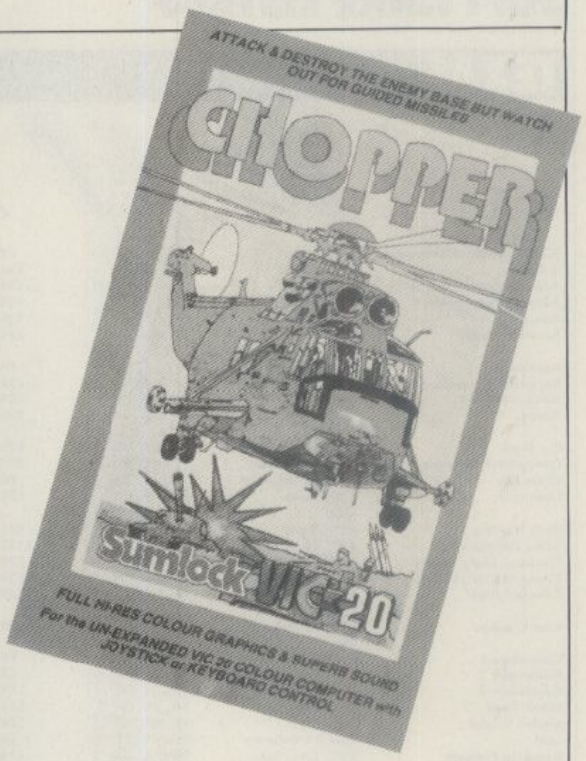
SOFTWARE LISTING

BBC

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Data-Quiz	Ut	Bryants S/W	32K	C	BRy	£4.88
Database	Bs	Computercat	16K	C	COc	£11.95
Database	Bs	Software for All	16K	C	SO	£9.95
Defchr	Ut	Micro-Aid	16K	C	MIa	£2.95
Defender	Gm	Acornsoft	32K	C	ELAC	£9.95
Desk Diary	Bs	Acornsoft	32K	C	ELAC	£9.95
Desk Diary	Bs	Acornsoft	16K	C	AC	£9.95
Devil's Causeway	Gm	Anirog Computers	16K	C	ANi	£6.00
Dissassembler	Ut	Micro Power	16K	C	PRo	£5.95
Dissassembler	Ut	Program Direct	16K	C	P	£3.00
Dissassembler	Ut	Davansoft	16K	C	DAv	£5.95
Dissassembler	Ut	C J E Microcomputers	16K	C	CJ	£5.00
Distances	Ed	Micro-Aid	32K	C	MIa	£2.95
Digital X-Word Compiler	Gm	N. Darwood	16K	C	ND	£6.00
DNA Replication	Ed	Garland Comp.	32K	C	GA	£17.65
Dragon Rider	Gm	Salamander Software	32K	C	SA	£6.95
Dragon Quest II	Gm	Bug Byte	32K	C	LI	£11.50
Dragon Quest	Gm	Bug Byte	32K	C	LI	£11.50
Drawing	Ut	B.B.C.	16K	C	BB	£10.00
Dungeon Adventure	Gm	Level 9 Computing	32K	C	LE	£9.90
Early Learning	Ed	B.B.C.	16K	C	BB	£10.00
Early Numbers	Ed	Bryants S/W	32K	C	BRy	£4.80
Early Warning	Gm	A&F Software	16K	C	AA	£6.00
Educational (1)	Ed	Golem	16K	C	GO	£8.05
Educational (2)	Ed	Golem	16K	C	GO	£8.05
7 Educational Games	Gm	Micromail	32K	C	MIm	£5.75
Eldorado Gold	Gm	Program Power	32K	C	PRo	£7.99
Electric	Ed	Database Software	16K	C	DAt	£5.50
European Studies	Ed	Aztec S/W	32K	C	AZ	£6.50
Escape from Pulsar 7	Gm	Digital Fantasia	32K	C	DI	£8.95
Fairytale	Gm	Molimerx	32K	C	MO	£10.06
Feasibility Experiment	Gm	Ditigal Fantasia	32K	C	DI	£8.95
Filer	Bs	Micro Power	16K	C	PRo	£8.95
Firien Wood	Gm	MP S/W	32K	C	MP	£6.50
Flags	Ed	Micro-Aid	16K	C	MIa	£2.95
Flush	Ut	Micro-Aid	16K	C	MIa	£1.00
Football Pools Predictor	Do	Mayday Software	16K	C	MD	£4.99
Footer	Gm	Micro Power	32K	C	PRo	£6.95
Frenzy	Gm	Persoft	16K	C	PE	£5.75
Frogger (Machine Code)	Gm	A&F Software	32K	C	AA	£8.00
Fruit Machine	Gm	Superior Software	32K	C	SUp	£6.50
Fruit Machine	Gm	Bug Byte	32K	C	BU	£5.50
FORTH	Ut	Acornsoft	32K	C	AC	£16.85
Fun Games	Gm	B.B.C.	16K	C	BB	£10.00
Galactic Commander	Gm	Micro Power	32K	C	PRo	£6.95
Games Pack 1	Gm	Computersmith	16K	C	COm	£5.50
Galaxians	Gm	Superior S/W	32K	C	SUp	£7.00
Game of Logic	Ed	N. Darwood	16K	C	ND	£8.00
Games of Logic and cunning	Gm	Golem	16K	C	GO	£9.20
Games of Strategy	Gm	B.B.C.	16K	C	BB	£10.00
Games Pack II	Gm	Micromail	32K	C	MIm	£6.75
Genetic Code	Ed	Garland Comp.	32K	C	GA	£17.65
Geography Italy	Ed	Corona S/W	32K	C	COr	£5.00
Ghost/Diamonds	Gm	A Lane	16K	C	ALa	£3.00
Ghost Maze	GM	Software for All	32K	C	SO	£6.95
Grand Prix	Gm	Software for All	32K	C	SO	£5.95
Golf	Gm	Bryants S/W	32K	C	BRy	£4.88
Golf	Gm	Bug Byte	32K	C	BU	£7.00
Golf	Gm	Computersmith	32K	C	COm	£5.50
Gomoku	Gm	Micro Power	16K	C	PRo	£3.95
Graphics Package	Ut	Salamander Software	32K	C	SA	£24.95
Graph and Charts Pack	Bs	Acornsoft	32K	C	AC	£9.95
Graph and Charts Pack	Bs	Acornsoft	16K	C	AC	£9.95
Great Britain Ltd	Gm	S.W. Hessel S/W	32K	C	SH	£5.95
Guzzler	Gm	Computersmith	32K	C	COm	£5.50
Hangman	Gm	Aztec S/W	16K	C	AZ	£5.50
Hangman	Gm	MP S/W	32K	C	MP	£4.00
Helicopter Rescue/Tunnel/ Roadrace	Gm	A Lane	16K	C	ALa	£4.00
Home Accounts	Do	Persoft	32K	C	PE	£12.50
Home Finance	Do	B.B.C.	16K	C	BB	£10.00
Hydraulics	Ed	Database Software	16K	C	DAt	£5.50
Inkosi	Gm	Chalksoft	32K	C	CHa	£5.95
Invaders	Gm	Superior S/W	32K	C	SUp	£7.00
Invaders	Gm	Software for All	16K	C	SO	£6.95
Invaders	Gm	Hexagon S/W	16K	C	HE	£6.00
Invaders	Gm	MP S/W	32K	C	MP	£6.50
Invisible Man	Ed	Chalksoft	32K	C	CHa	£5.95
Inheritance	Gm	S.W. Hessel S/W	32K	C	SH	£5.95
Inheritance	Ed	Garland Comp.	32K	C	GA	£34.70
J.R.	Gm	Software for All	32K	C	SO	£6.95
Jumbles	Ed	Bryants S/W	32K	C	BRy	£4.88
Jumbo	Gm	Molimerx	32K	C	MO	£17.25
Junior Maths Pack	Ed	Micro Power	32K	C	PRo	£5.95
Katakombs	Gm	Golem	32K	C	GO	£9.20
La Princesse (French)	Ed	Aztec S/W	32K	C	AZ	£6.50
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Laser Command	Gm	Micro Power	32K	C	PRo	£6.95
Letters	Ed	Chalksoft	32K	C	Cha	£6.95
Library Dewey Classification	Ed	Aztec S/W	32K	C	AZ	£6.50
Link-4-Plus	Gm	ABC Software	16K	C	AB	£6.95
Lisp	Ut	Acornsoft	32K	C	AC	£16.85
Lisp	Ut	Acornsoft	16K	C	AC	£16.85
Logo 2	Ut	Computer Concepts	32K	C	COe	£10.00
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Mailing A	Bs	Micro-aid	16K	C	MIa	£3.95
Mailing B	Bs	Micro-Aid	16K	C	MIa	£3.95
Martians	Gm	Micro Power	32K	C	PRo	£5.95
Mastermind	Gm	Micro Power	16K	C	PRo	£3.95
Maze Invaders	Gm	Micro Power	32K	C	PRo	£4.95
Maze Man	Gm	C J E Microcomputers	32K	C	CJ	£6.00
Micro Budget	Do	Micro Power	16K	C	PRo	£6.95
Metrics (5)	Ed	Chalksoft	32K	C	CHa	£9.95
Micro Maths	Ed	LCL	16K	C	LU	£24.50
Minefield	Gm	Eduquest	16K	C	ED	£5.95
Master Copier	Ut	Aztec S/W	16K	C	AZ	£6.50
Maths Translation	Ed	Corona S/W	32K	C	COr	£5.00
Micro-Derby	Gm	Bug Byte	32K	C	BU	£5.50
Micro Man	Gm	Pro S/W	32K	C	PS	£8.00
Middle Kingdom	Gm	Pro S/W	16K	C	PS	£8.00
Minefield	Gm	A&F Software	16K	C	AA	£6.00
Missile Control	Gm	C J E Microcomputers	32K	C	CJ	£9.00
Mission Impossible	Gm	Aztec S/W	16K	C	AZ	£6.50
Mixed Games	Gm	I.J.K. S/W	16K	C	IJ	£3.95
Model A Invaders	Gm	I.J.K. S/W	16K	C	IJ	£4.95
Model B Invaders	Gm	I.J.K. S/W	32K	C	IJ	£6.95
Money Box	Ed	Bryants S/W	32K	C	BRy	£4.88
Monsters	Gm	Acornsoft	32K	C	AC	£9.95
Monster Battles	Gm	Bryants S/W	32K	C	BRy	£4.80
Multifile	Bs	Bug Byte	16K	C	BU	£25.00
Multiple Choice	Ed	Eduquest	32K	C	ED	£25.00
Munchyman	Gm	Micro Power	16K	C	PRo	£5.95
Music	Do	B.B.C.	16K	C	BB	£10.00
Musical Numbers	Ed	Bryants S/W	32K	C	BRy	£4.88
Musical Number Box	Gm	Bryants S/W	16K	C	BRy	£3.75
Music Program	Do	Golem	32K	C	GO	£6.90
Mutant Invaders	Gm	I.J.K. S/W	16K	C	IJ	£5.95
MX 80 Type 3 Screen Dump	Ut	Software for All	16K	C	SO	£6.95
Othello	Gm	Computer Concepts	16K	C	COe	£8.95
Othello	Gm	Computer Concepts	32K	C	COe	£8.95
Othello	Gm	Computercat	16K	C	COc	£8.95
Parity	Ed	N. Darwood	16K	C	ND	£6.00
Payroll	Bs	Micro-Aid	32K	C	MIa	£5.95



Payroll 2	Bs	Micro-Aid	32K	C	Mla	£5.95
Peeko Computer	Bs	Acornsoft	16K	C	AC	£9.95
Pete the Plastered Postman/ Asteroid Lander	Gm	ASP Software	16K	C	AS	£8.50
Pharoah's Tomb	Gm	A&F Software	32K	C	AA	£8.00
Philosopher's Quest	Gm	Acornsoft	16K	C	AC	£9.95
Picsave	Ut	Hexagon S/W	16K	C	HE	£6.00
Painting	Ut	B.B.C.	16K	C	BB	£10.00
Peeko Computer	Ut	Acornsoft	32K	C	AC	£9.95
Procflush	Ut	Micro-Aid	16K	C	Mla	£1.00
Powerboat Race	Gm	Futura S/W	32K	C	FU	£7.95
Polaris	Gm	Bug Byte	32K	C	BU	£5.50
Procvar	Ut	Micro-Aid	16K	C	Mla	£1.95
Princess	Gm	Aztec S/W	16K	C	AZ	£6.50
Punctuation	Ed	Bryants S/W	32K	C	BRy	£4.88
Reversi & Gomuko	Gm	Pro S/W	16K	C	PS	£8.00
Reversi 1	Gm	Micro Power	16K	C	PRo	£4.95
Reversi 2	Gm	Micro Power	32K	C	PRo	£4.95
Road Runner	Gm	A&F Software	32K	C	AF	£6.90
Robot	Gm	Miking S/W	32K	C	Mlk	£4.95
Roulette	Gm	Micro Power	32K	C	PRo	£4.95
Searchbas	Ut	Micro-Aid	16K	C	Mla	£1.95
Seed Germination	Ed	Garland Comp.	32K	C	GA	£18.82
Sequences	Ed	Chalksoft	32K	C	CHa	£5.95
Sheepdog Trials	Ed	Bryants S/W	32K	C	BRy	£4.80
Shootout	Gm	MP S/W	32K	C	MP	£5.00
Skwosh	Gm	Miking S/W	32K	C	Mlk	£3.95
Snake	Gm	Computer Concepts	32K	C	COe	£6.67
Snapper	Gm	Acornsoft	32K	C	AC	£9.95
Sort M/C	Ut	Micro-Aid	16K	C	Mlc	£1.00
Sortbas	Ut	Micro-Aid	16K	C	Mlc	£1.00
Soundplan	Ut	ME & P Products	16K	C	ME	£10.00
Spacehawks	Gm	Computer Concepts	32K	C	COe	£7.80
Spacemaze	Gm	Micro Power	32K	C	PRo	£5.95
Spacefight	Gm	Miking S/W	32K	C	Mlk	£7.95
Space Adventure	Gm	Pro S/W	32K	C	PS	£8.00
Space Warp	Gm	Bug Byte	32K	C	BU	£11.50
Space Fighter	Gm	MP S/W	32K	C	MP	£8.50
Space Fighter	Gm	Superior S/W	32K	C	SUp	£7.00
Space Games Pack 1	Gm	Futura S/W	16K	C	FU	£3.99
Space Games Pack 2	Gm	Futura S/W	16K	C	FU	£3.99
Space Games Pack 3	Gm	Futura S/W	16K	C	FU	£4.99
Space Games Pack 4	Gm	Futura S/W	16K	C	FU	£4.99
Space Invaders	Gm	Pro S/W	16K	C	PS	£8.00
Space Trek	Gm	Program Direct	32K	C	P	£5.99
Space Pirates	Gm	Bug Byte	16K	C	BU	£8.00
Speechparts	Ed	Bryants S/W	32K	C	BRy	£4.88
Squash	Gm	Aztec S/W	16K	C	AZ	£5.50
Star Maze	Gm	Database Software	32K	C	DA	£7.50
Star Trek	Gm	Micro Power	16K	C	PRo	£4.95
Startrek/Candy Floss	Gm	I.J.K. S/W	16K	C	IJ	£5.95
Star Treck	Gm	Hexagon S/W	16K	C	HE	£5.50
Statpack	Ed	Micro-Aid	32K	C	Mla	£7.95
Stats 1	Bs	ME & P Products	16K	C	ME	£15.00
Storybuilder	Ed	Bryants S/W	32K	C	PRo	£4.88
Superlife	Gm	Golem	32K	C	GO	£9.20
Super Hangman	Gm	I.J.K. S/W	32K	C	IJ	£3.95
Swamp Monsters	Gm	M P Software	32K	C	MP	£6.50
Swoop	Gm	Micro Power	32K	C	PRo	£6.95
Tables Test	Ed	Bryants S/W	32K	C	BRy	£4.88
Tape Copy	Ut	Davansoft	16K	C	DAv	£7.50
Teacher's Toolkit	Ed	Wida Software	32K	C	WI	£30.00
Text Processing Pack	Bs	Eduquest	32K	C	ED	£10.00
The Frog	Gm	James Hager	32K	C	JA	£6.50
The Golden Baton	Gm	Digital Fantasia	16K	C	DI	£8.95
3D Maze	Gm	I.J.K. S/W	32K	C	IJ	£3.95
The Time Machine	Gm	Digital Fantashia	16K	C	DI	£8.95
Timetrek	Gm	Micro Power	32K	C	PRo	£6.95
Touch Typist	Ed	Computercat	16K	C	COc	£9.95
Tower of Alos	Gm	A&F Software	16K	C	AA	£6.90
Towns of Britain	Ed	Aztec S/W	16K	C	AZ	£6.50
The Computer Programme Programs Vol 2	Do	B.B.C	32K	C	BB	£10.00
The Computer Programme Programs Vol 1	Do	B.B.C.	16K	C	BB	£10.00
Threed OXO	Gm	Micro-Aid	16K	C	Mla	£2.50
3-D Maze	Gm	Hexagon S/W	16K	C	HE	£6.00
3D Maze	Gm	Earthshock S/W	16K	L	EA	£3.00
Utilities	Ut	Golem	16K	C	GO	£8.05
Utilities	Ut	Micro-Aid	16K	C	Mla	£4.95
Valley	Gm	ASP Software	32K	C	AS	£11.45
Varkman/Meanies	Gm	Aardvark Software	16K	C	AAs	£4.00
Vogon Attack	Gm	Micromail	32K	C	Mlm	£6.33
Water Relations of Plant Cells	Ed	Garland Comp.	32K	C	GA	£18.82
What's my number	Gm	Square Software	16K	C	SQ	£6.00
Where?	Ed	Micro Power	32K	C	PRo	£5.95
White Barrows Conquering Everest	Gm	ASP Software	16K	C	AS	£11.45
Wordwise	Gm	Computer Concepts	32K	C	COe	£74.75
Word Processor	Bs	Pro S/W	32K	C	PS	£19.95
Wordy	Gm	Square Software	16K	C	SQ	£6.00
World Geography	Ed	Micro Power	32K	C	PRo	£5.95
Zombies	Gm	Micro Power	16K	C	PRo	£3.95



TANDY COLOUR

Alcatraz II	Gm	Spectral Assoc	16K	C	MD	£8.95
Artillery	Gm	Spectral Assoc	16K	C	MD	£7.95
Battlefleet	Gm	Spectral Assoc	16K	C	MD	£13.95
Black Sanctum	Gm	Mark Data Prods.	16K	C	MD	£17.50
Bugoutc Monitor	Ut	Spectral Assoc	4K	C	MD	£19.95
Calixto Island	Gm	Mark Data Prods.	16K	C	MD	£17.50
Cave Hunter	Gm	Mark Data Prods.	16K	C	MD	£19.95
Chromasette	Gm	Cload Inc	16K	C	MD	£5.95
Color Beserk	Gm	Mark Data Prods.	16K	C	MD	£19.95
Colour Invaders	Gm	Spectral Assoc	16K	C	MD	£19.95
Compuvoice	Ut	Spectral Assoc	16K	C	MD	£44.95
Croid	Gm	Spectral Assoc	16K	C	MD	£11.95
Editor Assembler	Ut	Spectral Assoc	16K	C	MD	£34.95
Game Of Life	Gm	Spectral Assoc	16K	C	MD	£13.95
Graphic Animator	Gm	Spectral Assoc	4K	C	MD	£9.95
Laser Command	Gm	Spectral Assoc	16K	C	MD	£9.95
Lothars Labyrinth	Gm	Spectral Assoc	16K	C	MD	£13.95
Madness & Minotaur	Gm	Spectral Assoc	16K	C	MD	£17.93
Magic Box	Ut	Spectral Assoc	16K	C	MD	£24.95
Magikube	Gm	Computer Ware	16K	C	MD	£17.50
Mazerace	Gm	Computer Ware	16K	C	MD	£14.95
Meteoroids	Gm	Spectral Assoc	16K	C	MD	£19.95
Scarfman	Gm	Cornsoft	4K	C	MD	£11.95
Secs	Ut	Datasoft	16K	C	MD	£19.95
Sigmon	Ut	Datasoft	16K	C	MD	£19.95
Sound Source	Ut	Spectral Assoc	16K	C	MD	£24.95
Space Traders	Gm	Spectral Assoc	16K	C	MD	£13.95
Space War	Gm	Spectral Assoc	16K	C	MD	£19.95
Storm	Gm	Computer Ware	16K	C	MD	£19.95
Sub Hunt	Gm	Spectral Assoc	16K	C	MD	£13.95
3D Drawing Board	Gm	Computer Ware	16K	C	MD	£19.95
Typing Teacher	Gm	Spectral Assoc	16K	C	MD	£19.95
Voyager	Gm	Avalon Hill	16K	C	MD	£14.95

TANDY COLOUR DEALER

Supplier Code

MD Microdeal
Deal House
Luxulyan
Bodmin
Cornwall PL30 5E
0726 850821

SOFTWARE LISTING

TEXAS

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
3D O's and X's/Mastermind	Gm	Apex S/W	16K	C	AP	£4.95
A-Maz-Ing	Gm	Texas	8K	R	BR	£24.00
Addition, Subtraction I	Ed	Texas	8K	R	MI,BR	£35.00
Addition, Subtraction II	Ed	Texas	8K	R	BR	£35.00
Attack	Gm	Texas	8K	R	BR	£30.00
Adventure Land	Gm	Texas	8K	C	BR	£24.95
Battlefront	Gm	TX Software	16K	C	TX	£6.00
Beginning Grammar	Ed	Texas	8K	R	BR	£20.00
Blackjack Poker	Gm	Texas	8K	R	BR	£24.00
Blasto	Gm	Texas	8K	R	BR	£25.00
Car Wars	Gm	Texas	8K	R	BR,MI	£25.00
Chequebook Manager	Bs	Texas Max	16K	D	BR	£19.00
Chess File	Gm	TX Software	16K	C	TX	£6.00
Connect 4	Gm	Texas	8K	R	BR	£24.00
Early Reading	Ed	Texas	8K	R	BR	£35.00
Editor Assembler	Ut	Texas	8K	R	BR	£115.00
Electrical Eng'g Library	Bs	Texas Max	16K	C	BR	£24.00
Electrical Eng'g Library	Bs	Texas Max	16K	D	BR	£35.00
Extended Basic	Bs	Texas	8K	R	BR	£100.00
Four in a Row	Gm	TX Software	16K	C	TX	£6.00
Gamestape 1	Gm	Apex S/W	16K	C	AP	£1.95
Gamestape 2	Gm	Apex S/W	16K	C	AP	£3.95
Gamestape 3	Gm	Apex S/W	16K	C	AP	£4.95
Ghost Town	Gm	Texas	8K	C	BR	£24.95
Golden Voyage	Gm	Texas	8K	BR	AB	£24.95
Golf	Gm	TX Software	16K	C	TX	£6.00
Graphing Package	Do	Texas Max	16K	C	BR	£14.00
Graphing Package	Do	Texas Max	16K	D	BR	£19.00
Hangman	Gm	Texas	8K	R	BR	£24.00
Haunted House	Gm	Apex S/W	16K	C	AP	£5.95
Household Money Management	Do	Texas	8K	R	BR	£25.00
Hunt The Wumpus	Gm	Texas	8K	R	BR,MI	£25.00
Hustle	Gm	Texas	8K	R	BR	£30.00
Lunar Lander	Gm	Apex S/W	16K	C	AP	£4.95
Mailing List	Bs	Texas Max	16K	D	BR	£60.00
Market Simulation	Bs	Texas	32K	C	BR	£9.00
Market Simulation	Bs	Texas	32K	D	BR	£19.00
Maths Routine Library	Ed	Texas Max	16K	C	BR	£24.00
Maths Routine Library	Ed	Texas Max	16K	D	BR	£35.00
Maze/Towers of Hanoi	Gm	Apex S/W	16K	C	AP	£5.95
Mind Challenges	Gm	Texas	16K	R	BR	£24.95
Minimemory	Ut	Texas	8K	R	MI	£89.95
Mission Impossible	Gm	Texas	8K	C	MI	£24.95
Multiplication	Ed	Texas	8K	R	MI	£35.00
Munchman	Gm	Texas	8K	R	MI	£29.95
Music Makers	Do	Texas	8K	R	MI	£35.00
Music Maker	Ed	Texas	16K	D	MI	£14.00
Music Skills Trainer	Ed	Texas Max	16K	C	MI	£19.00
Music Skills Trainer	Ed	Texas Max	16K	D	MI	£24.00
Mystery Funhouse	Gm	Texas	8K	C	MI	£24.95
Nim/O's and X's	Gm	Apex S/W	16K	C	AP	£4.95
Number Magic	Ed	Texas	8K	R	MI	£18.00
Oldies but Goodies	Gm	Texas Max	16K	C	MI	£9.00
Oldies but Goodies	Gm	Texas Max	16K	D	MI	£14.00
Othello	Gm	Texas	8K	R	MI	£40.00
Personal Financial Aid	Do	Texas	8K	C	MI	£9.95
Personal Record Keeping	Do	Texas	8K	R	MI	£50.00
Personal Report Generator	Do	Texas	8K	R	MI	£70.00
Physical Fitness	Do	Texas	8K	R	MI	£20.00
Pirate Adventure	Gm	Texas	8K	R	MI	£39.95
Pre-School Learning Fun	Ed	Texas	8K	R	MI	£17.00
Programming Aids I	Ut	Texas	16K	C	MI	£9.00
Programming Aids I	Ut	Texas	16K	D	MI	£14.00
Programming Aids II	Ut	Texas	16K	D	MI	£24.00
Programming Aids III	Ut	Texas	16K	D	MI	£19.00
Pyramid of Doom	Gm	Texas	8K	C	MI	£24.95
Roulette/Craps	Gm	Apex S/W	16K	C	AP	£4.95
Savage Island I	Gm	Texas	8K	C	MI	£29.95
Savage Island II	Gm	Texas	8K	C	MI	£29.95
Saturday Night Bingo	Gm	Texas Max	16k	C	MI	£14.00
Soccer	Gm	Texas	8K	R	MI,BR	£30.00
Sorcerers Castle	Gm	Apex S/W	16K	C	BR	£5.95
Speech Editor	Ut	Texas	8K	R	AP	£35.00
Statistics	Do	Texas	8K	R	MI	£45.00
Strange Odyssey	Gm	Texas	8K	C	MI	£24.95
Structural Eng'g Library	Bs	Texas	16	C	MI	£24.00
Structural Eng'g Library	Bs	Texas Max	16K	D	MI	£35.00
TI Logo	Ut	Texas	48K	R	MI	£160.00
TI Invaders	Gm	Texas	8K	R	MI,BR	£40.00
TI Trek	Gm	Texas Max	16K	D	MI	£14.00
Teach Yourself Extended Basic	Ed	Texas	32K	C	MI	£20.00
Teach Yourself Extended Basic	Ed	Texas	32K	D	MI	£29.00
Teach Yourself Basic	Ed	Texas	32K	C	MI	£30.00
Teach Yourself Basic	Ed	Texas	32K	D	MI	£40.00
Terminal Emulator	Ut	Texas	8K	R	MI	£57.00
The Count	Gm	Texas	8K	C	MI	£24.95
Tombstone City	Gm	Texas	8K	R	MI,BR	£40.00
Tunnels of Doom	Gm	Texas	8K	R	MI,BR	£40.00
UCSD PASCAL 4	Ut	Texas	48K	D	MI	£380.00
US Football	Gm	Texas	8K	R	MI	£24.00
Video Chess	Gm	Texas	8K	R	MI,BR	£50.00
Video Games I	Gm	Texas	8K	R	MI,BR	£25.00
Video Games II	Gm	Texas	8K	R	MI	£25.00
Voodoo Castle	Gm	Texas	8K	C	MI	£24.95
Yahtzee	Gm	Texas	8K	R	MI	£30.00
Zero Zap	Gm	Texas	8K	R	MI	£24.00

TEXAS DEALERS

Supplier Code

AP Apex Trading Ltd
115 Crescent Drive South
Brighton
BN2 6SB

BR Brighton Gamer
24 Gloucester Road
Brighton
Sussex
0273 698424

CHi Childsplay Software
8 Vyner Grove
Ashton on Mersey
Sale M33 5GR
061 973 4302

MI Micro & Video Palace
62-64 Kensington High Street
London W8
01 937 8587

MIf Mik-Soft
132 High Street
Kempson
Bedford
MK41 7BN
0234 852045

RU Rumbelows Shops
Nationwide

TX TX Software
109 Abbotswold
Harlow
Essex
CM18 6TQ



VIC 20

3-D Maze	Gm	Adcom	8K	C	MI	£7.50
3-D Maze	Gm	Hi-Tech	3K	C	SU,Slg	£8.30
					XI	£8.62
A-Maz-Ing	Gm	Audiogenic	8K	C	Mlc	£6.99
Alpha Blaster	Gm	Sumlock	5K	C	SUm	£7.95
Alien	Gm	Commodore	3K	R	SU,MI,SR, Slg, CAd, BR COa,TW,Mlc	£19.95
Alien Attack	Gm	Adcom	5K	C	MI	£7.00
Alien Attack	Gm	Hi-Tech	3K	C	XI,Slg	£8.62
Alien Blaster	Gm	Paysoft	5K	C	TW	£5.25
Alien Blaster	Gm	MAC	3K	C	MOr	£5.50
Alien Blitz	Gm	Audiogenic	3K	C	Mlc,GE	£7.99
Alien Blitz	Gm	Audiogenic	5K	C	BR	£7.99
Alien Maze	Gm	Adcom	8K	C	MI	£7.50
Alien Maze	Gm	Hi-Tech	3K	C	SU,Slg	£8.30
					XI	£8.62
Alien Invasion	Gm	Computermat	3K	C	AVo	£8.95
Alien Wars	Gm	Hi-Tech	3K	C	SU,Mlr	£8.30
					XI	£7.80
					Slg	£8.62
Amok	Gm	Audiogenic	5K	C	Mlc,GE	£6.99
Ant Raiders	Gm	PR Software	3K	C	TH	£7.95
					PRs	£7.50
Asteroid Belt	Gm	Adcom	8K	C	MI	£7.50
Asteroid Belt	Gm	Hi-Tech	3K	C	Slg,XI	£8.62
Asteroid Blitz	Gm	Mossoft	3K	C	MOs	£6.00
Asteroids	Gm	Bug Byte	5K	C	TH	£8.99
Astro Fighters	Gm	Sumlock	5K	C	SUm	£6.95
At the Circus	Gm	Sumlock	5K	C	SUm	£5.95
Avenger	Gm	Commodore	3K	R	SU,MI,SR, Slg,CAd,BR COd,TW,Mle	£19.95
A.V.I.T.W.	Gm	Bug Byte	5K	C	TH	£8.99
Balloon	Gm	MAC	3K	C	MOr	£5.50
Balloon Bomber	Gm	Hi-Tech	3K	C	Slg,XI	£8.62
Bill Sowerbutts Gardening Hints	Do	Micro Computer S/W	16K	C	Mlt	£4.99
Bill Sowerbutts Gardening Hints	Do	Micro Computer S/W	16K	C	Mlt	£4.99
Blitz	Gm	Commodore	3K	C	COd	£4.99
Boxing	Gm	MAC	5K	C	MOr	£4.95
Booby Trap	Gm	MAC	3K	C	MOr	£5.50
Bomber	Gm	Mossoft	3K	C	MOs	£4.00
BOSS	Gm	Audiogenic	8K	C	TH	£14.99
Calorie Counter	Do	Mavac Ent.	8K	C	MAv	£3.50
Car Drive	Gm	Adcom	5K	C	MI	£7.00
Car Drive	Gm	Hi-Tech	3K	C	Mlr, SU	£8.30 £7.80
					Slg	£8.62
Car Race	Gm	Adcom	5K	C	MI	£7.00
Car Race	Gm	Hi-Tech	3K	C	Slg,XI	£8.62
Cattle Roundup	Gm	Computermat	3K	C	AVo	£8.95
Charset 20	Gm	Adcom	8K	C	MI	£8.00
Charset 20	Gm	Rabbit S/W	3K	C	CR	£4.99
Chase	Gm	Computermat	3K	C	AVo	£8.95
Chess	Gm	Commodore	3K	R	TH	£24.95
Chopper	Gm	Sumlock	5K	C	SUm	£6.95
Cloudburst	Gm	Audiogenic	3K	R	TH	£19.99
Code Breaker	Gm	Adcom	5K	C	MI	£5.00
Code Breaker	Gm	Rabbit S/W	3K	C	CR	£2.99
Cosmic Battle	Gm	Adcom	5K	C	MI	£8.00
Cosmic Battle	Gm	Rabbit S/W	3K	C	CR	£4.99
Cosmic Blaster	Gm	MAC	3K	C	MOr	£5.50
Crazy Balloon	Gm	Hi-Tech	3K	C	Slg,XI	£8.62
Data Pack	Ut	Sumlock	5K	C	SUm	£8.95
Death Maze	Gm	Mossoft	3K	C	MOs	£5.00
Defenda	Gm	Llamasoft	5K	C	TH	£9.95
Deflection	Gm	Adcom	5K	C	MI	£7.00
Deflection	Gm	Hi-Tech	3K	C	Slg,XI	£8.62
Destroyer	Gm	Sumlock	5K	C	SUm	£7.95
Dice	Gm	MAC	3K	C	MOr	£5.50
Diggles Kitchen Vol 1	Do	Micro Computer S/W	16K	C	Mlt	£4.99
Diggles Kitchen Vol 2	Do	Micro Computer S/W	16K	C	Mlt	£4.99
Diggles Kitchen Vol 3	Do	Micro Computer S/W	16K	C	Mlt	£4.99
Dissasembler/Data Writer/Joystick Read	Ut	Aardvark S/W	8K	C	AAr	£5.00
Dive Bomber	Gm	MAC	3K	C	MOr	£5.50
Dragon Maze	Gm	Adcom	8K	C	MI	£7.50
Dragon Maze	Gm	Hi-Tech	3K	C	SU,Slg, XI	£8.30 £8.62
Dune Buggy	Gm	Rabbit S/W	3K	C	CR	£4.99
Duplicate	Gm	Paysoft	5K	C	TW	£5.25
Editor	Ut	Soft Toys	3K	C	EM	£8.00
Explosion	Gm	Big Softie	3K	C	BI	£4.50

VIC 20 DEALERS

Supplier Code

AAr Aardvark Software
15 Queensbury Avenue
Hartlepool
Cleveland TS26 9NW

AD Adamsoft
18 Norwich Avenue
Rochdale
Lancs OL11 5JE

AN Anglo American Software
138a Stratford Court
Sparkhill
Birmingham
021 771 2995

AV Avalon Hill Games
650 High Street
North Finchley
London N12
01 445 3044

CAd Camden Electronics
(Systems Division)
462 Coventry Road
Small Heath
Birmingham
021 773 3240

CE Castle Electronics
15 Castle Street
Hastings
East Sussex
0424 437875

CHa Chalksoft Ltd
Lowmoor Cottage
Tonedale
Wellington
Somerset TA21 0AL

COd Commodore Information
675 Ajax Avenue
Slough
Berks
75 79292



AVo AVO Software Distribution
131 Lord Street
Hoddesdon
Herts
EN11 8NG

BA Baust Computing Consultants
31 Peak Lane
Fareham
Hants PO14 1RX
0329 281480

BI Big Softie
5 Aston Park
Finaghy
Belfast BT10 0JG

BRi Bridge Software
36 Fernwood
Marple Bridge
Stockport
Cheshire SK6 5BE

BR Brighton Gamer
24 Gloucester Road
Brighton
Sussex
0273 698424

CR Cream Computer Shop
Rabbit Software
380 Station Road
Harrow
Middx
01 863 0833

EM Emjay
17 Langbank Avenue
Rise Park
Nottingham
NG5 5BU

FB FBC Systems Ltd
10 Castlefields
Main Centre
Derby
0332 365280

GE Gemini Electronics
50 Newton Street
Manchester M1
061 236 3083

REFERENCE

SOFTWARE LISTING

VIC 20

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Fire Trek	Gm	Hi-Tech	3K	C	Mlr,SU	£7.80
					Xl	£8.30
					Slg	£8.62
Fly Snatcher	Gm	PR Software	3K	C	TH	£7.95
					PRs	£7.50
Frog/Varkman	Gm	Aardvark S/W	12K	C	AAr	£5.00
Frogger	Gm	Rabbit S/W	8K	C	CR	£7.99
Game Graphics & Graphics						
Games Tape I	Gm	Titan	3K	C	TI	£5.00
Grand Prix	Gm	Hi-Tech	3K	C	Mlr,SU	£8.30
						£7.80
Graphvics	Ut	Adamsoft	3K	C	AD	£19.00
Graphvics	Ut	Adamsoft	8K	C	AD	£19.00
Gunfight	Gm	Sumlock	5K	C	SUm	£6.95
Gridtrap	Gm	Sumlock	5K	C	SUm	£7.95
Gun Men	Gm	Hi-Tech	3K	C	Mlr,SU,	£7.80
					Xl,Slg	£8.30
Hamurabi	Gm	Mavac Ent.	13K	C	MAv	£3.50
Hangman	Gm	Paysoft	5K	C	TW	£5.25
Hangman Maths	Gm	Audiogenic		C	Mlc,GE	£7.99
Head On	Gm	Computermat	3K	C	AVo	£8.95
Hesdon	Gm	Hi-Tech	3K	C	Slg,Xl	£8.62
Highways Plot	Gm	Adcom	8K	C	MI	£5.00
Horse Race	Gm	Mavac Ent.	5K	C	MAv	£3.00
Hires/Multicolor Utilities	Ut	Adamsoft	3K	C	AD	£13.00
ICBM	Gm	Hi-Tech	3K	C	Slg,Xl	£8.62
Invader Fall	Gm	Hi-Tech	3K	C	SU,Slg,	£8.30
					Xl	£8.62
Indi 500	Gm	Hi-Tech	3K	C	Slg,Xl	£8.62
Inkosi	Gm	Chalksoft	8K	C	CHa	£5.95
Intro. to Basic 1	Ed	Commodore	3K	C	Nl,Mlc	£14.95
Invader Fall	Gm	Adcom	8K	C	Mlc	£7.50
Invader Fall	Gm	Audiogenic	3K	C	MI	£6.99
Invisible Man	Ed	Chalksoft	8K	C	CHa	£5.95
Jelly Monsters	Gm	Commodore	3K	R	Nl,Slg,	£19.95
					CAd,CE,	
					SR,Mlc	
Jumpin' Jack	Gm	Sumlock	5K	C	SUm	£7.95
Jungle	Gm	Adcom	5K	C	MI	£6.00
Jungle	Gm	Rabbit S/W	3K	C	CR	£4.99
Kamikaze	Gm	Mavac Ent.	5K	C	MAv	£2.50
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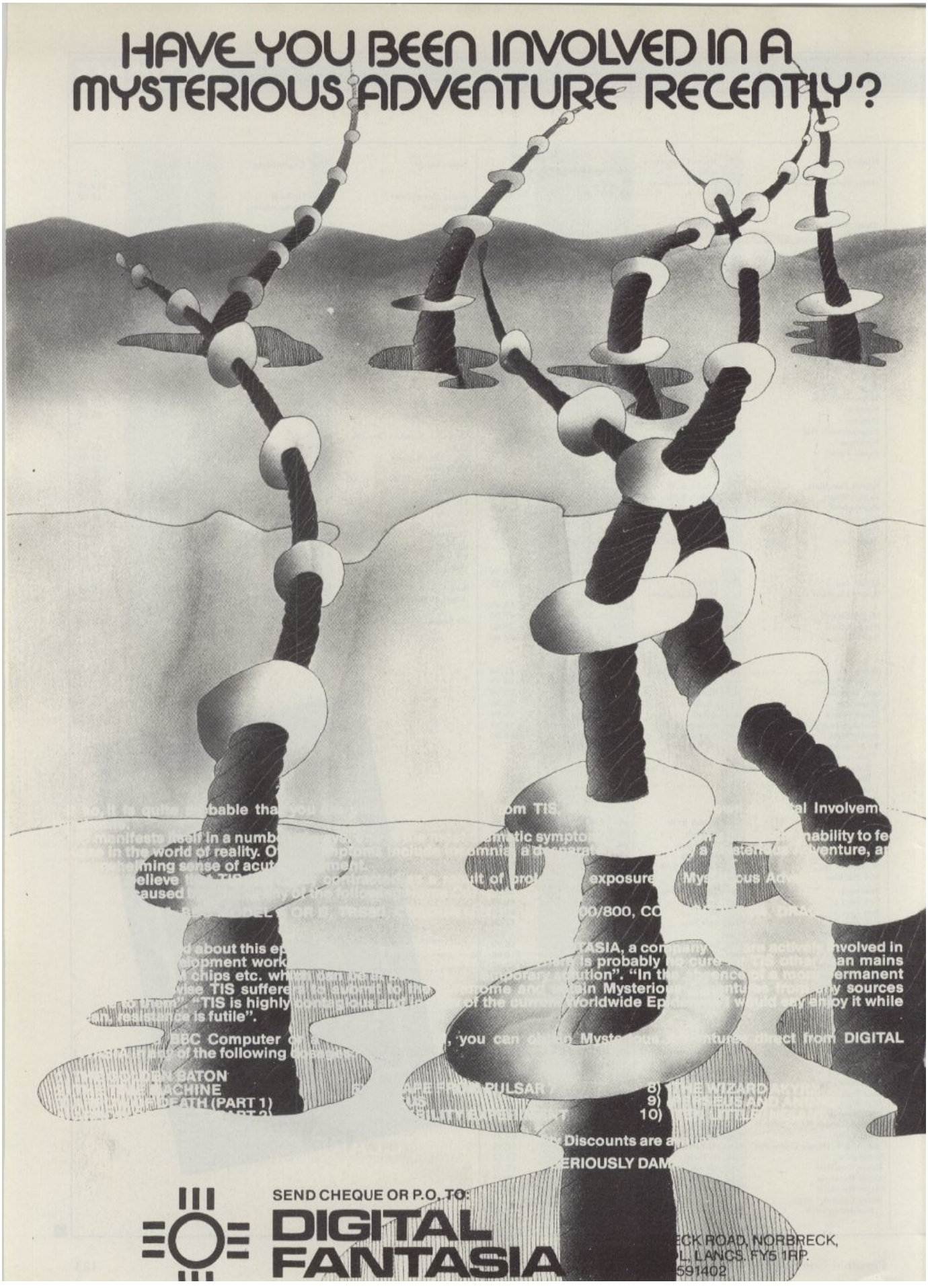
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MICROTERMS

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.

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 it's printing. Also used as a prompt to input information or a command.

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

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.

Display Mode
Means of indicating the form in which the computer's output will appear on the *VDU* screen. It is either text only, text and graphics or graphics only. The display mode is usually represented by a number and the difference between these numbers indicates the change in the display capabilities of the screen, for instance on the BBC computer Mode O gives a higher resolution than Mode 1.

DOS
Disc Operating System. This refers to the piece of computer code that controls the action of the disc drive. On some machines this code has to be loaded into the machines memory and on others it is present in the *ROM* onboard the disc drive. The DOS tells the disc drive how to load and save programs on the disc as well as carrying out any disc management functions such as updating the directory.

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.

EPROM
Erasable Programmable Read Only Memory. When programming, 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.

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.

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 a 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.

Machine Language (or Code)
The lowest (and most 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*.

Parallel/Serial
Denotes the manner in which the computer's output is sent to its peripheral devices. Serial means that the information is passed out one byte after another and it uses a system of special characters to signify control codes of the device. Parallel communications are sent out along a series of wires using the high or low state of the wire to indicate which bits are set and therefore making up a byte.

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.

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.

Print Out
Same as *hardcopy*.

Program
A set of *instructions*, which tells the computer to perform a sequence of tasks also called software.

PROM
Programmable Read Only Memory. Proms are a special form of *ROM*, which can be individually programmed by the user.

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.

Register
A general-purpose *memory*, or set of memory *locations*, built into the *microprocessor* itself. Sometimes, particular registers may be designated for a specific purpose.

RND
In BASIC this stands for RANDOM and instructs the computer to select random numbers, it 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*.

Sequential File
This is a data file that can be created on either a disc or a cassette system. As its name suggests, the information is stored one piece after another. If this information is to be changed or modified in any way then the whole file has to be read back into memory and then written back again once the changes have been made.

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.

Syntax
The grammar of a programming *language*.

Tab
Really stands for tabulate and allows you to automatically put figures and/or words into columns, forming a table.

Toolkit
Name given to a piece of code that runs in a computer independantly of any other programs and adds commands to the machines language to make the process of programming or debugging easier. Commands such as Renumber, Auto and Trace are common in toolkits. Toolkits take the form of a program that is loaded into the machine on power-up or a chip that is inserted on the circuit board which is then initialised by a SYS or USR call from the operator.

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.

VDU
Visual Display Unit. Usually a TV set in hobby computers, but may be a video monitor which accepts the output directly from the computer.

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

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

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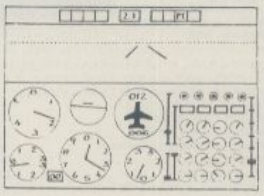
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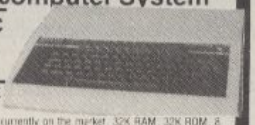
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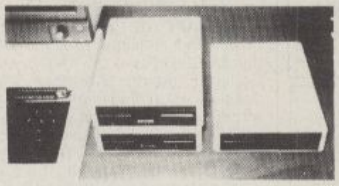


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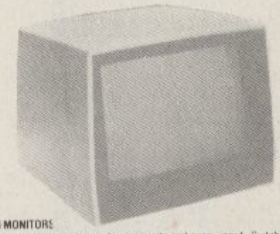
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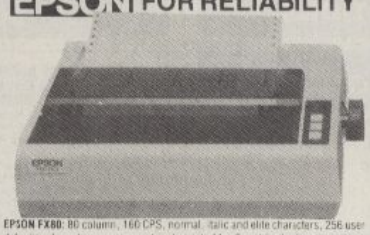
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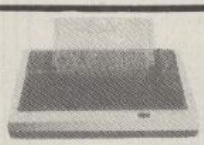
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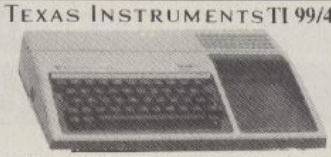
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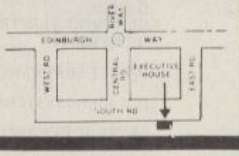
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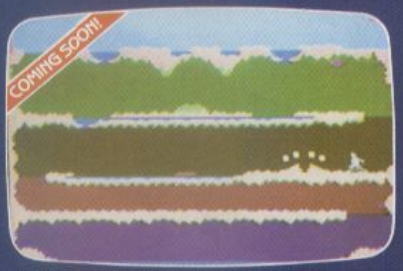
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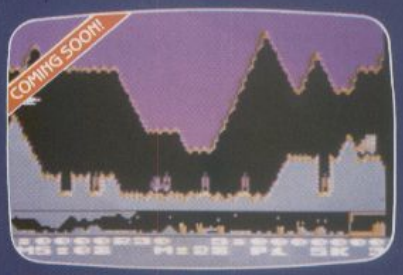




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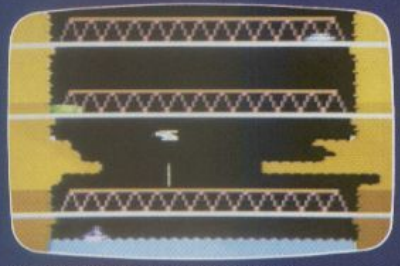
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