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December 1983
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Personal Computing Today

VOLUME 2 NUMBER 5 DECEMBER 1983

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ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

With winter now upon us and the Christmas festivities just round the corner I'd like to welcome you to our December issue. As usual there are piles of programs for you to type into your computer, or to convert to run on your computer as well as stacks of software, news and reviews too.

No doubt lots of you will be tearing down to your local computer software dealer to pick up the best for your family and friends' Christmas presents. Try consulting the second in our special software reviews report. Here are loads of games reviews which you can peruse and work out which you think best suits you, and anyone you want to buy software for. We've tried to cover as many different computers as possible so that there's something for everybody. So turn to the page which carries the Special Software Review Report.

Computers with programs specially featured for them this month include the VIC 20, Atari, Oric, CBM 64 and ZX Spectrum. Owners of these machines will be able to key in the relevant programs straight away, but if you spot a program you like the look of and don't own the computer it is written for, just use the carefully written Hints on Conversion section contained within each program. Using these hints and your own computer's manual you should be able to run them on any computer. Get your digits on your computer keyboard and start typing.

Finally this month you must not miss the chance to win an Acorn Electron home computer. Although available in small quantities so far this machine has been very well received by both press and trade alike. Made by Acorn Computer it is very similar in design as the BBC Model B computer but costs only £150. All you have to do to win your very own Electron is correctly complete the crossword which you'll find on the competition pages.

And as a footnote: we were hoping to review a new computer in this issue, the Laser 200, as explained in the Next Month page of our November issue. Unfortunately, I am sorry to say that it will not be appearing in the December issue due to unforseen circumstances. Don't worry, it will definitely appear in our January issue, so watch out!

Cover photograph: Dragon Disc Drive kindly supplied by Devron Computer Centre, 155 Moorgate, London EC2.

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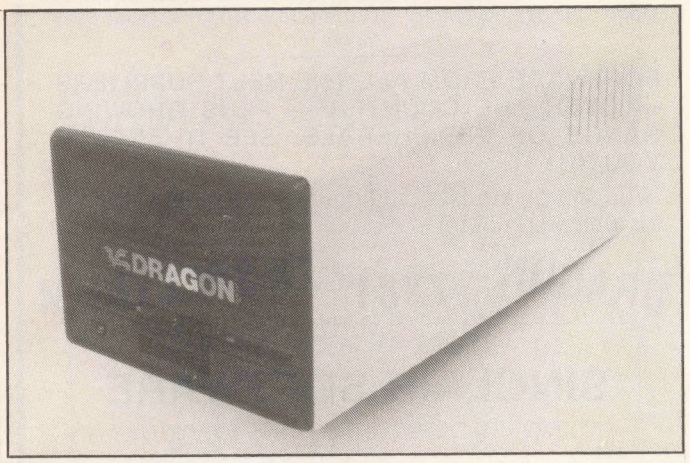
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Cuthbert Goes Walkabout
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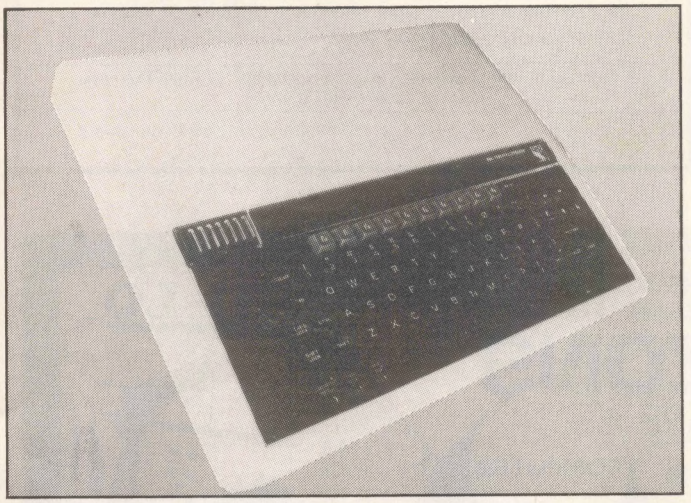
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Dragon Disc System 64
Our hardware feature has this month extended to computer peripherals in the form of Dragon Data's new disc drive system. Turn to page 64 for a full review of this system.



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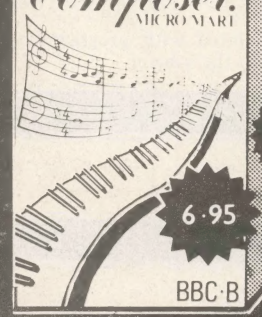
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NEWS NEWS NEWS

Lack of Response Inhibits Brainwave

Our apologies to those of you who turned up at the National Exhibition Centre in Birmingham on 4, 5 or 6 November to find the doors closed and not a computer in sight. The home computing, video and electronics family show, Brainwave '83, which was to have taken place there was cancelled after our November issue had gone to press and unfortunately, we couldn't let you know.

In the light of the current booming interest in these media, we were very surprised at this turn of events, especially as an early November date would be expected to catch much of the Christmas market.

To try to unravel the mystery we contacted the Show Manager. He told us that the excellent initial reaction by the public, dealers and press was not mirrored by the manufacturers themselves, and that a disappointing level of bookings had prompted them, reluctantly, to cancel the show. They felt that a poor turn out of contributors would make for a less interesting, or even disappointing event from the visitors point of view.

Manufacturers, apparently, feet that there has been a dearth of such events recently — witness the Great Home Entertainment Spectacular at Olympia which was not well attended by visitors and the Personal Computer World Show at the Barbican, both of which occurred in September.

The organisers do not rule out the possibility of a Brainwave in the future, but what do you think? Are areas outside London being neglected by the Computer Houses? We'd like to hear your views on the matter.

Bytes To Cure Cavities

To many people the only obvious connection between computers and teeth are 'bytes', but a competition being run jointly by the General Dental Council and leading computer manufacturers is hoped to bring to light ideas of how computer technology can be used to improve dental hygiene among children. The prizes to be won total £5,000.

Children aged between 12 and 18 can enter the competition either as individuals or in groups and class entries are also admissable. They are asked either to write a computer program on dental health, or to use a computer to undertake a survey of dental health or knowledge about dental care. Details of the competition will be circulated to schools or can be obtained by writing to **The General Dental Council, 37 Wimpole Street, London W1M 8DQ.**

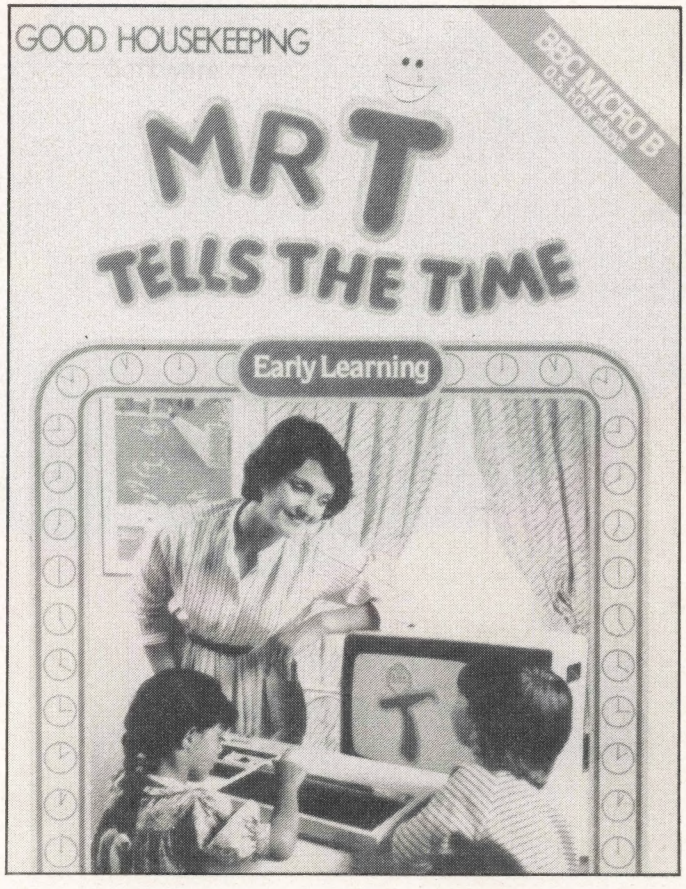


Good Housekeeping's Soft Touch

The studied calm of National Magazine House was shattered recently when a bunch of three to six year olds launched the latest release from this publisher — the **Good Housekeeping Early Learning Software List.**

The general tone of the launch was mayhem, with, adults and children alike, having fun with the six titles which make up the first series. This covers a range of pre-school learning skills including counting, telling the time and recognising coins and their values. Learning should be combined with fun, especially for three to six year olds and the central character of the series, Mr T, injects fun into the learning procedure. He acts as a friendly guide enabling the child to play not against the computer, but in the company of this lively and personable fellow who reacts with encouraging approval or dismay at the child's choice. Bright colours, eyecatching animated graphics and a variety of amusing and realistic sounds e.g. clocks chiming, contribute to the fun element.

The software was demonstrated on BBC micros but is also compatible with the Sinclair Spectrum and Commodore 64. The software is available in cassette form and costs £12.95 including VAT from leading computer stores, specialist computer departments of major high street retailers and by direct response from advertisements in Good Housekeeping and other publications.



NEWS NEWS NEWS



Buy Your Computer A Christmas Present

Put a smile on your BBC Micro's VDU on Christmas morning by buying it a Buggy Kit. This builds up into a three wheeled robot controlled by the computer.

The Buggy pack, which sells at around £190 (including VAT), consists of a simple-to-build Fischertechnik construction kit and all the software required to program this friendly robot. Assembling the buggy requires no special skills or equipment — all the components come pre-wired and already soldered.

The Buggy's suite of 12 structured programs involve the user in the potential of the microcomputer as a switching device, memory unit, graphics terminal, programmable device, information processor and a problem solving aid. Its capabilities are limited only by one's imaginination. The Kits should soon be available in High Street stores nationwide.

Calling All Closet Software Reviewers

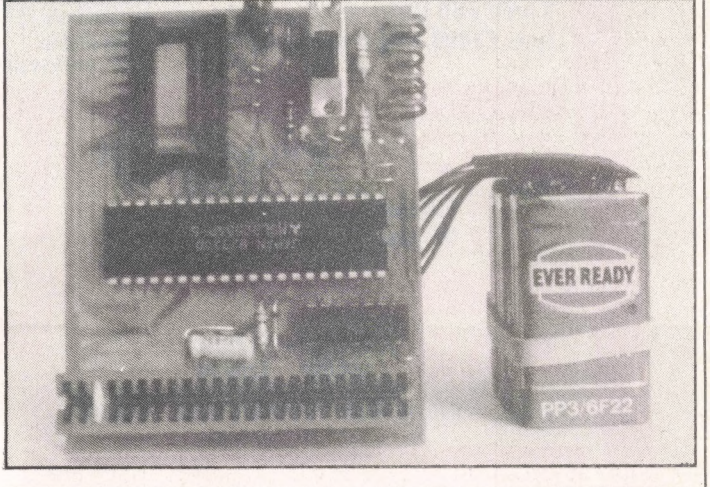
Many thanks to all you addicts out there, heads down and fingers flying over the keyboards, reviewing the latest and best software coming into the market.

We do, however, need even more of you, particularly with machines such as the **Jupiter Ace, Commodore 64, Atari 400 5and 800, BBC Models A or B** and very soon we will be needing those trendsetters among you with the **Electron.** Reviewing software (mainly games) is fun and you get to keep the tape.

Now You See Them....

Two new products launched recently allow you first to program your Epsoms and then to erase them. Promer-81 is a low cost Eprom programmer for 2516, 2532, 2716 and 2732 available from Cambridge Microelectronics. Its low price of £19.95 + VAT should persuade users to put their programs in Eproms.

The Uvipac is then available to erase your hard work. Designed especially for the home microcomputer enthusiast, the Uvipac is priced at £19.95. All enquiries to Ground Control, Alfreda Avenue, Hullbridge, Essex, SS5 6LT. (0702 230324.)



Club Contacts

Droitwich Computer Club covers all usual home computers. Aims to provide a meeting place for interested parties and meets in the Walnut Room of the Norbury House on the first and third Wednesdays of each month. Entry fees are children 30p, adults, £1.00. Information from A R Middleton on Droitwich 775570 after 6 p.m.

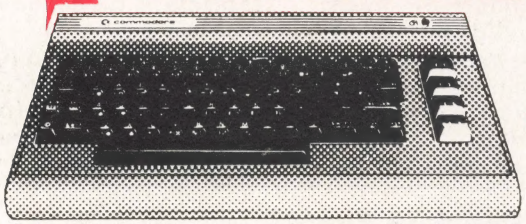
Kingston Computer Club have lined up an impressive array of lectures for the winter months. Meets in the Children's Section of Kingston Library, Fairfield West, Kingston on the first and third Tuesday of each month. Information from Gron Jones (398 7156) and Bob Southall (399 0898).

Hell's Temple Fan Club for enthusiasts of the Oric game of the same name. Contact Dopple-Ganger at Orchard Cottage, Saville Hall Lane, Dodworth, Barnsley, York S75 3NG.

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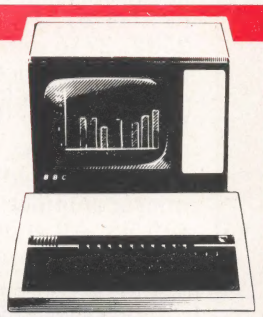
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NEXT MONTH

Laser 200



New on the computer scene is the Laser 200 computer, and we'll be taking the lid off it in the **January** 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 January *Personal Computing Today* to find out what the Laser 200's rays are really like.

Games And Software

With the Christmas rush now over, you'll have plenty of time to study our reviews of the many software packages, games and utilities, which were launched around the Christmas period. As ever, we have compiled a comprehensive assortment for the most popular micros and we're sure you'll find this section both informative and interesting

On the games front, we'll be featuring programs for you to type in your own machines, most of them with hints for coverting for use with other machines. Lots to keep you busy.

We've also been very busy updating our **Software Listings Section** so make sure you'll be able to refer to this very comprehensive list by ordering your **January** copy of **Personal Computing Today** from your newsagent now using the coupon below.



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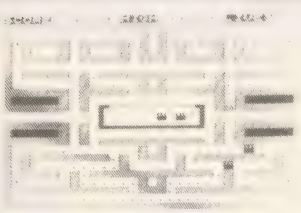
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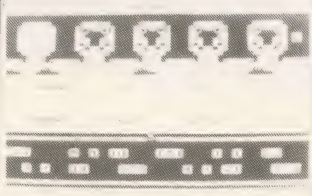


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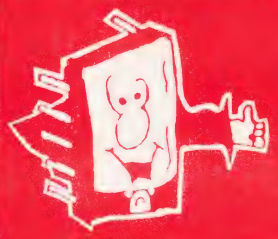
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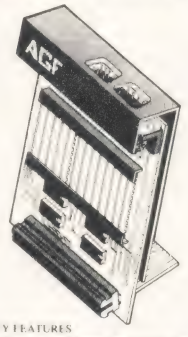
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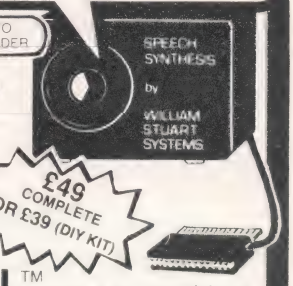
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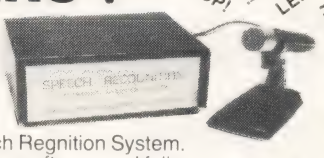
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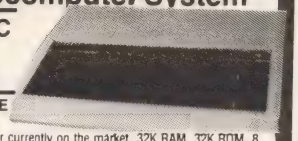
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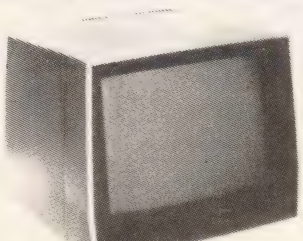
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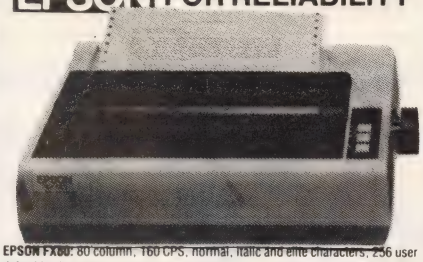
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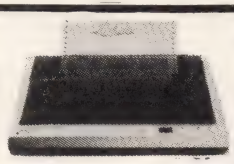
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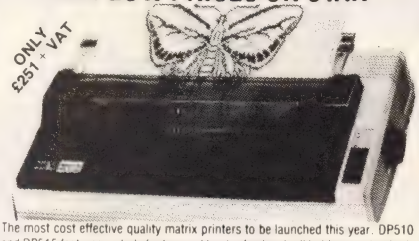
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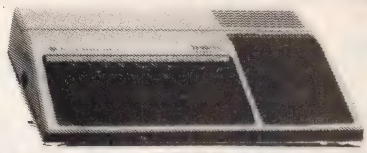
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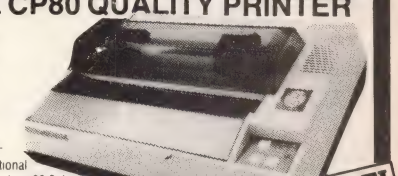


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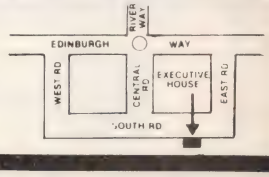
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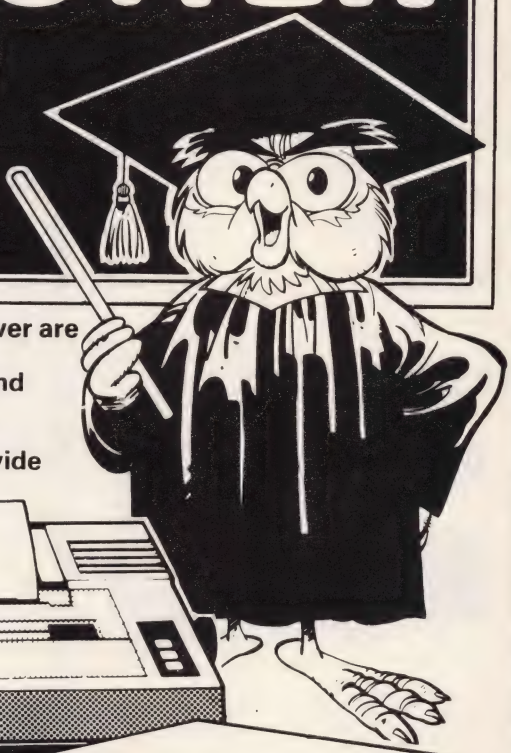
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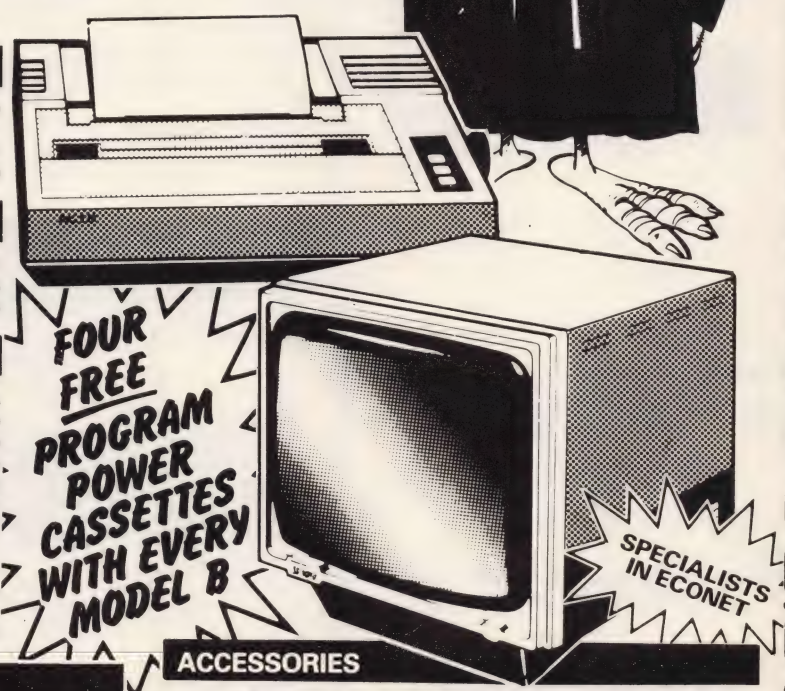
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SOFTWARE

SKI SPECTRUM

Practice your parallel turns for a peak performance in this slalom race of daredevil daring.



This program has been written for a Sinclair Spectrum with (16K/48K) of memory.

The game is really very simple, the idea being to manoeuvre a skier down a slalom course, which is indicated by the flags (⚑ ⚑), at the same time attempting to avoid clumps of trees. The skier is controlled by the 'P' and 'Q' keys (P-Right, Q-Left), and should be directed between the flags as they move up the screen.

The score is calculated at the end of each run, which is indicated by the finish line. Hitting flags or missing out gates causes your score to be reduced from a perfect score to the final score shown at the end of the run. Hitting a flag causes one point to be lost and missing out a gate costs two points, so it is always better to attempt a gate and hit the flags than missing out the gate totally.

The trees have no effect on your score, however they should still be avoided as they do affect your skier's health and could cause him to just stop and die. This will only happen after a certain number of trees have been hit, this number alters depending on the size of the course.

At the end of the game not only is the score shown but you are also given a number of options. These are:

1) Quit the game.
2) Change game options.
3) Play course again.

The only option to need explanation is No. 2. This choice will bring back the options that are shown at the beginning of the game and will allow you to alter any course specifications. These include:

1) Change the layout of the course (this option is not available at the start of the game).
2) Level of difficulty (the 'Expert' option sometimes gives a course that is not always possible to complete perfectly).
3) Number of gates required (this is effectively the length of the course).

SKI SPECTRUM

HOW IT RUNS

Line 20	Jumps to the instructions and graphics and initialisation of variables.
Lines 500-699	Move skier routine. It checks the 'P' and 'Q' keys and alters the position of the skier accordingly. It also checks for any collisions with trees or poles or any missing out of gates.
Lines 900-1090	Main program loop, controlled by the number of gates to be printed. It controls the calculation of the position of the gates, prints the course and calls the 'move skier' routine. Lines: 1030-1060 control the printing of the trees on the course and therefore the spacing out of the gates.
Lines 1100-1140	Print the finish of the course.
Lines 1145-1170	Print out the total score and how it was achieved.
1180-1195	Display and control the end of game options.
1199-1210	1199 Stops the game if any key bar 'C' and 'A' is pressed. 1200-1210 Displays the repeat course option. It uses the RAND function to produce the same settings for the course.
Lines 1400-1550	Print game instructions and load in the UDG's.
Lines 1900-2080	1900 Set the start for the random numbers (uses RAND). 2000-2080 Displays the game options (shown both before the game starts and at the end of each game if required). Lines 2000-2040 Control the level of difficulty. 2050-2080 Control the number of gates required and how many trees are lethal.

HINTS ON CONVERSION

Here are some useful details to help you convert the program to other machines

CHR$ 16: This is the control code for INK. The number following it is the actual colour.

POKES USED:

23658,8: This sets the machine to upper case characters and therefore eliminates the need to test for both upper and lower case when expecting any input.

23692,100: This POKE prevents the SCROLL message appearing, which may happen when the Finish is printed.

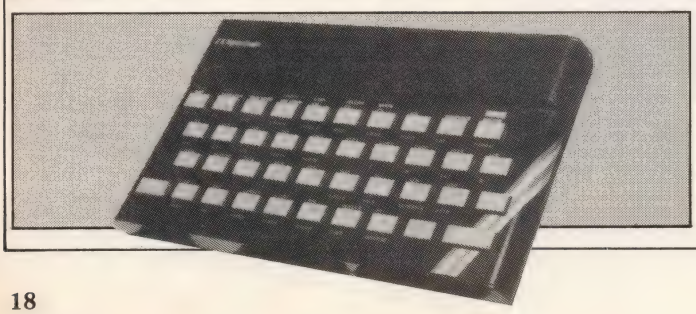
PAUSE: This causes a wait until a key is pressed. The reason that there are two PAUSES close together is to cancel the effect of the last key pressed. Without both PAUSES being there the program may not stop at all.

USR 3280: This calls a ROM routine which scrolls the screen up one line.

RANDOMIZEr: This starts the RND function on a certain set of numbers for the production of the course, which can if need be, be repeated, or altered by recalculating a value for 'r'.

ATTR (x,y): This function gives the attributes of the screen position (x,y) and it is used only to find out the next position of the skier. 57 = pole, 58 = missed a gate, 60 = tree.

BORDER, PAPER, INK: These three functions affect the colour. The number following them is the colour used. 1 = Blue, 2 = Red, 3 = Magenta, 4 = Green, 5 = Cyan, 6 = Yellow, 7 = White, 0 = Black.





PROGRAM LISTING

```
  20 GO TO 1500
 500 LET x$=INKEY$," "
 505 PRINT AT 7,x;" "
 510 LET x1=x: LET x=x+(x$="P" A
ND x1<>31)-(x$="Q" AND x1<>0)
 520 LET p$=CHR$ (148*(x$="Q")+1
49*(x$="P")): IF x=x1 THEN LET P
$=CHR$ 146
 530 IF ATTR (8,x)=57 THEN LET p
$="▟▙": LET h=h+1: LET m=m+1: GO
 TO 690
 540 IF ATTR (8,x)=56 THEN LET m
=m+1: GO TO 690
 550 IF ATTR (8,x)=60 THEN LET t
=t+1: PRINT AT 8,x; INK 4;" ": GO TO 690
 690 PRINT AT 8,x;p$
 699 RETURN
 900 PRINT AT 8,x;"☃"
 910 PRINT AT y,y;g$
1000 FOR j=0 TO g-2
1010 LET pos=INT (RND*26)+1
1020 LET nsp=ABS (y-pos)
1025 IF d$<"3" THEN LET nsp=nsp-
1: IF d$="1" THEN LET nsp=nsp-2
1030 FOR i=0 TO nsp
1032 LET p=INT (RND*29)
1035 PRINT AT 21,p; INK 4;"*"
1040 LET a=USR 3280
1050 GO SUB 500: IF t=gc THEN GO
 TO 1400
1060 NEXT i
1070 PRINT AT 21,pos;g$
1080 LET a=USR 3280
1085 GO SUB 500: IF t=gc THEN GO
 TO 1400
1090 LET y=pos: NEXT j
1100 POKE 23692,100: FOR j=1 TO
15
1110 LET a=USR 3280
1120 GO SUB 500: IF t=gc THEN GO
 TO 1400
1125 IF j=3 THEN PRINT AT 21,0;"
"TAB 13;"FINISH";AT 7,x;" "
1130 NEXT j: PRINT ''TAB (4);"PR
ESS ANY KEY TO CONTINUE"
1140 PRINT AT 8,x;"☃"
1145 PAUSE 0: PAUSE 0: CLS
1150 PRINT AT 0,13;"SCORE"
1160 PRINT '" You hit: ";t;" tre
e(s)"'TAB (10);h;" pole(s)"''"an
d missed ";g-m;" gate(s) out of
";g
1170 PRINT ''''" TOTAL SCORE = "
;g*3-((g-m)*2+h);"/";g*3
1180 PRINT ''"PRESS: Q to end th
e game.          "'TAB (7);"C to ch
enge level etc.    "'TAB (7);"A t
o play again.          ": PAUSE 0
1190 IF INKEY$="C" THEN CLS : GO
 TO 1200
1195 IF INKEY$="A" THEN CLS : RA
NDOMIZE r: GO TO 2100
1199 STOP
1200 PRINT " Do you wish to chan
ge the       course (Y/N)?": PAUS
E 0: IF INKEY$<>"Y" THEN RANDOMI
ZE r: GO TO 2000
1210 GO TO 1900
1400 PAUSE 2: PAUSE 100: INK 7:
PAPER 0: BORDER 0: CLS
1410 PRINT AT 5,6; BRIGHT 1;"You
've EXPIRED!!!"
1420 PLOT 96,24: DRAW 48,0: DRAW
 0,56: DRAW -48,0,PI: DRAW 0,-56
: DRAW -6,8: DRAW 0,56: DRAW 56,
0,-PI*.75
1430 PRINT AT 13,14;"RIP": BEEP
2,.5
1440 FOR j=1 TO 18: LET a=USR 32
80: NEXT j
1450 BORDER 7: PAPER 7: INK 0: B
RIGHT 0: CLS
1460 GO TO 1180
1499 STOP
1500 CLS : PRINT "  Use P and Q
keys to move man  right and left
 in and out of the poles."''"  T
ry to avoid the trees as they sa
p your strength and after  awh
ile you will just expire!!!"''"
 Points are only lost for  m
issing gates and hitting poles."
1510 FOR j=0 TO 63
1520 READ n: POKE USR "A"+J,n
1530 NEXT j
1540 DATA 0,60,62,60,32,32,32,32
,0,60,124,60,4,4,4,12,73,62,8,
73,85,34,20,0,0,2,7,7,7,127,0,96
,33,99,228,88,16,32,192,6,132,70
,37,26,8,4,3,0,28,42,73,28,42,73
,8,0,0,32,72,144,255,156,46
1550 PRINT ''TAB (3); FLASH 1;"
PRESS ANY KEY TO CONTINUE": PAUS
E 0
1900 LET r=INT (RND*65000): RAND
OMIZE r
2000 CLS : PRINT " What difficul
ty do you require?"'"  1)Expert"
'"  2)Hard"'"  3)Easy"
2010 PAUSE 0: LET d$=INKEY$
2020 LET s$="  "
2030 IF d$="2" OR d$="1" THEN LE
T s$="  "
2035 IF d$>"0" AND d$<"4" THEN L
ET g$=CHR$ 16+CHR$ 1+CHR$ 145+CH
R$ 16+CHR$ 2+s$+CHR$ 16+CHR$ 1+C
HR$ 144: GO TO 2050
2040 GO TO 2000
2050 CLS : PRINT " How many gate
s do you require, (5< nos.>100)"
: INPUT g
2060 IF g<5 OR g>100 THEN GO TO
2050
2065 LET gc=INT (.5+g*.2)
2070 CLS : PRINT ''TAB (1); FLA
SH 1;"WARNING:"; FLASH 0;" Do no
t hit more than ";gc;" tree(s)."
2090 POKE 23658,8
2100 BORDER 5: PAPER 7: INK 0
2120 LET y=16: LET x=11
2125 LET t=0: LET h=0: LET m=0
2130 PRINT AT 8,x;"☃"
2135 PRINT AT 0,0;"Press any key
 to start
": PAUSE 0: CLS
2140 GO TO 900
```

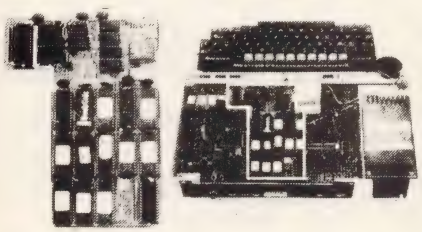


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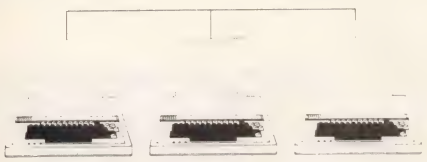
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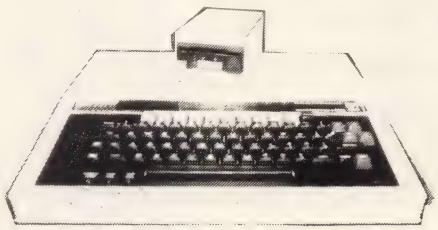
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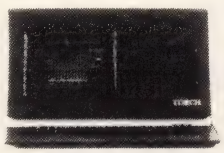
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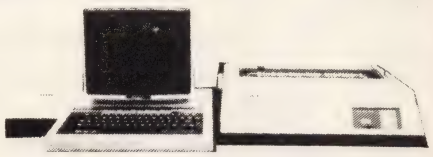
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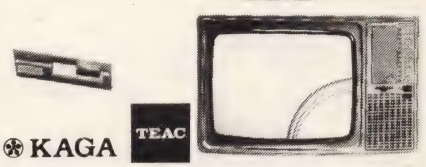
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MNSM12N	Snayo SM12N Green Monitor 15MHz	75.05	86.31

EPSON RX-80 & FX-80

Printers			
PAETRACT	Tractor unit for Epson FX-80	34.20	39.33
PPFF1K	1000 Sheets fan-fold tractor feed paper	6.19	7.12
PPROLLTR	Roll paper for Sparkjet/Epson (TR-1)	1.70	1.96
PRCP80	Film Ribbon for CP-80 printer	4.75	5.46
PRE80	Ribbon for Epson MX/FX/RX 80	5.70	6.55
PRJP101	Inkjets for JP101 (pack of 4)	5.70	6.55
PRMX100R	Ribbon refill for Epson MX/FX 100	4.37	5.03
PRTP1200	Fabric Ribbon for Smiths Corona TP-1	2.85	3.28
PRTP1220	Film Ribbon for Smiths Corona TP-1	2.85	3.28
PTCP80	CP-80 80cps Printer (MX-80 type III)	284.05	326.66
PTFX80	Epson FX80 160cps Printer	365.09	419.85
PTFX100	Epson FX100 160cps Printer	493.05	567.01
PTJ6100	Junki 6100 Daisy Wheel Printer 18cps	365.09	41985
PTJP101	BBC Spark-Jet Printer	284.05	326.66
PTMX100	Epson MX?? Type 3 Printer	422.75	486.16
PTMX80	Epson MX-80 80cps Dot matrix printer	350.55	403.13
PTRX80	Epson RX-80 Printer 100cps	257.00	295.55
PTRX80FT	Epson RX-80FT Printer 100cps (T/Fric)	280.25	322.29
PTT1040	TEC F10-40 40cps Daisy Wheel Printer	1220.75	1403.86
PTTCOLR	Torch Colour Printer	1472.50	1693.38

ACORN COMPUTER

Electronequip

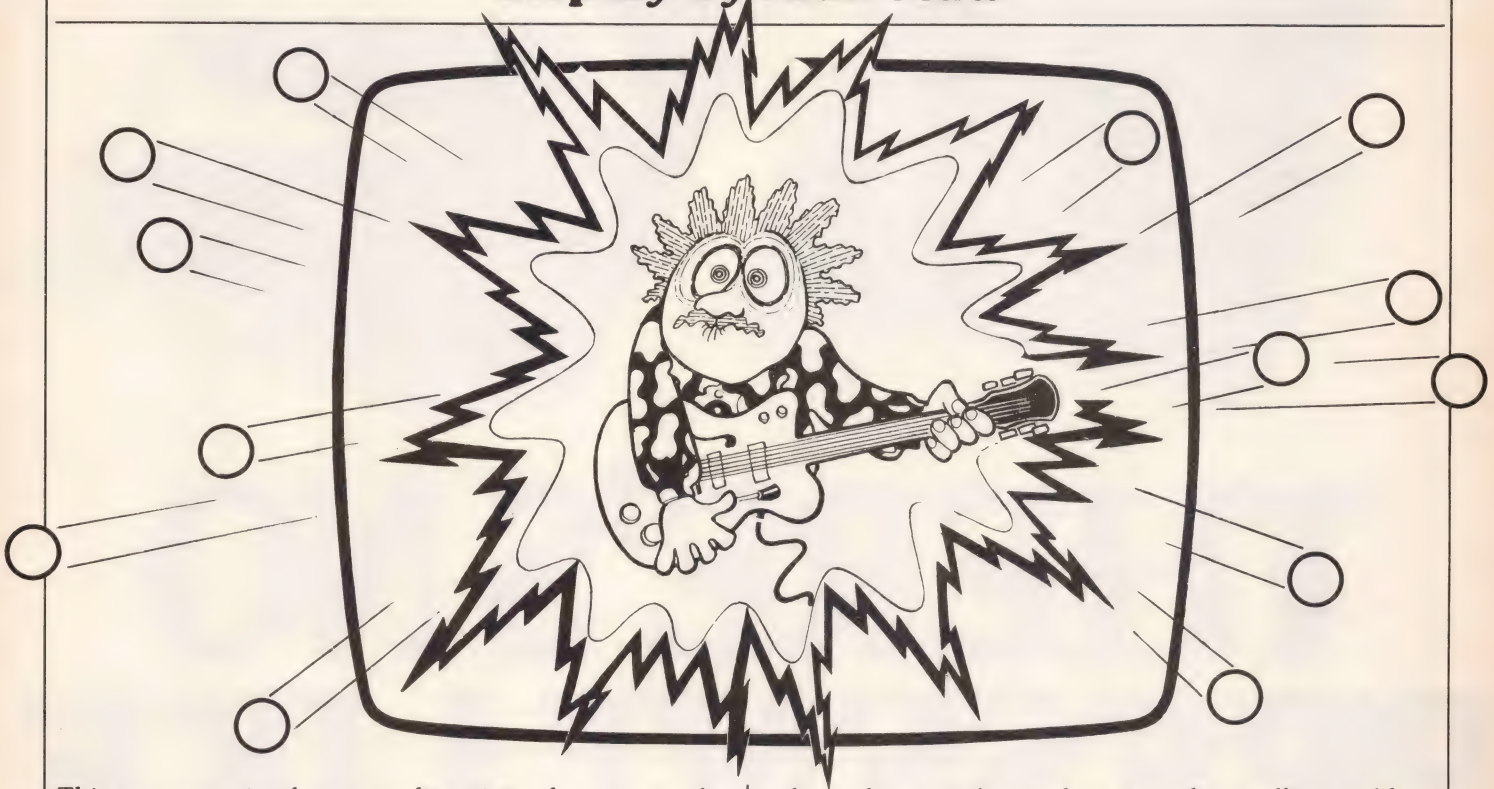
BBC

36-38 West Street, Fareham, Hants (0329) 230670

SOFTWARE

RADIOACTIVE DECAY

Irradiate your screen with this exploding colour display by Alan Maw



This program simulates a radioactivity decay series by filling the screen with 640 white atoms which decay randomly into red atoms. The rate of the decay is proportional to the number of atoms remaining and these are shown at the bottom of the screen.

Such a program may be of interest to any students of physics amongst you, and to find the half life, simply plot the number of atoms remaining against time. The simulation of radioactive decay takes the form of atomic colour changes, from white to red to yellow to blue. Further decay can be shown by a simple extension of the program and different atoms, and their corresponding half lives, introduced by adding some delays.

This simple program runs by generating a random x and y. After a check of the screen contents for each position of x and y, printing is achieved by use of the **ATTR** function. The program could be adapted for other machines by the use of **PEEK** and **POKE** for the display.

PROGRAM LISTING

```
  10 BORDER 3: PAPER 7: INK 0: D
LS
  20 PRINT AT 0,7; PAPER 6;"RADI
OACTIVE DECAY"
  30 PRINT : PRINT : PRINT : PAP
ER 2; INK 7;"The screen is full
of 640 white atoms which decay r
andomly into red atoms. "
  40 PRINT : PRINT ; PAPER 4; IN
K 7;"The number remaining is sho
wn atthe bottom of the screen"
  50 PRINT : PRINT : PRINT ; PRI
NT ; PAPER 6; INK 0;"If you want
 more stages in a    decay serie
s you can make the    red atoms d
ecay into yellow and the yellow
into blue"
  60 PRINT ; PRINT ; PRINT ; PAP
ER 1; INK 7;"PRESS ANY KEY TO CO
NTINUE"
  70 PAUSE 0
  80 INPUT ; INVERSE 1;"HOW MANY
 STAGES (1,2 OR 3)?" ;s
  90 CLS
 100 LET z=640: LET w=0: LET r=0
 110 LET x=INT (RND*20): LET y=I
NT (RND*32)
 120 IF ATTR (x,y)=56 THEN LET w
=w+1: LET z=z-1: PRINT ; INK 2;A
T x,y;"■"
 130 PRINT ; PAPER 2: INK 7;AT 2
1,0;z;" "
 140 IF s=1 THEN GO TO 110
 150 LET x=INT (RND*20): LET y=I
NT (RND*32)
 160 IF ATTR (x,y)=58 THEN LET w
=w-1: LET r=r+1: PRINT ; INK 6;A
T x,y;"■"
 170 IF s=2 OR s=3 THEN PRINT ;
PAPER 6; INK 2;AT 21,13;w;" "
 180 LET x=INT (RND*20): LET y=I
NT (RND*32)
 190 IF s=3 AND ATTR (x,y)=62 TH
EN LET r=r-1: PRINT ; INK 1;AT x
,y;"■"
 200 IF s=3 THEN PRINT ; PAPER 1
, INK 6;AT 21,27;r;" "
 210 GO TO 110
```

THE WORLD'S FINEST PROGRAMMING TUTORIAL FOR ONLY £12·95



THERE'S NO PRESENT LIKE THE FUTURE.

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Buy the Logic 3 'Learn Computing' Series at computer shops and major retail stores all over Britain. In case of difficulty, write to Logic 3 in Windsor.

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Address _____

_____

_____

I have already/intend to get a _____ microcomputer
(delete as inapplicable)

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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 p105 for the second part.

Title:	**Super Cassette A**
Type:	**Tape**
Supplier:	**Melbourne House**
Machine:	**Commodore 64**
Price:	**£6.95**

This is a somewhat disappointing collection of games from Melbourne House, with only four out of the total being near a reasonable commercial standard.

The games vary from the general 'shoot 'em down' theme to 'steeraround obstacles' plus one or two that are not really games as such – e.g. Poetry, which automatically generates random, nonsensical and boring verse.

Flight Simulator was considered to be 'Top of the Pops' by my two sons and myself. In this



game you are presented with a very good graphic display of a cockpit interior showing fuel, horizon, nose tilt, height, speed, under carriage and distance from field indicators. The none too easy task is to land on the runway which can be seen illuminated through the cockpit windscreen.

There is a version of the popular Simon musical pattern game, making good use of the 64's sound and graphics. Another game, Slalom, requires you to steer a skier around trees and ravines down a mountainside gaining extra points for passing through gates on the way.

Star Pilot is the only other program that came close to a recommendation. This involves traversing the universe searching for alien spaceships to trap in your

▶

SOFTWARE REVIEWS

gunsights. The other 11 games vary in their degree of mediocrity but in general all were uninteresting and made poor use of the machine's excellent sound and graphics capabilities. **D.J.W.**

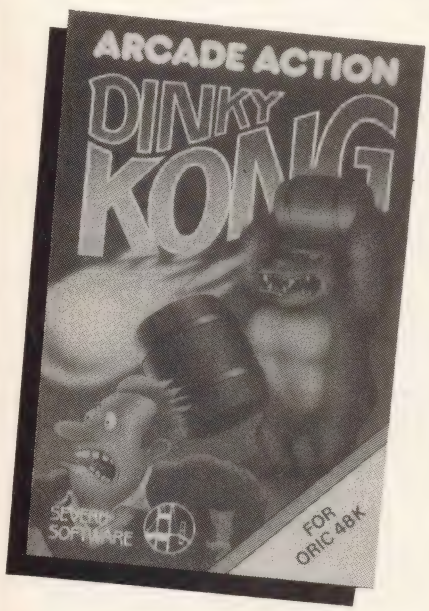
Ratings Table

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

Title: Dinky Kong
Type: Tape
Supplier: Severn Software
Machine: Oric 1 48K
Price: £6.95

This is an entertaining version of the arcade game in which you play the part of the would be hero attempting to rescue your girl friend from the clutches of the gorilla standing on the top of a series of platforms. You must climb the ladders between the platforms, dodging or leaping over barrels and fireballs. There are nine levels of difficulty but I found level one quite tricky enough!

The program is written almost entirely in machine code but relies upon a BASIC routine to control the movement of the player through the use of the cursor shift keys. Unfortunately, the repeat function is slow to operate through the keyboard and repeated pressing of the cursor shift keys quickly tires the fingers.



The program did crash on occasions, the most frustrating times being those which left the screen frozen and the keyboard inoperative. At other times a life would be lost for no apparent reason. Luckily these problems did not occur often.

Screen presentation is very good and the program makes excellent use of Oric's colour and graphic facilities. The use of the sound facility is less expensive but appropriate to the game. The tape loading instructions could be clearer; once the machine code is loaded the tape has to be stopped and a further CLOAD command given to load in the final part of the program. In spite of these few difficulties, this must be one of the best games I've found so far and represents good value. **P.W.**

Ratings Table

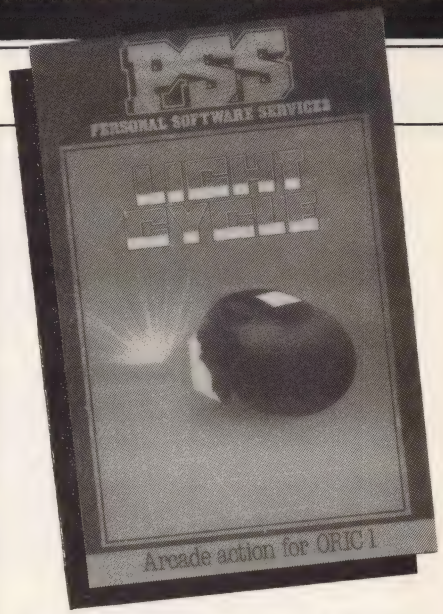
Program Quality	* * * *
Value for Money	* * * * *
Presentation On-screen	* * * *
Ease of use	* * *
Crashproofing	* *
Supplied Instructions	* * *
Overall	75%

Title: Light Cycle
Type: Tape
Supplier: P.S.S.
Machine: Oric 1
Price: £6.95

This game for one or two players is sure to get your fingers tied in knots. The object is to match your skills against your opponent and drive your machine around the playing grid taking care to avoid the walls and the towers that appear in ever increasing numbers. You must also ensure that you don't cross the trail left by either machine. In the one player game, the computer plays the part of the absent second player.

The program is written in machine code and uses Oric colour and sound facilities to good effect, although the presentation could hardly be called spectacular. Direction and speed control are effected by five keys for each of the machines. The game requires quick responses and it takes some time to learn the necessary key functions and to become proficient in their use. Joysticks would be a great advantage.

I experienced no problems at all in operating the program; the instructions were adequate and try as I might, I was unable to crash



the program. One minor irritation was that to EXIT the program one must first switch off as both the BREAK and RESET are disabled.

Overall, the program represents quite good value, though it failed to keep my interest for very long. **P.W.**

Ratings Table

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

Title: Schizoids
Type: Tape
Supplier: Imagine
Machine: Spectrum
Price: £5.50

After playing Arcadia, I was hungry, almost desperate for the next release from Imagine – but what a disappointment! The two programs are entirely different. Schizoids is an original game but unsurprising. You act as a sort of dustman, pushing various objects into the black hole in the centre of the screen. Once done, there is no amazing colour display, just an addition to your score. The game is in black and white and is maddeningly slow. Sound is almost non-existent and I felt absolutely no desire to have a second game.

The 3D effect does exist but is not stunning or a "Breathtaking visual experience". As for it having . . . "all those arcade features you would expect from Imagine", where are they?

To sum up, I agree with one of the phrases in their advert – "Schizoids is *not* a game, but is a state of mind" . . . yes . . . boredom!! **D.L.**

Ratings Table

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

Title: Invisible Man
Type: Tape
Supplier: Quicksilva
Machine: Vic 20 +3K
Price: £5.95

This is not a game, rather an educational program designed for children between the ages of six and ten. By the use of grid references, an invisible man and parts of his body must be found.

This program teaches you compass directions and how to make grid references. The way it does this is quite simple: by taking a shot and missing you receive a clue as to where the man might be by using compass directions. At the start of the program you are given a chance to look at the instructions. These are very easy to follow and explained all the necessary points. Once the program starts you are asked to choose your level of play but I didn't notice any difference between each level. You are then asked to input your name, a friendly step that makes the program more interesting for children.

You can't cheat by trying every place on the grid because there is a time limit of about one hundred seconds to stop you. When you are finished you are told how many seconds you took and also how many shots you had.

As the program uses a 3K RAM pack I think the graphics could have been a lot better, but the keyboard graphics used are adequate for the purpose.

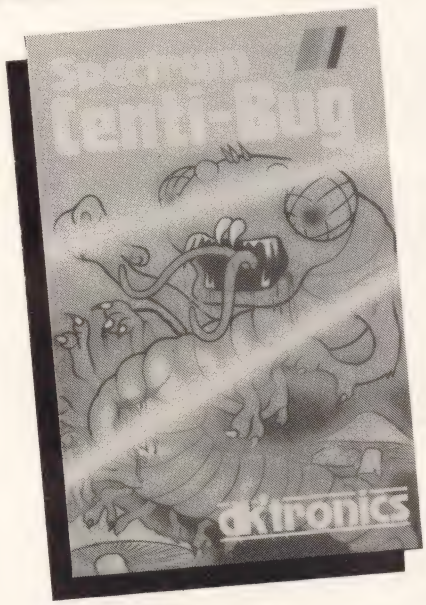
Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * *
Ease of use	* * * *
Crashproofing	* * * *
Supplied Instructions	* * * *
Overall	79%

Title: Centi-Bug
Type: Tape
Supplier: Dk'tronics
Machine: Spectrum
Price: £4.95

Centi-Bug is an extremely complicated game to explain so I won't try. All the game is is another "shoot em up" one. Unusually, the game has no apparent purpose – no planet to defend, prize to find, or damsel to rescue. perhaps for this reason the game has to be special by itself – and it is.

Machine code has been used efficiently, resulting in very fast motion – just watch the fourth or fifth centi-bug "crawl" down the screen in at least fifth grear! This replica comes complete with a very unfriendly spider who crawls out at just the wrong moment every time, but is worth 250 points if you can kill it.



Keys for play have been well chosen, the LEFT and RIGHT keys being well away from the FIRE key. Unfortunately, the program has a tendency to crash – instead of just disengaging the BREAK function, the screen turns black and the computer will not NEW. This should not cause too much of a problem, however, because the control keys are the numerics and are therefore some way from the BREAK key.

Despite the convenient positioning of the UP and DOWN buttons, I found it all too easy to mix them up – to my peril. I didn't like the sound much either. Hi Res graphics and colour are used. One complaint is that the player's gunship/laser base is only one character but overall, a fair game if you like plain fast destruction. **D.L.**

Ratings Table

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

Title: Dotman
Type: Tape
Supplier: Anirog
Machine: Unexpanded Vic 20
Price: £6.00

Dotman is yet another of those games that gets you munching around the screen trying to keep your belly satisfied. All the usual stuff (ghosts, power pills and dots), but no bonus fruit; in fact I found no bonuses at all.

The ghosts look as if they didn't pass the 'Pacman' IQ test, meaning that they are inclined to get confused if you happen to stop moving. Once you start moving your 'mouth' it can only be stopped by bumping it into a wall. Changing direction is easy enough once you've got the hang of it. Control is by keyboard or joystick, there being no difference in terms of ease between them.

All necessary instructions are included and – very rare for this kind of game – these is also a brief description. The graphics are nice and clear, even with the black background and the choice of colours is excellent. The sounds are loud especially when eating the pills. Scoring is simple: two points for a dot, ten for a pill, and one hundred for a ghost. The present and highest scores are shown on the screen.

A good game, but hardly addictive!

Ratings Table

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

Title: Hustler
Type: Tape
Supplier: Bubble Bus
Machine: Commodore 64
Price: £5.99

Tired of saving the world from Battling Aliens? Then try Hustler. It might not be everbody's idea of fun, but to pool freaks it is a must.

You are introduced to Hustler with a rather nifty rendition of the Pot Black tune. You may play six

SOFTWARE REVIEWS



different versions of the game which include such titles as Mini-pool, Superpool etc. One or two people are allowed to play the game. The cue is represented by a cross, which is moved to the required position by a joystick or the four function keys. A power gauge in the bottom right hand corner indicates the strength of a shot.

The screen display consists of the table, cushions, score and power gauge. Graphics on Hustler are good and sound is superb, with good effects on hitting balls and cushions. During a game of Hustler, you may if you wish, abort by simply pressing the RESTORE key. The entire Hustler programme is written in machine code, which cannot be listed.

All in all the Hustler is a good game, but not terribly addictive, it does not take long to master, and skill levels cannot be altered. My highest score out of six balls was seven shots which only took me a day to achieve. This is one for the family to enjoy and overall good fun. **R.A.B.**

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * * * *
Ease of use	* * * *
Crashproofing	* * *
Supplied Instructions	* * *
Overall	71%

Title:	**Exterminator**
Type:	**Tape**
Supplier:	**Bubble Bus**
Machine:	**Commodore 64**
Price:	**£5.99**

If you like centipede-type games, then you'll just love 'Exterminator'. It competes very favourably with the famous 'Atari' game. As soon as you see the first title you know you are onto a goodie. Written entirely in Machine Code, this game is one of the new breed of top class games available for the CBM 64.

Your instructions come in the way of a very impressive piece of programming at the beginning of 'Exterminator'. You'll experience your first encounter with such deadly foes as tarantulas, scorpions and eagles etc. If you are of a nervous disposition and need time to pluck up courage to kill the deadly aliens, you can sit back and watch the computer try to save the earth – (it's not very good either!)

Play is easy, blast everything that moves and everything that doesn't, except the spider, who is indestructable, and also pretty slow. It is most important to kill the scorpion early or else he lays white eggs over the screen increasing the speed and number of your enemies. An extra man is awarded after every 10,000 points which come in handy at the higher levels.

'Exterminator' will have you up half the night trying to improve your score. My highest score was 73,000 – achieved after a week of constant play. This game is 'finger pressin' good!' **R.A.B.**

Ratings Table

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

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

The "tea-pot" game is excellently squeezed into the 3.5K RAM of the unexpanded VIC 20. The tea-pot game? Well, not exactly, but certain graphic characters do strike a passing resemblence...

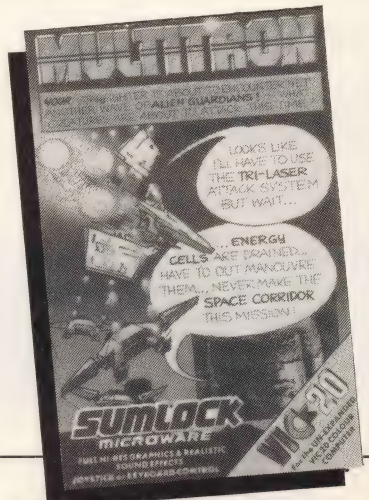
Whilst piloting your starfighter through the galaxy you have to combat with alien guards. On the first screen meanies are shot down with relative ease but on subsequent stages, where warp stingers, tri-missiles (tea-pots), star hoppers, space turtles and the cosmic phoenix appear, things become less cosy. Firstly, the aliens have learned how to wait till your cannon fire is exhausted – and watch out for the turtles – they can hide in their shells, whilst you battle with impunity.

If you finally beat the aliens, you arrive in the space lanes and have to steer your way through. One touch of the sides, and you are destroyed by anti-matter. I have not beaten the lanes yet, but I understand a bonus ship awaits at the other end.

Control is by either keyboard or joystick, with Left, Right and Fire being all you have to worry about. The disadvantage of the keyboard is that you are unable to fire and move at the same time. Bearing in mind the complexity of the program compared to memory size, the graphics and sound are first class. Rarely does one find such a mix. Indeed, the number of different stages in this game serve to keep your interest alive throughout. **N.C.M.W.**

Ratings Table

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



AT LAST, A HOME COMPUTER THAT IMPROVES WITH AGE.



It's surprising how many first-time relationships with a home computer go sour with age.

You buy an attractive, discounted little machine so that you and the children can learn about computers.

Instead, you learn about its limitations: the dull graphics. The plugs that fall out. The cheap power supply. The unalterable "beginners" language. The stiff, fragile keys. No provision for future developments. If only you'd looked around a bit in the beginning...

"Quality costs a little more, but it's usually worth paying for" (Personal Computer News – CGL M5 Review, June '83.)

The CGL M5 is designed and built by Sord, one of Japan's leading computer specialists, with three main ideas in mind.

First, to be easy and fun to learn and operate.

Second, to be rugged enough to last through hours and hours of operation.



And third, to form the basis of a powerful, versatile home computer system that won't need replacing until you're ready for a dedicated business system.

Built to learn

The CGL M5 is designed to be easy for non-geniuses to use.

"On the M5, most of the work is done for you, and all that is left is the need to work out what to do next, rather than how to do it." (Personal Computer News, June '83.)



If you make a mistake, you can correct it with a simple movement of the cursor. So you only correct that mistake, not a whole line; nor do you have to indulge in complex edit commands.

Budding video game designers and computer artists will love to get their hands on the 16 colour graphics and 32 moveable images called "sprites."

"The M5 makes professional graphic effects very simple for even the beginner to achieve." (Personal Computer World, Aug. '83.)

Built to last

"It works first time, doesn't need a lot of mollycoddling and jiggery-pokery to persuade it to continue to do so, and what's even better, it continues to work well. You don't have to balance cold cartons of milk on the top, shove matches in the back to keep the plugs in, or press the keys with several pounds force to make them respond." (Personal Computer News, June '83.)

Being able to build things that work and carry on working without endless maintenance is something at which the Japanese seem to excel.

Built to grow

To be truly versatile, a home computer has to understand very different things.

So you need different "languages," which the M5 provides by supplying part of its memory in plug-in cartridges.

"The M5 eliminates the worst limitations on machines at this level, which is that they tend to be stuck with whatever language is provided by the management." (Personal Computer News, June '83.)

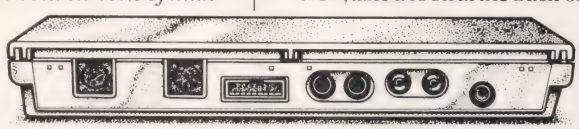
The computer is supplied complete with a Basic-I cartridge, a standard integer BASIC language and a simple learning text.

Plug in the Basic-G cartridge, and you can access the M5's incredibly sophisticated graphic and sound capabilities which are far in advance of similarly-priced computers.

Move on to the Basic-F cartridge, and you have scientific, technological and statistical computing power usually available only on big computers with equally big price tags.

The FALC cartridge provides a tailor-made language for data management, spreadsheet accounts and business problems. Combine FALC with a disc and you could *"turn the M5 into a small business machine"*. (Personal Computer Magazine, August '83.)

Now, take a look at the back of the M5.



Notice the sockets (usually an extra) for a standard Centronics-type printer, the separate video monitor and hi-fi sound output.

Even the language cartridge socket has hidden potential:

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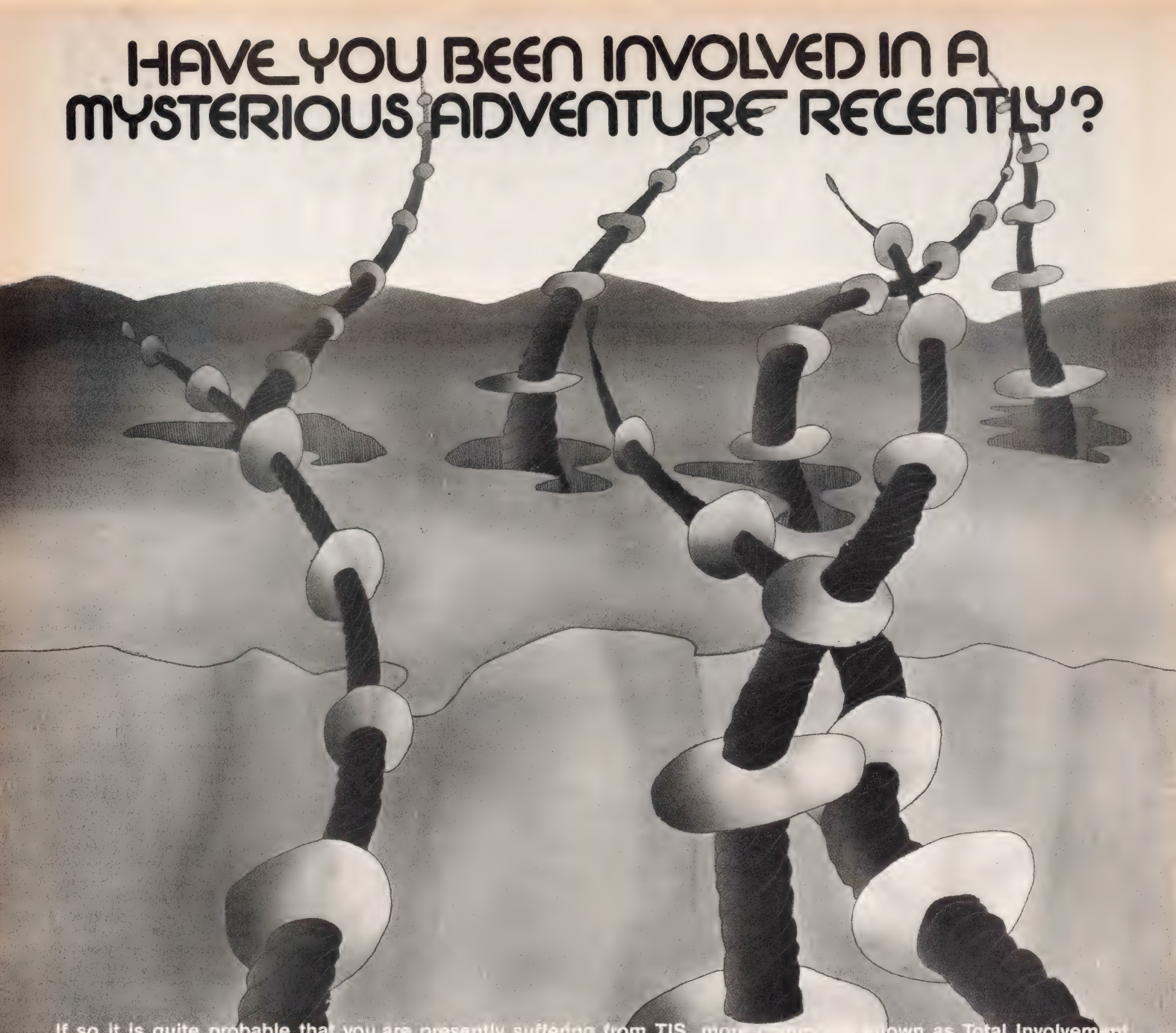
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SOFTWARE

ELEGANT EDITOR



Practise producing a clearer, more versatile screen display on your Atari with this progam by Eric Beresford

Typing BASIC programs into the Atari is easy – the screen editor makes it a joy but the resultant listing is cramped and hence difficult to read. By modifying the display format itself, a cleaner more readable listing will result meaning less eye strain and more fun when programming.

The editing screen is in BASIC graphics mode 0, or GR0 for short. This is a text mode with 24 rows of 40 characters in length. There is a choice of colour and brightness for the border and background, but the characters themselves are the same colour as the background, and can be varied only in brightness.

The display is produced by a chip called Antic, which is a video microprocessor executing a program 50 times per second to generate an image on the screen. The program executed by Antic is called a Display List and if we write our own program and get Antic to carry it out we can in effect, change the screen display.

The BASIC SETCOLOR command (SE) is the usual way to set up colours on the screen. For example, SE.2,3,0 followed by ▶

ELEGANT EDITOR

RETURN sets the background to deer red. The form of the SE statement shown in the BASIC Manual is :SETCOLOR (REGISTER 0-4), (COLOUR 0-15), (LUMINESCENCE 0-14-4- even colours only). Your SETCOLOR statement is then converted to a number (0-255) and effectively POKED into the appropriate colour location.

Now an alternative and quicker way to set the colour is to use the POKE command and POKE the colour locations directly. To do this, the following format is required:

POKE COLOR LOC, COLOR 16 + LUMINESENCE

where COLOR LOC is the address of the appropriate colour location, COLOR is the required colour (number in range 0-15), LUM is the required brightness (even number in range 0-14).

The left and right margins tell the computer where to display the text. In normal GR.0 mode the left hand margin is three characters into the text line and the right hand margin is set at the 40th position. Since the first character is printed at position 0, then the default values for the left and right margins are 2 and 39 respectively. You can POKE your own values into the left and right margin locations and so set the text where you want it on the screen.

Problems

Even when we have customised the display list program, changed the colour of the screen and set the margins to suit, one problem still remains and that is the RESET. When RESET is pressed, the display will return to the normal GR.0 display. There must therefore be some provision within the program to prevent this.

Antic sets the address of its display list from 560(Lo), 561(Hi). After RESET the Atari always loads a byte from address 9. If it is at zero, nothing happens. If it is at 2 it will jump to a machine code subroutine, the starting address of which is held in addresses 2 (Lo) and 3 (Hi). It must also be noted that when RESET is pressed it does not clear these locations like it does many others.

Type in the program and CSAVE it before running because any mistakes in the data statements may cause the machine to crash. After a few seconds on RUN the word READY will appear. Press the RESET button and the new moded GR.0 will be displayed. To alter the colours and margins simply alter lines 50-70 and RUN again until you get the display you require. When happy with it, CSAVE the basic program and just reload and run it every time to produce your own custom display.

NOTE: After running your program once, you can type in and CLOAD any other programs and you should find screen editing a whole lot easier on the eyes. If you type GR.0 and press RETURN you get your old GR.0 display so the new display format will not interfere with your own games programs using GR.0.

If you get bored with your new format display, POKE 9 with 0 and press RESET to return to the default display.

So there you have it – a new graphics mode for the Atari that should make it easier to type in those long BASIC programs. Have fun!!

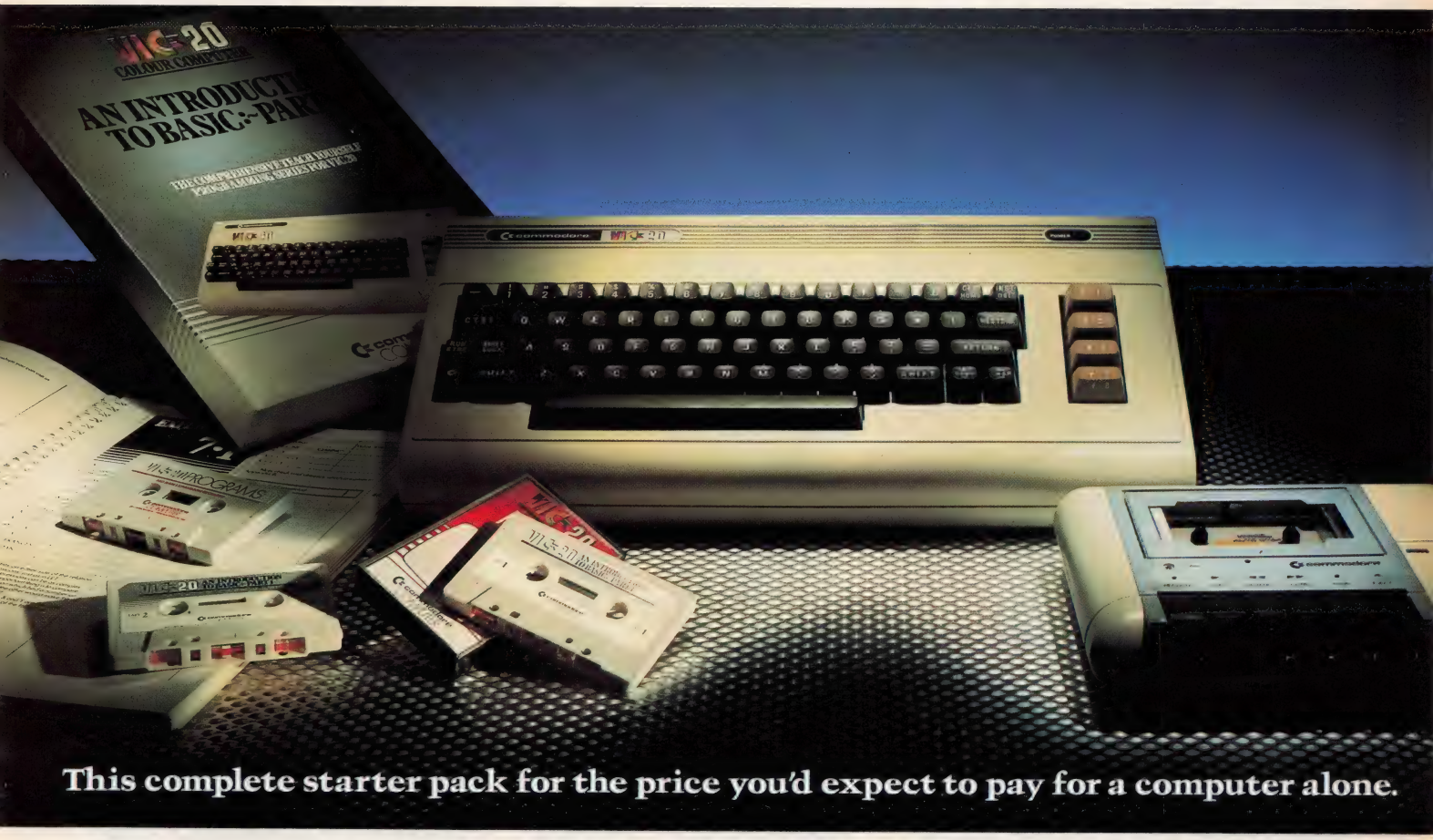
HOW IT RUNS

Lines 10-250	Contain useful addresses of the new display locations
Line 300	Reads in the data statements and stores them in the upper half of page six. These form a small machine code program and a display list.
Lines 330-350	Set the flag at location to 2 and the locations two and three are set to point to the small machine code program in the upper half of page six. This means that every time the RESET button is pressed, the computer will execute the machine program.
Lines 400-440	Set up the colour for the display and the left and right hand margins. By POKING the locations which the machine code program will use, you can alter these statements to suit yourself.
Lines 500-620	Consist of the machine code program and display list (on RESET). The program sets up pointers at 560 and sets up colours and margins to the values set by lines 400-440.

PROGRAM LISTING

```
10 REM ******************************
20 REM *** NEW EDITING DISPLAY ***
30 REM ******************************
40 REM
50 REM *** LIST OF USEFUL LOCATIONS FOR USE WITH MODED DISPLAY  ****
60 REM
70 REM
80 START=1678:REM MACHINE CODE PROGRAM LOAD ADDRESS
90 REM
0100 DLIST=560:REM DISPLAY LIST POINTER
0110 REM
0120 FLAG=9:REM DISPLAY MODE ADDRESS 0=NORMAL GR.0 , 2=MODIFIED GR.0
0130 REM
0140 CASINI=2:REM MACHINE CODE ROUTINE POINTED TO BY THIS LOCATION
0150 REM
0160 LEFTMARGIN=1678:REM LEFT MARGIN SET ADDRESS
0170 REM
0180 RIGHTMARGIN=1679:REM RIGHT SET ADDRESS
0190 REM
0200 BRIGHTNESS=1680:REM CHAR BIGHTNESS ADDRESS
0210 REM
0220 SCREEN=1681:REM SCREEN COLOR
0230 REM
0240 BACKGROUND=1682:REM SCREEN BACKGROUND COLOR
0250 REM
0260 REM ******************************
0270 REM
0280 REM *** MAIN PROGRAM ***
0290 REM
0300 FOR MEM=START TO START+97:READ PROG:POKE MEM,PROG:NEXT MEM
0310 REM
0320 REM
0330 POKE FLAG,2
0340 STARTHI=INT(START/256):STARTLO=START-256*STARTHI
0350 POKE CASINI,STARTLO:POKE CASINI+1,STARTHI
0360 REM
0400 POKE LEFTMARGIN,0
0410 POKE RIGHTMARGIN,39
0420 POKE BRIGHTNESS,12
0430 POKE SCREEN,36
0440 POKE BACKGROUND,0
0450 REM
0460 END :REM *** END OF PROGRAM ***
0470 REM
0480 REM *** MACHINE CODE DATA ***
0490 REM
0500 DATA 0,0,0,0,0
0510 DATA 169,186,141,48,2
0520 DATA 169,6,141,49,2,173,142,6
0530 DATA 133,82,173,143,6,133,83,173
0540 DATA 144,6,141,197,2,173,145,6
0550 DATA 141,198,2,173,146,6,141,200
0560 DATA 2,96,112,32,66,64,156,0
0570 DATA 2,0,2,0,2,0,2,0
0580 DATA 2,0,2,0,2,0,2,0
0590 DATA 2,0,2,0,2,0,2,0
0600 DATA 2,0,2,0,2,0,2,0
0610 DATA 2,0,2,0,2,0,2,0
0620 DATA 2,0,2,0,2,65,186,6
0630 REM
0640 REM ************************
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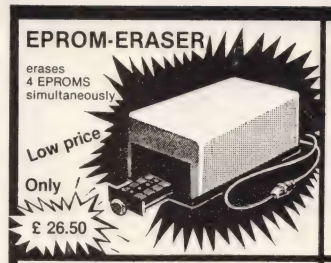
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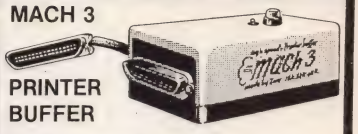
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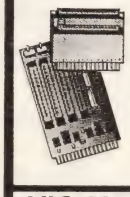
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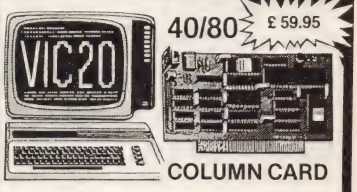


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YOUR LETTERS

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 Pct,
I have an expanded Video Genie with 48K internal memory plus a feature ROM giving an additional 6 commands, a Radio Shack TRS 80 Video Display and an EG 602 microprinter. I bought the computer in March 1981 and gradually built up to the above system. That was the Apple, Pet, Tandy era and they were about the only ones to choose from then. Now, there are many more cheaper and just as powerful computers with additional features from the VG ie colour and high-res graphics.

I am writing to ask you if you can give any general guide-lines as to how much you can sell second-hand computers for? Also, any guide-lines for selling unwanted software?

I have often considered changing to a BBC B machine and a printer. Can you "trade-in" an older computer for a new one? If you can, how much do I "lose out"?

Considering that Tandy/Genie is such a well established machine, I cannot understand how their software prices have remained so high as compared with other newer computers. I regard software for these machines expensive. Here, I am mainly thinking of Molimerx and Kansas prices, the cost of a typical game from Molimerx costs between £10 and £15 + 75p postage and packing, and £9.50 inclusive of postage and packing from Kansas. How can they charge so much for ONE game, whereas if you scan the adverts, some people offer 25 games on one cassette for, say, £9.00? I'm sure many people will agree with me when I say that software for Tandy/ Genie machines should be reduced.

The above three computers I mentioned ie Apple, Pet and Tandy/ Genie never have much in the way of programs published for them, or articles about them. I think it would be a good idea to produce another magazine for users of those particular types of computers.
Yours irately,
David Beale
Corbridge

Editor's reply: Well, rather a marathon task you have set us. The questions can, however, be answered quite briefly. With regards the sale of computers and software, I really wouldn't hold out much hope of any useful remuneration. Peripherals can sometimes be sold with a better financial return. I would advise you to advertise locally and see what the response is. I don't know of any companies which operate trade in schemes.

Taking your next point regarding software prices, you must bear in mind that 'you pays for what you get' quite often, and what appear to be bargains, eg 25 games on one cassette for £9.00, may not be of a good quality. However, Kansas and Molimerx are both reputable companies which have been operating for many years. If you are thinking of buying a BBC machine, bear in mind that the software prices for this micro are also on the 'high' side.

Your final point is an interesting one. PCT has, of necessity, to concentrate on a limited range of micros and we choose those ones which sell below £500 and are popular. However, there are magazines which concentrate solely on the micros you mention. For example, Argus Specialist Press have recently launched a magazine for the Apple user, "Orchard", and another sister magazine "Personal Software" produced a special on the Commodore range in the summer issue this year.

Dear PCT
I intend to purchase a Sinclair Spectrum personal computer. Will you kindly give me the title and publishers of an explanatory initial book on the Spectrum which is most likely to introduce a senior citizen to the mysteries of personal computing in a way which will not put him off for the rest of his life.
Yours sincerely,
K E Kemp-Turner
Newmarket

Editor's reply: Thank you for your query on this subject which will be of interest to many readers who may also be contemplating buying or who have recently bought a Sinclair Spectrum.

There are many such publications available and in this space I can only mention a few. The ZX Spectrum User's Handbook is probably the most comprehensive. This is written by RJ Simpson and TJ Terrell and published by Newnes Microcomputer Books. It should be available from any bookshop dealing with Butterworth publishers. A 'handier' book may be the Spectrum Handbook by Tim Langdell and published by the Century Publishing Company at £4.95. Another suggestion is the Spectrum Pocket Book by Trevor Toms and published by Phipps Associates. All of these books should be available from your local Spectrum dealer store, or bookshops should be able to order them for you.

Dear PCT,
Would you be so kind as to publish this letter in your magazine. I would like to correspond with persons who own a ZX Spectrum. The idea would be to correspond via tapes and in this way to exchange ideas, news and programs we write by circulating the tapes to anyone in-

terested. If I get more than one reply, we can start a universal ZX Club through which members can learn more about their machines.

Anybody interested in such an idea and who would wish to participate could write to me sending their full address. Each member would then receive the name of one other member, and the chain would start from here. The only condition laid down would be that each person becoming a member would circulate only their own programs and be an active member.

I hope that I will soon receive the addresses of all interested persons, after which I shall send them more information. I would like to emphasise the fact that no membership fees will be involved. The address to write to is 796 Kuyper Street, Rietfontein, 0084, Pretoria, South Africa.

Yours faithfully,
G.J. Coetzee

Editor's reply: This seems like a good idea. There is no official international ZX Club, although many clubs claim to be international. Although we have many readers who own ZX Spectrums, you may hit a wider market by sending such details to a Sinclair related magazine such as ZX Computing.

Dear PCT
May I be the first to thank you for the excellent **PCT Shape Maker** which was a free gift in your October issue. I own an Oric micro (with an 8 x 6 character grid), and managed to convert the card for my machine simply by cutting off the two columns on the left hand side leaving the 6 columns on the right for characters. An excellent paper saving idea!!

On another note, how about an **Adventure Corner** in PCT? I love playing adventures and find it a nuisance to have to buy another magazine just for a page or two of reviews, hints for adventures and readers' letters.

Even when I spent 12 months in Australia, I continued to buy PCT and although it cost about £1.45 and arrived two to three months late, it was worth every penny.

Yours faithfully,
DJ Wright
Chester

Editor's reply: I'm glad you're happy with your Shape Maker and thank you for writing in with the conversion for the Oric, I'm sure many other Oric owners will find it a useful hint.

I'm sorry that we aren't able to have a regular adventure corner, but our Software Review is very comprehensive and as we have so many different tastes to cater for, it would be unfair to fill these pages with adventures. If you are interested in hearing from other Adventure addicts, perhaps you'd like a mention in this magazine. If so, send in all details and we'll give you a mention.

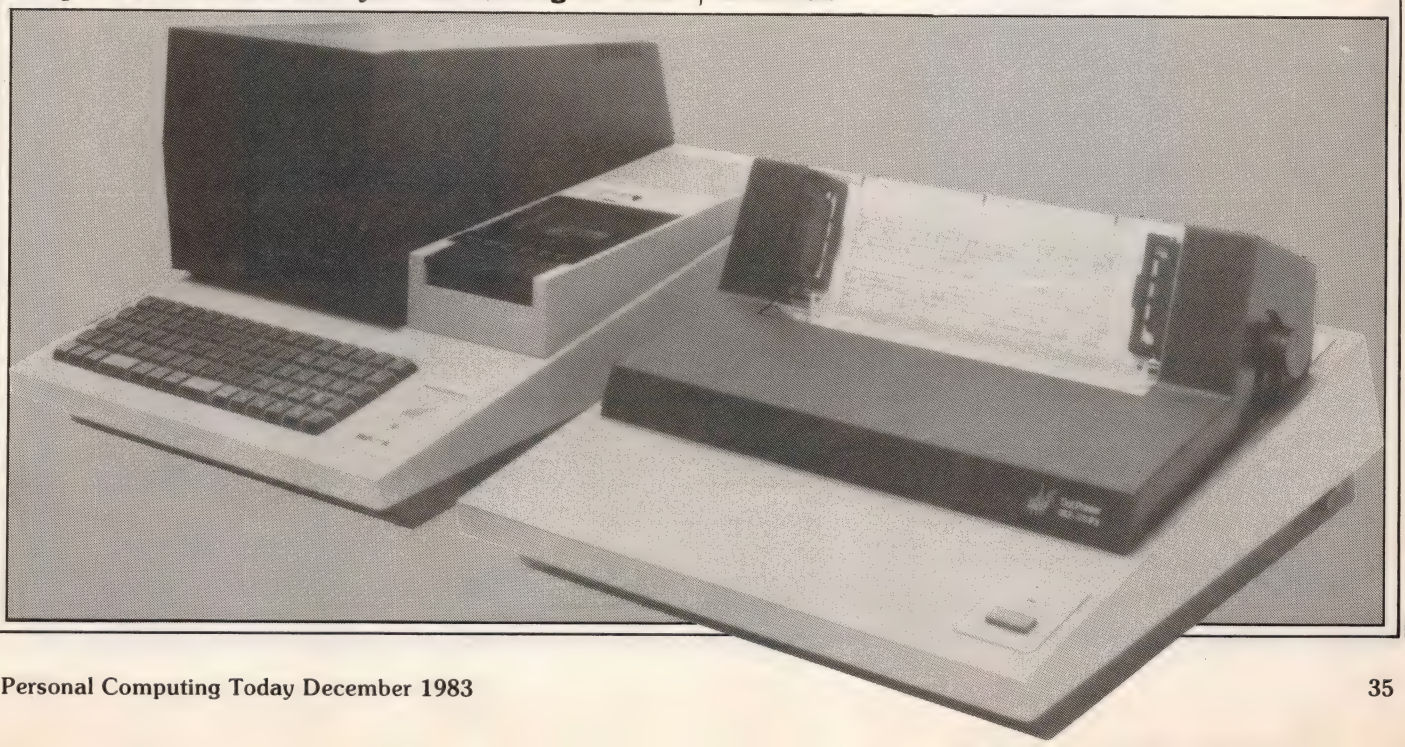
In our October issue we published a letter from Mrs J Edwards, who was having trouble loading programs originally designed for the Sharp MZ80K computer into her Sharp MZ80A. Our reply did not fully satisfy the David Computer Software Company of Bramhall, Stockport and here we publish their more detailed answer.

Dear PCT
I am afraid that your advice to Mrs Edwards (Micro-Answers, October) will not have solved her problem with loading MZ-80K programs on her MZ-80A. As a software house specialising in Sharp programs, perhaps you might allow us to add to your reply.

The problem is unconnected with screen size, which is the same for both machines (although the A has an added area for its scroll facility). The systems used by the A and the K for encoding BASIC programs are incompatible, and it is not therefore possible for either to load the others programs from cassette. Both Sharp and ourselves produce converters, machine code programs which load BASIC programs, modify the format, and save them to cassette, which overcomes this difficulty.

K programs can be entered on the A from the keyboard, and will generally run. There are some minor differences between the two machines, which the user can generally correct for – for instance, the character sets differ slightly, and on 'GET' the A responds to a key already depressed. An inexperienced user could encounter difficulties if the programmer has used PEEKs or POKEs to alter, or obtain data from, the BASIC interpreter itself. These can be recognised easily since they will all be to addresses between 4608 and 18440.

Yours faithfully,
D.E. Loverseed
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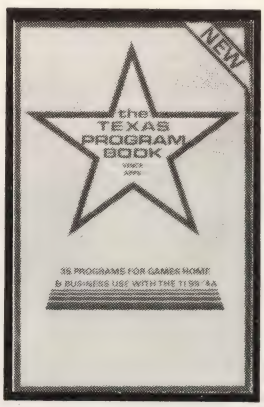
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The MTX500 has 32K of user RAM as standard (64K on the 512), expandable to 512K plus 16K of video RAM, controlled by a separate Video Processor. Sixteen colours, 40 column text, 256 x 192 high resolution graphics with all sixteen colours available, and 32 easily moveable user defined graphics characters (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are centronics printer port, two joystick ports, an uncommitted I/O port, 2400 Baud Cassette port, separate TV and Video Monitor ports, 4 channel sound with hifi output plus a dedicated cartridge port. Other standard features include the Z80A processor running at 4MHz, real time clock, full moving key keyboard with 79 keys including eight 2-function keys and separate numeric pad.

Software

The MTX's 24K ROM contains several languages and routines which enable the novice or the experienced programmer to make full use of the machine. Standard languages are MTX BASIC, MTX LOGO commands, NODDY. ROM routines include an ASSSEMBLER/DISASSEMBLER with screen display of the Z80 CPU registers, memory and program,which can be manipulated from the keyboard. Machine code programs can be stepped through one instruction at a time, and easily called from within BASIC programs. A further feature is the Virtual Screen facility which enables the programmer to split the screen into a maximum of eight sections to work independently whilst maintaining all full screen facilities. Pascal is available as an add-on ROM pack.

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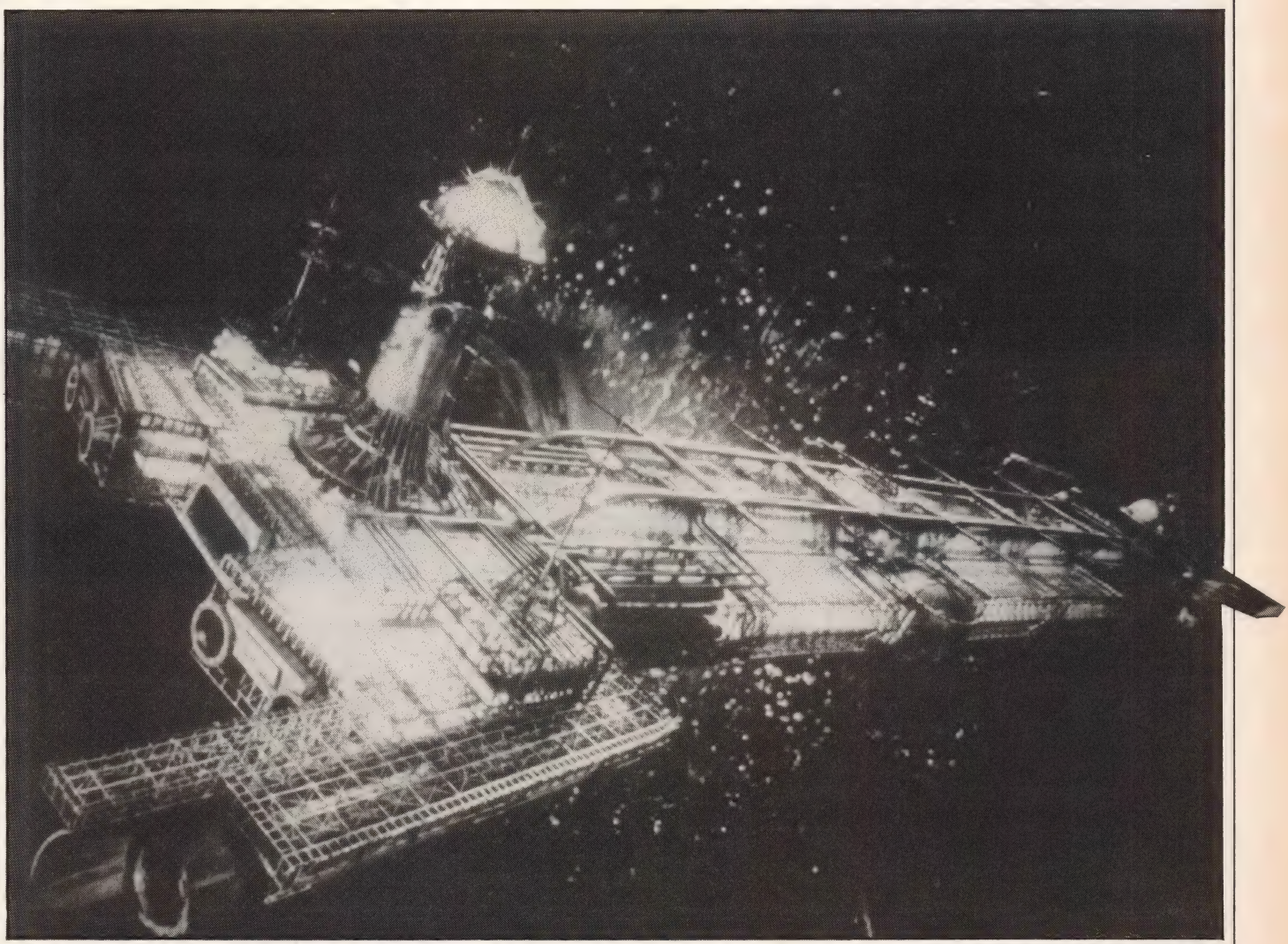
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SOFTWARE

ASTEROID INVADERS



Peter Simpson has adapted this popular arcade game for the MZ 80K. So to sharpen up your landing skills, start here.

This program is a copy of the popular arcade game. The aim is to eject your landing craft from the mothership, dodge the asteroids and land on a base with possible scores of 50, 100 and 150 points.

Variables Used

A(19)	Array containing screen locations of the twenty asteroids/invaders.
C(19)	Array containing directions of the twenty asteroids/invaders.
E	Display code of asteroids (72) or invaders (201).
HS	Hi-score.
N	Number of invader that is firing. Invader N + 10 also fires.
O	Number of asteroid/invader that is being moved.
Q	Number of lives left.
SC	Score.
TC	Number of points gained by landing on base.
TD	Number of bases cleared.
X	Screen location of landing craft (53248 to 54247).
XM	Screen location of invader's missile.
XO	Screen location of asteroid/invader number 0

You must then guide the landing craft back up to the mothership through the fleet of firing invaders. The points will then be added to your score. You have three "lives" at the start and one is lost each time you crash. A hi-score is kept.

ASTEROID INVADERS

Notes

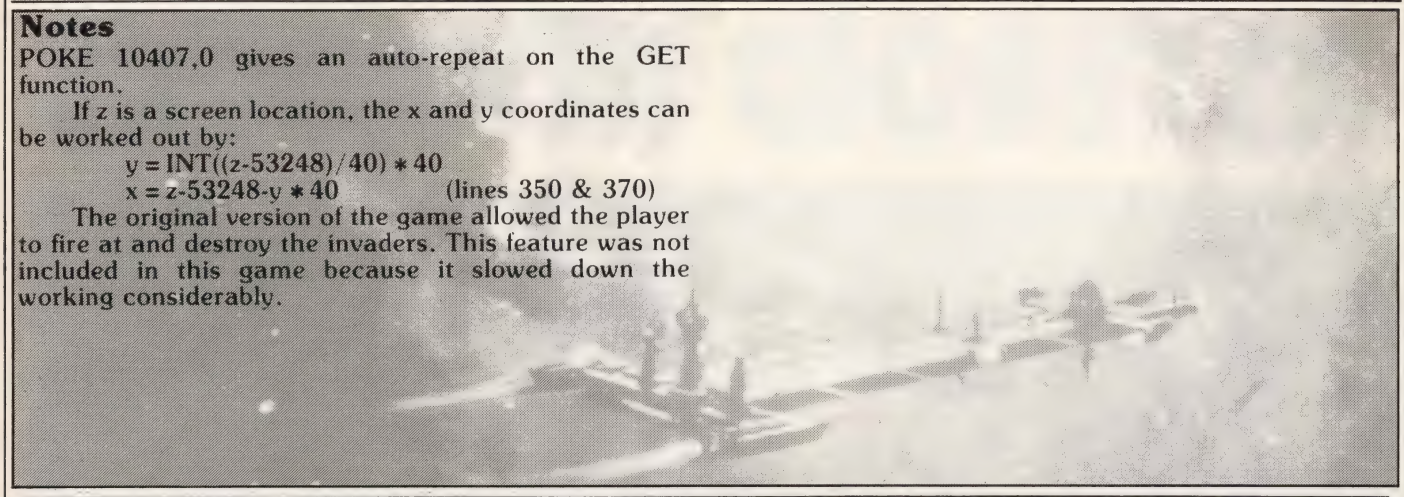
POKE 10407,0 gives an auto-repeat on the GET function.

If z is a screen location, the x and y coordinates can be worked out by:

$y = INT((z-53248)/40) * 40$

$x = z-53248-y * 40$ (lines 350 & 370)

The original version of the game allowed the player to fire at and destroy the invaders. This feature was not included in this game because it slowed down the working considerably.



HOW IT RUNS

10-90	Initialize variables and screen display.	620-630	Change asteroid/invader number.
100-210	Move mothership.	640-660	POKE bases onto screen.
220-280	GET routine and move landing craft.	670-700	Reset directions of asteroids/invaders.
290-410	Land on base routine.	710-730	Reset screen locations of asteroids/invaders.
420-450	Move asteroid routine.	740-830	End routine.
460-610	Invader fire routine.	840-1130	Instructions.

PROGRAM LISTING

```
10 DIMA(19),C(19):POKE10407,0:GOSUB840
20 PRINT"■":L=53288:Q=3:F=1
30 FORA=53248TO53287:POKEA,56:POKEA+960,67:NEXT
40 PRINT"■SCORE";SC;TAB(28);"HI";HS
50 FORA=1TOQ:POKE53264+A,202:NEXT
60 GOSUB640
70 POKEXO,0:POKEXM,0
80 D=40:E=72:M=0:N=0:O=10:XM=A(M):XO=A(O):FI=0
90 GOSUB670:GOSUB710:IFTD=6THENGOSUB640
100 POKEL+80,0:POKEL+82,0
110 POKEL,67:POKEL+1,67:POKEL+2,67
120 POKEL+40,208:POKEL+41,199:POKEL+42,208
130 G=0
140 GETA$:IFA$=""THENG=G+1:IFG<>10THEN140
150 IFG=10THEN170
160 POKEL+41,46:POKEL+81,0:X=L+81:GOTO220
170 POKEL,0:POKEL+1,0:POKEL+2,0
180 POKEL+40,0:POKEL+41,0:POKEL+42,0
190 L=L+F:IFL=53324THENF=-F:L=L+F
200 IFL=53288THENF=-F:L=L+F
210 GOTO110
220 GETA$
230 POKEX,0
240 IFA$="Z"THENX=X-1
250 IFA$="X"THENX=X+1
260 X=X+D:P=PEEK(X):POKEX,199
270 IFX>53368THEN300
280 IFP<>46THEN740
290 SC=SC+TC:TC=0:PRINT"■";TAB(5);SC:GOTO70
300 IF(P=0)+(P=53)THEN420
310 IF(P=67)+(P=201)+(P=72)THEN740
320 IFP=164THENTC=50
330 IFP=165THENTC=100
340 IFP=166THENTC=150
350 FORA=54208TO960+X-INT((X-53248)/40)*40:POKEA,202:FORB=0TO50:NEXT
360 POKEA,67:NEXT
370 FORA=960+X-INT((X-53248)/40)*40TOXSTEP-40:P=PEEK(A):POKEA,204:FORB=0TO50
380 NEXT:POKEA,P:NEXT
390 D=-40:E=201:GOSUB670:GOSUB710
400 FORA=-2TO2:POKEX+A,0:NEXT
410 TD=TD+1
420 N=N+1:IFN=20THENN=0
430 P=PEEK(A(N)):POKEA(N),O
440 A(N)=A(N)+C(N):POKEA(N),E
450 IFE=72THEN220
460 A=1
470 POKEXM,P1:XM=XM+40:P1=PEEK(XM):POKEXM,53
480 IFP1=199THEN740
490 IFP1=201THEN470
500 IFP1<>0THENPOKEXM,P1:P1=0:GOTO530
510 A=A+1:IFA<>3THEN470
520 GOTO550
530 M=M+1:IFM=20THENM=0
540 XM=A(M)+40
550 A=1
560 POKEXO,P2:XO=XO+40:P2=PEEK(XO):POKEXO,53
570 IFP2=199THEN740
580 IFP2=201THEN560
590 IFP2<>0THENPOKEXO,P2:P2=0:GOTO620
600 A=A+1:IFA<>3THEN560
610 GOTO220
620 O=O+1:IFO=20THENO=0
630 XO=A(O)+40:GOTO220
640 POKE54169,166:POKE54187,166:POKE54205,166
650 POKE54147,165:POKE54148,165:POKE54165,165
660 POKE54166,164:POKE54106,164:POKE54107,164:POKE54108,164:TD=0:RETURN
670 FORA=0TO19:POKEA(A),0
680 IFRND(1)<.5THENC(A)=-2:GOTO700
690 C(A)=2
700 NEXT:RETURN
710 FORA=0TO19
720 B=INT(RND(1)*640)+53408:IFPEEK(B)<>0THEN720
730 A(A)=B:POKEB,E:NEXT:RETURN
740 P1=0:P2=0:FORA=1TO10:POKEX,RND(1)*15+241:NEXT
750 Q=Q-1:IFQ<>0THENPRINT" ":GOTO30
760 PRINT"■YOU TWIT! YOU HAVE CRASHED THREE TIMES!"
770 PRINT"YOUR FINAL SCORE IS";SC;" POINTS"
780 IFSC>HSTHENPRINT"AND YOU HAVE BEATEN THE HI-SCORE";HS:HS=SC:GOTO800
790 PRINT"BUT YOU HAVEN'T BEATEN THE HI-SCORE";HS
800 PRINT"■    PRESS S TO START":SC=0
810 GETA$:IFA$=""THEN810
820 IFA$="S"THEN20
830 GOTO810
840 PRINT"■         INSTRUCTIONS"
850 PRINT"         ────────────"
860 PRINT" You will appear in a large ship at the"
870 PRINT"top of the screen moving backwards and"
880 PRINT"forwards. The screen will fill with"
890 PRINT"asteroids which will move when you press"
900 PRINT" the SPACE key. This will also eject your"
910 PRINT" landing craft. Using the direction keys"
920 PRINT"(Z & X), dodge the asteroids and land"
930 PRINT"on one of the bases at the bottom. The"
940 PRINT"bases are rated :"
950 PRINT"                    ■ - 150 points"
960 PRINT"                    ■ - 100 points"
970 PRINT"                    ■ -  50  points"
980 PRINT"      [PRESS A KEY TO CONTINUE]"
990 GETA$:IFA$=""THEN990
1000 PRINT"■The points will be awarded when you get"
1010 PRINT" back to your ship but here comes the"
1020 PRINT"catch: the asteroids are replaced by"
1030 PRINT"invaders which are also moving but are"
1040 PRINT"shooting as well. If you reach your"
1050 PRINT"ship, your score will be increased."
1060 PRINT" If you crash into an asteroid, invader"
1070 PRINT"or the ground, or if you miss your ship"
1080 PRINT"a  Life  will be deducted. When all"
1090 PRINT"three are used up, the game will end."
1100 PRINT" A Hi-Score is kept."
1110 PRINT"■      [PRESS A KEY TO START]"
1120 GETA$:IFA$=""THEN1120
1130 RETURN
```

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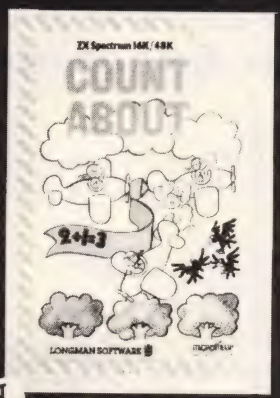
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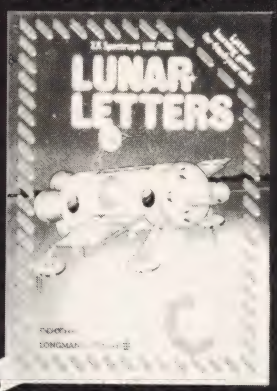
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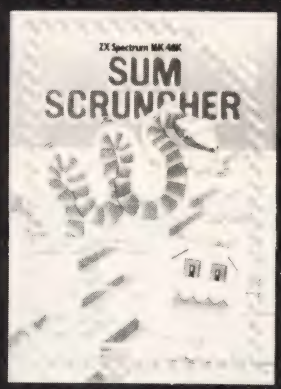
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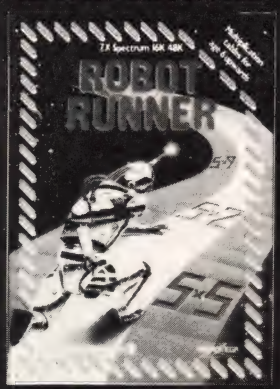
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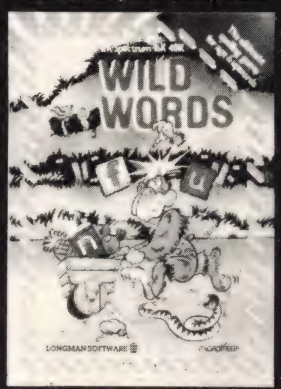
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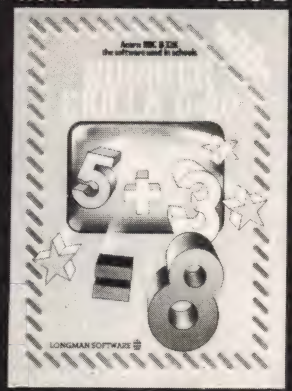


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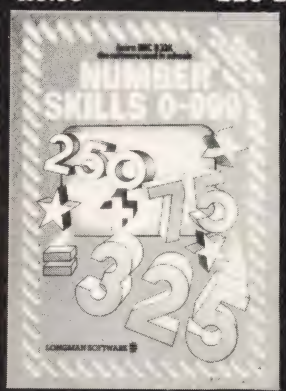


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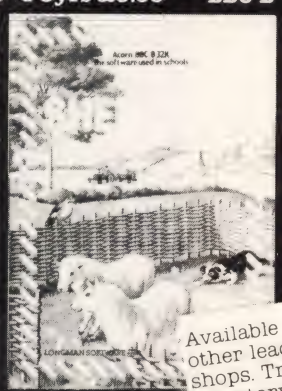
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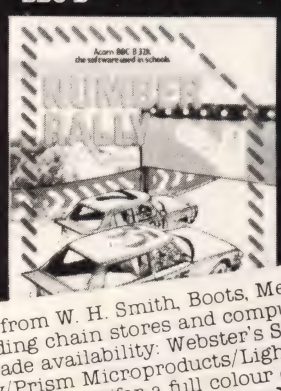
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LONGMAN SOFTWARE

MICROSPOT

SPEEDING UP THE SPECTRUM

Philip Crawley makes your 16K or 48K Spectrum go faster

The Spectrum is not famed for being the fastest micro on the market and consequently any speed increase is inialuable. Since the majority of Spectrum users are gamesters the faster they can get the machine to run the better. The method described here will achieve a speed increase in the order of forty percent and when used with other tricks (e.g. placing frequently used routines at the start of the program) it can give that extra 'zip' that makes the new version of Pac-man.

Fifty times a second the central processor (Z80A in our case) sends out an 'interrupt'. This is a signal that causes the computer to halt execution of whatever it was doing and scan the keyboard. If this can be disabled then a certain amount of time wasting can be eliminated. Program one sets up the routines to switch the interrupt off and on. The last user defined graphic is used a a useful address, however the four bytes could be put at any convenient point in memory (above Ramtop, Rem statement, printer buffer etc.). The machine code is very simple:

DI	243	
RET	201	Disable
EI	251	
RET	201	Enable

The second program allows you to time the difference with interrupts set on and off. Use a stop-watch and the BEEPS (Lines 30, 60, 80 and 140) as reference to the starting and stopping of the counting.

Several words of warning; The interrupt must be switched on at the end of the program otherwise the keyboard becomes disabled. The interrupt must be enabled before INKEY$ or INPUT is used or the computer will crash. A viable alternative is to treat the keyboard as eight ports and leave the interrupt disabled (see chapter twenty three of the Spectrum manual).

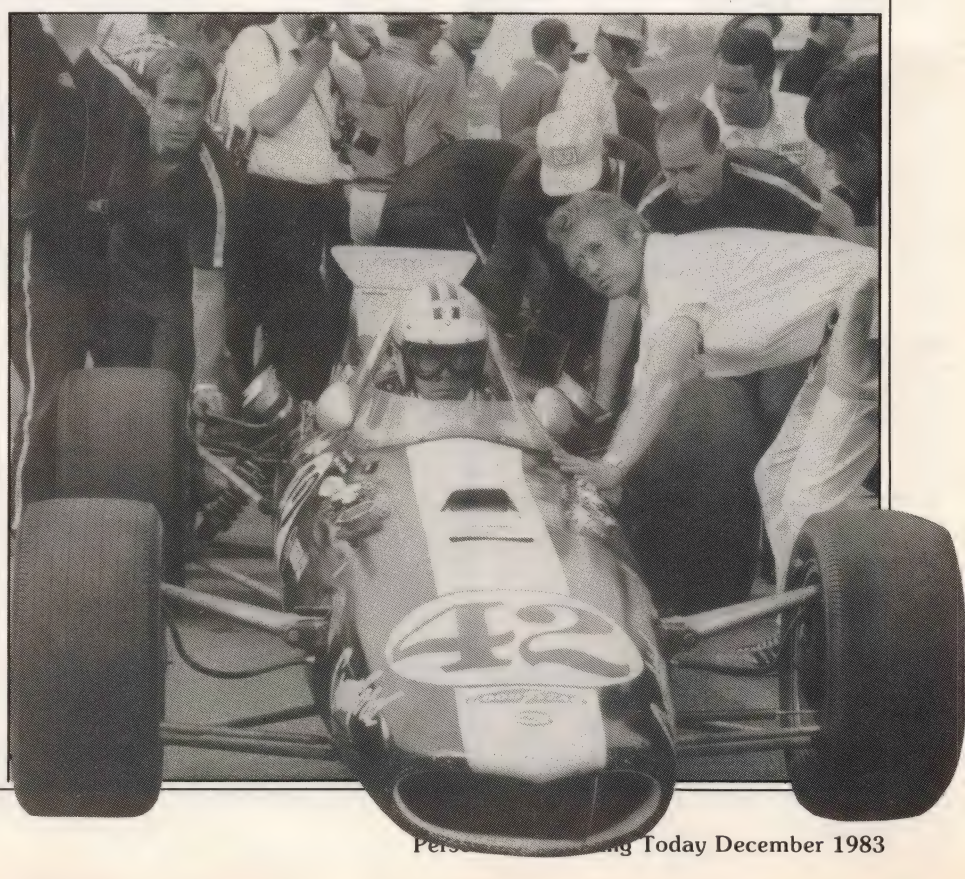
PROGRAM LISTING

PROGRAM ONE

```
10   LET DI = 243
20   LET RET = 2Ø1
30   LET EI = 251
40   LET ADDRESS = USR "U"
50   POKE ADDRESS + Ø,DI
60   POKE ADDRESS + 1,RET
70   POKE ADDRESS + 2,EI
80   POKE ADDRESS + 3,RET
```

PROGRAM TWO

```
 10   LET DI = USR "U"
 20   LET EI = USR "U" + 2
 30   BEEP 1,Ø
 40   FOR N = 1 TO 1ØØØ
 50   PRINT AT 1Ø,1Ø;N
 60   NEXT N: BEEP 1,Ø
 70   INPUT "PRESS ENTER ";A$
 80   BEEP 1,Ø
 90   RANDOMIZE USR DI
100   FOR N = 1 TO 1ØØØ
110   PRINT AT 1Ø,1Ø;N
120   NEXT N
130   RANDOMIZE USR EI
140   BEEP 1,Ø
150   STOP
```



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Not all home computers stay at home.

The BBC Micro is the ideal family computer–simple to operate, yet fast, powerful, with enormous potential.

But it's nice to know, when you buy one for your home, that the business, educational and scientific worlds agree with your choice.

Here are a few stories to illustrate how the BBC Micro gets out and about. And one to remind you how helpful it can be when it stays at home.



A practical lesson in business admin.

The contribution of the BBC Micro in the classroom has long been recognised at Perins Community School in Hampshire.

The School has 12 BBC Micros used extensively across the syllabus: in fact some pupils are using them to study for their GCE O Levels in computing.

One of the programs available to Perins teachers such as David Beck, pictured below with his class, is "Newsagent."

This program contains all the necessary information for the class to run a newsagent's shop; allowing them to organise daily deliveries, make up bills and keep an eye on stock control and ordering.

It's a nice example of how the BBC Micro can be used not only to acquaint a class with the language of computers, but also with some of the realities of the community in which they live.



Correcting Jodrell Bank.

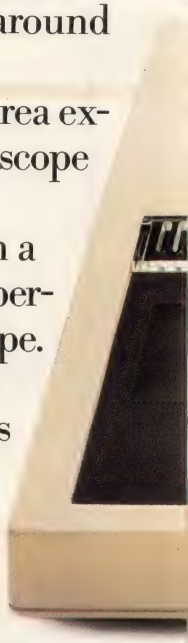
The BBC Micro is a familiar worker around Jodrell Bank.

You'll find it in the reception area explaining the workings of a radio telescope to visitors, for example.

But it's also been helping in a more testing task: to improve the performance of the Defford telescope.

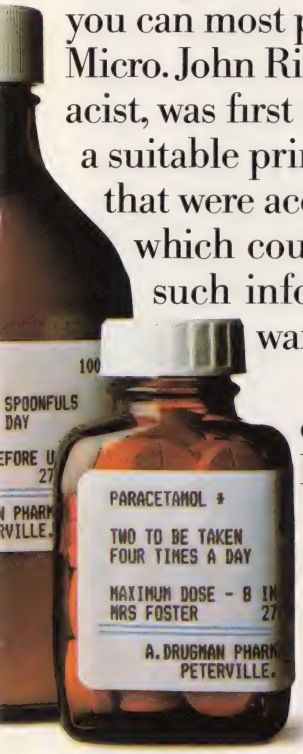
In this application it has been used to make calculations necessary to determine the precise parabolic shape of the dish.

Theodolites are used to do the measuring–then the BBC Micro works out the necessary corrections.



The end of the scrawl.

If any of you have noticed how much easier it is to read and understand labels on drugs and medicines these days, then you can most probably thank the BBC Micro. John Richardson, a Preston pharmacist, was first to realise how a micro with a suitable printer could produce labels that were accurate and legible and which could include, automatically, such information as drug reaction warnings.



At the same time it could record drug usage for better stock control.

He chose the BBC Micro for its versatility and potential for expansion.

John Richardson believes that this system will be recognised as standard in the profession and be used in hospitals, health centres and pharmacies throughout the UK.

Meanwhile back at home.

Dr. & Mrs. Yarwood bought a BBC Micro as a birthday present for their 12 year old daughter.



However, it quite quickly became common property.

All three can now write their own programs. Mrs. Yarwood is particularly proud of one program she has compiled to help teach her daughter French vocabulary.

They all agree that although the Micro is fast and powerful enough to be at home in Jodrell Bank, it is also the ideal computer at the Yarwood home: simple to set up (virtually any TV set and cassette player is all you need) and simple to use.



All this for only £399.

The BBC Micro comes with a comprehensive, step-by-step User Guide which introduces you to your 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 for you to experiment with, ranging from music and graphics to games like Kingdom and Bat 'n' Ball.

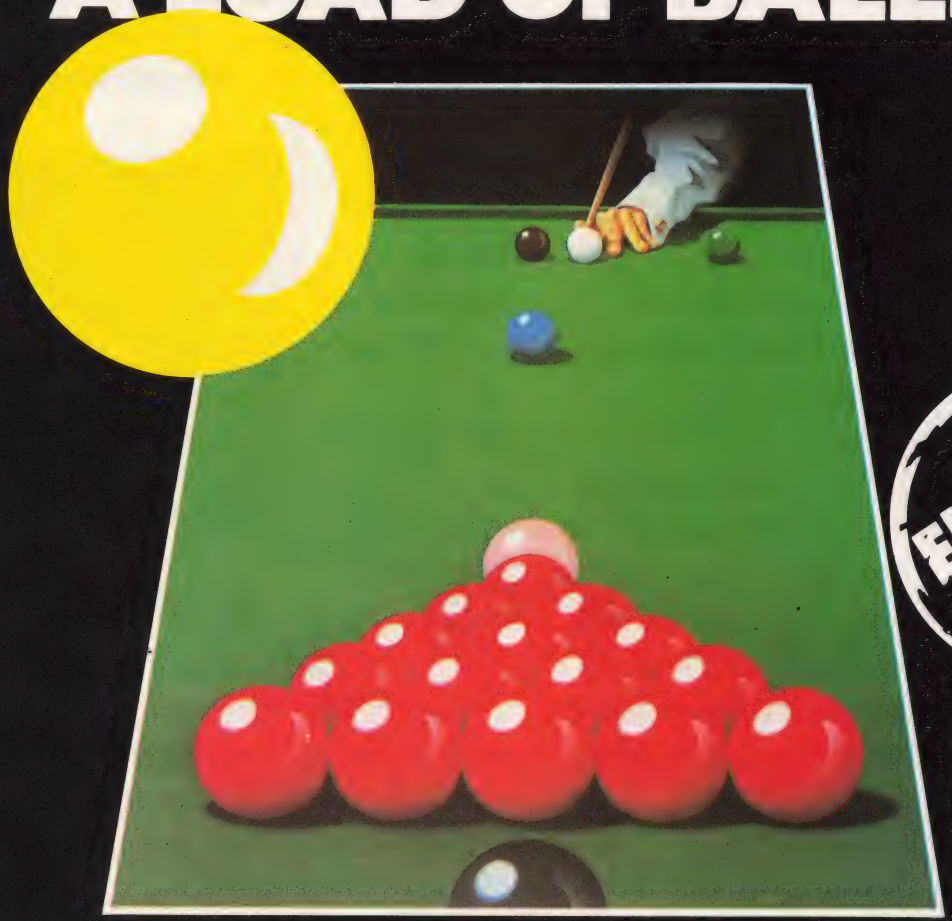
The BBC Micro is available from W H Smith Computer Shops, Boots, John Lewis and local Acorn stockists.

Alternatively 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 or 0933-79300.

The BBC Microcomputer System.

Designed, produced and distributed by Acorn Computers Limited.

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PERIPHERALS

ADD ONS

This month we investigate light pens and interfaces along with other 'extras' of interest

TROJAN LIGHT PEN for Dragon Microcomputer
Manufacturer: Trojan Products
Price: £10 including program

A light pen is a simple device which when pointed at a screen tells the joystick port how much light it is is picking up. The complex bit is the software which is an integral part of the system and this is where the Trojan light pen scores over many others.

The Trojan pen comes with a well-documented cassette which loaded easily after a little manipulation of the volume. All that is required to set up the system are the pen, a very bright screen and the space bar.

The instructions are very comprehensive, telling you how to use the joystick (0) command to tell where the pen is, and includes a breakdown of how the routine used by the demonstration software works. The demo tape then gives an example multiple choice section and advice on how to access the pen from machine code. Other options from the main menu are a light graph, showing how much light the pen can see at different points on the screen, a sound/music graph (which plays different notes at different points on the screen), a Nim game, and a particularly spectular HI RES drawing routine. This latter feature allows limited computer aided design by drawing with the pen. A list of options along the bottom of the screen allows you to move one of the two cursors, draw boxes and circles freehand, erase figures, fill an area or join up the two cursors.

Because the pen detects changing light levels it is necessary to point it at the option, press the space bar and wait for a stroke of light to be picked up. This may not be the neatest arrangement as the draw is very fiddly, but the quality of the software makes it a very worthwhile and economical package.

The Trojan Light Pen is available from **Trojan Products, 166 Derlwyn Dunvant, Swansea, AS2 7PF** or telephone **0792 205491.**



W.D. PRINTER INTERFACE for use with the BBC micro and ZX Printer
Manufacturer: W.D. Interfaces
Price: £29.95

Currently selling at £39.95 the ZX Printer is a very cheap printer with limitations. Coupled with an interface of this sort, costing less than £30, one can have a printer for the BBC micro for under £70. A very attractive proposition indeed when one considers that the cheapest printer on the market for the BBC machine is around £250. However, there is always a catch and as expected the quality of a cheap printer is not as good as with more expensive models. Having said that, the ZX Printer is an extremely popular and reliable machine producing quite acceptable print outs.

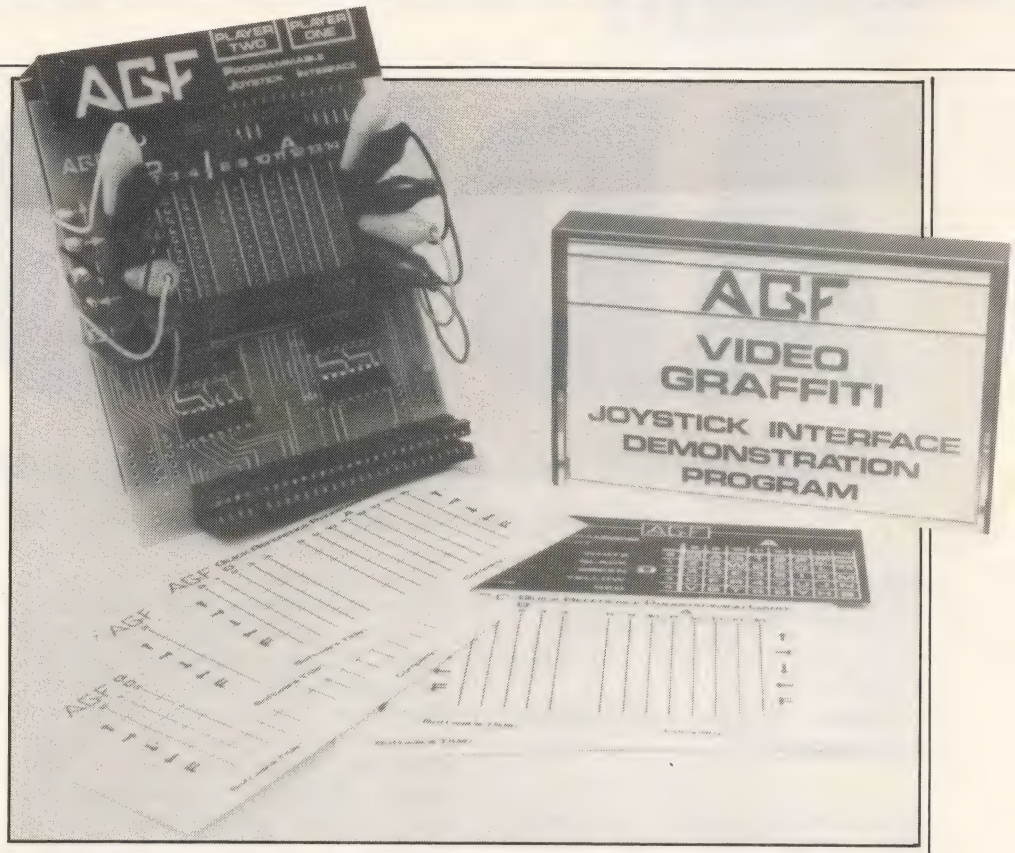
Now to the Interface itself. It plugs into the 1 Mhz bus on the BBC machine and requires mains power. The package is supplied with detailed documentation containing explanations of how to wire up a three pin plug through to how to use the machine coded river which sends data down the 1 Mhz bus. However, there is no explanation of how to go about doing more complicated operations than just ▶

ADD-ONS

printing text, and teletext characters and other non ascii characters are just printed as spaces. Since the teletext adaptor uses the same socket it couldn't be used at the same time as the Interface.

So the idea behind the Interface has its limitations, not least being the fact that it connects such a versatile microprocessor as the BBC to a very limited printer, but for those of you simply requiring listings of your programs, or if you already own a ZX Printer and wish to buy a BBC micro, this could just be an econimical buy.

The W.D Interface is available from **W.D. Interface, 12 Leabank Ave, Barforth, Leeds LS25 2BL** or telephone **0532 864328.**



AGF PROGRAMMABLE JOYSTICK INTERFACE for Sinclair Spectrum Manufacturer: AGF Hardware Price: £32.95

As games for the Sinclair Spectrum get more and more advanced higher scores are striven for. A joystick allows a much quicker response than a fiddly keyboard. However, as the Spectrum has no joystick port, there is no standard joystick available.

The ideal solution is to write software for the keys and then to mimic the keys with a joystick. This is what the AGF programmable joystick controller allows you to do. It plugs into the back of the Spectrum's edge connector.

The top of the interface has sockets for two Atari type joysticks, which have become a standard among joysticks. To buy one of these with the Interface will cost you £7.54 from AGF. The programmable part defines which direction corresponds to each key. This is done by using five pairs of coloured clips, one for each direction and one extra one. The centre of the board consists of thirteen vertical rails labelled 0 to 15 with the numerics 6 and 7 missing. For each key to be simulated on the keyboard matrix, two clips must be attached to the appropriate rails, one clip from 0 to 4 and one from 8 to 15. These are divided up into two sections, A for 8 to 15 and D for 0 to 4, presumably for across and down. This is where the corresponding key is found on the grid which comes with the Interface. The grid is backed with a sticky substance allowing it to be stuck on top of the Spectrum and there are ten cards for making a permanent note of which clips go where.

At £32.95 it is not cheap, but it is well made and easy to use. Because it is 'Programmable' and relies on keyboard input, it is unlikely to conflict with other Sinclair products. The Interface comes complete with a demonstration cassette called Video Graffiti which allows one to draw lines on the screen by simulating the cursor key. This program is quite limited however, and is only useful as a demonstration. The Interface is available from **AGF Hardware, 26 Van Gogh Place, Bognor Regis, W. Sussex PO22 9BY** or telephone **0243 823337.**

DATAPEN LIGHTPEN Manufacturer: Datapen Microtechnology Limited Price: £25

The Datapen is a stylish piece of hardware available for the BBC, DRAGON and VIC 20 computers. Much thought seems to have gone into the physical characteristics of the pen and it certainly handles very well. Special features include a red LED indicator light which lights up when valid video data are being taken on board, and an on/off switch which allows the computer to ignore any signals that come from the pen before the user is ready.

The pen upholds the claim that it is completely insensitive to local lighting conditions. Light from a phototransistor in the tip of the lightpen is amplified and passed through a highpass filter to give good rejection of light other than the high frequency light from the television or monitor raster.

The lightpen comes with a rubber tip to provide a non-slip effect on the screen and I found this most useful. It can however be easily removed if a low performance television is being employed and more light is needed.

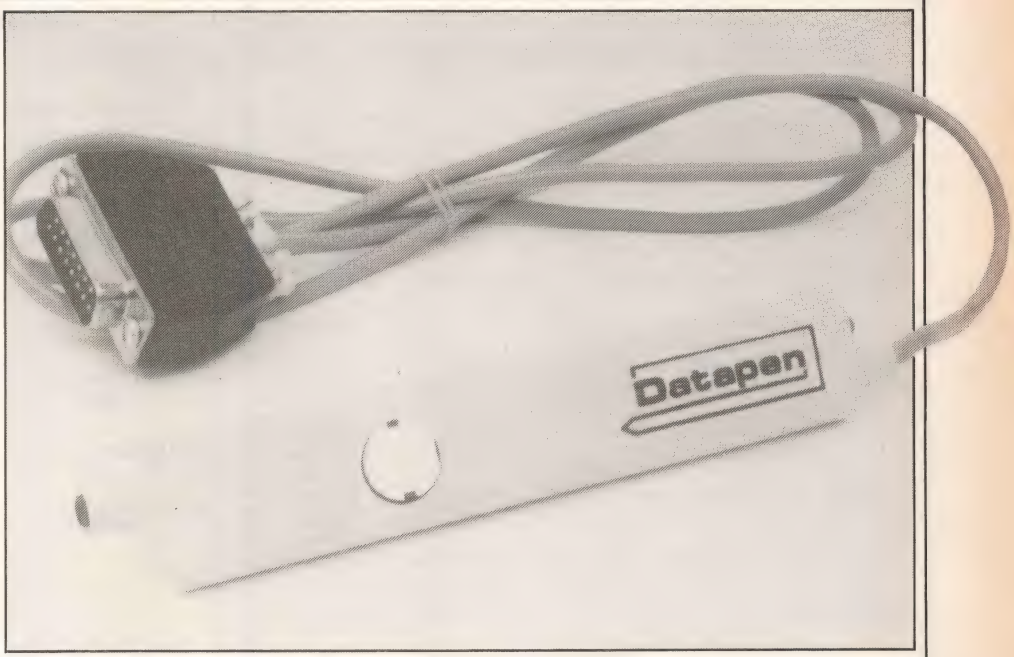
Accompanying Package

The supplied documentation for the pen is excellent with full instructions and explanation. There are example programs for demonstrating the values that the pen is generating in the computer and hints on finding higher resolution and stabilising position.

The demonstration software for the VIC 20 (unexpanded if necessary) are Shape-Create, Symbol-Draw and Medium Resolution Draw. The BBC and Dragon 32 get Shape-Create and Sketch. I tried out the BBC versions and both turned out to be excellent utilities demonstrating what the light pen can do.

In sketch you simply toggle between MOVE and DRAW, moving a cursor around the screen and drawing to it from the last position visited. The present and last coordinates are displayed on screen. The Shape-Create program is even better. I can't imagine an easier way of creating use-defined graphics on the computer. You simply choose the keyboard character you wish to use and go into DEFINE mode. Filling in the standard eight by eight square is simplicity itself. Deletion and changes in colour of display are also achieved using the pen.

Also provided is a listing of the demonstration program and hints on how to combine elements into your own programs. The Datapen is available from **Datapen Microtechnology Ltd, Kingsclere Road, Overton, Hants RG25 3JB.**



SUNCOM JOY SENSOR
Manufacturer: Consumer Electronics Ltd
Price: £29.95

The Suncom Joy Sensor is not a joystick in the true sense of the word since it isn't a stick, just a thin, flat, oblong box with pressure sensitive points on its surface, When in use it is similar to the Mattell Intellivision disks or Sord joypads.

It consists of a flat silver box measuring three inches by six by three-quarters. On its surface are two fire "Buttons" to allow for right and left handed players plus a rapid fire "button". At one end of the box is a recess containing the joystick simulator touch sensitive pad which actually replaces the joystick. Lines and squares on the pad mark out the direction of movement. In the middle of the box is a switch marked " * " or " + " to select the number of directions (eight or four).

In practice the system works well. One runs one's finger around the inside rim of the touch sensitive pad allowing smooth turns or holds one's fingere over more than one direction for rapid, sharp turns.

The printing on the device is slightly different to that on the box and the rapid fire sensor is not behind the word "Rapid" but below it. The device is light and not very robust but it doesn't need to be as there are no moving parts as in a normal joystick.

In summary, therefore, I found the rapid fire and the eight or four way switch very useful but think the price rather high.



The unit is available from **Consumer Electronics Ltd, Failsworth, Manchester M35 OHS** or by telephone **061-682 2339.**

BWN PROGRAM COPYHOLDER
Manufacturer: BWN Products
Price £6.95 + pp

Not your standard Add-on but a very useful gadget for any programmer, amateur or otherwise. By holding copy to be typed into a microprocessor at a comfortable distance from the eye, the eyestrain caused by reading it is greatly reduced. You may consider this improvement to be of considerable value when typing in some of our programs!

The copyholder consists of a rectangular board capable of holding a single sheet, magazine or book up to 12 inches in length, firmly in place. A flexible sliding rule is attached to the board to keep your place on the program copy and this can also be used to measure those awkward spaces in some program lines. When it is not required the program holder can be folded flat and stored in a drawer.

A useful appendage for the home computer enthusiast and not outrageously expensive. The copyholder is available from **BWN Products, 57 Tan-y-lan, Morriston, Swansea, SA6 7DU** or telephone **0792 781069** for details.

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CHOOSING A HOME MICRO

WARNING

Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

THE PITFALLS

"DON'T LET THE ADD ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost.
These offers usually have a hidden sting inasmuch as the essential accessories such as connection leads, peripherals and software often carry very high cost premiums.
e.g. software for low cost hardware usually costs between £29 and £49 for a ROM cartridge!!

CHECK THE QUALITY OF THE PRODUCT.

Raw materials are now an area where corners can be cut, and shoddy workmanship during 'building' can effect the 'up-time' of your unit.
Areas to watch out for are unreliable edge connectors, corrosion and poor quality P.C.B.s. Low quality components and bad design will seriously effect the reliability of the end product, and can lead to false economy.

DON'T BUY A GAMES MACHINE

Unless you want just games and nothing else! With a games computer you are limited.
Some computers, however, have the advantage of both games facility plus the whole world of computing to explore, as your interest and skills develop. A real computer system will allow you to expand your knowledge of the Hi-Technology world, and help earn its keep with its added uses in the field of education, communication and home business use.

SOFTWARE

Make sure the system you choose has a growing library of support software, to enable you to realize the full potential of your machine.

KEY POINTS TO LOOK FOR

● High Resolution Colour

In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together. If the result is less than 35,000, then the graphics can hardly be considered high resolution.
Without high resolution graphics displays such as those used in games tend to be "Chunky" in appearance.

● High Quality Sound

Some computers claim to provide a sound channel when in reality all that can be found inside the computer is a small buzzer controlled by electronic pulses. At the very least a sound facility should provide more than one channel and a raise channel as well (for gun shot effects in games for example). The best systems also provide envelope control of the sound channels to produce very sophisticated effects; very important for generating music. Also look for the ability to connect to external amplifiers.

● Keyboard

For accurate entry of programs and data into a computer it is important that the keyboard has a good tactile feel in operation. Coupled with acoustic feedback the user is fully aware when the computer has accepted his/her actions. Also of importance in a keyboard is layout. A standard computer keyboard layout will familiarise the user with the vast majority of computers used in the world of business and professional applications; very important if the purpose of purchasing a computer is educational.

● RAM

One of the most important features of a computer is the amount of RAM, or memory, included. In general the more powerful and exciting a computer program is the more RAM it requires. But take care, all computers are advertised quoting the total RAM used in the system. Computers use up a great deal of their own RAM for storing essential data and particularly in supporting the graphics display and the CPU.
If it is less than 32K think again, is it enough?

● Computer Language

It is too dificult to program a computer in its own binary language so high level languages are used, the most popular being BASIC. However, there are a number of BASICs, some being very different from the rest.
A de facto standard in the computer industry is Microsoft BASIC.
Learn this one and you will be able to program in the majority of computer BASICs; such an important point if a home computer is to be used to educate your children to face the technology of the future.

● Expansion

As your interest and knowledge of computing grows, you will need a computer system that will grow with you; able to accommodate Printers, Disk-drives, Joysticks, Communications Modem, and Colour Monitor, as well as produce HI-FI sound effects.



Choosing the right system carefully will save you from throwing your money away. Check full specification, plus peripherals and software prices, before you buy. Preferably choose a Real computer system that can expand to meet your needs.

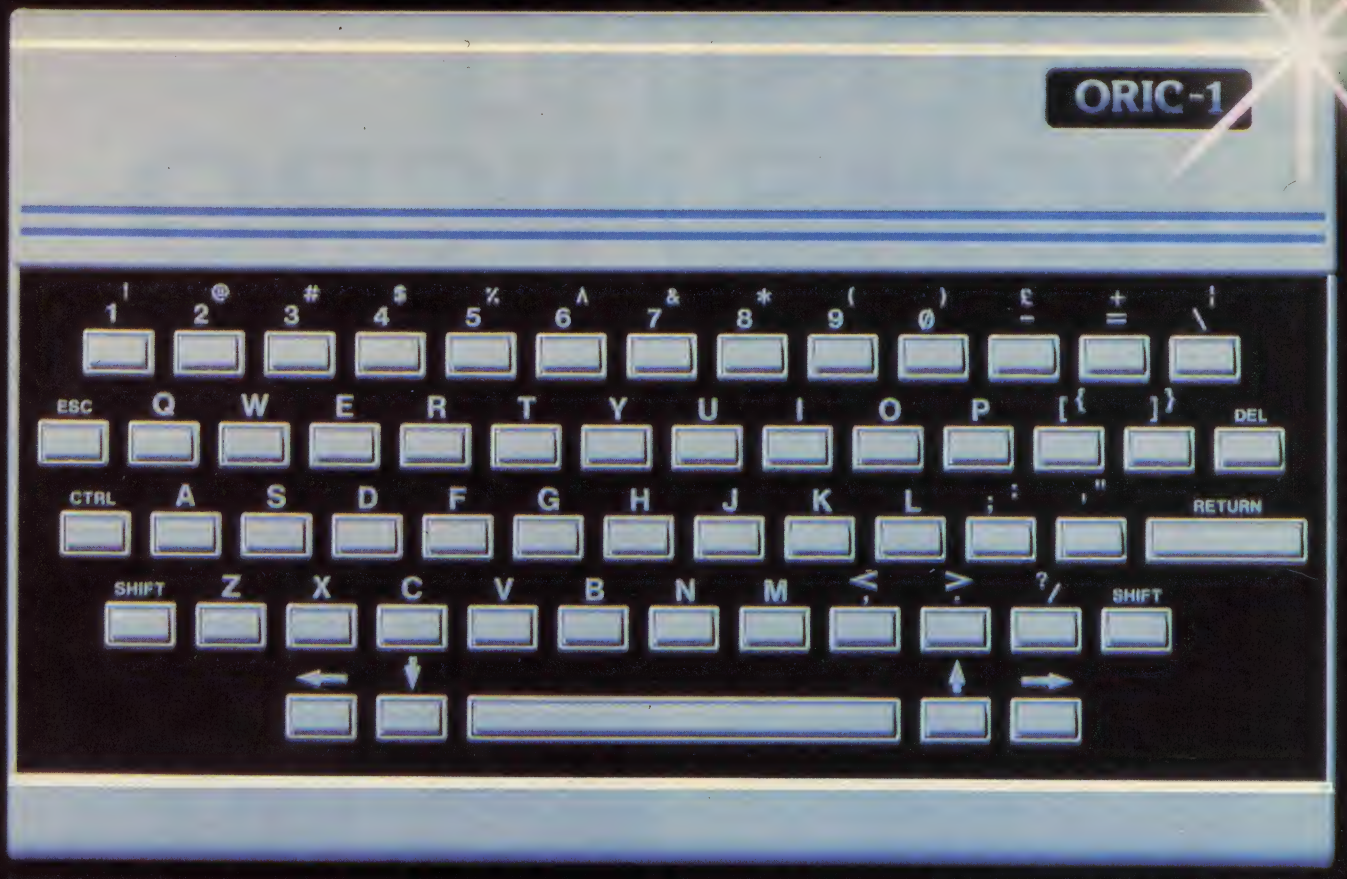
● Software

The computer you choose should have a growing selection of utility software to make the most of its capability.
Remember, computing is here to stay. You can't learn to compute on a toy, or a device which does not behave like a real computer.
In short, look out for a computer which offers all the points above, and you will be sure of getting the best value for money.

To find out which company offers you the right choice, with:-

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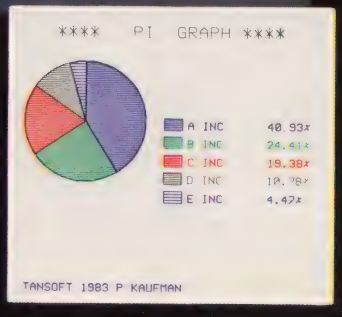
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ORIC Software

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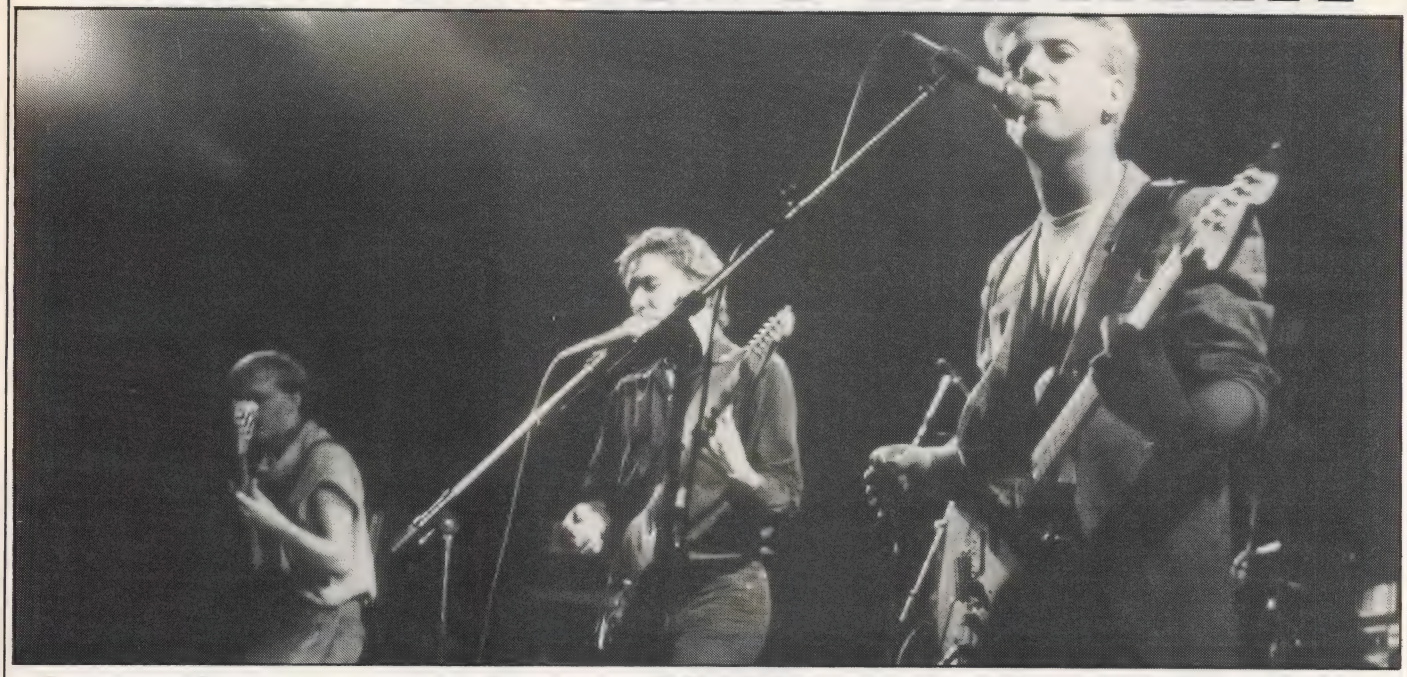
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CBM MUSIC MAKER



Learn how you and your CBM64 can make sweet music with this instructive program by Jamie Clyde.

One of the strengths of the Commodore 64 is the ability to produce sound. To the beginnner, getting the machine to make these sounds may seem impossible but it is really quite simple.

In order to produce a single note, one must turn on the speaker and set the waveform and pitch. To achieve these things a small amount of programming is necessary.

To turn on the speaker the standard statement, 'POKE 54296,15' is used. Setting the wavelength is necessary to inform the computer how to play the note. There are four choices of wavelength, which are as follows:

Triangle: smooth, flowing note:
POKE value 17

Sawtooth: rough, broken note:
POKE value 33

Pulse
POKE value 65

Sound/noise
POKE value 129

So, for example, a smooth flowing note is achieved by inputting the standard wavelength statement, 'POKE 54276', followed by the relevant POKE value, i.e. 'POKE 54276,17'.

To set the pitch, the high and low frequency registers must be POKED with the values given in the CBM 64 User Guide. For instance, to play middle C, enter 'POKE 54273,34:POKE 54272,75'.

Music Maker Program

This program demonstrates the above introductory remarks. The object is to put a 'tune' into the computer and then to hear it play back. There is a choice of instruments and if desired, backing music also. When typing in the listing be especially careful of Line 8000 and beyond.

Variables Used

NF	Note frequencies for tune
SF	Set values for notes
O1	Octave value to be added
OC	Octave number
I	Flag – solo or not
K$	Keyboard string (valid keys)
A1,A2	Backing music note values
D	Tempo
AD	Attack/decay
SR	Sustain/release
RT	Backing waveform
WA	Tune waveform
PH	High pulse frequency
PL	Low pulse frequency
L1,L2	Frequency for backing music
AT$	Cursor down string
Q	Number of notes in tune
R$	Get $

HINTS ON CONVERSION

Converting this program for use on other machines would be very difficult since the Commodore 64 has such complex sound facilities. The following list of peculiarities may help.

POKE Locations:
54296 volume
54272 voice 1, low frequency
54273 voice 1, high frequency
54274 voice 1, low pulse
54275 voice 1, high pulse
54277 voice 1, attack/decay (envelope)
54278 voice 1, sustain/release (envelope)
54279 voice 2, low frequency
54280 voice 2, high frequency
54281 voice 2, low pulse
54282 voice 2, high pulse
54283 voice 2, waveform
54284 voice 2, attack/decay (envelope)
54285 voice 2, sustain/release (envelope)

54276 voice 1, waveform
53281 background colour
GET X$ is the same as X$ = INKEY$
CHR$ (142) switch to upper case letters
53280 border colour
CHR$ (14) switch to lower case letters
CHR$ (8) disables SHIFT and RETURN keys (prevents user changing case mode)

HOW IT RUNS

Lines 100-130	Set up frequencies by reading in data
Lines 210-270	Main play routine – type in and record note
Lines 500-550	End of routine
Lines 2000-2050	Play note
Lines 3000-3450	Play backing music
Lines 5000-5990	Set up instrument and other choices
Lines 6000-6080	Input sound frequencies
Lines 7000-7090	Set up sound settings
Lines 7100-7170	End of tune routine
Lines 7500-7520	Play back tune
Lines 8000-8140	Instructions
Lines 10000-10070	Data for notes

PROGRAM LISTING

```
0 REM ******************
1 REM *  MUSIC MAKER   *
2 REM *                *
3 REM *FOR COMMODORE64*
4 REM *                *
5 REM *      B Y       *
6 REM * JAMIE   CLYDE *
7 REM *[C] J.C APR.'83*
8 REM ******************
90 PRINT"■ HANG ON PLEASE!
100 DIMNF(500,2),SF(96,2),A1(2,2),A2(6,2),K$(21)
110 FORT=0TO94:READSF(T,1),SF(T,2):NEXT
120 K$="AWSEDFTGYHUJKOLP:;*=↑"
130 FORT=1TO21:K$(T)=MID$(K$,T,1):NEXT
200 GOSUB5000:O1=13*5
210 FORN=1TO500
220 GETR$:IFR$=""THENFORI=1TO100:NEXT:GOTO500
230 FORG=1TO21:IFK$(G)=R$THENGOSUB2000:GOTO530
240 NEXTG:IFR$="■"THENQ=N:GOTO7100
250 R=ASC(R$):IFR(133ORR)139THENR$="":GOTO500
260 OC=R-133:PRINT"■";LEFT$(AT$,2);TAB(15)"■OCTAVE:■";OC
270 O1=13*OC
499 REM * FINNISH NOTE & RECORD IT *
500 IFR$=""THENNF(N,1)=0:NF(N,2)=0:POKE54283,0
530 IFA=1THENGOSUB3000
550 NEXTN
998 Q=N-1:GOTO7100
1999 REM * PLAY NOTE *
2000 IFO1+G)94THENG=G-21
2002 FORP=1TO2:NF(N,P)=SF(G+O1,P):NEXT
2010 POKE54283,WA
2020 FORKL=1TO2:POKE54281-KL,NF(N,KL):NEXT
2050 RETURN
2999 REM * VOICE NO.2 *
3000 ON F GOSUB3020,3200,3100
3010 GOTO3400
3020 L1=(NF(N,1)-13):L2=(NF(N,2)-13)
3025 IFL1<0THENL1=0
3027 IFL2<0THENL2=0
3030 RETURN
3100 AF=AF+1:IFAF=6THENAF=1
3110 L1=A2(AF,1):L2=A2(AF,2)
3120 RETURN
3200 AF=AF+1:IFAF=2THENAF=1
3210 L1=A1(AF,1):L2=A1(AF,2)
3250 RETURN
3400 POKE54272,L2:POKE54273,L1
3450 RETURN
4999 REM * SET UP PROGRAM *
5000 PRINT"■":POKE53280,3:POKE53281,6
5010 AT$="■■■■■■■■■■■■■■■■■■■■"
5020 PRINTLEFT$(AT$,5);TAB(15)"■ MUSIC MAKE ■
5030 PRINTTAB(12)"■(C)BY J. CLYDE '83"
5040 INPUT"■■■■■■DO YOU WANT INSTRUCTIONS [Y/N]";I$
5050 IFI$="Y"THENGOSUB8000
5060 PRINT"■■ INPUT:
5070 PRINT"■■■■■■■■1] PLAY INSTRUMENT
5080 PRINT"■■■■■■■■2] DEFINE OWN SOUND
5090 PRINT"ENTER 1/2"
5100 INPUTI:IFI<>1ANDI<>2THEN5100
5110 ON I GOSUB5800,6000
5120 PRINT"■■■ INPUT: ■
5130 PRINT"■■■■■■■■■■1] SOLO
5140 PRINT"■■■■■■■■■■2] ACCOMPANIED
5150 PRINT"ENTER 1/2
5160 INPUTI:IFI<>1ANDI<>2THEN5160
5170 IFI=2THENGOSUB5500
5180 PRINT"■":POKE53280,8:POKE53281,0
5190 GOSUB7000
5200 PRINT"■";TAB(13)"■ MUSIC MAKER ■
5210 PRINT"■■■KEYS 'F1-F7'TO CHANGE OCTAVE
5220 PRINT"■■■CLR/HOME TO ESCAPE/PLAYBACK■■
5230 PRINT"■■■W ■■E ■■■T ■■Y ■■U ■■■O ■■P ■■■* ■■↑ ■
5235 PRINT"■ A  S  DF  G  H  JK  L  :;  =  ■
5240 PRINT"■";LEFT$(AT$,2);TAB(15)"■OCTAVE:5
5245 PRINT"■";LEFT$(AT$,18);TAB(10)"■ SOUND INFORMATION ■
5250 PRINT"■■WAVEFORM :";WA
5260 PRINT"■ATTACK/DECAY :";AD
5270 PRINT"■SUSTAIN/RELEASE :";SR
5280 PRINT"■PULSE H :";PH
5290 PRINT"■PULSE L :";PL
5490 RETURN
5499 REM * SET NON SOLO MODE *
5500 PRINT"■■ INPUT: ■
5510 PRINT"■■■■■■■■■1] MELODIC  ACCOM.
5520 PRINT"■■■■■■■■■2] CONSTANT ACCOM.
5530 PRINT"■■■■■■■■■3] JAZZ     ACCOM.
5540 PRINT"■INPUT 1/2/3■
5550 INPUTI:IFI<>1ANDI<>2ANDI<>3THEN5550
5560 ON I GOSUB5600,5650,5700
5590 A=1:RETURN
5600 F=1:RT=17
5620 RETURN
5650 F=1:FORT=1TO2:A1(1,T)=SF(20,T):NEXT
5670 FORT=1TO2:A1(2,T)=SF(0,T):NEXT
5690 RT=33:RETURN
5700 F=1:F$="030834753685"
5710 FORTK=1TO3:A2(TK,1)=VAL(MID$(F$,TK*4,2))
5720 A2(TK,2)=VAL(MID$(F$,TK*4+2,2))
5730 NEXT:RT=129
5750 RETURN
5789 REM * CHOOSE AN INSTRUMENT *
5800 PRINT"■■INPUT:■
5810 PRINT"■■■■■■■1] PIANO
5820 PRINT"■■■■■■■2] FLUTE
5830 PRINT"■■■■■■■3] HARPSICORD
5840 PRINT"■■■■■■■4] XYLOPHONE
5850 PRINT"■■■■■■■5] ORGAN
5860 PRINT"■■■■■■■6] COLLIAPE
5880 PRINT"■■■■■■■7] ACCORDIAN
5890 PRINT"■■■■■■■8] TRUMPET
5900 PRINT"ENTER [1-8]"
5910 INPUTI:IFI<1ANDI>8THEN5910
5915 INPUT"■■TEMPO (1TO50)";D
5920 D=20:IFI=1THENWA=65:AD=9:SR=0:PL=255:PH=0:RETURN
5930 IFI=2THENWA=17:AD=96:SR=0:RETURN
5940 IFI=3THENWA=33:AD=9:SR=0:RETURN
5950 IFI=4THENWA=17:AD=9:SR=0:RETURN
5955 IFI=5ORI=6THENWA=17:AD=0:SR=240:RETURN
5960 IFI=7THENWA=17:AD=102:SR=0:RETURN
5970 WA=33:AD=96:SR=0
5990 RETURN
5999 REM * DEFINE SOUND *
6000 INPUT"WAVEFORM [P/S/N/T]";W$
6010 INPUT"ATTACK/DECAY [0-255]";AD
6015 IFAD<0ORAD>255THEN6010
6020 INPUT"SUSTAIN/RELEASE [0-255]";SR
6025 IFSR<0ORSR>255THEN6020
6030 INPUT"TEMPO [1-50]";D
6040 IFW$="P"THENINPUT"PULSE<H [0-15],L [0-255]>";PH,PL:WA=65
6050 IFW$="S"THENWA=33
6060 IFW$="T"THENWA=17
6070 IFW$="N"THENWA=129
6080 RETURN
6070 IFW$="N"THENWA=129
6080 RETURN
6999 REM * SET SOUND SETTINGS *
7000 POKE54272,0:POKE54273,0
7010 POKE54279,0:POKE54280,0
7015 POKE54296,15:POKE650,0
7020 POKE54276,RT:POKE54283,WA
7030 POKE54277,64:POKE54284,AD
7040 POKE54278,00:POKE54285,SR
7050 IFWA=65THENPOKE54281,PL:POKE54282,PH
7090 RETURN
7099 REM * END OF PROGRAM ROUTINE *
7100 PRINT"■■■ PRESS 'P' TO PLAY BACK
7110 PRINT"■      'T' TO PLAY AGAIN
7120 PRINT"■      'S' TO STOP
7130 INPUTR$
7140 IFR$="P"THENGOSUB7500:GOTO7100
7150 IFR$="S"THENPRINT"■":POKE54296,0:END
7160 IFR$="T"THENPOKE54296,0:RUN100
7170 GOTO7130
7499 REM * PLAY BACK *
7500 GOSUB7000:FORN=1TOQ
7510 IFA=1THENGOSUB3000
7515 GOSUB2010
7520 FORT=1TOD:NEXTT,N:RETURN
7999 REM * INSTRUCTIONS *
8000 PRINT"■";CHR$(8)CHR$(14)
8010 PRINTTAB(10)"■■■ \ ┌ ♥ ┐ ─ \ ♠ ┘ ¯ _ ■
8020 PRINTTAB(13)"■ BY \AMIE ┬LYDE
8030 PRINT"■■■■HE  OBJECT  OF  THIS PROGRAM  IS TO  ENABLE  YOU TO PLAY A";
8040 PRINT" TUNE AND HEAR IT  PLAYED  BACK TO YOU .  DU  ARE ABLE TO  PLAY A ";
8050 PRINT" PREDEFINED  INSTRUMENT OR  YOU  CAN MAKE YOUR OWN SOUNDS YOURSELF.
8060 PRINT"■■■■F  YOU  CHOOSE  TO DESIGN  YOUR OWN  SOUND  THEN  YOU ";
8070 PRINT" WILL  BE  ASKED WHAT  WAVEFORM,ATTAGK &  DECAY AND SUSTAIN";
8080 PRINT" & RELEASE.┬NTER THE WAVEFORM AS A LETTER [IE. 'P'FOR PULSE]."
8090 PRINT"■■■■DU  CAN  BE  ACCOMPANIED  BY  THE  COMPUTER  IN  THREE  DIF";
8100 PRINT"FERENT  WAYS .  \ELODIC  MEANS ";
8105 PRINT"THE  COMPUTER PLAYS AN  OCTAVE BELOW YOU . ";
8110 PRINT"┬ONSTANT  IS A ECHO  AND \AZZ IS A JAZZY BEAT!.
8120 PRINT"■■■ ┬└─♥♥ │ ┌─ ♥┐●─┬─┤♠└─ │┌─ ┬┌─┘└┘┌─  ■
8130 GETR$:IFR$<>" "THEN8130
8140 PRINTCHR$(142):RETURN
10000 DATA1,18,1,35,1,52,1,70,1,90,1,110,1,132,1,155,1,179,1,205,1,233,2,6
10010 DATA2,37,2,69,2,104,2,140,2,179,2,220,3,8,3,54,3,103,3,155,3,210
10020 DATA4,12,4,73,4,139,4,208,5,25,5,103,5,185,6,16,6,108,6,206,7,53,7,163,8,2
3
10030 DATA8,147,9,21,9,159,10,60,10,205,11,114,12,32,12,216,13,156,14,107,15,70
10040 DATA16,47,17,37,18,42,19,63,20,100,21,154,22,227,24,63,25,177,27,56
10050 DATA28,214,30,141,32,94,34,75,36,85,38,126,40,200,43,52,45,198,48,127
10060 DATA51,97,54,111,57,172,61,126,64,188,68,148,72,169,76,252,81,161,86,105
10065 DATA91,140,96,254,102,194,108,223,115,88,122,52,129,120,137,43,145,83
10070 DATA153,247,163,31,172,210,183,25,193,252,205,133,217,189,230,176,244,103

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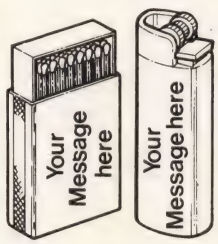
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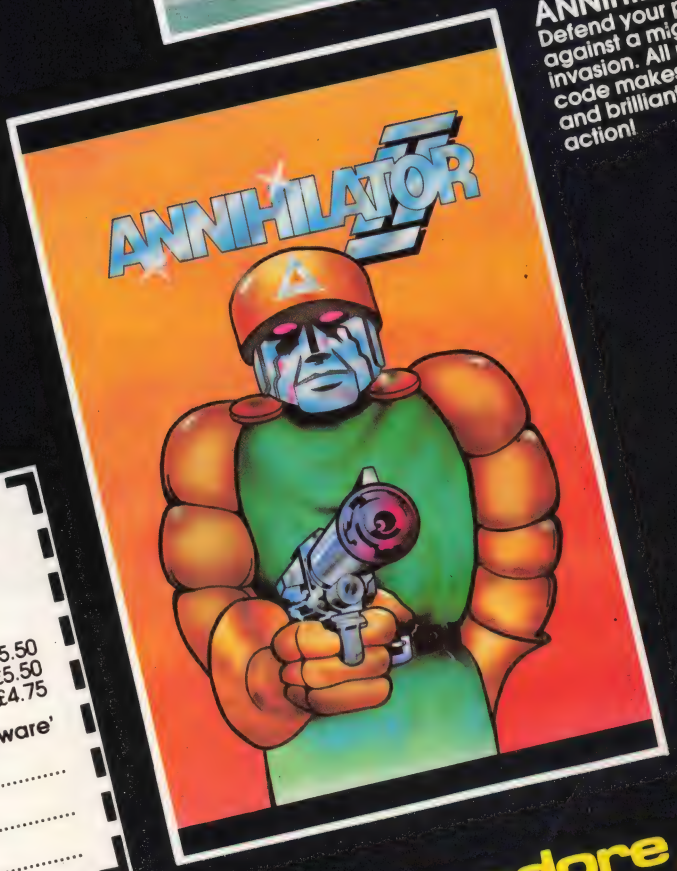
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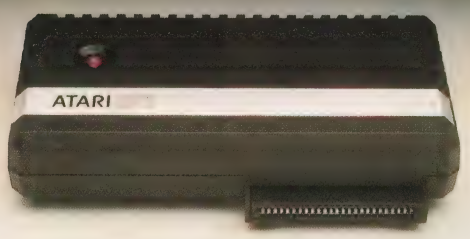
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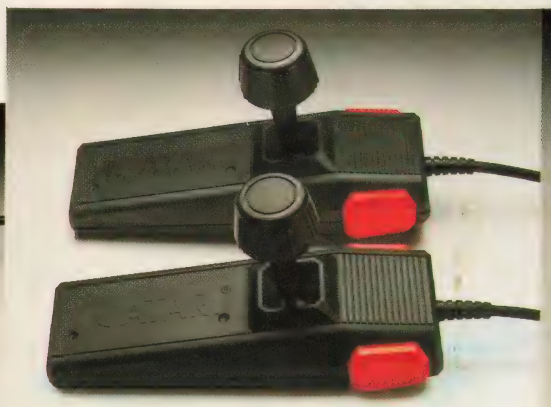
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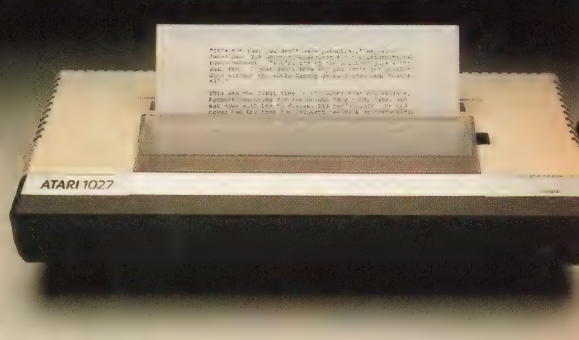
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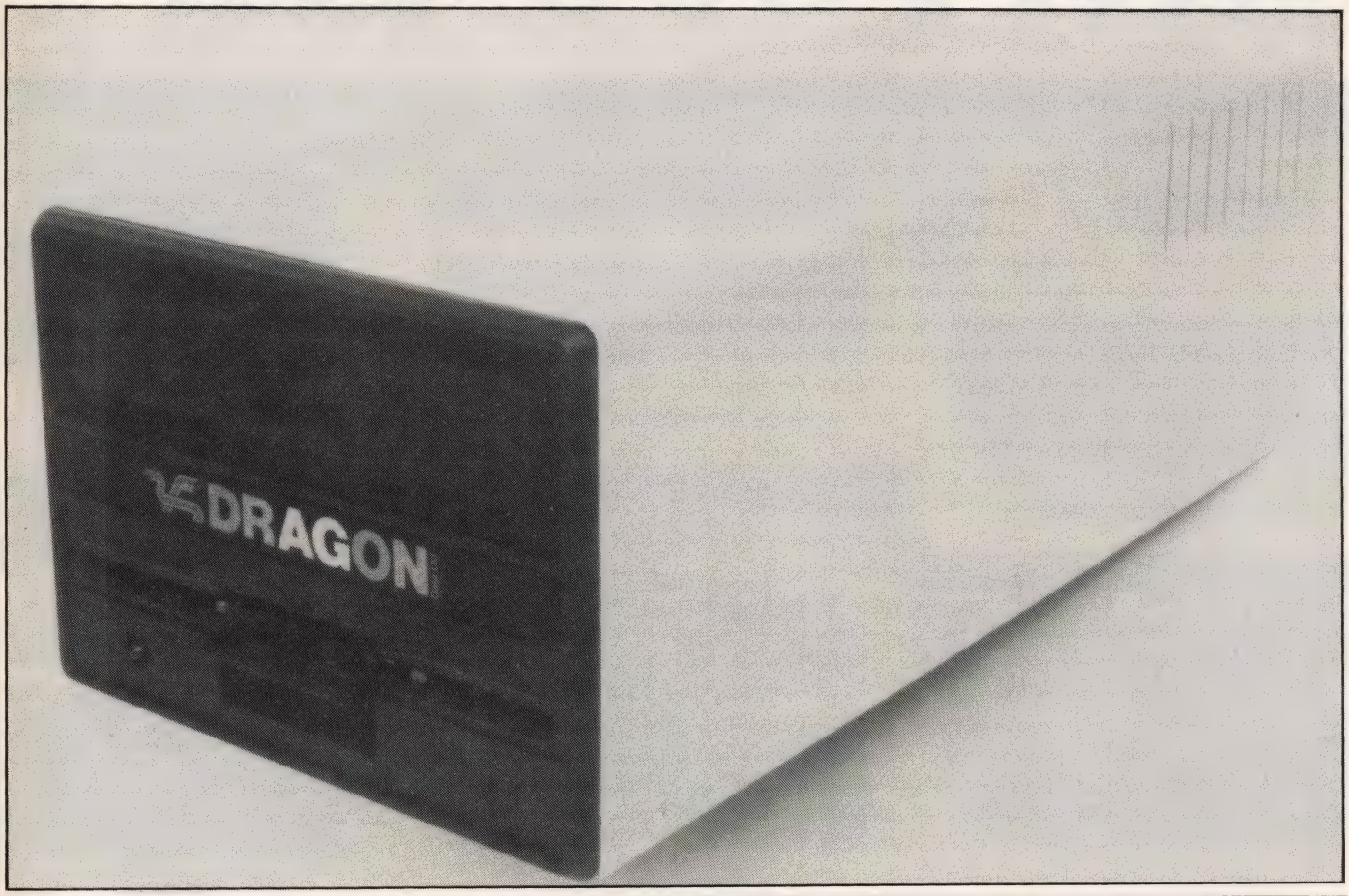
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HARDWARE REVIEW

DRAGON DISCS



David Waters investigates what Drives the Dragon's Discs and examines the latest piece of hardware from this Welsh Company.

The first question anyone has to ask is are you going to spend £250 buying a disc system for the Dragon. If you've been using the machine for any length of time you must by now be frustrated with the slow loading and saving of programs by the cassette system. Discs, in theory at least should relieve you of all that. However, the cost of discs, £275 for the first drive with a controller and then £200+ for any more does make you think twice. But assuming that you have made the choice and have struggled out and found a dealer with the hardware for sale what do you get for your money?

Starting Up

The disc drive comes in a box with cables for mains and a ribbon cable to connect up to the DOS itself which is contained in a black cartridge which fits into the cartridge port on the Dragon. Making sure that the machine is switched off first you connect up and insert the cartridge, switch on, and you are ready to go. The Dragon operates its discs in a 40 track double density format, this means that you can get in theory 186,000 bytes onto a disk. In practice, because one track is taken up by the directory you only have about 175,000 bytes per disc — enough for most people!

The first command you come across is the Disc initialing command, which formats a virgin disc to 40 tracks so that it can be read by the disc system. This is built into the DOS and when called the machine automatically takes over and formats the disc for you. Once you have completed this you are ready to go.

Running

With the disc system there are some new commands for you to learn. Up till now you have been using CSAVE and CLOAD for your programs with a cassette; with the disc you use the same commands, but without the 'C'. The preliminary handbook lists all the commands, and gives a brief description of them, but my initial reaction to it is that it assumes that the user has a working knowledge of discs. Many of the functions are not

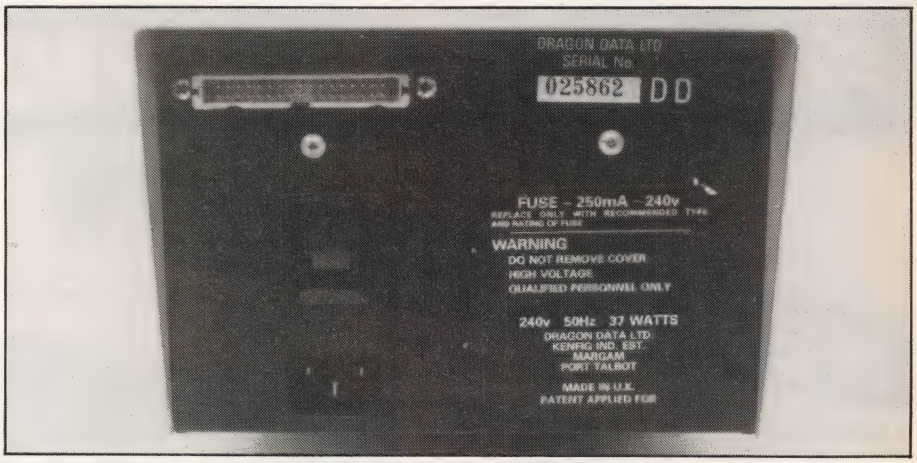
fully explained and once more I can see a fortune being made by people publishing books to explain the operating system in detail. Another word of warning, I have now seen three copies of the DOS handbook, and so far each one contains more pages of *errata*. This can be be most disturbing and one hopes that Dragon will keep those who bought the early versions informed of these later changes.

The Dragon DOS does add another dimension to the computer, and if you are the type of person who has spent hours writing your own programs one advantage of the system will be that you can save to disc as you go along, thereby thwarting any danger of a mains or computer failure which could result in the loss of many hours work. The disc system is very fast, the access time compares very favourably with other systems.

Software Problems

Unfortunately at the time of writing there is very little software available to run with the Dragon discs. Dragon Data have decided to hold back their own software until the release of the Dragon 64 later this year when the upgraded machine will come into its own with the OS.9 operating system. So for the 32K machine its a question of shopping around, or trying to use some of your own home-grown programs. One firm who have been very fast off the mark with software are MST Consultants who specialise in business type programs for the Dragon. I looked at three of their programs, having already had experience of them in the original cassette version. For these applications, mailing lists, business accounts and spreadsheets you can really appreciate the value of discs. The programs, which are all menu driven, load into the machine in seconds and all the data can be loaded and saved onto disc. If you are operating a small business these are a godsend.

I also tried to load some of the commercial BASIC programs which I had, but came up against a problem if any of them used a large amount of memory. Because the DOS uses up about 1.5K of RAM to operate I constantly found that running made me run out of memory when I encountered the lines which set up the arrays. The handbook gives you no help on this and it is left to the user to try and figure out the areas of memory which are being



corrupted and to alter the program accordingly.

With discs it is relatively easy to make backup copies, and because the discs themselves can be damaged very easily it is advisable to do so as soon as you have finished working for the day. Good housekeeping is essential with discs. The Dragon makes this easy, you can use the copy command and just make a copy of individual files, or you can use the more powerful Backup command which transfers all the information from one disc to another. Even if you only have one disc drive the Dragon gives you on screen instructions to move the disc in and out of the drive. The DIR command will always tell you what the current state of play is on any disc — it lists all the files you have on disc, how long they are, what type of file (BASIC, machine code, data or backup), and the number of free bytes remaining on the disk.

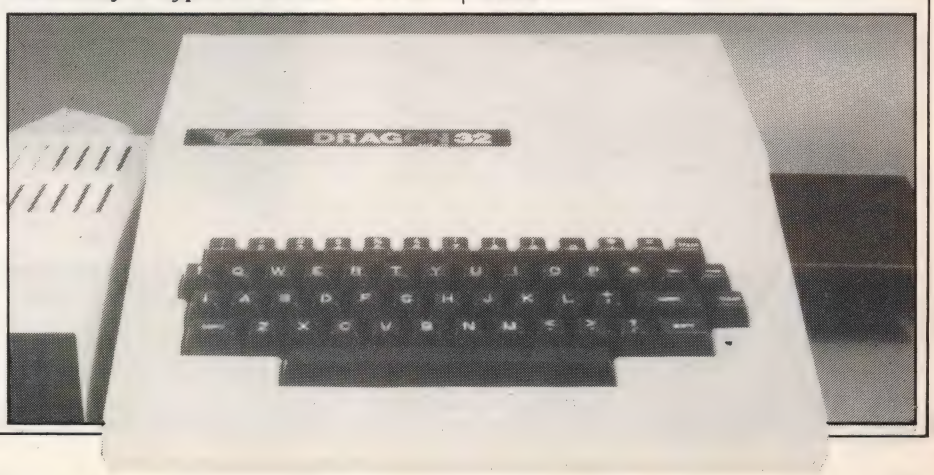
Additional Commands Possible

Using the Dragon DOS also gives you some new commands for the Dragon itself when writing programs. One that I found the most useful is AUTO. No longer is it necessary to type in the line number as you enter a program, the computer does it for you and you can set the parameters for it yourself. For some reason the DOS is set up in default to start at line 100 and increase in steps of 10, but you can change the default very simply and make your own. If you want to build in a pause to the execution of your program the command WAIT is provided, e.g. WAIT5000 pauses the program for 5 seconds.

Unsolved Problems

Unfortunately the DOS does nothing for some of the other problems with the Dragon — the 32 column screen size and the inherent problem with bounce on the keys, making touch typing a hazardous exercise — you'll have to wait for the upgraded Dragon 64 for those. What it does provide is a good, efficient and fast storage system — at the end of the day you've got to make up your mind if the cost of it is worth it.

The software mentioned in this article: Mailing list, Business Accounts, Spreadsheet, Stock Control etc is available from **MST Consultants, Newton Road, Bovey Tracey, Devon TQ13 9BB.**



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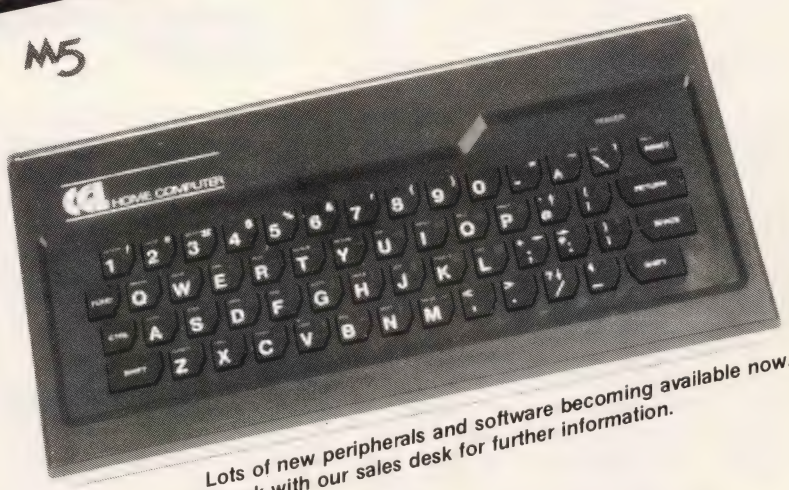
The Atari 800XL is unlikely to be available before Christmas, but is in any case no different from the 600 XL except all 64K RAM is built inside box.

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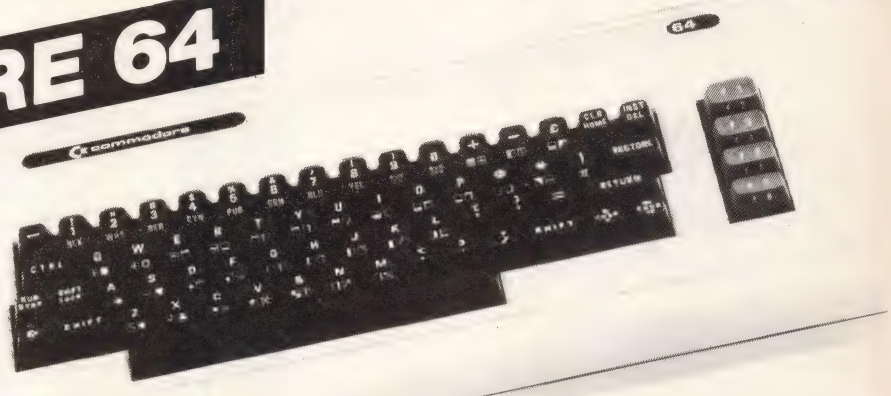
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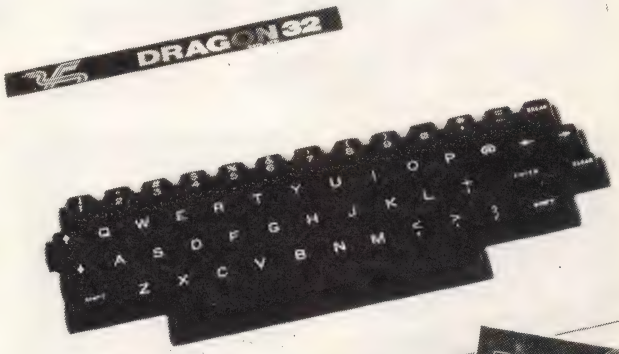
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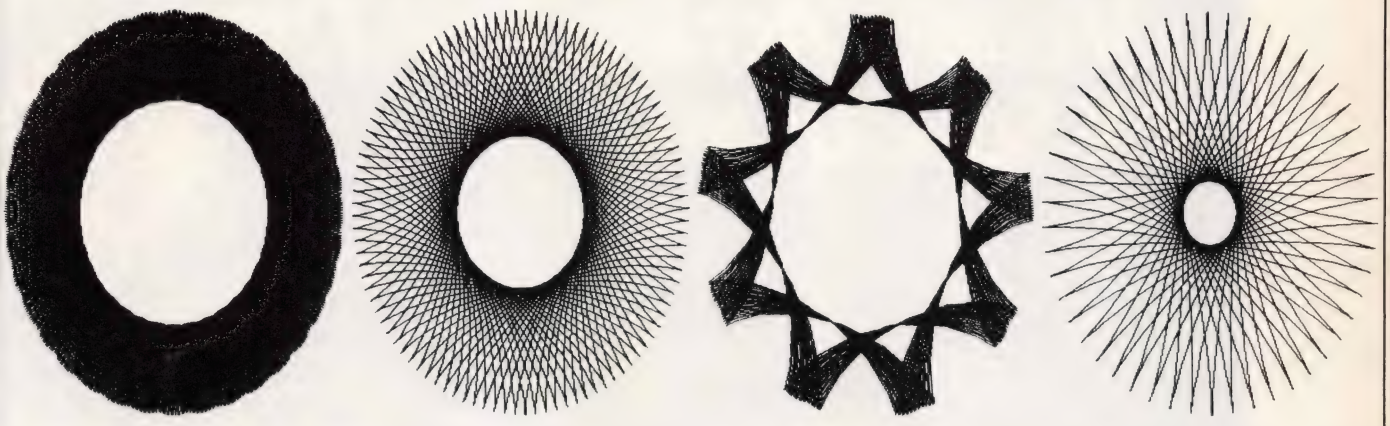
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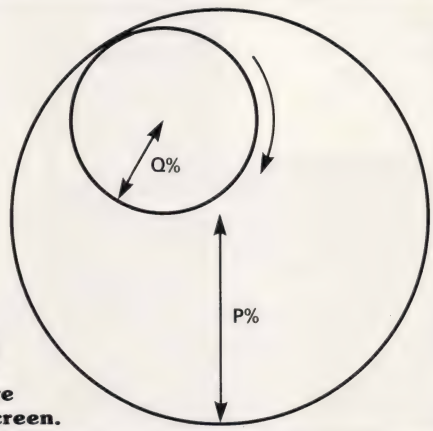
SPIROGRAPH



Run rings around your BBC micro using this artistic program by Paul Salt.

This program draws spiral patterns on the screen in three colours. It simulates a wheel revolving around a larger wheel (Fig. 1). The diameter of the larger wheel is fixed to its largest value (so as to draw the largest pattern) and you select the radius of the smaller wheel to produce the varying patterns. Experiment with different radii to see what patterns you can produce.

There is a small procedure to calculate the number of times the smaller wheel revolves around the larger one, so that the user can estimate the complexity (and therefore the time) of the pattern. Integer variables are used to speed up the program. The pattern is drawn on a white background, the first one third is drawn in green, the second third in red and the final third in yellow.



The smaller circle rotates within the outer. By inputting different radii, the various patterns are produced on the screen.

HOW IT RUNS

Line 10	Sets mode
Lines 20	P% – radius of larger wheel. G% controls resolution of the pattern, low resolution – high speed and vice versa. This is set to 10 (10°)
Line 40	Calls PROCCAL
Line 110	Graphics cursor to starting point
Lines 140-220	Draw pattern
Lines 140-170	Selects colour of pattern
Lines 190-200	Polar co-ordinates of pattern
Line 230	Beeps when finished
Lines 250-300	Procedure for calculating number of times the small wheel rotates around the larger wheel to complete the pattern.

PROGRAM LISTING

```
 10 MODE1
 20 P%=500:G%=10
 30 INPUT''"ENTER THE SIZE OF THE WHEEL (1-500) ";Q%
 35  IF Q%>500 THEN30
 40  PROCCAL
 50 PRINT''"THE PEN WILL GO AROUND ";K%" TIMES"
 60 PRINT''"PRESS ANY KEY TO CONTINUE"
 70 S=GET
 80  VDU19,0,2,0,0,0
 90  COLOUR131
100 CLS
110  MOVE P%+630,500
120 M%=360*(K%/3)
130  A%=P%-Q%
140  FOR Z%=0 TO 360*K% STEP G%
150  IFZ%<=M%:GCOL0,0
160  IFZ%>M% AND Z%<=2*M%:GCOL0,1
170  IFZ%>2*M%:GCOL0,2
180 B=RAD(Z%)
190 X%=A%*COS(B)+Q%*COS((A%/Q%)*B)+630
200 Y%=A%*SIN(B)-Q%*SIN((A%/Q%)*B)+500
210  DRAWX%,Y%
220 NEXT Z%
230 VDU7
240  END
250 DEF PROCCAL
260  FOR Y%=1 TOQ%
270  IF (500*Y%)MODQ%=0THEN290
280 NEXTY%
290  K%=Y%
300 ENDPROC
```

PLAY TH

Arcade Action For The ZX Spectrum

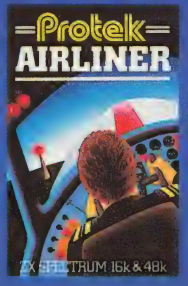
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The protek joystick interface is simple to use. It just plugs in at the back of your Spectrum and is compatible with any "Atari type" Joystick Connector. We recommend the Spectravision Joystick at only £9.95 for Pistol Grip Joystick with a top and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

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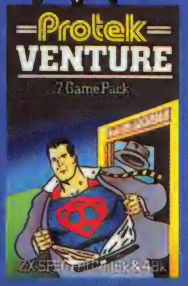












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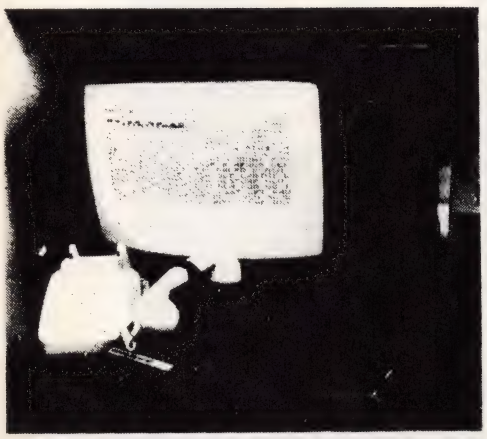
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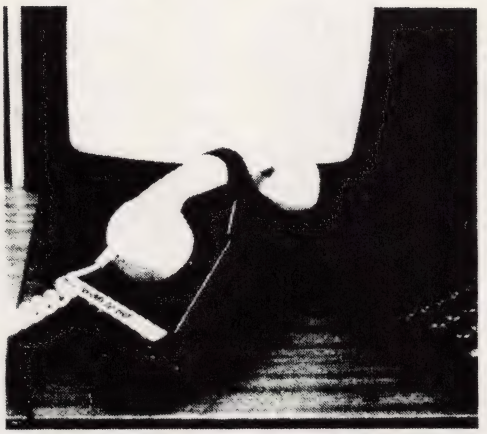
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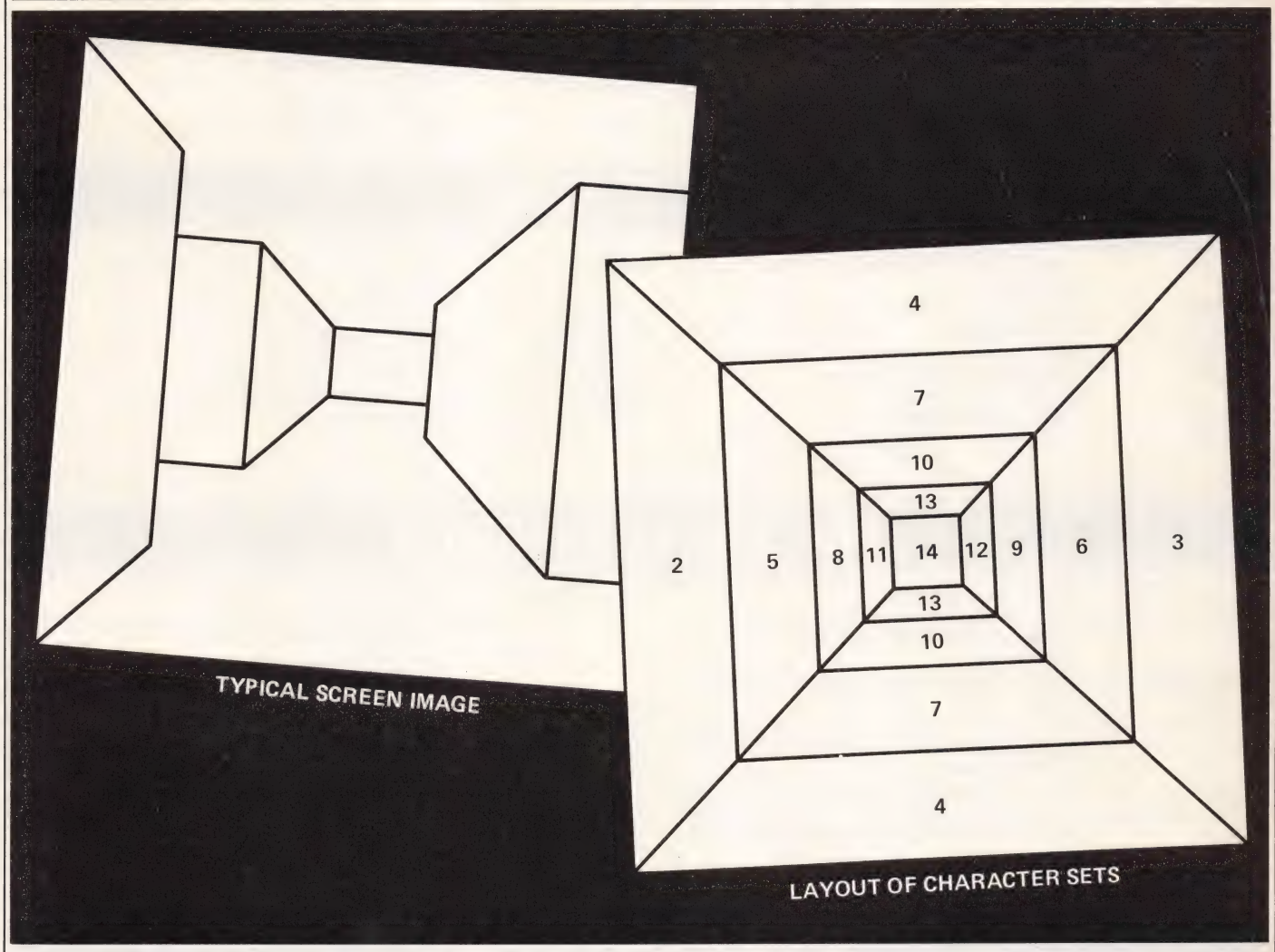
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SOFTWARE

IN A MAZE

G. Anderson's adaptable program will a-maze you for hours.



This game has been coded in TI Extended Basic and runs on the TI99/4A in just under 16K. The game is easy, all the player has to do is escape from a simple maze, sounds easy?

When the program is run initially a simple set of instructions on the use of the keyboard control is displayed and when the player is ready he can continue by pressing any key. The program then scans the screen to read the maze and on completion, the maze will be displayed showing the exits and the player's position.

After a short delay the screen will clear and the game can begin. A three dimensional image is then shown of your position. You will see that the maze is not so simple! If the player becomes hopelessly lost he can use the help option by pressing the H key. This will redisplay the maze with the player's position. However it will also add 10 steps to your score.

In theory it's possible to emerge from the maze in under 16 steps, but if you get that good then why not change the layout of the maze and see just how difficult it can become (modify lines 840-1080). As a tip, the direction in which the player faces is towards the top of the screen at the start of the game. If this becomes too easy then change line 630 to DIR = INT(RND * 4) + 1 and this will return a random direction. This game shows a method of creating a maze game on any micro. This method simply uses a two dimensional matrix (array) in which values of 0 and 1 represent pathways. All that any program has to do is to scan the area around the player to detect the presence of walls and pathways. All that is then required is to add the desired graphics.

This game uses many TI graphics commands, which like most micros are unique, and could ▶

IN A MAZE

cause problems when converting the code to run on other computers. It may be easier to redesign your own graphics than to convert these used here.

Before I explain the commands used it may be wise to explain the method used to draw the corridors. Firstly the TI99/4A is said to use a very slow form of BASIC so the problem was how to redraw the corridor quickly. This was overcome on the Texas by drawing the corridor once only and then simply changing the colour sets used for each of the three elements of the corridor i.e. walls and floors. Using this method of patterning, which is very simple on the Texas (CALL COLOR), the speed of execution can be brought up to an acceptable level. It should also be said for those trying to convert this game to TI Basic that the sprites used are there only to clip the doors to give a clearer image and could be safely omitted.

Apart from the graphics commands the basic syntax of the game can remain the same on any micro. Listed here are some of the non-standard commands used within this program.

List of Variables

S	Character set number.
MAZE$(,)	Matrix to store corridor locations.
DIR	Direction of player, 1 = up, 2 = right, 3 = down, 4 = left.
YP,XP	Vertical and horizontal position of player.
ST	Number of steps taken.
L	Length of corridor in front of player.
CF	Presence of wall flag.
FO	Presence of exit flag.

HOW IT RUNS

100-360	Introduction and instructions.
370	Randomize.
380-420	Character codes used.
470-480	Set up maze.
490-560	Scan maze and store values in matrix.
570-590	Locate player starting position.
600	Display map and player.
610-640	Draw and paint corridor.
650-730	Scan keyboard for instructions.
740-800	Check for legal move, exit and execute instruction.
810-830	Help routine (display map and player).
840-1080	Draw map subroutine.
1090-1510	Subroutine to colour corridor.
1520-1870	Subroutine to draw corridor.
1880-1940	Subroutine to display player's position.
1950-2010	Program termination.

HINTS ON CONVERSION

CALL CLEAR	Clears entire screen.
CALL CHAR(X,A$)	Redefines characters, X represents the character code. A$ defining code in hexdecimal.
CALL SCREEN(X)	Paints screen to desired colour (2 represents black).
CALL KEY(Ø,K,S)	Detects keyboard input. K is the ASCII code of key depressed. S is the keyboard status Ø if no key is depressed.
CALL COLOUR(A,B,C)	Defines the foreground and background colours of the desired colour set. A is the character set and B,C are the foreground and background colours.
CALL SPRITE (X,A,B,C,D)	Creates and positions the sprite. X = Sprite number 1 to 28. A = Character code number of pattern required. B = Foreground colour of sprite. C = Vertical position 1 to 194. D = Horizontal position 1 to 256.
CALL DELSPRITE(ALL)	Deletes all sprites from screen.
CALL CHARSET	Resets all characters to their standard shape.

The code has been written so that the maze defined in lines 840 to 1080 can be changed by the player. This means that almost any maze can be constructed and the program will still run. However, the exits shown as a ' (grave Character code 96) symbol should be left in the same positions and no corridor should be longer than 4 steps.

PROGRAM LISTING

```
100 REM *********************
110 REM ****               ****
120 REM **** IN A MAZE     ****
130 REM ****               ****
140 REM *********************
150 REM *** G ANDERSON    ***
160 REM ***  5-2-82       ***
170 REM *********************
180 CALL CLEAR
190 DISPLAY AT(5,9):"I N  A  M A
 Z E"
200 DISPLAY AT(6,9):"===========
====="
210 DISPLAY AT(8,1):"THE OBJECT
OF THIS GAME IS"
220 DISPLAY AT(9,1):"TO ESCAPE F
ROM A MAZE IN THE"
230 DISPLAY AT(10,1):"LEAST POSS
IBLE NUMBER OF "
240 DISPLAY AT(11,1):"MOVES. THE
 DIFFERANCE IS "
250 DISPLAY AT(12,1):"THAT YOU A
RE IN THE MAZE."
260 DISPLAY AT(14,1):"TO MOVE FO
RWARD PRESS E."
270 DISPLAY AT(15,1):"TO TURN US
```

```
E THE ARROW KEYS."
280 DISPLAY AT(16,1):"THE H KEY
CAN BE USED FOR "
290 DISPLAY AT(17,1):"HELP BY SH
OWING THE MAZE "
300 DISPLAY AT(18,1):"AND YOUR P
OSITION."
310 DISPLAY AT(19,1):"HOWEVER, I
T WILL ADD 10"
320 DISPLAY AT(20,1):"STEP TO YO
UR SCORE.";
330 DISPLAY AT(22,1):"THE DOORS
ARE SHOWN IN "
340 DISPLAY AT(23,1):"GREEN & TH
E EXIT IN BLACK"
350 DISPLAY AT(24,1):"  PRESS AN
Y KEY TO START"
360 CALL KEY(0,K,S):: IF S=0 THE
N 360
370 CALL CLEAR :: RANDOMIZE
380 C$(1)="FFFFFFFFFFFFFFFF"
390 C$(2)="80C0E0F0F8FCFEFF"
400 C$(3)="0103070F1F3F7FFF"
410 C$(4)="FF7F3F1F0F070301"
420 C$(5)="FFFEFCF8F0E0C080"
430 REM ****LOAD CHARS*****
440 FOR S=2 TO 14 :: FOR T=1 TO
5
450 CALL CHAR(23+8*S+T,C$(T))
460 NEXT T :: NEXT S
470 CALL SCREEN(2)
480 GOSUB 840
490 REM ****LOAD ARREY*****
500 DIM MAZE$(21,29)
510 FOR Y=1 TO 21 :: FOR X=0 TO
29
520 CALL GCHAR(Y,X+2,D)
530 IF D=72 OR D=96 THEN MAZE$(Y
,X)="1" ELSE MAZE$(Y,X)="0"
540 NEXT X :: NEXT Y
550 FOR Y=0 TO 21 :: MAZE$(Y,0)=
"0" :: NEXT Y
560 FOR X=0 TO 29 :: MAZE$(0,X)=
"0" :: NEXT X
570 REM FIND POSITION OF PLAYER
AT RANDOM
580 YP=INT(RND*20)+1 :: XP=INT(R
ND*6)+11
590 IF MAZE$(YP,XP)="0" THEN 580
600 CALL COLOR(6,14,1):: GOSUB 8
40
610 CALL CLEAR :: CALL COLOR(6,1
,1,7,1,1)
620 GOSUB 1520
630 DIR=1
640 GOSUB 1090
650 REM *******START*******
660 CALL KEY(0,K,S):: IF S=0 THE
N 660
670 IF K=72 THEN 810
680 IF K=69 THEN 740
690 IF K=83 THEN DIR=DIR-1
700 IF K=68 THEN DIR=DIR+1
710 IF DIR=0 THEN DIR=4
720 IF DIR=5 THEN DIR=1
730 GOSUB 1090 :: GOTO 660
740 IF DIR=1 AND MAZE$(YP-1,XP)=
"1" THEN YP=YP-1 :: GOTO 780
750 IF DIR=2 AND MAZE$(YP,XP+1)=
"1" THEN XP=XP+1 :: GOTO 780
760 IF DIR=3 AND MAZE$(YP+1,XP)=
"1" THEN YP=YP+1 :: GOTO 780
770 IF DIR=4 AND MAZE$(YP,XP-1)=
"1" THEN XP=XP-1 :: GOTO 780
780 ST=ST+1 :: GOSUB 1090
790 IF YP=10 AND XP<3 AND DIR=4
THEN 1950
800 IF YP=10 AND XP>19 AND DIR=2
 THEN 1950 ELSE GOTO 660
810 REM ********HELP*******
820 ST=ST+10
830 CALL COLOR(6,13,1):: GOSUB 8
40 :: CALL CLEAR :: GOSUB 1520 :
: GOSUB 1090 :: GOTO 660
840 REM ******DRAW MAP*****
850 CALL CLEAR :: CALL DELSPRITE
(ALL)
860 DISPLAY AT(1,1):"   H HHHH
  HHHH"
870 DISPLAY AT(2,1):"H HHHH  H
HHH H    HHH"
880 DISPLAY AT(3,1):"H  H   HHHH
   HHHH H HHH H"
890 DISPLAY AT(4,1):"H HHHH H  H
HH  H  HHH H HHH"
900 DISPLAY AT(5,1):"HHH  HHH  H
 H     H HHHH  H"
910 DISPLAY AT(6,1):"     H HHHH
   HHHH  H H  HH"
920 DISPLAY AT(7,1):"   HHHH  H
  H H   HHHH   H"
930 DISPLAY AT(8,1):"   H  H  HH
H  HHHH    H HHHH"
940 DISPLAY AT(9,1):" HHHH HHHH
HHHH H   HHH  H"
950 DISPLAY AT(10,1):"H H   H
 H H      H   HHH"
960 DISPLAY AT(11,1):" H     H
 HHHH  H  H HHH H"
970 DISPLAY AT(12,1):" HHHH  HHH
  H H  HHHH H HHH"
980 DISPLAY AT(13,1):"  H HHH  H
```

IN A MAZE

```
HHH HHHH    H H HH"
990 DISPLAY AT(14,1):" HHHH H  H
     H   HHHH    H"
1000 DISPLAY AT(15,1):"HH H  HHH
H  HHHH HHH H   HHH"
1010 DISPLAY AT(16,1):" HHHH  H
   H    H HHH HHH H"
1020 DISPLAY AT(17,1):"HH  HHHH
 H H  HHHH H  H HH"
1030 DISPLAY AT(18,1):"H H  H
 HHHH  H   HHHH H"
1040 DISPLAY AT(19,1):"HHH  HHHH
 H  HHHH  HH  HH  H"
1050 DISPLAY AT(20,1):"  HHHH  H
HH  H  HHHH    HHHH"
1060 IF YP=0 THEN 1080
1070 GOSUB 1880
1080 RETURN
1090 REM *****DRAW DOORS*****
1100 CF=0 :: L=0 :: S=-1 :: FO=0
1110 IF YP=10 AND XP<3 AND DIR=4
 THEN FO=1
1120 IF YP=10 AND XP>24 AND DIR=
2 THEN FO=1
1130 ON DIR GOTO 1140,1410,1230,
1320
1140 REM *****UP********
1150 IF MAZE$(YP-L,XP)="0" THEN
CF=1
1160 S=S+3 :: IF S=14 THEN 1500
1170 IF CF=1 AND FO=0 THEN CALL
COLOR(S,5,5,S+1,5,5,S+2,5,5):: C
ALL COLOR(#S-1,1,#S+12,1,#S,1,#S
+13,1):: GOTO 1160
1180 IF CF=1 AND FO=1 THEN CALL
COLOR(S,2,1,S+1,2,1,S+2,2,1):: C
ALL COLOR(#S-1,1,#S+12,1,#S,1,#S
+13,1):: GOTO 1160
1190 IF MAZE$(YP-L,XP-1)="1" THE
N CALL COLOR(S,13,15):: CALL COL
OR(#S-1,15,#S+12,15)ELSE CALL CO
LOR(S,6,15):: CALL COLOR(#S-1,1,
#S+12,1)
1200 IF MAZE$(YP-L,XP+1)="1" THE
N CALL COLOR(S+1,13,15):: CALL C
OLOR(#S,15,#S+13,15)ELSE CALL CO
LOR(S+1,6,15):: CALL COLOR(#S,1,
#S+13,1)
1210 CALL COLOR(S+2,15,1)
1220 L=L+1 :: GOTO 1150
1230 REM *****DOWN********
1240 IF MAZE$(YP+L,XP)="0" THEN
CF=1
1250 S=S+3 :: IF S=14 THEN 1500
1260 IF CF=1 AND FO=0 THEN CALL
COLOR(S,5,5,S+1,5,5,S+2,5,5):: C
ALL COLOR(#S-1,1,#S+12,1,#S,1,#S
+13,1):: GOTO 1250
1270 IF CF=1 AND FO=1 THEN CALL
COLOR(S,2,1,S+1,2,1,S+2,2,1):: C
ALL COLOR(#S-1,1,#S+12,1,#S,1,#S
+13,1):: GOTO 1250
1280 IF MAZE$(YP+L,XP+1)="1" THE
N CALL COLOR(S,13,15):: CALL COL
OR(#S-1,15,#S+12,15)ELSE CALL CO
LOR(S,6,15):: CALL COLOR(#S-1,1,
#S+12,1)
1290 IF MAZE$(YP+L,XP-1)="1" THE
N CALL COLOR(S+1,13,15):: CALL C
OLOR(#S,15,#S+13,15)ELSE CALL CO
LOR(S+1,6,15):: CALL COLOR(#S,1,
#S+13,1)
1300 CALL COLOR(S+2,15,1)
1310 L=L+1 :: GOTO 1240
1320 REM ******LEFT********
1330 IF MAZE$(YP,XP-L)="0" THEN
CF=1
1340 S=S+3 :: IF S=14 THEN 1500
1350 IF CF=1 AND FO=0 THEN CALL
COLOR(S,5,5,S+1,5,5,S+2,5,5):: C
ALL COLOR(#S-1,1,#S+12,1,#S,1,#S
+13,1):: GOTO 1340
1360 IF CF=1 AND FO=1 THEN CALL
COLOR(S,2,1,S+1,2,1,S+2,2,1):: C
ALL COLOR(#S-1,1,#S+12,1,#S,1,#S
+13,1):: GOTO 1340
1370 IF MAZE$(YP+1,XP-L)="1" THE
N CALL COLOR(S,13,15):: CALL COL
OR(#S-1,15,#S+12,15)ELSE CALL CO
LOR(S,6,15):: CALL COLOR(#S-1,1,
#S+12,1)
1380 IF MAZE$(YP-1,XP-L)="1" THE
N CALL COLOR(S+1,13,15):: CALL C
OLOR(#S,15,#S+13,15)ELSE CALL CO
LOR(S+1,6,15):: CALL COLOR(#S,1,
#S+13,1)
1390 CALL COLOR(S+2,15,1)
1400 L=L+1 :: GOTO 1330
1410 REM ******RIGHT*******
1420 IF MAZE$(YP,XP+L)="0" THEN
CF=1
1430 S=S+3 :: IF S=14 THEN 1500
1440 IF CF=1 AND FO=0 THEN CALL
COLOR(S,5,5,S+1,5,5,S+2,5,5):: C
ALL COLOR(#S-1,1,#S+12,1,#S,1,#S
+13,1):: GOTO 1430
1450 IF CF=1 AND FO=1 THEN CALL
COLOR(S,2,1,S+1,2,1,S+2,2,1):: C
ALL COLOR(#S-1,1,#S+12,1,#S,1,#S
+13,1):: GOTO 1430
1460 IF MAZE$(YP-1,XP+L)="1" THE
N CALL COLOR(S,13,15):: CALL COL
```

```
OR(#S-1,15,#S+12,12)ELSE CALL CO
LOR(S,6,15):: CALL COLOR(#S-1,1,
#S+12,1)
1470 IF MAZE$(YP+1,XP+L)="1" THE
N CALL COLOR(S+1,13,15):: CALL C
OLOR(#S,15,#S+13,15)ELSE CALL CO
LOR(S+1,6,15):: CALL COLOR(#S,1,
#S+13,1)
1480 CALL COLOR(S+2,15,1)
1490 L=L+1 :: GOTO 1420
1500 IF FO=1 THEN CALL COLOR(14,
2,1)ELSE CALL COLOR(14,5,1)
1510 RETURN
1520 REM *******DRAW*******
1530 CALL CLEAR
1540 FOR TT=2 TO 14 :: CALL COLO
R(TT,1,1):: NEXT TT
1550 DISPLAY AT(2,5):")888888888
8888888888882"
1560 DISPLAY AT(3,5):"()88888888
8888888888820"
1570 DISPLAY AT(4,5):"(()8888888
8888888888200"
1580 DISPLAY AT(5,5):"(((()88888
8888888882000"
1590 DISPLAY AT(6,5):"((((APPPPP
PPPPPPPJOOOO"
1600 DISPLAY AT(7,5):"((((@APPPP
PPPPPPJHOOOO"
1610 DISPLAY AT(8,5):"((((@@APPP
PPPPPJHHOOOO"
1620 DISPLAY AT(9,5):"((((@@@YHH
HHHHBHHHOOOO"
1630 DISPLAY AT(10,5):"((((@@@XY
HHHHB`HHHOOOO"
1640 DISPLAY AT(11,5):"((((@@@XX
@";CHR$(128);CHR$(128);"Z``HHHOO
OO"
1650 DISPLAY AT(12,5):"((((@@@XX
P";CHR$(136);CHR$(136);"X``HHHOO
OO"
1660 DISPLAY AT(13,5):"((((@@@XX
P";CHR$(136);CHR$(136);"X``HHHOO
OO"
1670 DISPLAY AT(14,5):"((((@@@XX
T";CHR$(128);CHR$(128);"{``HHHOO
OO"
1680 DISPLAY AT(15,5):"((((@@@X`
HHHHC`HHHOOOO"
1690 DISPLAY AT(16,5):"((((@@@`H
HHHHHCHHHOOOO"
1700 DISPLAY AT(17,5):"((((@@DPP
PPPPPPKHHOOOO"
1710 DISPLAY AT(18,5):"((((@DPPP
PPPPPPPKHOOOO"
1720 DISPLAY AT(19,5):"((((DPPPP
PPPPPPPPKOOOO"
1730 DISPLAY AT(20,5):"(((,88888
8888888883000"
1740 DISPLAY AT(21,5):"((,888888
8888888888300"
1750 DISPLAY AT(22,5):"(,8888888
8888888888830"
1760 DISPLAY AT(23,5):",88888888
8888888888883"
1770 CALL MAGNIFY(4)
1780 CALL CHAR(32,RPT$("F",64)):
: CALL CHAR(36,RPT$("F",32)&RPT$
("0",32))
1790 CALL SPRITE(#1,32,1,153,49)
:: CALL SPRITE(#14,32,1,9,49)
1800 CALL SPRITE(#2,32,1,153,193
):: CALL SPRITE(#15,32,1,9,193)
1810 CALL SPRITE(#4,32,1,129,81)
:: CALL SPRITE(#17,32,1,33,81)
1820 CALL SPRITE(#5,32,1,129,161
):: CALL SPRITE(#18,32,1,33,161)
1830 CALL SPRITE(#7,32,1,113,105
):: CALL SPRITE(#20,32,1,49,105)
1840 CALL SPRITE(#8,32,1,113,138
):: CALL SPRITE(#21,32,1,49,138)
1850 CALL SPRITE(#10,36,1,105,12
0):: CALL SPRITE(#23,36,1,57,120
)
1860 CALL SPRITE(#11,36,1,105,13
8):: CALL SPRITE(#24,36,1,57,138
)
1870 RETURN
1880 REM ***DISPLAY POSITION****
*****
1890 DISPLAY AT(YP,XP)SIZE(1):CH
R$(80)
1900 FOR T=1 TO 50
1910 FOR T1=1 TO 5 :: CALL COLOR
(7,2,1,9,5,1):: NEXT T1
1920 FOR T2=1 TO 5 :: CALL COLOR
(7,9,1,9,5,1):: NEXT T2
1930 NEXT T
1940 RETURN
1950 REM ****END SEQENCE****
1960 CALL CLEAR :: CALL DELSPRIT
E(ALL):: CALL SCREEN(3):: CALL C
HARSET
1970 DISPLAY AT(5,10):"WELL DONE
"
1980 DISPLAY AT(7,3):"YOU DID IT
 IN ";ST;" MOVES"
1990 DISPLAY AT(10,2):"TO PLAY A
GAIN PLEASE RERUN"
2000 DISPLAY AT(12,8):"THE PROGR
AMME"
2010 END
```

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```
  1 REM **********************
  2 REM *      BOMBER        *
  3 REM *  BY RICHARD TAYLOR *
  4 REM * © '83 September '83 *
  5 REM **********************
  6 REM
 10 RANDOMIZE 1000
 20 RANDOMIZE USR 61030
 30 RANDOMIZE : BORDER 6
 40 OVER 0: INVERSE 0: FLASH 0
 50 BRIGHT 0: INK 0: PAPER 7
 60 CLS
 70 GO SUB 9000
 80 GO SUB 8000
 90 LET Hi=0: LET z=1: LET Scor
e=0
 100 CLS : PRINT "  HI:";Hi;TAB
20;"SCORE:";Score
 110 PLOT 0,163: DRAW 255,0
 120 LET a=4000: REM LIMIT a
 130 LET a=6000: REM INTERACT a
 140 GO SUB 3000
 150 LET x=0: LET y=50: REM MOVE
 Plane,x,y
 160 LET x=255: LET a=30: REM MO
VE Enemy,x,a
 170 GO SUB 2000: GO TO 170
1000 LET a=0: LET b=176
1010 REM MOVE Plane,a,b\ENABLE P
lane
1020 REM ALL Bomb\MOVE Bomb,a,b
1030 REM ENABLE Bomb
1040 REM MOVE Enemy,a,b\ENABLE E
nemy
1050 CLS
1060 FOR a=0 TO 7
1070 PRINT PAPER a;: REM FILL
1080 BEEP .1,a+5: NEXT a
1090 PAUSE 25: FOR a=60 TO 0 STE
P -1: BEEP .005,a: NEXT a
1100 FOR c=0 TO 1000 STEP 20
1110 LET a=10: LET b=3: LET d=50
1120 REM SOUND a,b,c,d
1130 NEXT c
1140 LET a$="SCORE:"+STR$ Score
1150 LET x=0: LET y=50: LET t=2:
 LET w=3
1160 REM TEMPS\LARGE
1170 IF Hi>Score THEN GO TO 1200
1180 LET Hi=Score: LET a$="A New
 HIGH SCORE"
1190 LET x=60: LET y=100: LET t=
2: LET w=1: PRINT INK 1;: REM LA
RGE
1200 PRINT #0; FLASH 1;"      A
 New Level? (y/n)
1210 IF INKEY$<>"" THEN GO TO 12
10
1220 IF INKEY$="n" OR INKEY$="N"
 THEN GO TO 1500
1230 IF INKEY$<>"y" AND INKEY$<>
"Y" THEN GO TO 1220
1240 INPUT "New Level? ";Level
1250 IF Level<0 OR Level>3 OR Le
vel<>INT Level THEN GO TO 1240
1260 GO TO 90
1500 INPUT INKEY$; PRINT #0; FLA
SH 1;"      Another Game? (y/n)
"
1510 IF INKEY$<>"" THEN GO TO 15
10
1520 IF INKEY$="y" OR INKEY$="Y"
 THEN LET Score=0: LET z=1: GO T
O 100
1530 IF INKEY$<>"n" AND INKEY$<>
"N" THEN GO TO 1520
1540 LET a$="OK": LET w=16: LET
t=22
1550 CLS
1560 LET x=0: LET y=0: REM TEMPS
\LARGE
1570 LET a=21: LET b=31: REM GET
 x,y,a,b,a$
1580 FOR a=0 TO 21: LET b=a*.687
5
1590 REM PUT a,b,a$
1600 PAUSE 5: NEXT a
1610 LET a=INT (RND*8): PAPER a:
 BORDER a: CLS : BEEP 1,-10
1620 GO TO 1610
2000 LET a$=INKEY$: IF a$="" THE
N RETURN
2010 IF a$="6" THEN LET y=y+1+(L
evel<2): LET Score=Score-2
2020 IF a$="7" THEN LET y=y-1-(L
evel<2): LET Score=Score-10
2025 PRINT AT 0,26;Score;"  "
2030 IF y<20 THEN LET y=20
2032 IF y>168 THEN LET y=168
2035 REM MOVE Plane;COLUMN Plane
,y
2040 IF a$<>"0" THEN RETURN
2050 REM USE Bomb,z
2060 LET z=z+1: IF z=4 THEN LET
z=1
2070 REM LET a=LINE Plane\LET b=
COLUMN Plane\LET c=LINE Bomb
2075 IF c<>176 THEN RETURN
2080 LET a=a+10: LET c=(INT ((c+
4)/8))-32*(c>250): REM MOVE Bomb
,b,a
2090 RETURN
3000 FOR a=2 TO 31: LET b=INT (R
ND*10)+1: IF RND>.8 THEN GO TO 3
040
3010 LET d=INT (RND*5): FOR c=21
 TO 21-b STEP -1
3020 PRINT AT c,a; INK d; BRIGHT
 RND;"▩": BEEP .005,c+25: NEXT c
3030 PRINT AT c,a; INK d;"▲"
3040 NEXT a: RETURN
4000 REM LMTPARAM
4010 IF h$="plane" THEN GO TO 50
00
4015 IF h$="enemy" THEN GO TO 45
00
4020 LET o=176: REM LET p=CURREN
T h$\USE h$,h\MOVE h$,COLUMN h$,
o\ENABLE h$\USE h$,p
4030 CONTINUE
4500 REM LET o=LINE enemy
4510 LET o=o+11+INT (RND*6): IF
o>=150 THEN LET o=150
4520 IF o<20 THEN LET o=20
4530 LET p=255: REM MOVE enemy,p
,o\ENABLE enemy
4540 CONTINUE
5000 REM LET y=LINE Plane
5010 LET p=0: LET y=y+4: IF y>=1
68 THEN GO TO 5500
5020 REM MOVE Plane,p,y\ENABLE P
lane
5030 LET Score=Score-1: PRINT AT
 0,26;Score;"  "
5040 BEEP .005,60: CONTINUE
5500 LET a=176: LET b=0: REM MOV
E Plane,b,a\ENABLE Plane
5510 REM MOVE Enemy,b,a\ENABLE E
nemy
5520 REM ALL Bomb\MOVE Bomb,b,a\
ENABLE Bomb
5530 POKE 23681,0: CLS
5540 LET a$="YOU HAVE LANDED"
5550 LET w=2: LET t=1: LET x=0:
LET y=0
5560 PRINT INK 2;: REM LARGE
5570 LET Score=Score+200
5580 GO TO 1090
6000 REM INTPARAM
6010 IF h$="bomb" OR i$="bomb" T
HEN GO TO 7000
6020 IF h$="plane" OR i$="plane"
 THEN POKE 23681,0: GO TO 1000
6030 LET p=255: LET o=50: REM MO
VE enemy,p,o\ENABLE enemy
6040 CONTINUE
7000 IF h$="enemy" OR i$="enemy"
 THEN GO TO 7500
7005 IF i$="bomb" THEN LET h=i
7010 LET o=176: REM LET p=CURREN
T Bomb\USE Bomb,h\LET q=LINE Bom
b\LET r=COLUMN Bomb\MOVE Bomb,CO
LUMN Bomb,o\ENABLE Bomb\USE Bomb
,p
7020 LET q=INT (q/8): LET r=INT
(r/8): IF r>31 THEN LET r=31
7025 IF q>21 THEN LET q=21
7030 LET p=q+INT (RND*5)+1: IF p
>21 THEN LET p=21
7035 FOR o=q TO 10 STEP -1: PRIN
T AT o,r-1+(r=0);" ";AT o,r;" ";
AT o,r+1-(r=31);" ": BEEP .01,o+
30: NEXT o
7040 FOR o=q TO p: PRINT AT o,r-
1+(r=0);" ";AT o,r;" ";AT o,r+1-
(r=31);" ": BEEP .01,o+30: NEXT
o
7070 LET Score=Score+8-(Level*2)
: PRINT AT 0,26;Score;"  "
7080 CONTINUE
7500 LET o=50: REM MOVE Enemy,CO
LUMN Enemy,o\ENABLE Enemy
7510 IF h$="bomb" THEN LET i=h
7520 REM LET p=CURRENT Bomb\USE
Bomb,i\MOVE Bomb,COLUMN Bomb,o\E
NABLE Bomb\USE Bomb,p
7530 CONTINUE
8000 LET a$="BOMBER": LET x=8
8010 LET y=0: LET t=2: LET w=5
8020 PRINT PAPER 5; BRIGHT 1;"
8030 REM LARGE
8040 PLOT 0,160: DRAW 255,0
8050 LET a$="  A Game using"
8060 LET x=0: LET y=25
8070 LET t=1: LET w=2
8080 REM TEMPS\LARGE
8090 PLOT 0,0: DRAW 255,0
8100 DRAW 0,175: DRAW -255,0
8110 DRAW 0,-175: LET t=3
8120 LET w=6: LET x=8
8130 LET y=35: LET a$="FIFTH"
8140 PRINT INK 2;: REM LARGE
8150 LET t=2: LET w=1
8160 LET x=55: LET y=65
8170 LET a$="By RICHARD TAYLOR"
8180 PRINT INK 1;: REM LARGE
8190 PRINT AT 12,5;"Key 6 to mov
e down"
8200 PRINT AT 14,5;"Key 7 to mov
e up"
8210 PRINT AT 16,5;"Key 0 to dro
p a bomb"
8220 PRINT AT 18,3;" You must c
lear a path to";AT 19,3;"land on
."
8230 LET a=3: REM OBJECT Bomb,a
8240 LET a=1: REM OBJECT Plane,a
8250 REM OBJECT Enemy,a
8260 REM PRINT Bomb,▲\PRINT Plan
e,▬\PRINT Ene
my,▀
8280 LET a=1: LET d=2: LET b=3:
LET c=6
8290 REM SPEED Bomb,b,c
8300 REM SPEED Plane,a,a
8310 REM SPEED Enemy,d,a
8320 PRINT INK 2;: REM COLOUR Bo
mb
8330 PRINT INK 1;: REM COLOUR En
emy
8340 LET a=7: REM VECTOR Bomb,a
8350 LET a=4: REM VECTOR Plane,a
8360 LET a=12: REM VECTOR Enemy,
a
8370 FOR c=3 TO 13 STEP 10
8380 FOR a=0 TO 500 STEP 10
8390 LET b=5: LET d=80
8400 REM SOUND b,c,d,a
8410 NEXT a: NEXT c
8420 PAUSE 100
8430 BEEP .2,-12: BEEP .2,-10: B
EEP .2,-8: BEEP .2,-12: BEEP .2,
-12: BEEP .2,-10: BEEP .2,-8: BE
EP .2,-7: BEEP .2,-5: BEEP .2,-5
: BEEP .2,-8: BEEP .2,-7: BEEP .
2,-5: BEEP .3,-5
8440 PAUSE 30
8450 FOR a=0 TO 7: PAPER a
8460 INK 9: PRINT PAPER a-1+8*(a
=0); INK 8;: REM REPLACE
8470 LET b=40: LET c=5: LET d=0:
 LET e=90+a
8480 REM SOUND b,c,d,e
8490 NEXT a: PAPER 7: INK 0
8500 LET a$="   Press any key to
 continue  "
8510 PRINT #0;AT 1,0; BRIGHT 1;a
$
8520 PAUSE 5: LET a$=a$(2 TO )+a
$(1)
8530 IF INKEY$="" THEN GO TO 851
0
8540 CLS
8550 PRINT AT 17,0; FLASH 1; BRI
GHT 1;"SELECT LEVEL:"
8560 PRINT "0 - Easy"
8570 PRINT "1 - Medium"
8580 PRINT "2 - Hard"
8590 PRINT "3 - Very Hard"
8600 INPUT "Please Select:";Leve
l
8610 IF Level<0 OR Level>3 OR Le
vel<>INT Level THEN GO TO 8600
8615 REM ERASE Plane
8620 RETURN
9000 RESTORE
9010 FOR a=USR "a" TO USR "a"+47
9020 READ b: POKE a,b: NEXT a
9030 RETURN
9040 DATA 0,0,0,0,56,124,124,56
9050 DATA 255,153,153,255,255,15
3,153,255
9060 DATA 24,60,126,255,255,153,
153,255
9070 DATA 0,152,145,159,223,153,
153,255
9080 DATA 0,0,249,35,255,255,16,
0
9090 DATA 0,0,159,196,255,255,4,
0
9500 SAVE "Bomber" LINE 9990: SA
VE "Data"CODE 61030,4338
9990 CLEAR 61029: LOAD ""CODE
9999 RUN
```

Just an example of the power of FIFTH

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 recently purchased a Spectrum 48K which has performed quite well. However, last week I noticed that the colour was fluctuating when loading and running programs. I therefore retuned the T.V. receiver but the colour would not settle down and finally disappeared altogether after about five minutes. I tried all the channels but could not get the colour to reappear, so I switched it off. The next morning I tried it again and the colour was O.K. without any re-tuning. Could you tell me whether this is a fault with the Spectrum or the T.V.?

This is a problem caused by the output frequency drifting when the Spectrum gets warm. To get over this problem, turn any AFC or frequency lock off on the T.V. and when you retune you should get the colour back to normal.

Dear PCT

I am writing to say how pleased I am with your magazine and the way it explains computing to beginners like myself.

I have had a VIC 20 for a few months and would like to ask a few questions. Firstly, in the August issue of PCT, you had a program called "The Citadel". After a few hours spent typing in the listing, I found it wouldn't run. All that happened was that the screen displayed a mass of symbols. Since then, I have checked through my listing and I am still unable to get the program to run. Could it be because I am using a 32K expansion module? If so, would you explain how I could alter the program.

Secondly, could you tell me if there is a VIC 20 modem and if so, where I can obtain one?

Thank you for any help you can give me.

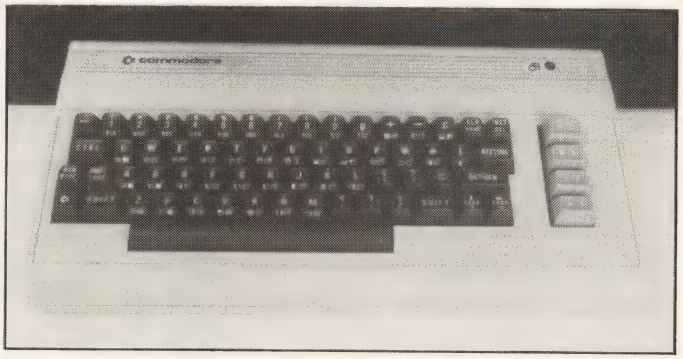
Yours sincerely,
V J Frostick
Romford

This problem could not be caused by the use of the 32K expansion module. I would suggest that you try omitting the POKE 36879,25 statement as the extra RAM relocates the screen. This should solve your problem.

In answer to your second question, Commodore do make a modem for the VIC 20. However it is only available in U.S.A. and has not been approved for use in Britain. Neither is there any software available for use with it.

Dear PCT

I have an unexpanded VIC 20 computer. In the NEWS feature of your September 1982 issue you said 'if you want to have the full facilities of the Commodore 64, all you need do in theory, is to take your VIC 20 to your



dealer and get him to replace the 20's pcb with the 64's pcb. And all for an estimated cost of £100'.

I was wondering if this upgrade is still possible and if so what is the cost. If you could provide me with the relevant information, I would be very grateful.

Finally, I must congratulate you on your excellent magazine, which has been improving in content since the first issue. Keep up the good work.

Yours sincerely,
Paul Titcomb
Godalming

I'm afraid that although Commodore did say this facility would be available at some point in the future, this is not now the case and it will not be possible to upgrade the VIC 20 to a machine with the CBM 64's capabilities.

Dear PCT

I have loaded in the program "Beastie Bombardment" which was listed in the October issue of *Personal Computing Today*, but have been unable to get the firing routine to work. I think there are some lines missed out of the program.

I should be grateful for any help you can give me on this.

Your sincerely,
J. A. Woods
Gosport

I'm sorry that you have had trouble with this program. However, we have had it exhaustively checked and can confidently say that there are no lines missing from the listing and the firing routine should work O.K. Have you checked and double-checked your listing? It is very easy to make a mistake, no matter how small, when typing in a program which prevents the program from running correctly.

However, we do admit to a mistake in the

"How it Runs" section. The firing routine is dealt with in Lines 72 to 105 and not 109 as printed. Apart from this small error, the program is correct.

Hope you have success.

Dear PCT

About eight months ago, I bought a VIC 20. I am very pleased with the computer but have one problem which I would like to solve. This first came to light after I had bought the Commodore cassette player. About thirty minutes after power up, if for any reason I crash, I can't use the machine again unless I leave it switched off for five to ten minutes. When I turn it on after the crash, the whole screen is filled with multi-coloured squares containing random characters. This happens frequently with or without the cassette player being plugged in. A SYS 64802 will also cause the same result after a time. What do you think the problem is?

I was also wondering if it is possible to use a Centronic's Model 739 on the VIC's RS232 interface without any extra programming.

Thank you for your time and I must also thank you for such an excellent magazine.

Yours sincerely,
Richard O'Brien
Dublin

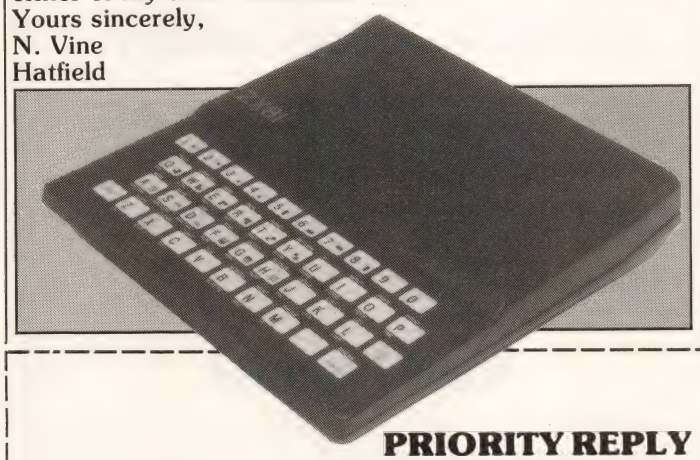
From the description you have given, it would appear that you have a faulty machine and should take it back to the dealer who you bought it from.

With regards your second query, the RS232 interface needs extensive programming. If the printer uses a Centronics interface a RS232 or IEEE to Centronics hardware is needed.

Dear PCT

I have a number of micros at home including a CBM 8K and a VIC 20. I was recently given a ZX81 with a printer, but the ZX81 no longer functions. I was therefore wondering if there is any way of attaching the printer to either of my other machines.

Yours sincerely,
N. Vine
Hatfield



The short answer to this is no, that is unless you possess a BBC microcomputer amongst your many others. No company so far has produced an interface for the ZX printer with any of the Commodore machines (at least to our knowledge) but W.D. Interfaces of Leeds, have just brought out an interface which allows the ZX printer to be used with the BBC machine. Details of this can be obtained by telephoning 0532 864328. Turn to the Add Ons pages for a review of this interface.

Hi-Res Editor

Further to the corrections for this program published in the November issue one reader, James Smith, wrote in expanding on the theme. His remarks and corrections follow:

The "EXSD" referred to in the "Key Reference Chart" should be "CTL E, CTL X,. . . etc.". Also "CTL A, CTL B, etc." should not include "CTL" and should include "C" and "D".

In your general explanation, it would have helped to say that the keys EXSD1234 etc. are CTL keys. Also I think it confusing to refer here to "(FCN S,D)" when it is not required to use the FCN key. For some reason the "D" key seems to have been ignored.

In the "How it Runs" section, lines 2210-2360 display random characters, but not random colours; and any key pressed after this will return the program to start.

Finally, in the listing, line 2100 should read "CALL CHAR (A,16,64,15)" – if the last figure is 16, then the right hand side of the frame will also be filled.

Program Corrections

Fun At The Fair

In October's issue of PCT, we noticed that a few characters had crept off the edge of the listing in the "Fun at the Fair" program. We apologise for the poor listing in some copies, some of which may contain a number of indecipherable characters. If this is the case, please write in to us and we will send you a clearer listing.

More specifically, Line 930 should read
PRINT AT 20,0;(F$+G$) (TO 34)
and the line in which G$ appears again should be
9020 LET E$=" ": LET G$="<30 spaces>"

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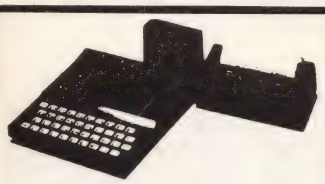
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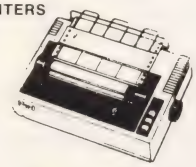
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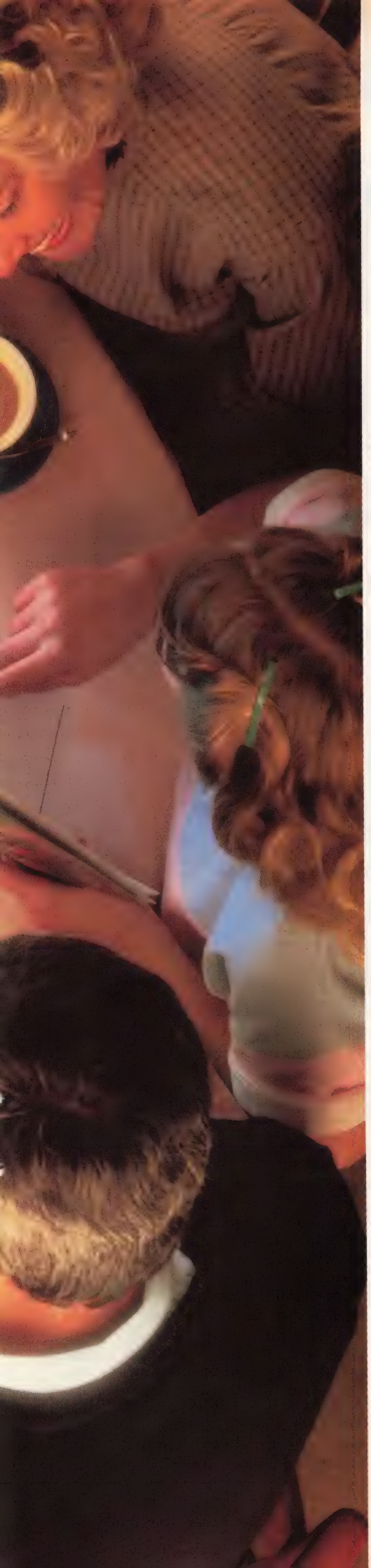
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The TI Home Computer is a real computer system

The TI Home Computer has got the memory power you might expect from more expensive computers, built in. At its heart is a powerful TMS 9900 16-BIT Microprocessor. Most other home computers have only an 8-BIT. And you can expand the memory from 16K of RAM up to 52K.

The total memory capacity is 114K Bytes.

A wide range of software for everyone

Another feature that makes the TI system so powerful, yet so easy to use is Solid State Software.™ These plug-in cartridges cover everything from space games like Parsec™ to teaching maths, managing home finances and composing music. And the range is getting wider all the time.

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CPU: TMS 9900 16-BIT, plus 256-byte Scratchpad RAM.
Memory: Total 114K bytes; 26K bytes ROM internal; up to 36K ROM cartridges external; 16K built-in RAM expandable to 52K bytes.
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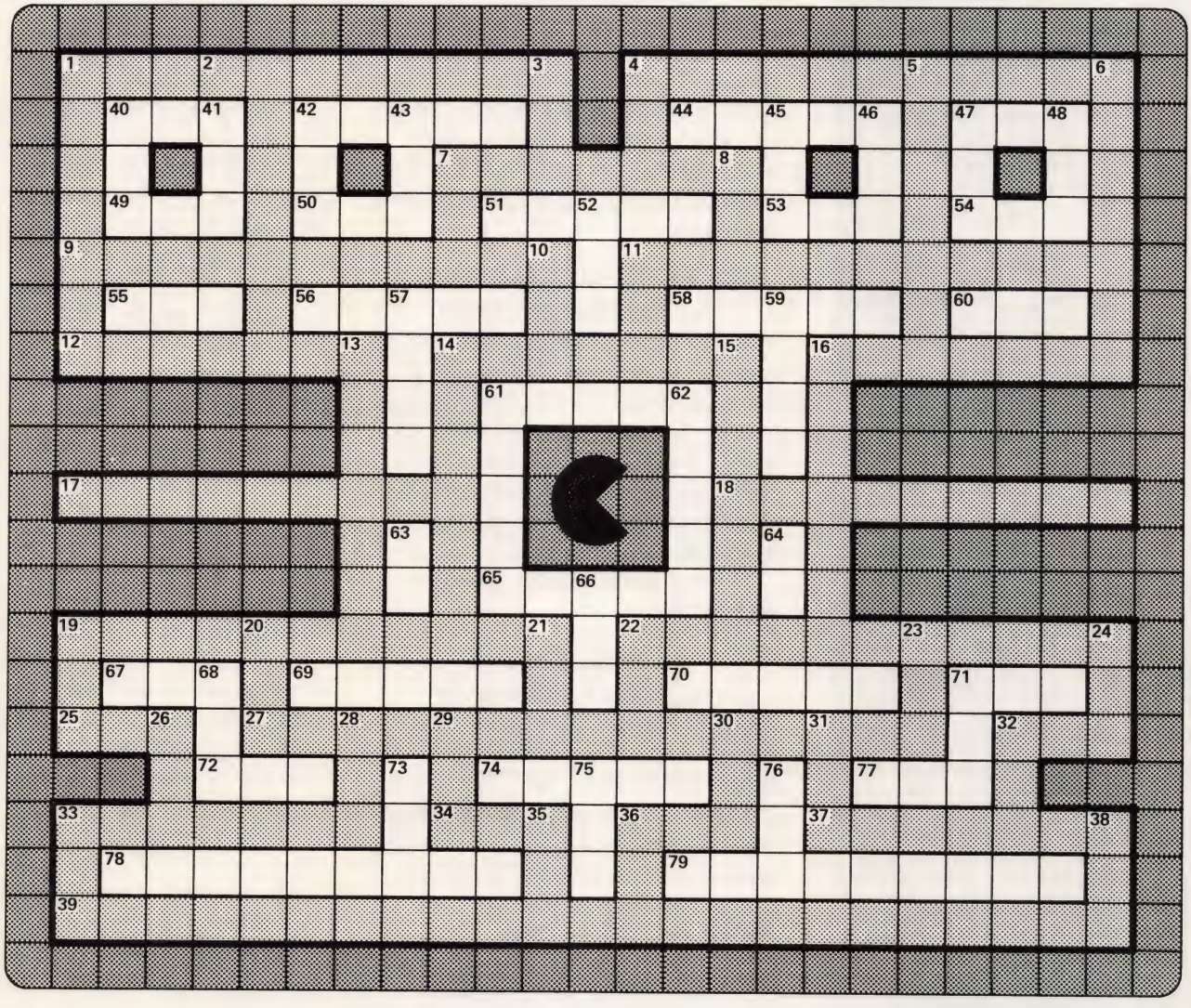
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PCT CROSSWORD

ELECTRON

COMPETITION



What a cracker of a competition awaits you in this (believe it or not) Christmas issue of *Personal Computing Today* with an Acorn Electron computer at stake.

Acorn Computers has generously donated one of the firm's latest, exciting machines the first prize in our crossword competition. Afficonados of *Personal Computing Today* may possibly remember our December 1982 crossword competition which pulled in well over 2,000 entries much to our delight. That competition was based on a space invader shape, but this year our crossword compiler has opted for a Pac-man type grid in which to place the crossword answers.

ABOUT THE ELECTRON

But first, let's all tell those of you who are unaware of the Electron's full capabilities exactly what this neat little machine can do.

For £199 you'll get a full 32K of memory, full strike keyboard which is very similar to the BBC Microcomputer except that it has single entry commands which makes operation much easier. High resolution graphics are also available which, in comparison to other machines, are perfectly adequate as far as speed goes (although slower than the BBC micro) and superior in terms of colour and resolution. Other facilities include BBC BASIC, Modes 0-6, Assembler and sound.

Coming with the Electron package is a 'Welcome' tape containing demonstration programs for the computer, and an introductory booklet called 'Start Programming with the Electron', and an excellent manual. The program ideas on the Welcome tape

Clues Across

1,73 Programming at the lowest level is insane. (3;7)
4,44 Handy word processor — for carpenters or bishops. (5;11)
7,71d Unhappy at preceding post code. (3;7)
9,52 Chapter One — leg broken by slippery customer. (3;11)
11,65 Add-on action for tempting computer... (5;11)
12,47a ...And she was tempted back. (3;7)
14,46 Wear away Sinclair's flying carpets. (3;7)
16,53 Express 6 — it gets right up your nose! (3;7)
17,67 Passionate — speak publicly — in computer language? (3;4,5)
18,40d Fall behind with this arcade game. (3;9)
19,70 Early computer type — classical? (5;11)
22,40a Put down in figures. (3;11)
25,61d Place of combat in another age. (3;5)
27,66 Commodore does it the hard way — by hand. (3;6,9)
32,59 Pontoon player loses his connection. (3;4)
33,54 Mineral or reptilian game. (3;7)
34,64 Katy acted — was it unconscious? (3;2)
36,50 Hit normal value. (3;3)
37,47d I invented Corn Flakes. (3;7)
39,(+39) Your New Year's Message — it's great! (3;3,7,2,8,3)

Clues Down

1,45 Metal screen. (3;7)
2,51 The whole welcome. (5;7)
3,62 Poke to death. (3;5)
4,42a Miss West is more subdued. (3;5)
5,48 Revert to bad English in this place. (3;7)
6,72 Find fairy in self denial. (3;7)
7,56 School tree. (3;5)
8,39 Teacher, a fellow union member. (3;7)
10,79 Revolutionary captures the king. (3;9)
11,42d The extreme ends of the arm? (3;3)
13,68 Start for golfers and end for mountaineers. (3;7)
14,75 Sample false reason. (3;7)
15,39 Exists as a horse and 20 in other words. (2;7)
16,76 One is unclear, in 15 terms. (3;7)
19,74 Copy fake gems. (3;5)
20,43 Mother is right to spoil the memory. (3;3)
21,58 Language expressed by doves. (3;5)
22,41 Long for labour politician. (3;3)
23,39 Nag witch to stir container. (3;8)
24,78 "And all our...have lighted fools", Macbeth affirms. (3;9)
26,69 Past aims. (3;5)
28,61a Elect Ron and he will be back! (3;5)
29,39 Second person to computer. (3;3)
30,71a Snake juice. (3;3)
31,60 Blacken the family name. (3;3)
32,57 Instrument said to frighten. (3;4)
33,63 Conditional untruth. (2;3)
35,77 Help from a Welsh computer? (3;3)
36,55 Naked conflict. (3;3)
38,49 Weapon turned on animal. (3;3)

Compiled by Steve Hare.

PCT CROSSWORD COMPETITION
ENTRY FORM

NAME .....
ADDRESS .....
.....
.....
..... POSTCODE .....

have been lifted from the BBC micro's tape of the same name, but is a very useful part of the whole package.

The future of the Electron is particularly bright as it has the backing of one of the most successful personal computer manufacturers, Acorn Computers and also due to the reputation which the BBC Micro, also designed and made by Acorn, has built up over the past year.

To make sure of your Electron just complete the crossword and send it off to our office by the closing date given in the Rules and Regulations.

PREAMBLE

The Pacman grid has been modified slightly to form a double puzzle. The main crossword (1-39) has 50 solutions in all. The subsidiary puzzle (40-79) has 45 solutions. The two grids have been paired off as shown — and all clues are in two parts — leading to two solutions — one to be entered in each grid. Where answers are of different lengths it will be obvious which grid they belong in. Those of the same length can only be entered where they fit with other answers.

To make things easier one answer in each pair is made up from letters found in the other. So when two answers are the same length, they are necessarily anagrams.

This leaves five clues with no pair. The secondary clue in each case, including 39 itself, refers to one word of a special New Year Message — which is to be entered in 39. These five clues do *not* contain anagrams.

Good luck!

RULES AND REGULATIONS

1. The competition is open to all UK and Northern Ireland readers of *Personal Computing Today* except employees of Argus Specialist Publications Ltd, their printers and distributors, Acorn Computers Ltd, or anyone associated with the competition.
2. All entries must be written legibly and submitted on the entry form from the magazine — photocopies will not be accepted.
3. As long as the correct form is used there is no limit to the number of entries you submit.
4. The winner will be the writer of the first correct entry picked and the Editor's decision will be final.
5. No correspondence will be entered into concerning the result of the competition.
6. The winner will be notified by post and his/her name will be published in a future edition of *Personal Computing Today*.
7. The closing date for the competition is 31st December, 1983 and final entries will be accepted with the postmark of that date.

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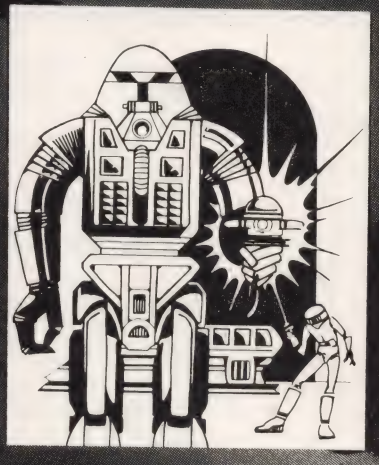
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Alien/Hieroglyphics/Wumpus/Movie — A varied mix from Carnell, all featuring imaginative responses and graphics and all of them good games for all ages (Hieroglyphics is particularly good for children). *Popular Computing Weekly Aug 82*



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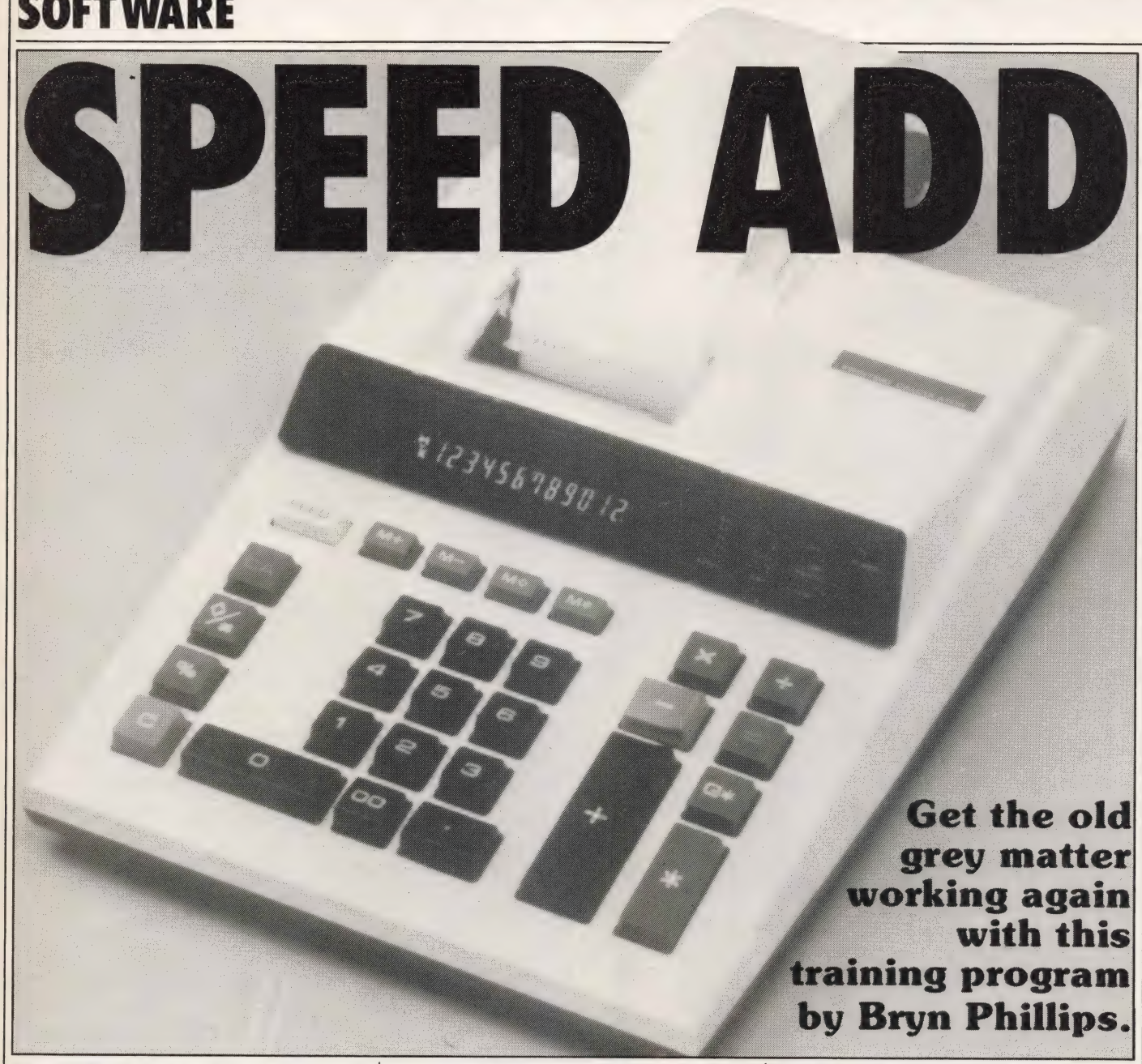
You will meet friends and enemies, old and new, in the long awaited sequel to Volcanic Dungeon. Using high resolution graphics and combining the best qualities of "Black Crystal" and "Volcanic Dungeon", we will allow you to become part of this tale of revenge.

"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

SPEED ADD



Get the old grey matter working again with this training program by Bryn Phillips.

One of the main problems with computers and calculators is that in the end you can lose the ability to do simple mental arithmetic. A simple problem and your hand automatically reaches for the buttons. Even if you do work it out in your head you invariably check the result. The purpose of this program is to train you to add up quickly and accurately, and the ultimate aim should be to add up a column of 10 three digit numbers in less than 5 seconds. If you can do that you will have no problem checking the cashier at the local supermarket — you would stand no chance with a calculator.

The program starts with a choice of grade. Unless you are fairly confident in your abilities start off with "NOVICE", you'll soon move on. You then have to complete a proficiency test which involves adding up 10 numbers. The computer gives you a proficiency score based on how long you take.

You then start the speed training. Again you have to add up a column of numbers, but this time you have to move at a pre-determined pace. The number of numbers in the column is determined by your proficiency score, and a bracket moves down the column at the required scanning speed. The more numbers in the column, the faster the scanning speed. You must then enter your answer. If it is incorrect, the computer goes through the addition with you at half speed to show you where you went wrong. You then have the choice of further speed training, a proficiency test or a grade change.

If you continue speed training the column of numbers will increase by one if the previous answer was correct, and decrease by one if the previous answer was incorrect. In this way you will always be working at peak ability.

The program is primarily intended for adults and older children, although it could be used for younger children with minor modifications. In the unexpanded VIC20 there is room left over for musical or visual "reward" subroutines if required. These might be attractive to young children in a primary version, but would prove annoying and distracting in the adult version so I have resisted the temptation to put any in. Give your brain some fun whilst restoring power!

Variables Used

N(i)	Array of numbers in test or training.
G	Grade level.
TM	Time taken to complete proficiency test.
T	Correct answer.
A	Your answer.
PF	Proficiency.
L	Number of numbers in speed training.

HOW IT RUNS

Line 7	Ensures that the first number is always different.
Lines 10-80	Allow grade to be chosen.
Lines 100-350	Proficency test.
Lines 365-640	Speed Training.
Lines 660-740	List options to continue.
Lines 800-880	Subroutine to generate numbers.



HINTS ON CONVERSION

The program is written in simple BASIC with no POKE, SYS, etc. commands peculiar to the VIC20, and conversion to other machines should be straightforward. The program will run unmodified on a PET, and presumably on a Commodore 64, although I have not tried the latter.

The only problem will be in modifying the cursor control commands which appear in the **PRINT** statements. These are listed below.

♡	Clear screen and move cursor to top LH corner.
[S]	Move cursor to top LH corner.
[Q]	Cursor down.
[O]	Cursor up.
[ ]	Cursor left.
[I]	Cursor right.

PROGRAM LISTING

```
5 DIMN(11)
7 Z=RND(-TI)
10 PRINT"SPEED ADD"
20 PRINT"CHOOSE GRADE"
30 PRINT"1 NOVICE"
40 PRINT"2 TRAINEE"
50 PRINT"3 ADVANCED"
60 PRINT"4 EXPERT"
65 PRINT"5 GENIUS"
70 GETA$:IFA$=""THEN70
80 G=VAL(A$):IFG<1ORG>5THEN70
100 PRINT"LEVEL TEST"
110 PRINT"YOU WILL BE ASKED TO  ADD UP 10 NUMBERS AS
QUICKLY AS YOU CAN"
120 PRINT"AS SOON AS YOU HAVE   FINISHED PRESS THE
SPACE BAR";
130 PRINT" AND ENTER   YOUR ANSWER"
140 PRINT"PRESS C TO CONTINUE"
150 GETA$:IFA$<>"C"THEN150
160 L=10:GOSUB800
165 T=0:T1=TI
170 PRINT"PROFICIENCY TEST"
180 FORI=1TOL
190 PRINT""N(I)
195 T=T+N(I)
200 NEXT
210 GETA$:IFA$<>" "THEN 210
215 TM=TI-T1
220 PRINT"PROFICIENCY TEST"
230 INPUT"YOUR ANSWER";A
240 IF A=T THEN PRINT"CORRECT":GOTO300
250 IF A<>T THEN PRINT"WRONG:TRY AGAIN"
255 PRINT"ANSWER"
256 PRINT""T
260 FOR J=1TO2000:NEXTJ
270 GOTO160
300 LV=(INT(TM/6+.5))/10:IFLV<5THENLV=5
310 IFLV<5THENLV=5
320 PF=INT(((100*5)/LV)+.5)
330 PRINT"PROFICIENCY"
340 PRINT"";PF;"%"
350 PRINT"PRESS C TO CONTINUE"
360 GETA$:IFA$<>"C"THEN360
365 L=INT(PF/10+1):IFL<2THENL=2
367 PRINT"EST. PROFICIENCY"L-5"-"L+5
368 PRINT                     GRADE LEVEL     "G
370 PRINT"PROF. LEVEL"L*10-5"-"L*10+5"%"
372 PRINT"GRADE LEVEL"G
374 PRINT"SPEED TRAINING"
380 T=0:GOSUB800
390 PRINT""
400 FORI=1TOL
410 PRINT"        "N(I)
420 NEXTI
425 PRINT""
430 FORI=1TOL
440 PRINT"       ["N(I)"]"
445 T=T+N(I)
450 FORJ=1TOINT(5000/L):NEXTJ
460 PRINT"        "N(I)"       "
470 NEXTI
475 PRINT""
480 FORI=1TOL:PRINT"                  ":NEXT
490 PRINT"ENTER ANSWER"
500 INPUT"";A
510 IFABS(T-A)>0.1THEN 520
515 L=L+1:IFL>10THENL=10
517 GOTO630
520 PRINT"      INCORRECT    "
530 PRINT""
540 FORI=1TOL:PRINT"       "N(I)"      ":NEXTI
550 T=0:PRINT""
560 FORI=1TOL
570 T=T+N(I)
580 PRINT"       ["N(I)"]"T
590 FORJ=1TOINT(9000/L):NEXTJ
600 PRINT"        "N(I)"         "
610 NEXTI
620 L=L-1:IFL<2THENL=2
625 GOTO640
630 PRINT"         CORRECT    "
640 FORJ=1TO2000:NEXTJ
660 PRINT"OPTIONS"
670 PRINT"1 SPEED TRAINING"
680 PRINT"2 PROFICIENCY TEST"
690 PRINT"3 CHANGE GRADE"
700 PRINT"4 FINISH"
710 GETA$:O=VAL(A$)
720 IFO<1ORO>4THEN710
740 ONOGOTO370,100,10,750
750 END
800 FORI=1TOL
810 ONGGOTO820,830,840,850,860
820 N(I)=INT(RND(1)*9)+1:GOTO870
830 N(I)=INT(RND(1)*20)+10:GOTO870
840 N(I)=INT(RND(1)*90+10):GOTO870
850 N(I)=INT(RND(1)*100)+100:GOTO870
860 N(I)=INT(RND(1)*900)+100
870 NEXTI
880 RETURN
```

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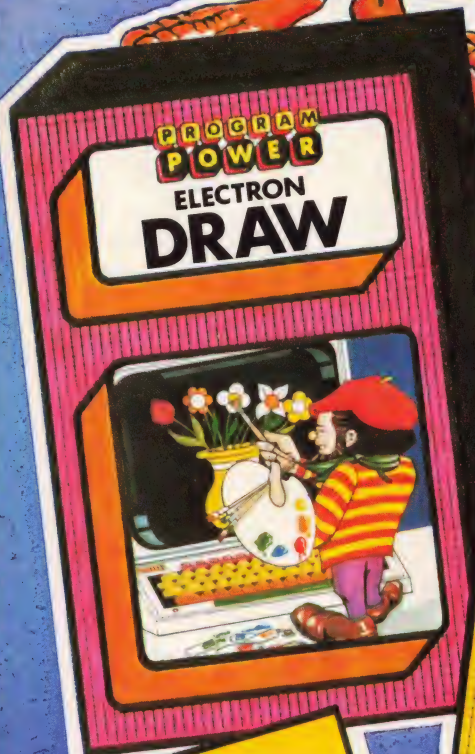




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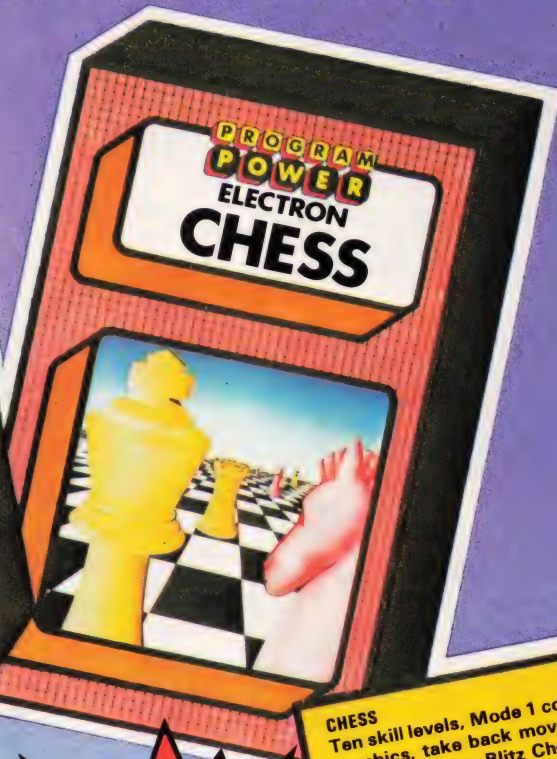
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COMPUTING POWER FEATURES								
BUILT-IN ROM	48K	32K	16K	10K	20K	16K	16K	16K
EXPANDABLE TO	96K	96K	N/A	42K	N/A	64K	N/A	N/A
BUILT-IN EXTENDED MICROSOFT® BASIC	YES	YES	YES	ADDITIONAL COST	NO	NO	YES	NO
BUILT-IN RAM	80K*	32K***	64K	48K	64K	32K	32K	16K
EXPANDABLE TO	256K**	256K**	64K	NO	N/A	32K	64K	48K
KEYBOARD FEATURES								
NUMBER OF KEYS	87	71	63	61	66	73	53	40
USER DEFINE FUNCTIONS	10	10	N/A	4	8	10	N/A	N/A
SPECIAL WORD PROCESSING	YES	YES	NO	NO	NO	NO	NO	NO
GENERATED GRAPHICS (FROM KEYBOARD)	YES	YES	NO	YES	YES	YES	YES	YES
UPPER/LOWER CASE	YES	YES	YES	YES	YES	YES	YES	YES
GAME/AUDIO FEATURES								
SEPARATE CARTRIDGE SLOTS	YES	YES	NO	YES	NO	NO	YES	NO
BUILT-IN JOYSTICK	NO	YES	NO	NO	NO	NO	NO	NO
COLORS	16	16	15	128	16	16	9	8
RESOLUTION (PIXELS)	256x192	256x192	280 x 160	320 x 192	320 x 200	256 x 640	256 x 192	256 x192
SPRITES	32	32	N/A	4	8	N/A	16	N/A
SOUND CHANNELS	3	3	1	4	3	1	3	1
OCTAVES PER CHANNEL	8	8	4	4	9	3	5	3
A.D.S.R. ENVELOPE	YES	YES	NO	NO	YES	YES	NO	NO
PERIPHERAL SPECIFICATIONS								
CASSETTE	2 CHANNEL	2 CHANNEL	1 CHANNEL	2 CHANNEL	1 CHANNEL	2 CHANNEL	2 CHANNEL	1
AUDIO I/O	YES	YES	NO	YES	NO	NO	YES	NO
BUILT-IN MIC	YES	YES	NO	NO	NO	NO	NO	NO
DISK DRIVE CAPACITY	256K	256K	143K	92K	170K	100K	100K	100K
(LOW PROFILE)	YES	YES	NO	NO	NO	NO	NO	NO
CP/M® COMPATIBILITY (Standard 80 column programs)								
CP/M® 2.2	YES	YES	NO****	NO	NO*****	YES	NO	NO
CP/M 3.0	YES	YES	NO	NO	NO	NO	NO	NO

Specifications are subject to change without prior notice.

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**** Apple II can accept modified 40 or 80 Column CP/M
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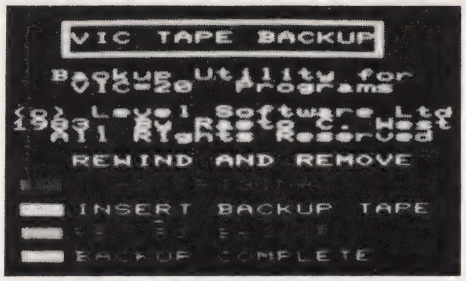
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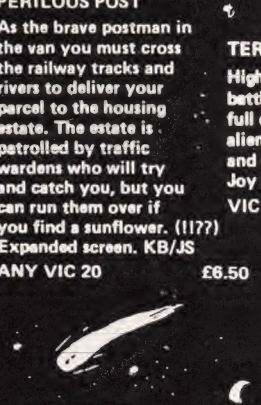
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MACHINE TYPE _____

CASSETS REQUIRED _____

_____



Welcome in your visitors with the spirit of Christmas using this novel and ingenious program by G W Gallagher.

When the festivities are in progress, this program will allow your computer to give a Christmas greeting to anyone with a moment to spare to look at the V.D.U. Simply load it and RUN, pressing the space bar occasionally on passing!

The display consists of two Christmas trees, one decorated indoors and the other outdoors in the falling snow. there is also a single note version of a carol, but if this is obtrusive, the sound can be easily omitted.

HOW IT RUNS

FIRST SCENE

PROCTREE (190 - 300)
The tree is made of green triangles, with red trunk and base.

PROCCANDLES (310 - 390)
The candles are placed at the ends of the branches, with flickering 'flames' drawn using Colour 8, flickering black-white.

PROCBAUBLES (400 - 450)
Coloured ornaments, using defined shapes, are placed on the tree.

PROCdefine (690 - 790)
The shapes used for the ornaments are defined.

PROCANGEL (460 - 500)
An angel, again using defined characters, is placed at the top of the tree.

PROCTINSEL (610 - 680)
No tree is complete without tinsel strands, and they are draped around the branches.

PROCGREETING (510 - 600)
Greetings messages are placed vertically down the screen on either side of the tree, using colours 9 and 14 so that the colours are flashing alternately.

PROCwence (1020-1160)
This may indeed make you 'wince'! It is a single note version of Good King Wenceslas, using only simple sound commands, with the notes stored as data. It will run through only once when the indoor tree is switched on, as it is not likely to be popular if running continually!
When the carol has run through once, the screen will continue to show the greeting until the space bar is pressed, at which point the outdoor scene will be drawn.

PROCTREE As above

PROCsnow (800 - 850)
The ground is covered in white using two solid triangles and the edges of the branches have a thin layer of white.

PROCfallingsnow (860 -1010)
The effect of falling snow is made using the logical colours 8 to 14. These 7 colours are first changed

to black using the VDU 19 command. Lines of dots are plotted over the whole screen, using each logical colour in turn. So that the snowfall does not look too symmetrical, random numbers are added to the coordinates of the points.

When all the dots are plotted, each of the colours 8 to 14 is turned to white and then back to black, giving the required impression.
As the spots are plotted in black, some of them will be seen on the green tree. It is a not unpleasing effect and it does help to show how the 'snow' has been drawn.

There is a space in the white snow at the bottom of the screen to place an individual message (Line 840).

When the space bar is pressed, the program will return to the first scene, until you END it all!

PROGRAM LISTING

```
  10 MODE2
  20  PROCdefine
  30 VDU5:VDU23;8202;0;0;0;0;
  40 REM.....G.W.GALLAGHER...1983...CHRISTMAS GREETINGS
  50 CLS:PROCTREE
  60 PROCCANDLES
  70 PROCBAUBLES
  80 PROCANGEL
  90 PROCTINSEL
 100 PROCGREETING :PROCwence
 110 REPEAT
 120    UNTIL GET=32
 130 GOTO 140
 140  CLS:PROCTREE
 150 PROCsnow
 160 PROCfallingsnow
 170  GOTO 50
 180 END
 190 DEFPROCTREE
 200 GCOL0,2
 210 MOVE600,930:MOVE530,850:PLOT85,670,850
 220 MOVE600,850:MOVE460,750:PLOT85,740,750
 230 MOVE600,750:MOVE430,650:PLOT85,770,650
 240  MOVE600,650:MOVE390,550:PLOT85,810,550
 250 MOVE600,550:MOVE320,400:PLOT85,880,400
 260 MOVE600,400:MOVE250,250:PLOT85,950,250
 270 GCOL0,1
 280 MOVE580,250:MOVE580,130:PLOT85,620,250:PLOT85,620,1
30
 290 MOVE450,130:MOVE450,80:PLOT85,750,130:PLOT85,750,80
 300 ENDPROC
 310 DEFPROCCANDLES
 320 GCOL0,1
 330 MOVE240,275:PRINTCHR$(227):MOVE930,275:PRINTCHR$(22
7)
 340 MOVE310,425:PRINTCHR$(227):MOVE850,425:PRINTCHR$(22
7):MOVE370,575:PRINTCHR$(227):MOVE760,575:PRINTCHR$(227)

 350 MOVE420,675:PRINTCHR$(227):MOVE730,675:PRINTCHR$(22
7):MOVE450,775:PRINTCHR$(227):MOVE700,775:PRINTCHR$(227)
 360 MOVE520,875:PRINTCHR$(227):MOVE630,875:PRINTCHR$(22
7)
 370 GCOL0,8:MOVE240,300:PRINTCHR$(232):MOVE930,300:PRIN
TCHR$(232):MOVE310,450:PRINTCHR$(232):MOVE850,450:PRINTCH
R$(232):MOVE370,600:PRINTCHR$(232):MOVE770,600:PRINTCHR$(
232)
 380 MOVE420,700:PRINTCHR$(232):MOVE730,700:PRINTCHR$(23
2):MOVE450,800:PRINTCHR$(232):MOVE700,800:PRINTCHR$(232):
MOVE520,900:PRINTCHR$(232):MOVE630,900:PRINTCHR$(232) :MO
VE520,900:PRINTCHR$(232):MOVE7630,900:PRINTCHR$(232)
 390 ENDPROC
 400 DEFPROCBAUBLES
 410 GCOL0,1
 420 MOVE500,300:PRINTCHR$(224):MOVE700,450:PRINTCHR$(22
4):MOVE550,840:PRINTCHR$(225):MOVE550,520:PRINTCHR$(226)
 430 GCOL0,4
 440 MOVE780,300:PRINTCHR$(224):MOVE480,440:PRINTCHR$(22
5):MOVE670,600:PRINTCHR$(226):MOVE570,720:PRINTCHR$(224)

 450 ENDPROC
 460 DEFPROCANGEL
 470 GCOL0,7
 480 MOVE550,950:PRINTCHR$(228):MOVE600,950:PRINTCHR$(22
9)
 490 MOVE550,925:PRINTCHR$(230):MOVE600,925:PRINTCHR$(23
1)
 500 ENDPROC
 510 DEFPROCGREETING
 520 VDU4
 530 COLOUR9
 540 PRINTTAB(2,2)"A";TAB(2,4)"M";TAB(2,5)"E";TAB(2,6);"
R";TAB(2,7);"R";TAB(2,8);"Y"
 550 PRINTTAB(2,10);"C";TAB(2,11);"H";TAB(2,12);"R";TAB(
2,13);"I";TAB(2,14);"S";TAB(2,15);"T";TAB(2,16);"M";TAB(2
,17);"A";TAB(2,18);"S"
 560 COLOUR14
 570 PRINTTAB(16,2)"A";TAB(16,4)"H";TAB(16,5)"A";TAB(16,
6);"P";TAB(16,7);"P";TAB(16,8);"Y"
 580 PRINTTAB(16,10)"N";TAB(16,11);"E";TAB(16,12);"W";TA
B(16,14);"Y";TAB(16,15);"E";TAB(16,16);"A";TAB(16,17);"R"
 600 ENDPROC
 610 DEFPROCTINSEL
 620 GCOL0,3:MOVE565,890:DRAW580,885:DRAW600,880:DRAW620
,885:DRAW635,890
 630 MOVE520,800:DRAW560,795:DRAW600,790:DRAW640,795:DRA
W680,800
 640 MOVE515,700:DRAW545,695:DRAW600,690:DRAW655,695:DRA
W685,700
 650 MOVE495,600:DRAW555,595:DRAW600,590:DRAW645,595:DRA
W705,600
 660 MOVE460,470:DRAW530,465:DRAW600,460:DRAW670,465:DRA
W740,470
 670 MOVE425,320:DRAW515,310:DRAW600,300:DRAW685,310:DRA
W775,320
 680 ENDPROC
 690 DEFPROCdefine
 700 VDU23,224,24,60,126,255,255,126,60,24
 710 VDU23,225,24,60,60,60,126,255,255,126
 720 VDU23,226,24,60,92,195,195,92,60,24
 730 VDU23,227,16,8,24,24,24,24,24,24
 740 VDU23,228,3,19,57,63,63,59,59,55
 750 VDU23,229,192,200,156,252,252,220,220,236
 760 VDU23,230,7,7,7,15,15,15,15,15
 770 VDU23,231,224,224,224,240,240,240,240,240
 780 VDU23,232,0,0,0,0,0,16,16,16
 790 ENDPROC
 800 DEFPROCsnow
 810 GCOL0,7:MOVE1239,0:MOVE0,0:PLOT85,1239,130:PLOT85,0
,130
 820 MOVE530,850:DRAW600,930:DRAW670,850:MOVE460,750:DRA
W600,850:DRAW740,750:MOVE430,650:DRAW600,750:DRAW770,650
 830 MOVE390,550:DRAW600,650:DRAW810,550:MOVE320,400:DRA
W600,550:DRAW880,400:MOVE250,250:DRAW600,400:DRAW950,250
 840 VDU5:GCOL0,1:MOVE100,50:PRINT"MERRY CHRISTMAS"
 850 ENDPROC
 860 DEFPROCfallingsnow
 870 FOR C=8 TO 14:VDU19,C,0,0,0,0:NEXT
 880 FOR C=8 TO 14
 890   GCOL0,C
 900   FOR Y= 1100 TO 130 STEP -70
 910     FOR X=10 TO 1230 STEP 50
 920       PLOT69,X+RND(50),Y-(C-8)*10 +RND(10)
 930       NEXT:NEXT:NEXT
 940 FOR C=8 TO 14
 950   VDU19,C,7,0,0,0
 960   FOR T=1 TO 500:NEXT
 970   VDU19,C,0,0,0,0
 980   NEXT
 990 X=INKEY(10):IF X=32 THEN 1000 ELSE 940
1000  VDU20:VDU5
1010  ENDPROC
1020 DEFPROCwence
1030 FOR T= 1 TO 17:READ L,N,D:SOUND1,L,N,10*D :NEXT
1040 FOR I=1 TO 300:NEXT
1050 FOR T= 18 TO 34:READ L,N,D:SOUND1,L,N,10*D :NEXT
1060 FOR I=1 TO 300:NEXT
1070 FOR T= 35 TO 48:READ L,N,D:SOUND1,L,N,10*D :NEXT
1080 FOR I=1 TO 300:NEXT
1090 FOR T= 49 TO 64:READ L,N,D:SOUND1,L,N,10*D :NEXT
1100 FOR I=1 TO 300:NEXT
1110 DATA-15, 61,1,0,61,,2,-15,61,1,0,61,,2,-15,61,1,-15
,69,1,-15,61,1,0,61,,2,-15,61,1,-15,41,2,-15,49,1,-15,41,
1,-15,49,1,-15,57,1,-15,61,2,0,61,,2,-15,61,2
1120 DATA-15, 61,1,0,61,,2,-15,61,1,0,61,,2,-15,61,1,-15
,69,1,-15,61,1,0,61,,2,-15,61,1,-15,41,2,-15,49,1,-15,41,
1,-15,49,1,-15,57,1,-15,61,2,0,61,,2,-15,61,2
1130 DATA -15,89,1,-15,81,1,-15,77,1,-15,69,1,-15,77,1,-
15,69,1,-15,61,2,-15,49,1,-15,41,1,-15,49,1,-15,57,1,-15,
61,2,0,61,,2,-15,61,2
1140 DATA -15,41,1,0,41,,2,-15,41,1,-15,49,1,-15,57,1,-1
5,61,1,0,61,,2,-15,61,1,-15,69,2,-15,89,1,-15,81,1,-15,77
,1,-15,69,1,-15,61,2,-15,81,2,-15,61,2
1150  RESTORE
1160 ENDPROC
```

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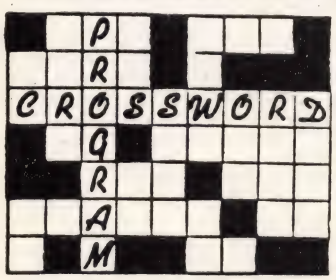
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sinclair special 5



Inside... New Interface 2 and ROM cartridges! New Software!

TAKING NEW SOFTWARE IN NEW DIRECTIONS

You'll see that this issue of Sinclair Special devotes considerable space to software.Why, when we've so much to say about hardware and peripherals? Simply because at Sinclair we believe in supporting first-class hardware with first-class software.

This month sees the start of a new commitment to education in our catalogue, both for adults and children.

In the field of micro theory, we've programs like Beyond BASIC and Make-a-Chip, which take you from the creation of simple ZX® assembler subsets to simulated circuit design projects.

There's Musicmaster, to teach you music terminology, note values and composition.

And if you're keen to beat your Spectrum at chess (which can be hard), you'll certainly want to try Chess Tutor 1, the first program in a complete chess masterclass.

Coming soon...

In the pipeline are many new releases, some of which break completely new ground. LOGO and micro-PROLOG for instance. They're fifth generation languages which will take you and your Spectrum closer than ever before to the creation and application of artificial intelligence.

A formal agreement between Sinclair and Macmillan Education has been announced, the first results of which will be published this autumn. These consist of five programs in a complete early reading course plus the first four of a series of programs based on Macmillan's top selling Science Horizons Scheme. All programs are designed for use in schools or the home.

And with Blackboard software, we're publishing six more home education programs for primary school children. Covering alphabet, spelling and punctuation, each of these programs is a true gem, unlike any other education software, and fascinating to run. Even for adults!

I believe that these new titles represent a major advance in educational software for the home.

New ROM software too!

You may well have heard news of ZX Interface 2® and ROM cartridge programs. You'll find full details of the Interface and its software on the facing page (and there's an order form on the back page too!). These offer an instant games playing facility at unbeatable prices, and expand the possibilities of using your Spectrum in yet another direction.

Alison Maguire

Alison Maguire
Applications Software Manager

SOFTWARE UPDATE

The latest cassette software for ZX® Computers



Chess Tutor 1

For 48K RAM Spectrum. **£9.95.**

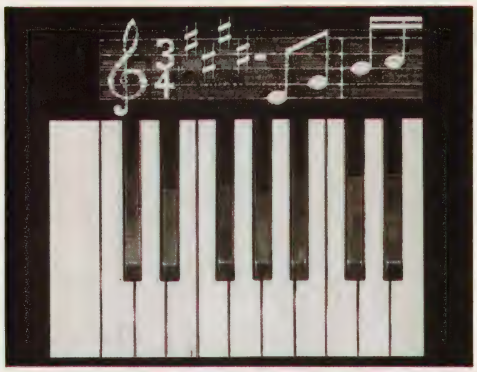
Chess Tutor is a new way of learning all about chess – using your ZX Spectrum.®

It starts from the beginning by teaching you about the chess pieces and the way they move – including castling, en passant, promotion, check, checkmate, stalemate and perpetual check.

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There are over 120 exercises and over 200 questions for you to answer – with demonstrations and hints from your ZX Spectrum when you want them.

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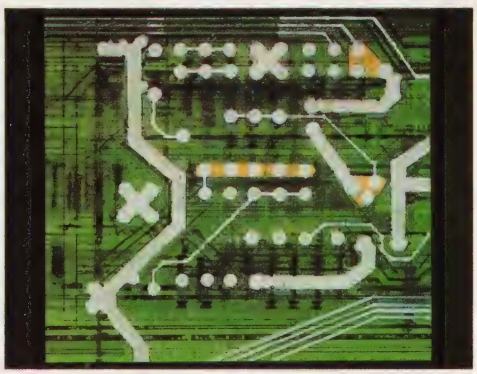
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Make-a-Chip is a fascinating way of finding out how computer logic works.

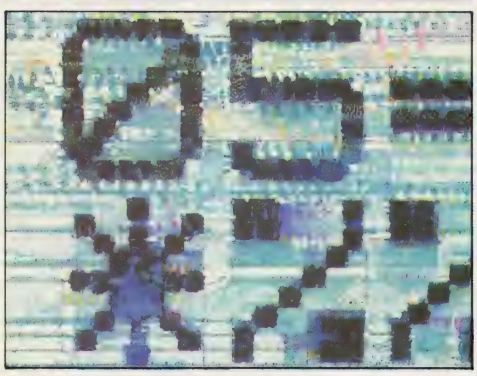


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Takes the agony out of assembler. Takes the mystery out of machine code.

Beyond BASIC gives you a deeper insight into the workings of your ZX Spectrum. It explains what happens inside your micro when you run a program, and it teaches you simple Z80 machine code programming.

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ZX INTERFACE 2®

The New ROM Cartridge/Joystick Interface

Loads programs instantly! Takes two joysticks! Just plug-in and play!

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum® system. It enables you to use new ZX® ROM cartridge software: plug-in programs that load instantly. It allows you to use two standard joysticks, without the need for separate, special interfaces.

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New! PSSST



Robbie the Robot sits in his garden. Help him fetch compost to cultivate his prize Thyrgodian Megga Chrysanthodil. Help him make the right choice of pesticide, to ward off devilish insects. Stop the insects breeding to overwhelming numbers before Robbie's plant has bloomed. PSSST is horticulture with a horrendous twist!

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This sophisticated program does everything you'd expect at board game level, and much more besides.

The high-resolution chessboard and pieces are arranged in a row and column system, so it's easy to key in your moves.

At any stage of the game you can request the computer to suggest a move, reverse roles or change the level of skill.

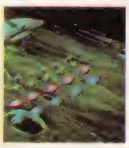
Full-colour high-resolution graphics.

Backgammon



Everything you need to play the famous and deceptively simple board game. Board, stones, rolling dice and doubling dice are shown in full colour and high resolution. Choose from four levels of skill to suit experts and beginners alike – full rules are included.

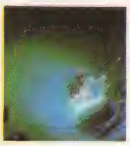
Space Raiders



Your skill is all that's stopping successive waves of aliens from destroying Earth. Use your gun base to attack. Shelter behind buildings... move out and blast the passing alien soaceship!

Full-colour high-resolution graphics with sound.

Planetoids



Dodge and swerve using your thrust button, turn on a planetoid... fire! But beware – the alien ship moves fast to destroy you with cluster bombs. And when it comes to the crunch, use your hyperspace button!

Full-colour high-resolution graphics with sound.

Hungry Horace



Horace is forever being chased around the park by guards.

He steals their lunch, eats pathway flowers and creates chaos in the park by ringing the alarm!

You'll have to be quick to keep Horace out of trouble!

Full-colour high-resolution graphics with sound.

New! Tranz Am



Set in a future time ruled by cars and trophies, in a land where petrol replaces gold, and status is possession of the 8 Great Cups of Ultimate.

Driving your Super Blown Red Racer, use your skill to outwit and crash the Deadly Black Turbos. Use your instruments to locate and collect the trophies – before you overheat or run out of fuel.

A program with outstanding multi-directional movement, graphic features, and a playing area equivalent to more than 600 times actual screen area.

Horace and the Spiders



Guide Horace on the hazardous journey to the cobwebbed house full of poisonous spiders.

Safely in the house, you must move along cobwebs, choose a spot... and jump on it! The spiders will be in a frenzy – scuttling to repair their precious web.

And when a spider is spinning a new section, you're safe to attack and destroy it!

Kill all the spiders, and a new web appears... with even more spiders to catch.

Full-colour high-resolution graphics.

New! Cookie



You're Charlie the Chef, who keeps his ingredients locked in the larder. But if the ingredients escape, they bring the inedible Nasties with them!

You must daze the escaping ingredients with flour bombs, and knock them into the mixing bowl. Stop them getting into the dustbin, at all costs! And beware of Nasties that get into the mixing bowl!

Cookie is fast-moving panic in the pantry, with a cast of real characters. A program to make you smile – and sweat!

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As Chief Test Pilot of the Acme Interstellar Transport Company, your task is to deliver and assemble spaceship kits. On your way round the galaxy, you're free to collect precious stones and gold.

The catch? Rocket fuel is precious and scarce. And the aliens don't take kindly to the theft of their valuables. You'll need your wits and your lasers!

With a host of features, including multi-directional movement, explosions, sound effects and one and two player option.

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Each Microdrive costs £49.95. Interface 1 costs £49.95, but just £29.95 if purchased with a ZX Microdrive. Extra ZX Microdrive cartridges: £4.95.

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Simply fill in the relevant sections on the order form below. Note that there is no postage or packing to pay on some purchases. Orders may be sent FREEPOST (no stamp needed). Credit card holders may order by phone, calling 01-200 0200, 24 hours a day. 14-day money-back option, of course. Please allow 28 days for delivery.

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GAMES

SOFTWARE REVIEWS

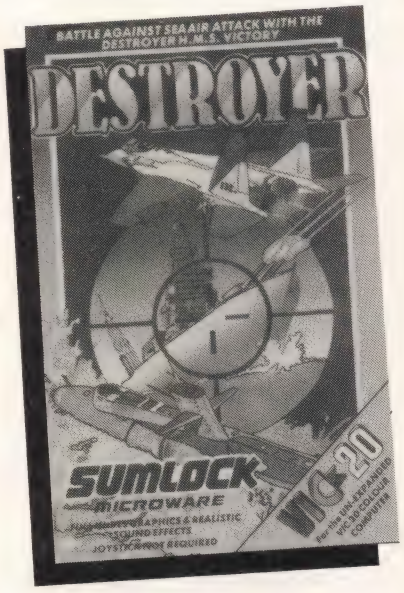
More software for you to peruse in the second part of our special report.

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

It is such a pity that good ideas can be ruined by lack of attention to detail. It is also apparent that the marketing side of Sumlock have never actually tested the product. The copy on the cassette sleeve reads "...VIC will automatically load and run the programme. Operating instructions will appear when the programme is fully loaded." They don't. In fact, you are launched straight into the game, and as you are playing against the clock, this is something of a disadvantage. When your four ships are destroyed, the word "REPLAY" appears on the screen, and the programe halts. Just how one is expected to re-start is a complete mystery. In the end, I had to resort to switching off and reloading.

The middle section of the game contains some good ideas: your ship is bobbing along the ocean and you are attacked by mines released by submarines. Points are scored by dropping depth charges and hitting the submarines. From time to time an aircraft is heard to drone into range. Scanners indicate the direction from which the plane will emerge, and you are given the opportunity to shoot it down before you are bombed. With your attention thus diverted a mine creeps up and destroys you!

Control is relatively simple, although six keys are required to



control left, right, depth charge left, depth charge right, guns right and guns left. There is no joystick control. Graphics are simple, the program being written for the unexpanded machine, and the game is undemanding. **N.C.M.W.**

Ratings Table

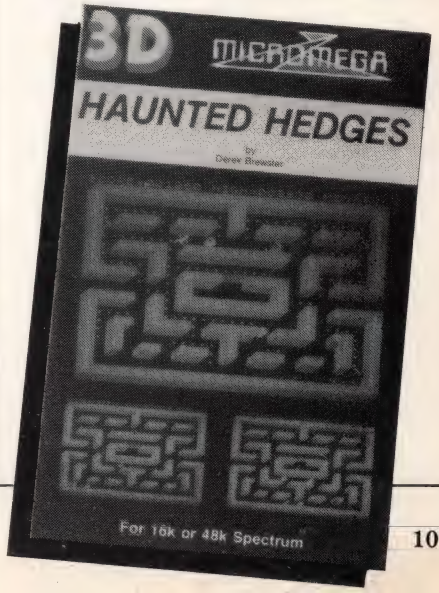
Program Quality	* *
Value for Money	* *
Presentation On-screen	* * *
Ease of use	* * *
Crashproofing	* *
Supplied Instructions	* *
Overall	45%

Title:	**Haunted Hedges**
Type:	**Tape**
Supplier:	**Micromega**
Machine:	**Spectrum 16/48K**
Price:	**£5.95**

Yes, believe it or not, this is yet another Pacman variant, but this time with an original storyline. The dots to be eaten are gold coins and the power pills are replaced by ice axes – a good way of explaining why your power over the ghosts runs out – the ice melts!

The most commendable feature of the game is the 3D effect which is very realistic. However, the graphic figures of the spirits and heroes are not so impressive. Sound and colour are well used to liven up the game, which is written in machine code.

The game offers a large number of features including five speed/skill levels, all of which I found fairly difficult and a hold game facility, which is a rare and very useful function enabling the control keys to be changed if desired. Surprisingly, however, there is neither a joystick option, nor Hall of Fame. Overall, though, a fairly good game. **D.L.**



SOFTWARE REVIEWS

Ratings Table

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

Title: Luna Crabs
Type: Tape
Supplier: Micromega
Machine: Spectrum 48K
Price: £5.95

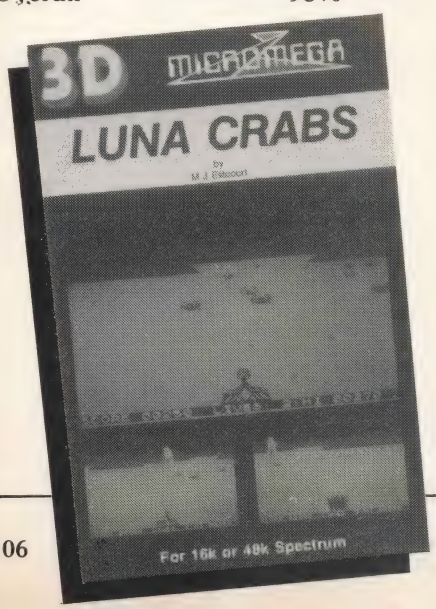
Once loaded this game presents the player with a stunning screen display in realistic 3D. Unlike certain (escapist) 3D games the enemy too are presented in impressive 3D. The game itself is a cross between Galaxians and 3D Combat Zone.

An unusual feature of this game is that moving left or right rotates the screen rather than the craft. The crabs appear on the screen as waves of creatures dropping alarming quantities of 'deadly acid-balls'. The sound effects too, are excellent.

This is a simple game which promises many hours of frustration. Certain features could have added to its attraction, such as having a two player option, Hall of Fame, and most importantly, better crashproofing. The game once stopped has to be reloaded but all in all the game is value for money. **D.L.**

Ratings Table

Program Quality	* * * *
Value for Money	* * * * *
Presentation On-screen	* * * * *
Ease of use	* * * * *
Crashproofing	* *
Supplied Instructions	* * * *
Overall	95%





Title: Cuthbert Goes Walkabout
Type: Tape
Supplier: Microdeal
Machine: Dragon 32
Price: £8.00

In this game you are Cuthbert waiting on the Lunar Landing Pad for the Federal Chief's State Visit. The object of the game is to switch on all the lights on the "pad", allowing the Federal Chief to land. To turn on a light you have to activate four switches by walking over them. They are located at the four corners of a square which represent each light. After completing a "pad", Cuthbert dances the Can-Can, and you get a bonus of 100 points, another life (you start off with five), and a new "pad" to light up.

To impede your progress there is a batch of intelligent Moronians which self-destruct when you bump into them. Unfortunately the explosion kills you at the same time, and a life is lost. You are allowed to jump over them, but be warned – they often change direction underneath you. Later in the game the Chief Moronian appears who is more intelligent and deadly. The graphics are simple, but adequate, and the sound is lively. A score of more than 500 points allows your name into the "Hall of Fame".

Overall I thought it was a very good game based on a simple idea and up to the usual high Microdeal standards. **S.F.**

Ratings Table

Program Quality	* * * * *
Value for Money	* * * * *
Presentation On-screen	* * * *
Ease of use	* * * * *
Crashproofing	* * * * *
Supplied Instructions	* * * * *
Overall	95%

Title: Morocco Grand Prix
Type: Tape
Supplier: Microdeal
Machine: Dragon 32
Price: £8.00

A joystick is required for this game in which you are required to drive a car along 100 miles of tyre screeching, clutch burning, wheel spinning, gas guzzling track.

Straight away you are asked which colour set you would like the computer to use: (a) Black and white, (b) white, orange, cyan, and magenta, (c) green, yellow, blue, red. Of the three I preferred the third.

The joystick controls your speed and direction. The further up you push the joystick the faster you go, and the further down the slower you go.

Your objective is made very difficult as you are travelling very fast and continually having to overtake and manoeuvre the black markers on the track. The task is not made any easier by the way the track changes width – any shunt with the sides and off you spin.



The graphics are excellent and the cars realistically drawn. It is pretty impressive the way your car spins off the road when you shunt another. The only bad point against the graphics is that the high-score table is very hard to read. Unfortunately it is not possible to put your name with the high-scores. The sound is impressive.

At first I found it difficult to manoeuvre the car through the

other cars, but practice made almost perfect and I found the game very enjoyable. Happy driving. **S.F.**

Ratings Table

Program Quality	* * * * *
Value for Money	* * * *
Presentation On-screen	* * * * *
Ease of use	* * * *
Crashproofing	* * * * *
Supplied Instructions	* * * *
Overall	83%

Title: Road Toad
Type: Tape
Supplier: dk'tronics
Machine: Spectrum (16K and 48K)
Price: £4.95

This is a standard implementation of a familiar game. What can you say about yet another 'frogger'? It has all the traditional ingredients – a frog must be guided across a motorway then a river, weaving between traffic on the road and negotiating disappearing turtles on the river.

On the plus side is the fact that the game runs in 16K and does not suffer in quality. In fact the graphics are pretty good. The snake running along the bank between road and river is lethal and is a feature sometimes not implemented. A time limit operates to increase the tension and this is quite a difficult version to play as the gaps between traffic are not large.

On the minus side, the turtles do not sink, they are wiped out like a chalk design being wiped off a blackboard, which looks rather silly. The river is one of the easiest I've crossed because of the large number of logs in it. Also the frog sometimes seems rather slow to respond to the keyboard, which is most frustrating on this kind of game.

If you don't already have this game then this version might be worth having, but it offers no great improvement on other versions around, so the best way to make your choice is probably by price. **M.W.**

Ratings Table

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



Title: The Dragon Composer
Type: Tape
Supplier: Microdeal
Machine: Dragon 32
Price: £15.00

I am not absolutely certain what to make of Dragon Composer. The program comes in a very elaborate packing and inside is a truly comprehensive manual – but who it's aimed at I'm not sure.

The cassette presents the user with two options, the first labelled "Composer" is the main program, but the second one, marked "Jukebox", when loaded, gives examples of what one can do with the first program.

The idea is that by using the program you can write your own music and play it through the sound system of your TV set or even by hooking it up to your Hi Fi. Programming the individual notes is time consuming, but they can be written in BASIC and the main program which is written and stored in machine code will then interpret them and play your tune. The program shows how you can use your on-screen facilities at the same time, so that if you are writing a game program for example you can write the music to go with it.

For the musician it really does open up new horizons in computing, because the program is capable of accepting up to four part harmony, therefore quite complicated musical scores can be written.

All in all a program for the enthusiast. The manual, although well written is hard work, and to accomplish anything does require a basic knowledge of music. **D.W.**

Ratings Table

Program Quality	* * *

SOFTWARE REVIEWS

Value for Money	* * *
Presentation On-screen	* *
Ease of use	* *
Crashproofing	* *
Supplied Instructions	* *
Overall	65%

Title: DragonFly Flight Simulator
Type: Tape
Supplier: Hewson Consultants
Machine: Dragon 32
Price: £6.95

It's a welcome change to see that the software houses are turning away from the slap and zap type games and are looking for programs which try to tax the computer's capabilities.

The number of flight simulator programs appearing on the market is a case in point. These programs, when well written, really do make some attempt to try to use the computer as a computer and not just as a glorified games machine. For any aspiring pilots trying out one of these programs will give you some idea of what it is like to fly the real thing. Often the graphics are realistic and the instrument display works.

However, the Dragon Fly Simulator does not fall into that category. The idea of the program is that you are at the controls of a single engined aircraft taking off from Norwich airport (why Norwich?) and you have the option of flying towards a radio beacon and then heading back to land at Norwich or of continuing and landing at Hethel.

The graphics are virtually non-existent. All the instruments are shown in digital form except for the aircraft attitude indicator which takes the form of three crude graphic dots which move with the aircraft. Flight control is through the keyboard and a joystick, but be warned – if you fly with this flight simulator and then try and put any of it into practice, you'll soon come to a sticky end – the joystick controls are back to front! A disappointing program that makes little use of the graphics. **D.W.**

Ratings Table

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

Title: Monitor
Type: Tape
Supplier: Jupiter Cantab
Machine: Ace 3K
Price: £5.95

Although one can write quite passable programs in BASIC without knowing the difference between a byte and a bit, this is not true of FORTH, which has been described as "a low-level high-level language". The FORTH programmer needs to know what bytes are being shifted where by his program, which means that in effect he needs a machine-code monitor.

This one from Jupiter Cantab is a more or less standard utility which lists, finds and exchanges as required, the contents of specified memory addresses. In addition it allows the interactive use of all words in the dictionary and adds fourteen of its own to carry out such functions as displaying the stack, poking bytes into nominated addresses and listing their contents in any of three number cases, plus ASCII. There are also 'find' and 'exchange' facilities, but no provision for reading the amount of memory left, which in 3K is rather an oversight.

The program will also quite happily list the non-existent contents of memory addresses which, although addressable by the Z80, are not currently present as RAM. There is no automatic carriage return between successive inputs and the display only makes use of half the screen, thereby producing a rather amateurish effect and providing in fact much less information than the comparable REMSOFT 'Toolkit' monitor, which represents a better alternative. **G.M.**

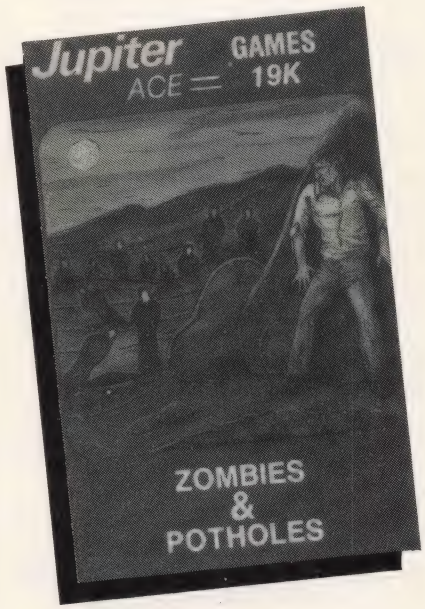
Ratings Table

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

Title: Zombies and Potholes
Type: Tape
Supplier: Jupiter Cantab
Machine: Ace 19K
Price: £7.95

The lot of the games programmer is not a happy one, for either he copies a well-known success with all the risks of future litigation, or he tries to be original and ends up with something as feeble as this.

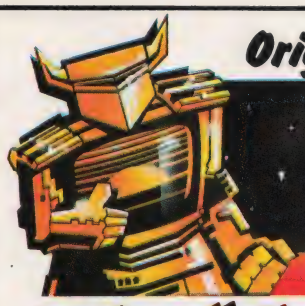
Here we have a "man" – or if that seems unpardonably sexist, let us speak of a "creature" – pursued (surprise! surprise!!) by a voracious crew of hungry "zombies" whom it must not only evade but also lure to their presumably second deaths down "potholes". Manoeuvering so that a pothole fills the path of the pursuing zombie is a simple matter of the simultaneous manipulation of eight keys, which to the sixteen-fingered inhabitants of the Alpha Centauri system is doubtless child's play. That the game is possible at all for mere Terrans, however, is due to the subtle design by which FORTH, one of the fastest computer languages on earth, is made to run so slowly as to make the whole game positively soporific.



When one is sufficiently bored with the whole enterprise to let the creature fall down the pothole itself, the program comes up with a childishly rude message. Maybe this program could be a hit in nursery schools, but it's definitely unsuitable for adults. **G.M.**

Ratings Table

Program Quality	* *
Value for Money	* *
Presentation On-screen	* *
Ease of use	*
Crashproofing	* * * *
Supplied Instructions	* *
Overall	30%



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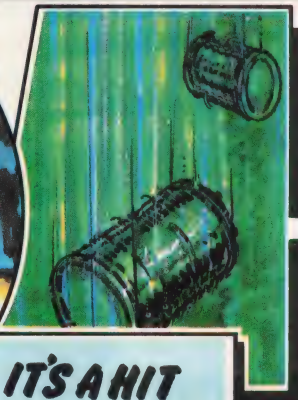
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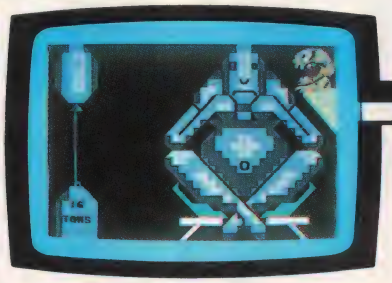


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Goodness Gracious



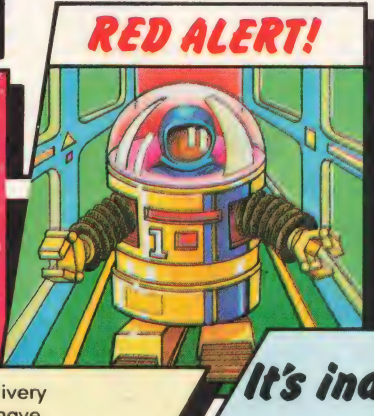




S.S. Achilles



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PCT 1

BASICALLY SPEAKING



The first part of our BASIC programming series for beginners brought to you by D. J. Tyler

More likely than not a lot of people recently received home computers of one type or another. After playing and probably mastering all those Arcade style games that came with it they are wondering, "what can I do with it now???".

You have probably heard that your particular computer can handle BASIC. "So what" I hear you cry, "the computer might be able to, but I can't".

You have read the manual that came with the computer and thought "now what do I do!!!". There are many many complaints of badly written manuals for the beginner, making it difficult to readily understand the staements and operations to programming.

In the following article it is hoped to break down the more common of these statements/operations used in the BASIC language (as this is the most common language used on home computers) so that you can comprehend what they do. The following is a list of those more usual statements found in programs and the ones used throughout this article.

INPUT
PRINT
IF.....THEN
GOTO
GOSUB;RETURN
FOR....NEXT
END
DIM
CLS
LET

As long as your computer has the BASIC language you will be alright. Also check the operating system part of your user's manual for any peculiarities. For instance the Acorn Atom always prefix the string variable with a $(dollar sign) whereas many others suffix the string variable with a $ (dollar sign), $A for Atom and A$ for many others.

Also certain aspects such as array labels may be different, again Atom decided to use double letter variables AA(?) where others may use just 1 letter with $ dollar sign suffix A$(?).

Some may even have assumptions in their basic dialect when using statements, in other words, assumes a statement is there when a certain line is written, eg.

Atoms again — instead of LET X = A + B it will assume that X will = 3 A + B, so is just written X = A + B. Also, take the statement IF A = 1 THEN GOTO 10, is the normal on most computers, the Atom assumes that when the statement IF is used, a THEN must be included with it, and it is not necessary to write it in the program. Of course the program will work equally as well with it written in.

It is just to say that various computers do have their own traits. Otherwise no problems should occur and the statements/operations discussed will put you well on the road to programming, as many programs can be written with only a limited amount of statements.

You then, of course can use from your local library (or buy if you wish) further books about programming which discuss more complex statements and show more efficient ways and finer points of acceptable tidy programming. At least you will have had the background now to 'read' programs and it is quite rightly said to "get a grip" of the situation just "read" other peoples' programs, as you might read a novel, and see how different ideas sprout for doing the same sort of thing. You will be surprised at yourself how quickly you can "see" how a routine is done.

It is a good start to describe some of the mathematical functions available for computing, again check your user's manual to see if they are available on yours.

Function	Application	Meaning
+ Add (plus)	LET A = B + C	B + C = A
− Take away (minus)	LET A = B − C	B − C = A
* Multiply by (asterisk)	LET A = B * C	B × C = A
/ Divide by (oblique)	LET A = B/C	B ÷ C = A
= Equal to	LET A = B	
> Is greater than	IF A > B	THEN ....
< Is less than	IF A < B	THEN ....
> = Is greater than or equal to	IF A > = B	THEN ....
< = Is less than or equal to	IF A < = B	THEN ....
> < Is not equal to	IF A > < B	THEN ....
ABS Absolute value	LET X = ABS A	The value of the number, ignoring the sign
INT Integer	LET X = INT A	The whole part of the number ignoring any decimal.
SQR Square root of	LET X = SQR A	$\sqrt{A} = X$
Exponention, to the power of	LET A = 10↑2 or LET A = 10**2	10 × 10 = A

It is a good idea to make up simple arithmetic problems using these operators to be able to recognise their function.

Right then, you have read the operating side of your computer manual; the computer is switched on and ready to enter a program routine.

We have to communciate with the computer, so to speak, using a language it understands, as we converse in English between ourselves. This is usually achieved by entering commands using the keyboard.

Now it becomes increasingly important how your keyboard is laid out. Is it a fullsize typewriter style or smaller push-button type? Are you a typist? Although it does not really matter at this stage, but as you progress to writing lagrer programs a good keyboard does play a major part to whether you wil enjoy it or not.

To start any program we have to start every instruction or set of instructions with a line number eg. 10, 20, 30 etc. These usually start at 10 and increases in multiples thereof. This is done, so if an error occurs or you leave something out, it can be readily inserted without having to re-number every other line. We come now to the first set of instructions.

Inputs and outputs

These allow us to "talk" to the computer and "it" can "talk" back to us, using its screen (monitor or TV). Talking computers are beginning to show their selves but it is probably unlikely you have one just yet. The language we probably know best is English so we humans use it. The computer though, has now to interpret that English into a form which can be used by the monitor program which controls the computer.

Here are some codes for Inputing or Outputting terms manipulated within the computer. They are called Variables and are names, so to speak, of a number of set of numbers or even a sentence (depending on how they are used) that the computer can understand.

Some machines can actually use names up to any length, some, only one letter eg. A or B etc. Again some accept a single letter with a numeric after it eg. A1 or B9 etc. Some can use a reversed out letter so you have twice as many variables.

So you get:
Name of any length eg. SECOND
Single letter (normal) eg. A to Z
Single letter (inverted) eg AtoZ

Single letter with one numeric eg. A1 to Z1 or A9 to Z9 etc. The last variable set gives up to 260 different variables, which is usually more than enough to use unless an extremely long and complex routine is to be written.

All this then, identifies to the computer numeric values and is given a name as above and is called thus in the program and used as required.

We can also enter letters and sentences which can include numerics and collectively these are known as STRINGS.

Again they can be called names eg. SECOND or be single letters, in fact the same type of variables as when used with numerics, but to distinguish the difference between a string and a numeric the suffix $ (dollar sign) is added to it.

So for strings we get:
Name up to any length with suffix $ eg. SECOND$
Single letter(normal) with suffix $ eg. A$ to Z$
Single letter(inverted) with normal suffix S eg. A$ to Z$

Don't forget to check, under the Strings heading in your user's manual, if the $ dollar sign prefixes or suffixes the variable names.

All this will allow the computer to manipulate letters and sentences, using lines something like,
10 INPUT A$
which will handle an input of letters or letters mixed with numerics.

Beware when using numerics with this type of ▶

BASICALLY SPEAKING

variable input, as it will only use them as they stand. If INPUT A$ equals 12345 the computer will only "handle" it as 12345 and will not do any mathematical problem or function with it.

Let's now use this input part of a statement to enter information to the computer. "Hold on", you say, "how do I know it is in the computer or that it wants me to enter anything at all!"

When you use the statement INPUT (variable) the computer will respond by printing on the screen a ? (question mark for some other prompt signature) and will wait, by halting the program, for you to enter whatever is required. If your program does not check to see whether the information is right or wrong, eg. a letter instead of a number, the computer will return an ERROR signal and print out a number or a message relating to a list of error messages in your user's manual. All this will result in your program being stopped and exited back to computer control program, not satisfactory at all if a lot of calculations or inputs are required by your program, so input check control within your statements is essential.

For example.

```
10 INPUT A$
20 IF A$ = "Y" THEN GOTO 100
30 IF A$ = "N" THEN GOTO 200
40 PRINT "Incorrect input, try again"
50 GOTO 10
```

Say that a program has asked you a question that requires an answer 'yes' or 'no' depicted by the input of either Y or N, it will naturally wait for your input as Line 10 will wait for Y or N. Line 20 IF A$ does equal Y then the program will GOTO line 100 which could be a routine to carry out for a true answer say to print instructions and rules to a game. If conversely you have played that game many many times and know the rules etc. you would enter N then line 30 will be reached (because line 20 is false) and if A$ equals N then the program is sent to line 200 say the game routine itself. If you slipped on the keyboard and pressed the space bar for instance line 20 and 30 will be false and so got to line 40 with the print out on screen that an incorrect input was entered, then line 50 sends the program back to the INPUT statement to try again.

This is just one way of doing this sort of thing, there are many other and probably better ways.

To test that our inputs are correct we can bring out of the computer the same information by using a PRINT statement to output to the screen, the values of our variables. Of course you can use a PRINT statement just to print sentences and these are enclosed in singular quotation marks eg. 10 PRINT "Your name is".

Let's now just put this all together and make up a simple program and run it.

Program

```
10 PRINT "Enter your name"
20 INPUT A$
30 PRINT "Enter your age in years"
40 INPUT A
50 PRINT "Enter your house number"
60 INPUT B
70 PRINT "And the Road in which you live"
80 INPUT B$
90 PRINT "Type in Print to check inputs"
100 INPUT C$
110 IF C$ = "Print" THEN GOTO 200
120 GOTO 90
200 PRINT "Your name is" A$
210 PRINT "Your age is" A "years"
220 PRINT "You live at"
230 PRINT B;B$
240 END
```

You have entered your program, now type RUN and press the RETURN key and answer the questions. Simple isn't it?

Now let's break the program down line by line.

Line 10 The computer prints on the screen Enter your name.

Line 20 This line is used to wait for you to enter a string of characters, in this case your name, and calls it variable A$. You will know that an Input is required due to the question mark or other prompt sign which is displayed.

Line 30 The computer prints on the screen, Enter your age in years.

Line 40 You oblige by entering your age as a number and the computer shows it as variable A.

Line 50 The computer prints on the screen, Enter your house number.

Line 60 As a number you enter the house number and the computer calls it variable B.

Line 70 Now the computer prints, And the road in which you live.

Line 80 Obviously a road is a name so you enter the name, the computer expects it as a string and calls your road name variable B$.

Line 90 The computer gives you an instruction this time and tells you to type in 'Print'.

Line 100 Uses the string variable C$ to store your previous typed in word, hopefully Print.

Line 110 This statement checks that, what's stored under name of C$ is what it should be, in our case Print, if it is, then shifts the program to line 200, if it is not, goes to the next line.

Line 120 This statement sends the program back to line 90 only if the statement in line 110 fails ie. if C$ does not equal Print.

Line 200 Prints out on the screen, what was put in for variable A$, in our case, your name and it prints "Your name is" prior to printing information in A$.

Line 210 Does the same for your age – this time variable A.

Line 220 Provides a line just to pre-empt that your address is to follow.

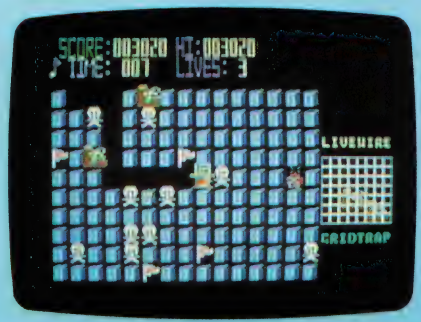
Line 230 The values or comments in variables B and B$ are printed on screen, in this case, house number and road name.

Line 240 This is a program End statement. All programs should include this on the last line of the program although may not necessarily be at the bottom of a listing, due to other routines etc. and provides a marker to the computer to when the program run ends.

When this program finishes its printout it automatically returns to computer control and to enable further use of it. Typing in RUN plus return must be input to continue its use. Use the program correctly at first to see it work, then when you are satisfied that you can understand that's going on, start playing with it, by entering the wrong information and see what happens, and write yourself corrections to it to avoid the program running incorrectly. You have probably discovered by now that it is a bit of a chore at the end of a RUN that you have to re-type RUN to continue its use. Life can be made easier by a simple GOTO statement to create a continuous loop of the same program only exitable by an Escape key or by physically turning off the computer, so try the GOTO statement.

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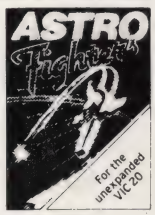
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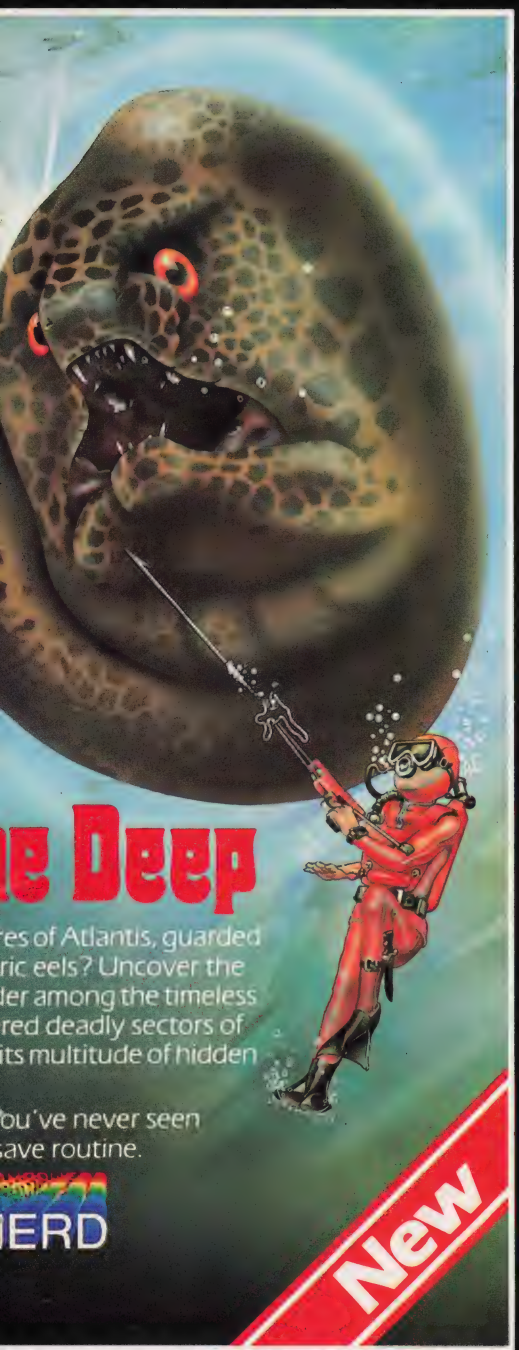
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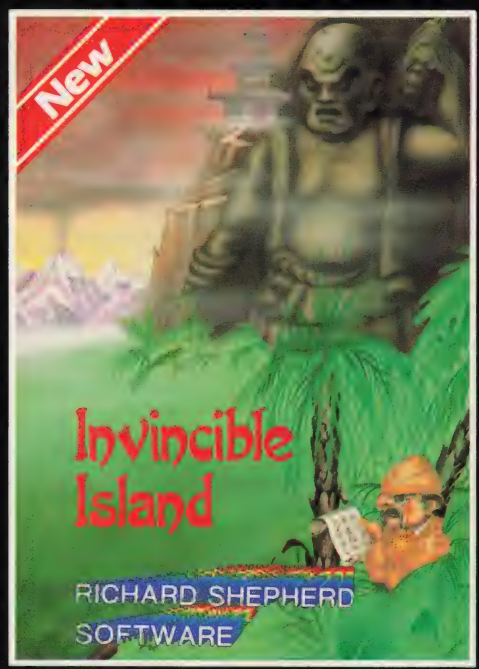
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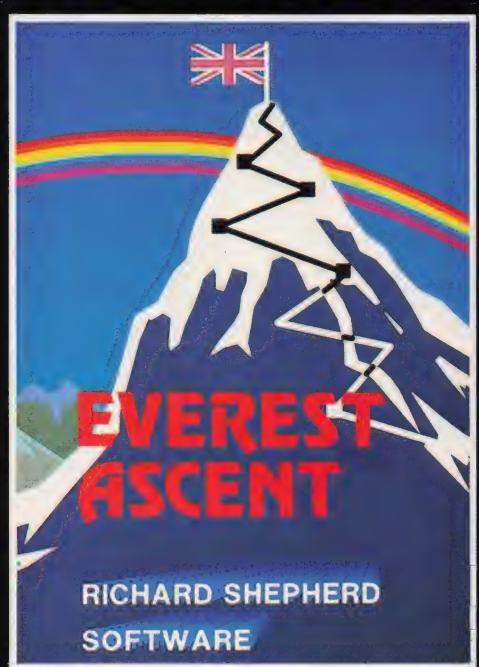




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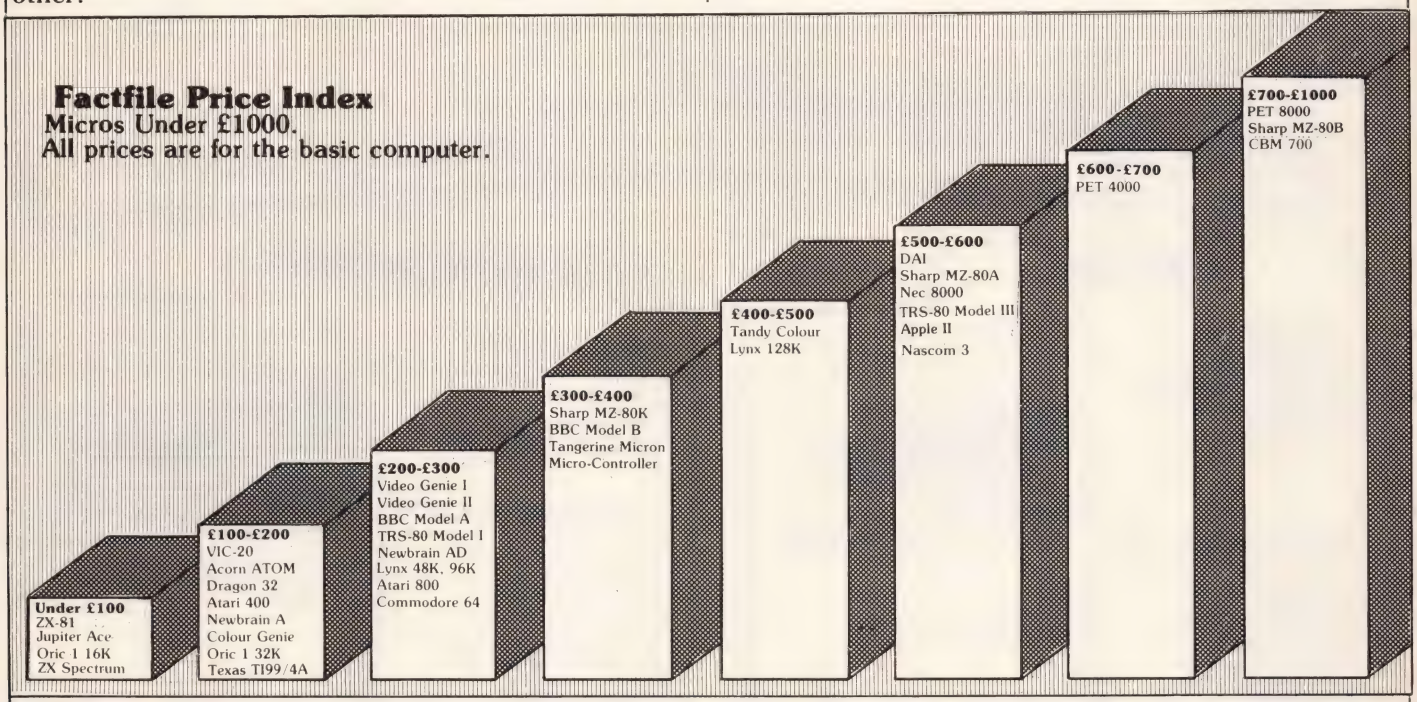
MICRO FACTFILE

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.

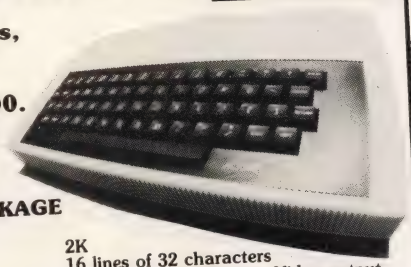
SERIAL/PARALLEL OUTPUT: This refers to the manner in which the micro transmits data to other units. If it puts out information in a long string, one bit after another, down a single wire or connector, it is a serial output. Parallel output is where pins or wires carry information simultaneously and are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

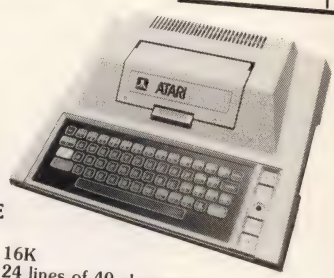
	DETAILS	PRICE
RAM	12K internal, 32K external options	£45-149
Printer	Yes	£232
Monitor	No	—
Disc Drives	Yes	£299
Other Languages	Yes	£11.50
Multi-user Capabilities	Yes	—
BASIC extensions (Toolkits)	Yes, BBC BASIC	£50

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

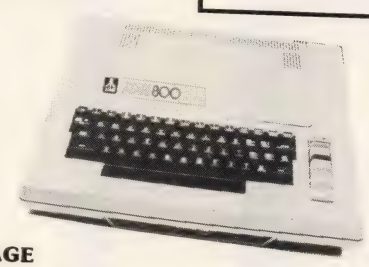
	DETAILS	PRICE
RAM	No	—
Printer	Yes	£199.90
Monitor	No	—
Disc Drives	Yes	£299.99
Other Languages	Yes	£39-79
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	TBA

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

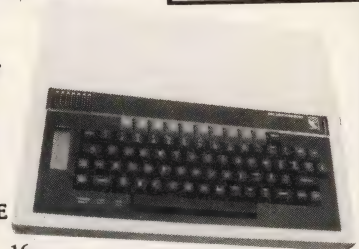
	DETAILS	PRICE
RAM	Yes	£199.99
Printer	No	—
Monitor	Yes	£299.99
Disc Drives	Yes	£39.79
Other Languages		
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	TBA

OTHER ADD-ONS:

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

BBC MICROCOMPUTER

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



STANDARD PACKAGE

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

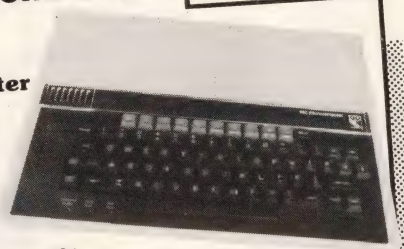
MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

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

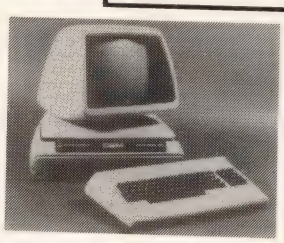
MANUFACTURER'S EXPANSIONS

	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	—

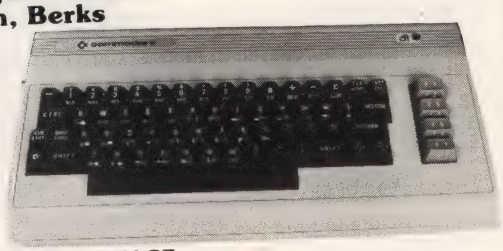
OTHER ADD-ONS:

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

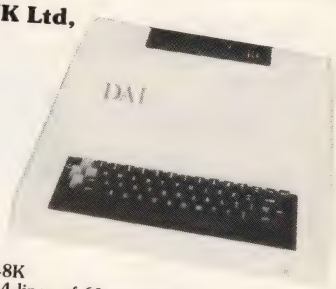
	DETAILS	PRICE
RAM	No	—
Printer	Yes	£230-276
Monitor	No	—
Disc Drives	Yes	£229
Other Languages	Yes	—
Multi-user Capabilities	Yes	—
BASIC Extensions	Yes	—

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

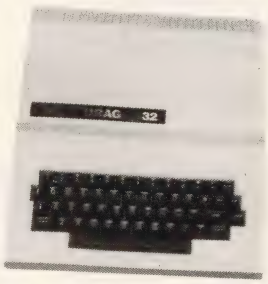
	DETAILS	PRICE
RAM	No	—
Printer	No	—
Monitor	No	—
Disc Drives	Yes	—
Other Languages	No	TBA
Multi-user Capabilities		—
BASIC extensions (Toolkits)	No Yes, maths pack	— £149

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

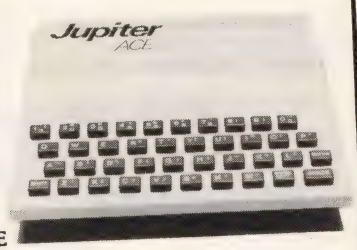
	DETAILS	PRICE
RAM	—	—
Printer	No	—
Monitor	No	—
Disc Drives	No	—
Other Languages	Yes	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

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)	TBA 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

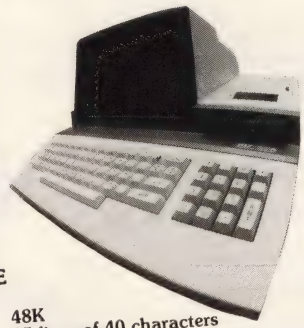
	DETAILS	PRICE
RAM	N/A	–
Printer	TBA	–
Monitor	No	–
Disc Drives	TBA	–
Other Languages	N/A	–
Multi-user Capabilities	No	–
BASIC extensions	TBA	–

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

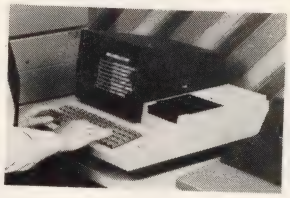
	DETAILS	PRICE
RAM	Yes	£120
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

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

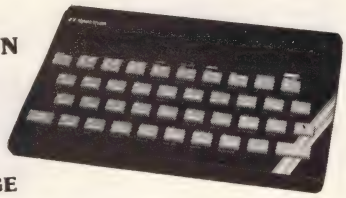
	DETAILS	PRICE
RAM	16K RAM pack	£29.95
Printer	ZX Printer	£59.95
Monitor	No	—
Disc Drives	No	—
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

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, Billicicay Road, Herongate, Brentwood, Essex CM13 3SD, £19.50; **Full-size keyboard,** Protos Computer Systems, Frome Computing, 20 Ashtree Road, Frome, Somerset, BA11 2SF, £64.95; **ZX99 Automatic tape control,** Data-cassette, 44, Shroton Street, London NW1 6UG, £59.95.

SINCLAIR ZX SPECTRUM

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



STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

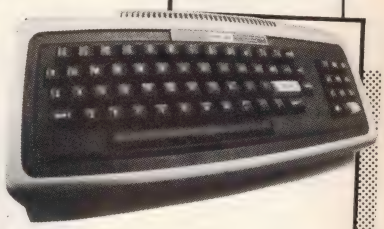
	DETAILS	PRICE
RAM	48K RAM for 16K version	£60
Printer	ZX Printer	£59.95
Monitor	No	—
Disc Drives	ZX Microdrive	TBA
Other Languages	No	—
Multi-user Capabilities	No	TBA
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

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,** Kran Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349; **48K internal RAM,** General Northern Microcomputers, (GNOMIC) 46 Middle Street, Blackhall, Marlepool, Cleveland, £70 + VAT; **32K RAM card,** Audio Computers, 87 Bournemouth Park Road, Southend on Sea, SS5 2JJ, £40 kit, £46 built.

TANDY TRS 80 III

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



STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

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

TANDY COLOUR

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



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	—

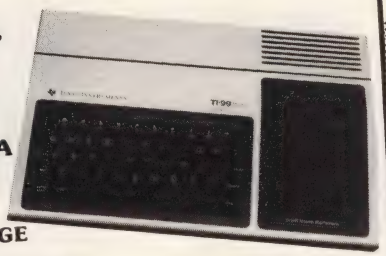
OTHER ADD-ONS:

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

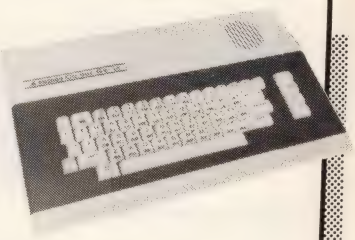
	DETAILS	PRICE
RAM	up to 48K (max)	£300
Printer	Yes	£275
Monitor	No	—
Disc Drives	Yes	£300
Other Languages	Yes	£50-£100
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

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**

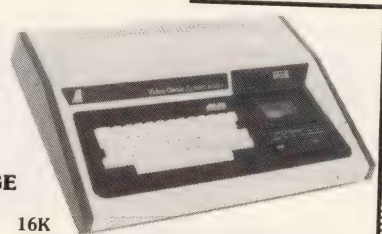
MANUFACTURER'S EXPANSIONS

	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

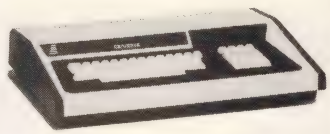
	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

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, Leicester LE1 4PF, £179-349; **EG3014 Expansion box with 16K/32K RAM,** Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £199-213; **48K internal RAM,** General Northern Microcomputers, GNOMIC, 46 Middle Street, Blackhall, Hartlepool, Cleveland, £70 +VAT; **32K RAM Card** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea, SS5 2JJ, £40 kit, £46 built.

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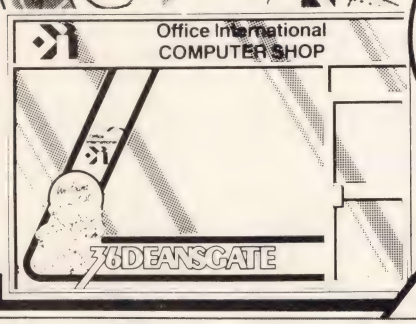


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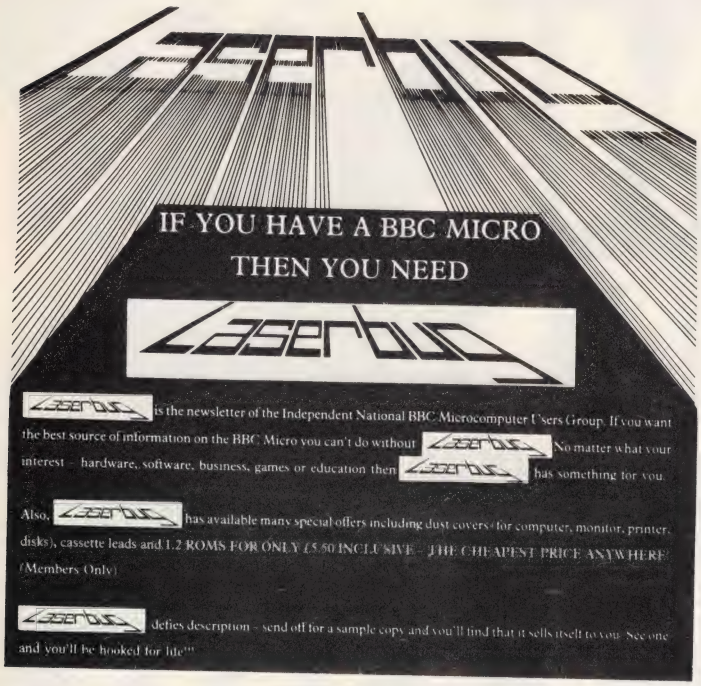


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St. Leonards-on-Sea,
E. Sussex TN38 8EA
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Looking through any computer magazine can be a bewildering experience if you're in search of a program. Count the hundreds of ads and thousands of titles on sale and it would be easy to lose heart!

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

Table Codes

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

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

The codes we have used are:

Program Type

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

How Sold

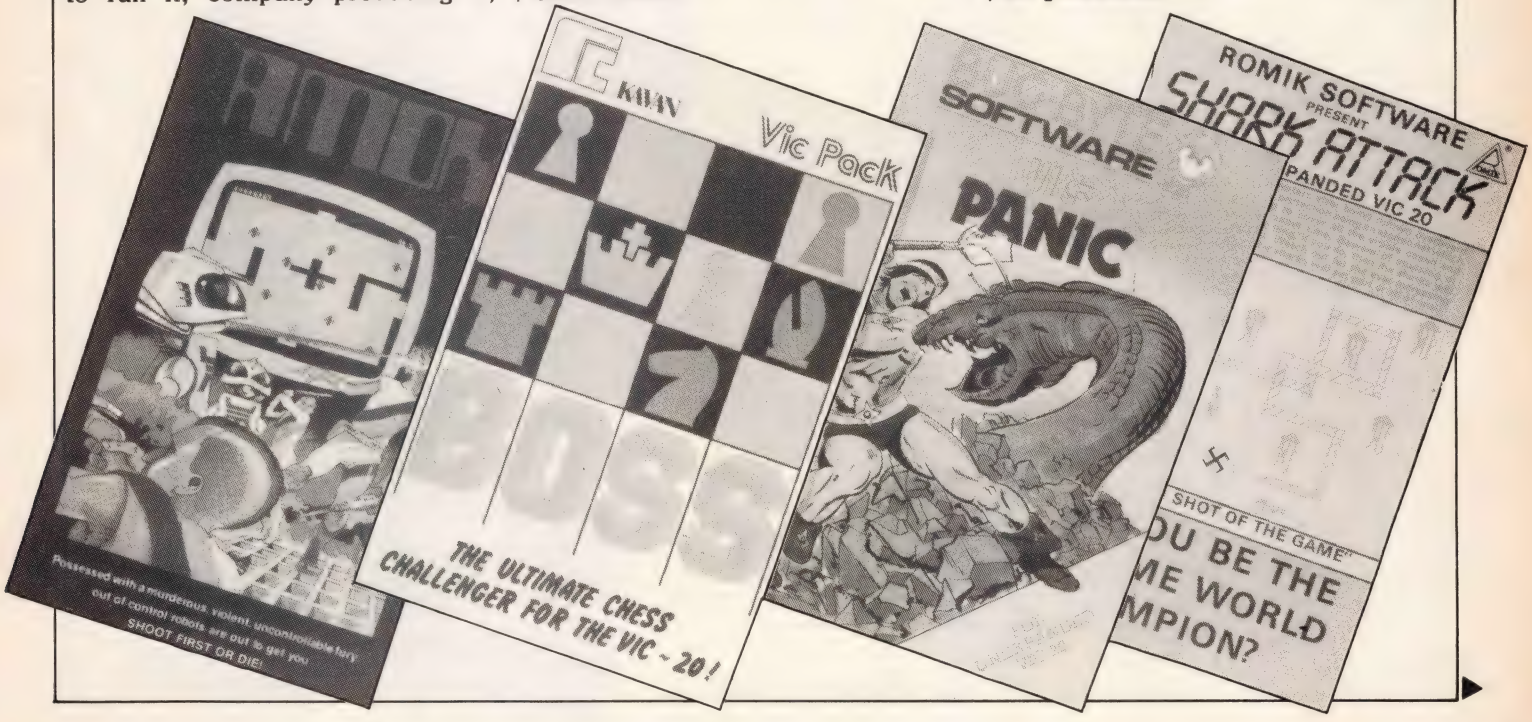
R = Cartridge (may include memory)
C = Tape (cassette)
D = Disc (for expanded systems)
L = Listing (sold as print-out)

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

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

ATOM

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
3-D Asteroids	Gm	Program Power	5K	C	PR	£6.85
747 Flight simulator	Gm	Bug Byte	12K	C	BR,AN,EL	£8.00
Adventure	Gm	Program Power	12K	C	BR,PR	£9.15
Adventures	Gm	Acornsoft	12K	C	Mlo	£30.00
Air Attack	Gm	Program Power	12K	C	BR,PR	£9.15
Air Attack	Gm	Program Power	12K	C	PR	£7.95
Air Strike	Gm	Pro S/W	9K	C	PS	£6.00
Alien Maze	Gm	Program Power	8K	C	PR	£5.69
Astrafire	Gm	Program Power	5K	C	PR	£4.54
Astro Birds	Gm	Program Power	12K	C	BR,PR	£9.15
Atom Adventure	Gm	Acornsoft	12K	C	EL,AC	£11.50
Atom Adventure	Gm	Hopesoft	12K	C	HO	£6.75
Atom Business Games	B/G	Program Power	12K	C	PR	£7.99
Atom Business Cassette	Bs	Acornsoft		C	AC	£7.50
Atom Business Pack	Bs	Acornsoft		C	Mlr,COu	£11.50
Atom Chess	Gm	Acornsoft	12K	C	EL,AC,AN	£11.50
Atom Chess	Gm	Acornsoft	12K	C	PR	£11.44
Atom Forth	Ut	Acornsoft		C	EL,AC,AN	£11.50
Atom Life Category	Bs	Acornsoft		C	AC,EL	£11.50
Atom List	Ut	Acornsoft		C	AC	£17.25
Atom Man	Gm	Hopesoft	12K	C	HO	£6.75
Atom Store	Bs	Program Power	12K	C	PR	£9.15
Atom Synthesiser	Gm	Acornsoft	12K	C	AC,EL	£11.50
Atomic Cube	Gm	A&F S/W	12K	C	AA	£4.95
Backgammon	Gm	Bug Byte	7K	C	BR	£7.00
Blitz	Gm	Rucksoft	4K	C	R	£2.65
Chaser	Gm	Hopesoft	4K	C	HO	£3.75
Chess	Gm	Bug Byte	12K	C	BR,AN,EL	£9.00
Chess	Gm	Program Power	12K	X	PR	£9.15
Constellation	Gm	Program Power	12K	C	PR	£7.99
Constellation	Gm	Program Power	12K	C	PR	£7.99
Colour Invaders	Gm	Hopesoft	12K	C	HO	£3.75
Cowboy Shootout	Gm	Program Power	12K	C	BR,PR	£7.99
Cylon Attack	Gm	A&F S/W	12K	C	AA	£4.95
Dambusters	Gm	Program Power	10K	C	PR	£5.69
Data Base	Ut	Acornsoft	6K	C	Mlo,COu,EL	£11.50
Death Satelite	Gm	A&F S/W	12K	C	AA	£6.00
Demon Dungeon	Gm	Program Power	5K	C	PR	£6.85
Derby, Blitz and Rat Race	Gm	Program Power	12K	C	PR	£6.84
Desk Diary	Bs	Acornsoft	12K	C	Mlo,COu,EL	£11.50
Detective	Gm	Computersmith	12K	C	CDm	£4.95
Disassembler	Ut	Hopesoft	3K	C	HO	£1.75
Disassemble Program	Ut	Program Power	4K	C	PR	£6.85
Dragon's Lair	Gm	Program Power	12K	C	PR	£6.85
Early Warning	Gm	A&F S/W	12K	C	AA	£4.95
Earth Rescue	Gm	Rucksoft	6K	C	R	£2.80
Easy Talker	Ed	Acornsoft	16K	C	AC	£5.00
Escape	Gm	A&F S/W	8K	C	AA	£4.95
Fall of Rome	Gm	Program Power	12K	C	PR	£7.99
Forth Tape	Ut	Acornsoft		C	COu	POA
Forth, Theory & Practice	Bs	Acornsoft		C	AC	£6.00
Galactica	Gm	Program Power	12K	C	PR	£5.69
Galaxian	Gm	Bug Byte	12K	C	BR,AN,EL	£8.00
Galaxian War and Invasion	Gm	Program Power	2K	C	PR	£6.84
Golf	Gm	Computersmith	12K	C	COm	£4.95
High Stats	Bs	Program Power	12K	C	PR	£7.99
Hyper Fire	Gm	Program Power	12K	C	PR	£9.15
Introductory Pack	Ed	Acornsoft	3K	C	AC,COu,EL	£23.00
Invader Force	Gm	Program Power	12K	C	PR	£9.15
Invaders	Gm	Bug Byte	12K	C	BR,AN,EL	£8.00
Lunar Lander	Gm	Program Power	12K	C	PR	£7.99
Martians	Gm	Program Power	12K	C	PR	£7.99
Maths Pack 1:	Ed	Acornsoft	4K	C	SU,COu, BR,AC	£11.50
Maths Pack II:	Ed	Acornsoft	6K	C	SU,COu, BR,AC	£11.50
Maze Ball	Gm	Program Power	12K	C	PR	£5.69
Microbudget	Bs	Program Power	12K	C	PR	£9.15
Mine Field	Gm	A&F S/W	6K	C	AF	£4.95
Missile Command	Gm	A&F S/W	12K	C	AF	£4.95
Mode 4 VDU	Ut	Program Power	12K	C	PR	£7.99
Moon Lander	Gm	Rucksoft	6K	C	R	£2.25
Munchy Man	Gm	Program Power	12K	C	PR	£5.69
Music Box	Gm	Program Power	12K	C	PR	£7.99
Parachute	Gm	Rucksoft	5K	C	R	£2.25
Peeko Computer	Ed	Acornsoft	6K	C	AC	£11.50

ATOM DEALERS

Supplier Code

AA A & F Software
10 Wilpshire Avenue
Longsight
Manchester
061 320 5482

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

ANg Anglia Computer Cnetre
88 St Benedicts Street
Norwich NR2 4AB
0603 26002

AN Anglo American Software
158a Stratford Court
Sparkhill
Birmingham
021 771 2995

BR Brighton Gamer
24 Gloucester Road
Brighton
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0273 698424

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16 Wayside
Chipperfield
Herts
09277 69255

COm Computersmith
40 Greensfields Avenue
Bromborough
Wirral
L62 6DD

COu Control Universal Limited
Unit 2
Andersons Court
Newnham Road
Cambridge
0223 358757

EL Eltec Services Ltd
231 Manningham Lane
Bradford
BD8 7HH
0274 491372

HO Hopesoft
Hope Cottage
Winterbourne
Newbury
Berks
RG16 8BB

IN Intelligent Artefacts Ltd
Cambridge Road
Orwell
Royston
Herts
0223 207689

Mlo Microage Electronics
135 Hale Lane
Edgeware
Middx
01 959 7119

Mlr Microstore
327 Kings Road
London SW3
01 352 9291

PR Program Power
5 Wensley Road
Leeds LS7 2LX
0532 683186

PS Pro Software
121 Tyn-y-Twr
Baglan
Port Talbot
W Glamorgan SA12 8YE

R Rucksoft
10 The Moorlands
Hanley Road
Malvern Wells
Worcs WR14 4PS

SU Superior Systems Ltd
178 West Street
Sheffield
0742 755005



Pirate Island	Gm	Hopesoft	12K	C	HO	£6.75
Polaris	Gm	A&F S/W	12K	C	AF	£3.95
Polecat	Gm	A&F S/W	12K	C	AF	£4.95
Pontoon	Gm	A&F S/W	12K	C	AF	£3.95
Programmer's Toolkit	Gm	Program Power		C	PR	£28.15
Reversi	Gm	Program Power	8K	C	PR	£5.69
Robot Control	Ed	Acornsoft	16K	C	AC,IN	£35.00
Robot Nim	Gm	A&F S/W	6K	C	AF	£3.95
Sketch Pad Program	Gm	Program Power	5K	C	PR	£5.69
Softscreen	Ut	Computer Concepts	12K	C	CO	£11.50
Space Invaders	Gm	Pro S/W	12K	C	PS	£6.00
Space Fighter	Gm	Program Power	12K	C	PR	£9.15
Space Invaders	Gm	Computer Concepts	12K	C	CO	£7.80
Space Adventure	Gm	Pro S/W	12K	C	PS	£6.00
Space Storm	Gm	Program Power	4K	C	PR	£5.69
Spirographics	Gm	Rucksoft	8K	C	R	£2.45
Star Raid	Gm	Rucksoft	11K	C	R	£3.30
Star Trek	Gm	Program Power	5K	C	PR	£6.85
Stockbroker	Gm	Program Power	5K	C	PR	£4.54
Super Race Track	Gm	Program Power	12K	C	PR	£5.69
Tangle	Gm	A&F S/W	6K	C	AA	£3.95
The Soft VDU	Gm	Acornsoft	8K	C	AC,BR,SU Mlo	£11.50
The Park	Gm	Program Power	12K	C	PR	£5.69
Time Tutor	Ed	A&F S/W	6K	C	AA	£3.95
Utility Pack 1	Ut	Acornsoft	2K	C	PR,Mlo,EL	£11.50
Warlords	Gm	Program Power	12K	C	PR	£7.99
Word Pack ROM	Ut	Acornsoft	8K	C	Mlo,EL	POA
Word Processings Pack	Bs	Acornsoft	8K	C	COu	POA
Word Tutor	Bs	Acornsoft	12K	C	EL,Mlo,COu	£11.50
Write Your Own Adventure	Ut	Hopesoft	12K	C	HO	£5.75
Yan	Gm	Program Power	3K	C	PR	£5.69
Yellow Pearl	Gm	Rucksoft	7K	C	R	£3.30

DRAGON

Arcade Action	Gm	Apex S/W	32K	C	AP	£3.95
Astroblast	Gm	Dragon Data	16K	R	KE	£19.95
Alcatraz II	Gm	Micro deal	16K	C	KE	£8.00
Aliens +	Gm	Wizard Software	32K	C	WZ	£7.95
Berserk	Gm	Dragon Data	32K	R	KE,SUm	£19.95
Black Sanctum	Gm	Dragon Data	16K	C	KE	£7.95
Breaker	Gm	Wizard S/W	32K	C	WZ	£3.50
Calixto Island	Gm	Dragon Data	16K	C	KE	£7.95
Computavoice	Ut	Dragon Data	16K	C	KE	£7.95
Cosmic Invaders	Gm	Dragon Data	32K	R	SUm	£19.95
Cyrus Chess	Gm	Dragon Data	16K	R	KE	£19.95
Devil's Island	Gm	Apex S/W	32K	C	AP	£4.95
Defense	Gm	Microdeal	16K	C	KE	£8.00
Destroyer	Gm	Sumlock	5K	C	SUm	£7.95
Dragon Mountain	Gm	Dragon Data	16	C	KE	£7.95
Dragon Invaders	Gm	Microdeal	16K	C	KE	£8.00
Dragon Selection 1	Gm	Dragon Data	32K	C	SUm	£7.95
Dragon Selection 2	Ut	Dragon Data	32K	C	SUm	£7.95
Dragon Startrek	Gm	Wizard Software	32K	C	WZ	£8.45
Examples from the Manual	Ut	Dragon Data	32K	C	SUm	£7.95
Escape	Gm	Microdeal	16K	C	KE	£8.00
Evictor	Gm	Wizard Software	32K	C	KE	£7.00
Flag	Gm	Dragon Data	16K	C	KE	£7.95
Flipper	Gm	Microdeal	16K	C	KE	£8.00
Forbidden City	Gm	Apex S/W	32K	C	AP	£4.95
Fruita	Gm	Wizard S/W	32K	C	WZ	£6.50
Galleons	Gm	Wizard S/W	32K	C	WZ	£5.00
Gamestape 1	Gm	Apex S/W	32K	C	AP	£1.95
Gamestape 2	Gm	Apex S/W	32K	C	AP	£2.95
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Ghost Attack	Gm	Dragon Data	32K	R	SUm	£24.95
Graphic Animator	Ut	Dragon Data	32K	C	SUm	£7.95
Haunted House	Gm	Apex S/W	32K	C	AP	£3.95
Island Adventure	Gm	Apex S/W	32K	C	AP	£3.95
Invaders Revenge	Gm	Microdeal	16K	C	KE	£8.00
Jerusalem Adventure	Gm	Microdeal	16K	C	KE	£8.00
Lightpen	Ut	Microdeal	16K	C	KE	£12.00
Madness and the Minotaur	Gm	Dragon Data	32K	C	SUm,KE	£7.95
Mansion Adventure	Gm	Microdeal	16K	C	KE	£8.00
Meteoroids	Gm	Dragon Data	32K	R	SUm,KE	£19.95
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Pharaoh's Curse	Gm	Apex S/W	32K	C	AP	£4.95

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AP Apex Trading Ltd
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BH B & H Software
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0279 723567

JM J Morrison (Micros Ltd)
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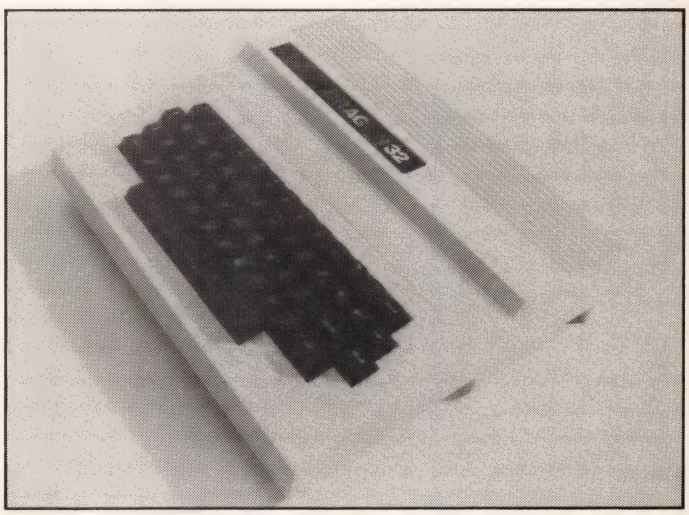
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SUm Sumlock Electronic Services
(Manchester Ltd)
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198 Deansgate
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061 834 4233



Program Pack 1	Gm	Microdeal	16K	C	KE	£8.00
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Typing Tutor	Ed	Dragon Data	16K	C	KE	£7.95
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Williamsburg Adventure	Gm	Microdeal	16L	C	KE	£8.00
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Word Processor	Bs	Juniper Comp	32K	C	JU	£25.00

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ORIC

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Adventureland	Gm	Kenema	48K	C	KEn	£4.99
Airline	Gm	CCS	48K	C	CCs	£7.95
Assembler & Disassembler	Ut	Durell	48K	C	DU	£9.95
Awari	Gm	Kenema	48K	C	KEn	£3.83
Backgammon	Gm	J Edwards	12K	C	JE	£5.50
Base	Gm	Tansoft	48K	C	TA	£9.95
Battleship Patrol	Gm	J Edwards	12K	C	JE	£5.50
Biorythms	Do	Tomorrows World	48K	C	TO	£5.95
CB/Ham Log	Do	Kenema	48K	C	KEn	£3.83
Centipede	Gm	PSS	48K	C	PSs	£6.95
Character/Graphic Generator	Ut	Headfiled Technology	48K	C	HEa	£4.95
Chess	Gm	Tansoft	48K	C	TA	£9.99
Code Breaker	Gm	Headfield Technology	48K	C	HEa	£4.95
Compendium	Gm	Salamander S/W	48K	C	SA	£7.95
Dallas	Gm	CCS	48K	C	CCs	£7.95
Death Satellite	Gm	A & F Software	16K	C	AA	£6.90
Death Trap	Gm	Headfield Technology	48K	C	HEa	£4.95
Design Aid	Ut	Kenema	48K	C	KEn	£3.83
Dinky Kong	Gm	Adrian Shepherd	16K	C	SE	£6.95
Dungeons of Intrigue	Gm	ASL Software	48K	C	ASl	£5.50
Family Records	Do	Kenema	48K	C	KEn	£3.83
Fishermans Log	Gm	Kenema	48K	C	KEn	£3.83
Five Alike	Gm	Pase	48K	C	PA	£4.99
Flight	Gm	Tansoft	48K	C	TA	£4.95
Forth	Ut	Tansoft	48K	C	TA	£4.95
Franklin's Tomb	Gm	Salamander	48K	C	SA	£9.95
Fruit Machine/Pontoon	Gm	Computamaster	48K	C	COt	£4.95
Gail	Gm	Severn Software	48K	C	SE	£6.95
50 Games	Gm	Cascade Software	48K	C	CAs	£9.95
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Graphics	Ut	Basic Concepts	48K	C	BA	£6.95
Happy Landings	Gm	Basic Concepts	48K	C	BA	£6.95
Hopper	Gm	P.S.S.	48K	C	PSs	£6.95
Invaders	Gm		48K	C	AR,PSs	£5.50
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Key Trainer	Ed	Kenema	48K	C	KEn	£3.83
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Mastermind	Gm	Tomorrows World	48K	C	TO	£5.95
Mastermynde	Gm	Headfield Technology	48K	C	HEa	£4.95
M/Code Monitor	Ut	PASE	48K	C	PA	£4.99
Mushroom Mania	Gm	Arcadia Software	48K	C	AR	£5.50
3D Noughts and Crosses	Gm	J Edwards	8K	C	JE	£5.50
ORIC Base	Do	Tansoft	48K	C	TA	£14.50
ORIC Chess	Gm	Tansoft	48K	C	TA	£9.99
ORIC Flight	Gm	Tansoft	48K	C	TA	£4.50
ORIC Forth	Ut	Tansoft	48K	C	TA	£15.00
ORIC Invaders	Gm	Titan	48K	C	TI	£6.95
ORIC Man	Gm	P.S.S.	48K	C	PSs	£8.95
ORIC Trek	Gm	Salamander	48K	C	SA	£9.95
Oricade	Ut	Severn Software	48K	C	SE	£8.50
Othello	Gm	J Edwards	10K	C	JE,KEn	£5.50
Painter	Gm	A&F Software	48K	C	AA	£6.90
Personnel Files	Bs	Kenema	48K	C	KEn	£17.39
Quest	Gm	J Wolstencroft	48K	C	JW	£6.95
Startrek	Gm	J Edwards	48K	C	JE	£5.50
Synthesiser	Do	Tomorrows World	48K	C	TO	£7.95
Teach Yourself Basic	Ed	Basic Concepts	48K	C	BA	£6.95
The Word	Gm	Headfield Technology	48K	C	HE	£4.95
Ultra	Gm	PSS	48K	C	PSs	£6.95
West Quest	Gm	PASE	48K	C	PA	£4.99
Worm	Gm	PASE	48K	C	PA	£4.99
Wriggler	Gm	FBC Systems Ltd	48K	C	FB	£5.50
Zodiac	Do	Tansoft	48K	C	TA	£9.99
Zodiac	Do	A&F Software	16K	C	AA	£6.90
Zrim	Gm	J Wolstencroft	48K	C	JW	£7.50

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3-D Basic	Gm	Kuma	6K	C	KU,XI,MI	£6.32
3-D Space Battle	Gm	Sumlock	48K	C	SUm	£8.00
Acrobat	Gm	Sumlock	48K	C	SUm	£6.33
Address Book	Gm	Highlight S/W	4K	C	HI,MI	£4.60
Address Book	Do	DCS	48K	C	DAv	£3.00
Agent 007	Gm	DCS	24K	C	DAv	£3.00
Aladdin's Cave	Gm	Kuma	48K	C	KU,BR	£6.32
Aldebaren I	Gm	Sharpsoft	20K	C	BR	£5.85
Alien Attack	Gm	Sumlock	48K	C	SUm	£6.50
Alien Attack	Gm	J Wolsencroft	24K	C	JW	£4.60
Analysis Book	Bs	Microtek	48K	C	ML	£95.00

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AR Arcadia Software
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ASl ASL Software
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BU Burslem Computer Centre
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0782 825555

CAs Cascade Software
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0249 653824

TO Tomorrows World
118 Worcester Road
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HG3 2UZ



Animate	Gm	Kuma	48K	C	KU,XI,MI	£9.20
Apollo Front Panel	Bs	Kuma	20K	C	KU	£14.35
Apolloword	Bs	Kuma	48K	C	KU,XI,LS	£28.70
Apolloword	Bs	Kuma	48K	D	KU,XI,LS	£63.25
Ardensoft Toolkit	Ut	Kuma	20K	C	KU	£40.25
Artillery/Biorythms	Gm	DCS	24K	C	DAv	£3.00
Asteroids	Gm	Sharpsoft	20K	C	BR	£5.85
Astor Dodge	Gm	Kuma		C	KU,BR	£6.32
Astor Shoot	Gm	Sumlock	48K	C	SUm	£6.33
Auto Cross	Gm	Highlight S/W	6K	C	HI,MI	£4.60
Backgammon	Gm	Highlight S/W	10K	C	HI,MI	£5.75
Bank Account	Do	Highlight S/W	6K	C	HI,MI	£4.60
BASIC-C	Ut	DCS	24K	C	DAv	£16.00
BASIC-B	Ut	DCS	24K	C	DAv	£12.00
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Basic Extensions	Ut	Kuma	20K	C	KU,XI,MI	£14.95
Basic Mod	Ut	DCS	20K	C	DAv	£5.00
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Bean Feast	Gm	DCS	24K	C	DAv	£3.00
Bingo Caller	Gm	DCS	48K	C	DAv	£3.00
Bio-Rhythm	Gm	Highlight S/W	6K	C	HI,MI	4.60
Block QC	Gm	Sharpsoft	20K	C	MI	£3.50
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Bomb Run	Gm	Sumlock	48K	C	SUm	£7.50
Bomber	Gm	Kuma	6K	C	KU,MI,XI	£6.32
Breakout	Gm	Kuma	48K	C	KU,MI,XI	£6.32
Breakout	Gm	Sharpsoft	20K	C	MI	£5.75
Bridge	Gm	Highlight S/W	22K	C	HI	£12.95
Broadwater Economic Simulations	Ed	BES	16K	C	BRo	£28.75
Brownian Motion	Ed	Kuma	48K	C	KU	£12.00
Bytesaver	Ut	DCS	20K	C	DAv	£4.00
CPM	Ut	Chrystal	48K	C	XI,KU	£172.50
Calc II	Bs	Kuma	20K	C	XI,KU,MI	£39.65
Camelot	Gm	Kuma	48K	C	KU,LS,MI, XI,SU	£6.32
Carols	Gm	Kuma	48K	C	KU,MI,XI	£6.32
Cash Book	Bs	Microtek	48K	C	ML	£95.00
Cash Flow Projection	Bs	NCG Ltd	36K	C	WC	£95.00
Castle Bloodstone Adventure	Gm	Sumlock	48K	C	SUm	£17.25
Casino	Gm	Kuma		C	KU	£6.32
Catch 2000/Invader	Gm	Kuma	12K	C	KU,XI,MI	£6.32
Cesil III	Ed	Kuma	20K	C	KU	£17.20
Chase	Gm	Highlight S/W	6K	C	HI,MI	£5.75
Chess	Gm	Kuma	12K	C	KU,XI,SU,BR	£12.00
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Chrystal Basic	Ut	Chrystal	48K	C	KU,XI	£46.00
Colditz	Gm	Sharpsoft	20K	C	BR	£8.46
Combat	Gm	Highlight S/W	6K	C	HI,MI	£5.75
Combat	Gm	Kuma	12K	C	XI,KU,MI	£6.32
Commands	Gm	Sharpsoft	20K	C	MI	£5.85
Composer	Gm	Highlight S/W	6K	C	HI,MI	£5.75
Concentration	Gm	Kuma	12K	C	XI,KU,MI	£6.32
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Connect 4	Gm	Highlight S/W	6K	C	HI,MI	£4.60
Connect Four	Gm	DCS	24K	C	DAv	£3.00
Cosmiad	Gm	Highlight S/W	10K	C	HI,MI	£5.75
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Cursed Chambers	Gm	J Wolstencroft	48K	C	JW	£5.75
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Demon Drive	Gm	DCS	24K	C	DAv	£3.00
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Double Precision Basic	Ut	Sharp	48K	C	MI	£28.75
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Election '84	Gm	Sharpsoft	20K	C	BR	£8.45
Electronic Organ	Gm	Kuma	12K	C	KU	£6.32
Electronic Organ	Gm	DCS	48K	C	DAv	£3.00
Empire II	Gm	Sharpsoft	20K	C	MI	£5.85
Enigma	Gm	Kuma	12K	C	KU	£6.32
Escape Forth	Gm	J Wolstencroft	24K	C	JW	£4.60
Evasion	Gm	Kuma	6K	C	KU,XI	£6.32
Executive	Gm	Kuma	6K	C	KU,MI	£9.20
Exploring Africa	Gm	Kuma	6K	C	KU,MI	£6.32
F DOS	Ut	Sharp	48K	C	MI	£57.50
Fall Out	Gm	Kuma	6K	C	KU,XI	£6.32
Finance	Bs	DCS	20K	C	DAv	£3.00

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CA Carswell Computers
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YO Youngs of Leicester
40/42 Belvoir Street
Leicester



SOFTWARE LISTING

SHARP

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Fireballs	Gm	Kuma	6K	C	KU,MI	£6.32
Fishing	Gm	Sumlock	48K	C	SUm	£8.50
Football Manager	Gm	Highlight S/W	10K	C	MI,HI	£5.75
Forth	Ut	Kuma		C	KU	£40.20
Foundry Package	Bs	Microtek	48K	C	ML	POA
Four in a Row	Gm	Kuma	6K	C	XI,KU,MI	£6.32
Fox and Geese	Gm	Highlight S/W	6K	C	MI,HI	£4.60
French Vocab	Ed	DCS	20K	C	DAv	£3.00
Fruit Machine	Gm	Kuma	6K	C	XI,KU,MI	£6.32
Fruit Machine	Gm	DCS	20K	C	DAv	£3.00
Full Accounting	Bs	Microtek	48K	C	ML	POA
Games Pack 1	Gm	Sumlock	48K	C	SUm	£8.50
Games Pack 2	Gm	Sumlock	48K	C	SUm	£8.50
Gamestape 1	Gm	DCS	48K	C	DAv	£8.00
Gamestape 2	Gm	DCS	48K	C	DAv	£8.00
Gamestape 3	Gm	DCS	48K	C	DAv	£8.00
Gamestape 4	Gm	DCS	48K	C	DAv	£8.00
Geography	Ed	DCS	20K	C	DAv	£3.00
Guess Word	Gm	Kuma	6K	C	KU,MI	£6.32
Hangman	Gm	Kuma	6K	C	KU,MI,XI	£6.32
Hangman	Gm	DCS	20K	C	DAv	£3.00
Head On	Gm	Highlight S/W	10K	C	MI,KU	£6.90
Head On	Gm	Kuma	6K	C	MI,KU,XI	£6.32
Head On	Gm	Sharpsoft	20K	C	BR	£5.85
Hissing Sid	Gm	Kuma		C	KU	£6.32
Home Budget I	Do	Kuma	6K	C	KU,LS,XI,MI	£6.32
Hunter Killer	Gm	Kuma	48K	C	KU,MI	£6.32
I Spy	Ed	Highlight S/W	22K	C	HI	£5.75
Instant Addition And The Four Rules	Ed	Kuma	48K	C	KU	£6.32
Intruder	Gm	Kuma	48K	C	KU,MI,XI	£6.32
Invaders	Gm	Kuma	20K	C	SU	£6.30
Invoice Control	Bs	David Computer Software	48K	C	DAv	£6.00
J S Line 4	Gm	Kuma	48K	C	KU,MI	£6.32
Junior Maths and Stepping Stones	Ed	Kuma	48K	C	KU	£6.32
Juntori	Gm	Sharpsoft	20K	C	MI	£5.85
Kentucky Derby	Gm	Kuma		C	KU	£6.32
Knights Commander	Ut	Knights	48K	C	KU	£28.75
Knights Commander	Ut	Knights	48K	D	KU	£74.75
Knights Fortran	Ut	Knights	48K	C	KU	£34.50
Knights Wee Pascal	Ut	Knights	48K	C	KU	£23.00
Large Display	Gm	Kuma	48K	C	KU	£6.32
Las Vegas	Gm	Sharpsoft	20K	C	MI	£5.85
Ledger	Bs	NCG Ltd	40K	C	WC	£90.00
Letterwriter WP	Bs	David Computer Software	48K	C	DAv	£10.00
Life	Gm	Kuma	48K	C	KU,XI,MI	£9.20
Linear Programming	Bs	NCG Ltd	20K	C	WC	£45.00
LP Gas Flow	Bs	DCS	20K	C	DAv	£3.00
Lunar	Gm	Kuma	48K	C	KU,XI,MI	£6.32
Lunar Lander	Gm	Kuma	48K	C	KU,XI,MI	£6.32
MZ Othello	Gm	Kuma	48K	C	KU	£12.00
Machine Code Editor	Ut	DCS	24K	C	DAv	£14.00
Machine Code Editor	Ut	DCS	48K	C	DAv	£14.00
Madness	Gm	J Wolstencroft	24K	C	JW	£4.60
Mailing List	Bs	DCS	48K	C	DAv	£6.00
Maniac	Gm	Highlight S/W	6K	C	MI,HI	£5.75
Man on the Run	Gm	Sumlock	48K	C	SUm	£6.33
Map of England	Gm	Kuma	48K	C	XI	£6.32
Map of Englad	Gm	Kuma	48K	D	KU	£12.00
Mastermind	Gm	Highlight S/W	6K	C	HI,MI	£4.60
Mastermind	Gm	Kuma	48K	C	KU,LS,XI,MI	£6.32
Match the Character	Ed	Highlight S/W	22K	C	MI,HI	£4.60
Match the Word	Ed	Highlight S/W	22K	C	MI,HI	£5.75
Maths	Ed	Highlight S/W	22K	C	MI	£5.75
Maths 1	Ed	DCS	48K	C	DAv	£3.00
Maths 2	Ed	DCS	48K	C	DAv	£3.00
Maths 3	Ed	DCS	48K	C	DAv	£3.00
Maths 4	Ed	DCS	48K	C	DAv	£3.00
Maths 5	Ed	DCS	48K	C	DAv	£3.00
Maths 6	Ed	DCS	48K	C	DAv	£3.00
Melody	Gm	Kuma	48K	C	KU	£6.32
Memory Tests	Ut	Kuma	20K	C	KU,MI,XI	£6.32
Minefield	Gm	Kuma	48K	C	KU	£6.32
Missle Defence	Gm	Sumlock	48K	C	SUm	£8.50
Miz-Maze	Gm	Kuma	48K	C	KU,XI	£6.32
Monkey Climb	Gm	Kuma	48K	C	KU,XI	£6.32
Moonlander	Gm	Highlight S/W	10K	C	HI,MI	£5.75
Mortar Attack	Gm	Kuma	48K	C	KU,XI	£6.32
Music Composer/Editor	Ed	Kuma	48K	C	KU,XI,LS	£12.00
Multiple Regression	Ed	NCG Ltd	24K	C	WC	£65.00
Navex	Ed	Kuma	48K	C	KU	£28.70
Pac Man	Gm	Kuma	48K	C	KU	£9.20
Pascal	Ut	Sharp	48K	C	MI	£34.50
Patience	Gm	Kuma	48K	C	KU,XI	£6.32
Payroll	Bs	Microtek	48K	C	ML	£65.00
Payroll	Bs	NCG Ltd	40K	C	WC	£150.00
Payroll 81-C	Bs	Sumlock	48K	C	SUm	£74.75
Payroll 81-D	Bs	Sumlock	48K	D	SUm	£74.75
Payroll	Bs	Tridata	48K	D	TR	£170.00
Pelmanism	Gm	Sumlock	48K	C	SUm	£5.75
Physics 1	Ed	DCS	48K	C	DAv	£3.00
Physics 2	Ed	DCS	48K	C	DAv	£3.00
Picture Count	Ed	Highlight S/W	22K	C	MI,HI	£5.75
Pilot	Ut	Kuma	48K	C	KU	£17.25
Poker	Gm	Kuma	48K	C	KU,HI,XI	£6.32
Polaris	Gm	Sumlock	48K	C	SUm	£6.50
Pontoon	Gm	Kuma	48K	C	KU,HI,XI	£6.32
Poseidon	Gm	Highlight S/W	6K	C	MU,HI	£5.75
Poster Printer	Bs	DCS	48K	C	DAv	£3.00
Princess & Monster Maze	Gm	Kuma	48K	C	KU,MI	£6.32
Program Filing Index	Bs	Kuma	20K	C	KU	£6.32



Quadrax	Gm	Kuma	48K	C	KU,MI,XI	£6.32
Quest	Gm	J Wolstencroft	48K	C	JW	£4.60
Race Track	Gm	Kuma	48K	C	KU,MI,XI	£6.32
Racing	Gm	Kuma	48K	C	KU	£6.32
Raider	Gm	Kuma	48K	C	KU,MI,XI	£6.32
Ram Test	Ut	DCS	48K	C	DAv	£3.00
Reactor	Gm	Kuma	48K	C	KU,MI	£6.32
Reportwriter WP	Bs	David Computer Software	48K	C	DAv	£8.00
Rhymes	Gm	Kuma	48K	C	KU,MI	£6.32
Road Hunter	Gm	Kuma	48K	C	KU,MI,XI	£6.32
Rocket	Ed	Kuma	48K	C	KU	£6.32
Roulette	Gm	Sumlock	48K	C	SUm	£6.33
Tank Wall	Gm	Kuma	48K	C	KU,XI	£6.32
Tank Practice	Gm	DCS	48K	C	DAv	£3.00
Target Practice	Gm	DCS	48K	C	DAv	£3.00
Tape Copier	Ut	DCS	20K	C	DAv	£4.00
Tenpin Bowling	Gm	Kuma	48K	C	KU,XI	£6.32
Timetabling Aid	Ed	Kuma	20K	C	KU	£22.45
Towering Inferno	Gm	Sharpsoft	20K	C	MI,BR	£5.85
Towers	Gm	DCS	48K	C	DAv	£3.00
Towers of Hanoi	Gm	Kuma	48K	C	KU	£6.32
Track Layer	Gm	Kuma	48K	C	KU,BR	£6.32
Trader Smith	Gm	Kuma	48K	C	MI	£6.32
Tudor Village	Gm	DCS	48K	C	DAv	£3.00
Trench Mortars	Gm	DCS	48K	C	DAv	£3.00
Tycoon	Gm	Kuma	48K	C	KU,XI	£6.32
Typewriter	Do	DCS	48K	C	DAv	£3.00
Typing Test/Tutor	Bs	DCS	20K	C	DAv	£6.00

UFO	Gm	Kuma	6K	C	KU,LS	£6.32
Video Draughts	Gm	DCS	48K	C	DAv	£3.00
War at Sea	Gm	DCS	48K	C	DAv	£3.00
Wizards Quest Adventure	Gm	Sumlock	48K	C	SUm	£10.50
Wordpro	Bs	Kuma	48K	C	KU,LS	£45.45
Wordpro	Bs	Kuma	48K	C	KU,LS	£91.95
Wordprocessor LW	Bs	DCS	48K	C	DAv	£10.00
Wordprocessor RW	Bs	DCS	48K	C	DAv	£8.00
Utility Tape 1 — Maths	Ed	DCS	48K	C	DAv	£8.00
Utility Tape 2 — Maths/Physics	Ed	DCS	48K	C	DAv	£8.00
Y Geirfa	Ed	DCS	20K	C	DAv	£3.00
Zen Dos	Ut	Kuma	4K	C	KU	£66.16
Zen Editor Assembler	Ut	Kuma	20K	C	KU,MI,XI	£22.45
Zenmod	Ut	Kuma	4K	C	KU,MI	£12.00
Z-80 Disassembler	Ut	Sumlock	48K	C	SUm	£12.00

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1K Chess	Gm	Artic	1K	C	ARt	£2.95
1K Fun Learning	Ed	A.Parsons	1K	C	APa	£3.95
1K Games Pack	Gm	Artic	1K	C	ARt,THs	£6.00
1K Maths	Ed	Mr Purves	1K	C	JP	£3.50
1K Super Trio	Gm	Software Masters	1K	C	XI	£7.95
16K Fun Learning	Ed	A.Parsons	16K	C	JP	£4.95
16K Games	Gm	Serious S/W	16K	C	SEr	£5.95
16K Maths	Ed	Mr Purves	16K	C	JP	£3.50
3-D Labyrinth	Gm	dK'tronics	16K	C	DK	£3.95
3-D Monster Maze	Gm	J K Greye	16K	C	BUf	£4.95
Adventure	Gm	Anglo American	16K	C	AN	£6.00
Adventure A	Gm	Artic	16K	C	ARt,THs,BUf, MI	£6.00 £8.00
Adventure B	Gm	Artic	16K	C	ARt,THs,BUf MI	£7.00 £8.00
Adventure C	Gm	Artic	16K	C	ARt,THs, BUf,MI	£8.00
Adventure I	Gm	Abersoft	16K	C	BUf,ABe	£9.95
Angle	Ed	AVC Software	16K	C	AVc	£3.00
Adventure	Gm	Abersoft	16K	C	BUf,ABe	£8.95
Action Games	Gm	A.Parsons	16K	C	JP	£4.95
Aladdin	Ed	Bryants S/W	16K	C	BRy	£1.87
Arithmetic Teasers	Ed	Hard & Soft	3K	C	HAr	£3.95
Around Europe in 80hrs	Gm	S W Hessel	16K	C	BUf	£4.25
Assembler	Ut	Artic	16K	C	ARt	£6.95
Art & Fun	Gm	A.Parsons	16K	C	APa	£4.95
Asset Stripper	Gm	Micro Games	16K	C	BUf	£4.50
Asteroids	Gm	Quicksilva	16K	C	BUf	£5.50
Atoms	Ed	AVC Software	16K	C	AVc	£3.00
Astro Invaders	Gm	John Prince S/W	16K	C	JO	£3.65
Bagatelle	Gm	Cambell Systems	1K	C	CAm	£4.00
Bank Account	Bs	Transform	16K	C	TRa	£8.75
Bank Account	Bs	Transform	32K	C	TRa	£10.75
Battleships/Kami-Kazi Drive	Gm	V&H Computer	16K	C	VA	£3.50
Battle of Britain	Gm	Micro Games	16K	C	BUf	£4.50
Beam Analysis	Bs	Hilderbay	16K	C	Hld	£25.00
Biology 1	Ed	AVC Software	16K	C	AVc	£3.00
Biology 2	Ed	AVC Software	16K	C	AVc	£3.00
Bearings	Ed	Bryant S/W	16K	C	BRy	£1.87
Breakout	Gm	Anglo American	16K	C	AN	£4.50
Breakout	Gm	Bug Byte	1K	C	BUf	£3.50
Brick-Stop	Gm	R & R Software	16K	C	RA,TOw	£3.75
Budget & Address Book	Do	Mr Purves	16K	C	JP	£4.00
Budget Programs (2)	Bs	Hilderbay	16K	C	Hld	£17.00
Bumper 7	Gm	Software Masters	1K	C	XI	£4.95
Cassette 1	Gm	Michael Orwin	1K	C	OS	£3.80
Cassette 2	Gm	Michael Orwin	1K	C	OS	£5.00
Cassette 3	Gm	Michael Orwin	16K	C	OS	£5.00
Cassette 4 ZX-Scaramble Gunfight Invaders Galaxy Invaders Snakebite Fungaloids Life 3D Tic Tac Toe	Gm	Michael Orwin	16K	C	OS	£5.00
Cassette G10 Backgammon	Gm	Psion	16K	C	PSi,SIn	£5.95
Cassette G11 Chess	Gm	Psion	16K	C	PSi,SIn	£6.95
Cassette G12 Perilous Swamp Sorceror's Island	Gm	Psion	8K	C	PSi,SIn	£4.75
Cassette G13 Space Raiders Bomber	Gm	Psion	16K	C	PSi,SIn	£3.95
Cassette G14 Flight Simulation	Gm	Psion	16K	C	PSi,SIn	£5.95
Cassette G2	Gm	Psion	16K	C	PSi,SIn	£4.95

ZX81 DEALERS

Supplier Code

ABe Abersoft
7 Maes Afallen
Bow Street
Dyfed SY24 5BA

AD Addictive Games
PO Box 278
Conniburrow
Milton Keynes
MK14 7NE

AN Anglo American S/W
138A Stratford Court
Sparkhill
Birmingham
021 7712995

APa A. Parsons
23 Coxhill Gardens
River
Dover

ARt Artic Computing
396 James Reckitt Avenue
Hull HU8 0JA

AVc AVC Software
PO Box 415
Harborne
Birmingham B17 9TT

BRy Bryants (Educational) Software
1 The Hollies
Chalcroft Lane
North Berstead
Bognor Regis
W Sussex PO21 55X

BUf Buffer Micro Shop
374A Streatham High Road
London SW16
769 2887

CAm Campbell Systems
Rous Rd
Buckhurst Hill
Essex IG9 6BL

CPt Computator
3 Thalia Close
Greenwich
SE10 4NA

DK dk'tronics
23 Sussex Road
Gorleston
Gt Yarmouth
Norfolk
0493 602453

HAr Hard & Soft
85 Snowdown Avenue
Hillingdon
Middx UB10 0SE

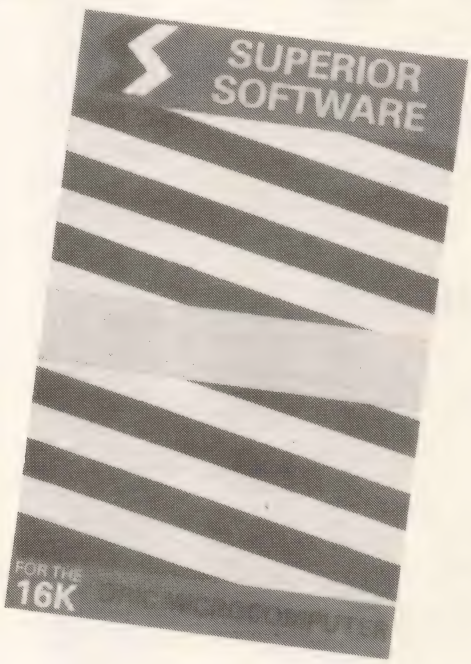
HEw Hewson Consultants
7 Graham Close
Blewbury
Oxon
0235 850075

Hld Hilderbrey Ltd
8/10 Parkway
Regents Park
London NW1
01 485 1059

IMa Image
185 Elm Road
New Maldon
Surrey KT3 3HX
01 942 7138

IM Imagine Software
Masons Building
Exchange Street East
Liverpool L2 3PN

JO John Prince S/W
29 Brook Ave
Levenshulme
Manchester M19



JP J Purves
12 Stobhill Road
Gorebridge
Midlothian EH23 4PL

MI Micro & Vldeo Palace
62-64 Kensington High St
London W8
937 8587

MCs Micro Computer Software
Unit D6
Pear Industrial Estate
Stockport Road
Lower Bredbury
Stockport SK6 2BP
061 494 2441

SOFTWARE LISTING

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Title	Program Type	Program Produced By	Memory Reqd	How Sold	Supplier Codes	Prices
Feet/Metres Conversion						
Rings Round Saturn						
Secret Code						
Mind Boggling						
Silvelte						
Memory (Educ)						
Cassette G3	Gm	Psion	16K	C	PSi,SIn	£4.95
Train Race						
Challenge						
Secret Message						
Mind That Meteor						
Character Doodle						
Currency Conversion						
Cassette G4	Gm	Psion	16K	C	PSi,SIn	£4.95
Down Under						
Submarines						
Doodling With Graphics						
Invisible Invader						
Reaction						
Petrol Conversion						
Cassette G5	Gm	Psion	16K	C	PSi,SIn	£4.95
Martian Knockout						
Graffiti						
Find the Mate						
Labyrinth						
Drop a Brick						
Continental (Educ)						
Cassette G6	Gm	Psion	16K	C	PSi,SIn	£4.95
Galactic Invasion						
Journey into Danger						
Create						
Nine Hole Golf						
Solitaire						
Daylight Robbery						
Cassette G7	Gm	Psion	16K	C	PSi,SIn	£4.95
Race Track						
Chase						
Nim						
Tower of Hanoi						
Docking the Spaceship						
Golf						
Fascinating Tower of Hanoi (problem)						
Cassette G8	Gm	Psion	16K	C	PSi,SIn	£4.95
Tower Trail						
Blank						
Cassette G9	Gm	Psion	16K	C	PSi,SIn	£6.95
Bio-Rhythms						
Your Bio-Rhythms						
Catacombs	Gm	J K Greye	16K	C	BUf	£4.95
Catalogue	Ed	Bryants S/W	16K	C	BRy	£1.87
Centipede	Gm	dK'tronics	16K	C	DK,BUf	£4.95
Centipede (Graphics)	Gm	dK'tronics	16K	C	DK	£4.95
Champions Quiz	Ed	Rose Cassettes	16K	C	BUf	£4.50
Character Predictor	Do	Hard & Soft	1K 3 K	C	HAr	£3.95
Chess	Gm	Micro Gen	16K	C	MK	£6.50
Chess Board	Gm	Hard & Soft	1K	C	HAr	£3.95
Chess 1.4	Gm	Abersoft	16K	C	ABs	£8.95
Chess II Special	Gm	Artic	16K	C	ARt	£45.00
Claws	Ed	Bryants S/W	16K	C	BRy	£1.87
Compound	Ed	AVC Software	16K	C	AVc	£3.00
Computer Count ZX	Bs	Silicon Tricks	16K	C	BUf	£7.95
Constellation	Gm	Anglo American	16K	C	AN	£8.00
Counter	Gm	Pizzel	16K	C	BUf	£5.50
Critical Path Analysis	Bs	Hilderbay	16K	C	Hld	£15.00
Crystal Ball	Do	Hard & Soft	1K 3 K	C	HAr	£3.95
Cursor Input	Ut	Serious S/W	1K 1 6 K	C	SEr	£2.95
Damsel & the Beast	Gm	Anglo American	16K	C	AN	£6.50
Damsel & the Beast	Gm	Bug Byte	16K	C	BUf	£6.50
Data Base	Bs	Mr Purves	16K	C	JP	£10.00
Data Base	Ut	Cambell Systems	16K	C	BUf	£10.00
Data File/Graphics	Ut	V&H Computer	16K	C	VA	£2.50
Death Isle	Gm	Buffer	16K	C	BUf	£4.50
Defender	Gm	Quicksilva	16K	C	QU	£5.50
Deflex	Gm	dK'tronics	16K	C	DK	£3.95
Dictator	Gm	Anglo American	16K	C	AN	£9.00
Dictator	Gm	Bug Byte	16K	C	BUf	£9.00
Diggles Kitchen S/W	Do	Micro Computer	16K	C	MCs	£4.99
Diggles Kitchen Vol 1 S/W	Do	Micro Computer	16K	C	MCs	£4.99
Diggles Kitchen Vol 2	Do	Micro Computer	16K	C	MCs	£4.99

ZX81 DEALERS

Supplier Code

MK Mikro Gen
24 Agar Crescent
Bracknell
Berks

NG Nick Godwin
4 Hurkur Crescent
Eyemouth
Berwickshire
TD14 5AP

OS Orwin Software
26 Brownlow Road
London NW10 9QL

PHi Phipps Associates
99 East Street
Epsom
Surrey
KT17 1EA

Plx Pixel Productions
39 Ripley Gardens
London W14 8HF

PSi Psion Ltd
2 Huntsworth Mews
Gloucester Place
London NW1 6DD

QU Quicksilva
95 Upper Brownhill Rd
Maybush
Southampton
Hants
0703 20169

RA R&R Software
34 Bourton Road
Gloucester
GL4 0LE
0452 502819

RO Rose Cassettes
148 Widney Lane
Solihull
W Midlands B91 3LH

S Screen Scene
144 St Georges Road
Cheltenham
Glos

SEr Serious Software
7 Woodside Road
Bickley
Bromley
Kent BR1 2ES

SIn Sinclair Software
Sinclair Research Ltd
6 Kings Parade
Cambridge CB2 1SN
0276 66104

THs The Essential Software Company (Visconti Ltd)
47 Brunswick Centre
London WC1
01 866 5445

TOw Town Book and Toys
15 Eastgate Street
Gloucester
Glos

TRa Transform Ltd
41 Keats House
Porchester Mead
Beckenham
Kent
01 658 1661

VA V & H Computer Services
182c Kingston Road
Staines
Middx

WId Wida S/W
2 Nicholas Gardens
London W5 5HY
569 6941

XI Xitan Systems
23 Cumberland Place
Southampton SO1
0703 38740



S/W						
Diggles Kitchen Vol	Do	Micro Computer	16K	C	MCs	£4.99
S/W						
Double Breakout	Gm	Beam Software	1K	C	THs	£6.00
Dragon Maze/Life	Gm	Software Masters	16K	C	XI	£6.95
Electricity	Ed	AVC Software	16K	C	AV	£3.00
Encounter	Gm	Pixel	16K	C	Plx	£5.50
Fast Life	Gm	dK'tronics	16K	C	DK	£3.95
Financial Package	Bs	Hilderbay	16K	C	Hld	£8.00
Football Manager	Bs	Addictive Games	16K	C	AD	£7.95
Forces	Ed	AVC Software	16K	C	AV	£3.00
Forensic	Ed	AVC Software	16K	C	AV	£3.00
Forth Compiler	Ut	Artic	16K	C	ARt	£35.00
Fortress/Pontoon	Gm	V&H Computer	16K	C	VA	£3.50
French	Ed	AVC Software	16K	C	AVc	£3.00
GB Ltd	Gm	S W Hessel	16K	C	BUf	£5.25
GCE Maths	Ed	Rose Cassettes	16K	C	BUf	£4.50
Galaxian	Gm	Artic	16K	C	ARt,THe MI	£3.95 £5.50
Galaxy Warrior/Star Trek	Gm	Artic	16K	C	ARt,MI	£6.50
Games Pack I	Gm	Silversoft	16K	C	BUf	£4.95
General Knowledge	Ed	A.Parsons	16K	C	APa	£4.95
Geography	Ed	Psion	16K	C	PSi	£6.95
Geography	Ed	AVC Software	16K	C	AVc	£3.00
Gold	Gm	Hilderbay	16K	C	Hld	£8.00
Gobbleman	Gm	Artic	16K	C	ARt	£3.95
Graph	Ed	AVC Software	16K	C	AVc	£3.00
Golf	Gm	R & R Software	16K	C	RA,TOw,S	£3.75
Gospel Stories	Ed	Bryants S/W	16K	C	BRy	£1.87
Grapix 2	Ut	Nick Godwin	16K	C	NG	£6.99
Greedy Gulch	Gm	Phipps Associates	16K	C	PHi	£5.00
Gulp	Gm	Cambell Systems	16K	C	BUf	£4.00
Hangman	Gm	Nick Godwin	16K	C	NG	£2.99
Hedgehog & Co	Gm	Buffer	1K	C	BUf	£3.00
High Res. Graphics	Gm	Macronics	16K	C	BUf	£4.00
History	Ed	Psion	16K	C	PSi,SIn	£6.95
House of Gnomes	Gm	Anglo American	16K	C	AN	£7.00
Human Biology 1	Ed	AVC Software	16K	C	AVc	£3.00
Human biology 2	Ed	AVC Software	16K	C	AVc	£3.00
Inheritance	Gm	S W Hessel	16K	C	BUf	£4.25
Invaders	Gm	Anglo American	16K	C	AN	£4.00
Invaders	Gm	Bug Byte	16K	C	BUf	£4.00
Invaders	Gm	Quicksilva	16K	C	QU	£5.50
Invaders	Gm	Abersoft	16K	C	ABe	£4.45
Inventions before 1850	Ed	Psion	16K	C	PSi	£6.95
Junior English I	Ed	Rose Cassettes	16K	C	BUf	£4.50
Junior English II	Ed	Rose Cassettes	16K	C	BUf	£4.50
Junior Maths I	Ed	Rose Cassettes	16K	C	BUf	£4.50
Junior Maths II	Ed	Rose Cassettes	16K	C	BUf	£4.50
Kingdom of Nam	Gm	Micro Games	16K	C	BUf	£4.50
Knockout Whist	Gm	Anglo American	16K	C	AN	£4.00
Labyrinth	Gm	Axis	16K	C	BUf	£5.95
Labyrinth	Gm	Software Masters	16K	C	XI	£5.95
Language Dictionary	Ut	Hewson	16K	C	HEw	£3.75
Life	Gm	Artic	2K	C	ARt	£3.00
Line Renumber	Ut	Hewson	16K	C	HEw	£4.95
Love and Death	Gm	Automata	1K	C	BUf	£5.00
Machine Code Monitor						
Disassembler	Ut	Micro Gen	16K	C	MK	£3.95
Madame ZX81	Do	AVC Software	16K	C	AVc	£3.00
Magic Cube	Gm	Cambell Systems	16K	C	BUf	£4.00
Magic Mountain	Gm	Phipps Associates	16K	C	PHi	£5.00
Man Page	Gm	Newsoft	16K	C	BUf	£4.00
Master Maths IV	Ed	LCL	16K	C	BUf	£5.00
Master Maths V	Ed	LCL	16K	C	BUf	£5.00
Master Mind	Gm	Hard & Soft	3K	C	HAr	£3.95
Mathematics	Ed	Psion	16K	C	PSi	£6.95
Maths	Ed	A.Parsons	16K	C	APa	£4.95
Maths Pack	Ed	Artic	4K	C	ARt	£11.00
Matrix Planner	Bs	G Asher	16K	C	BUf	£6.00
Mazeman	Gm	Abersoft	16K	C	ABe,BUf	£4.45
Mazogs	Gm	Bug Byte	16K	C	BUf	£9.00
Minefield	Gm	R & R Software	16K	C	RA	£3.75
Mini Space Invaders	Gm	Hewson	1K	C	HEw	£3.95
Mission Impossible	Gm	Buffer	16K	C	BUf	£4.50
Multifile	Ut	Anglo American	16K	C	AN	£17.50
Music & Composers	Ed	Psion	16K	C	PSi,SIn	£6.95
Music/Breakout/Invaders	Gm	Macronics	1K	C	BUf	£7.95
Namitar Raiders	Gm	Artic	16K	C	ARt	£3.95
Nightmare Park	Gm	Software Masters	16K	C	XI	£6.95
Novelists & Authors	Ed	Psion	16K	C	PSi,SIn	£6.95
Nowotnik, Demolition & Tenpin	Gm	Phipps Assoc	16K	C	PHi	£5.00
Numerology	Gm	Carnell	16K	C	BUf	£4.50
Odd One Out	Gm	Nick Godwin	16K	C	NG	£1.50
Office	Bs	Nick Godwin	16K	C	NG	£4.99
O Level Chemistry	Ed	Calpac	16K	C	BUf	£4.95
O Level French	Ed	Rose Cassettes	16K	C	BUf	£4.50
On Your Marks	Ed	Computatutor	16K	C	ARt	£3.95
Optimisation Package	Bs	Hilderbay	16K	C	Hld	£20.00
Oracle's Cove	Gm	Doric	16K	C	BUf	£6.95
Payroll	Bs	Hilderbay	16K	C	Hld	£25.00
Payroll	Bs	V&H Computer	16K	C	VA	£11.50
Payroll/Coin Analysis	Bs	V&H Computer	16K	C	VA	£12.65
Personnel Record System	Bs	Computator	16K	C	CPt	£9.95
P-E-P	Ut	R & R Software	4K	C	RA	£5.95



Pharaoh's Tomb	Gm	Phipps Associates	16K	C	PHi	£5.00
Phipps Adventures I	Gm	Phipps Associates	16K	C	PHi	£5.00
Phys Prob	Ed	AVC Software	16K	C	AVc	£3.00
Pilot	Gm	Hewson	16K	C	HEw	£5.95
Planet Defender	Gm	John Prince S/W	16K	C	JO	£3.65
Planet Lander	Gm	Hewson	1K	C	HEw	£3.75
Plotter	Ut	Nick Godwin	16K	C	NG	£4.99
Poets & Playwrites	Ed	Psion	16K	C	PSi,SIn	£6.95
Program Merge	Bs	ACS	16K	C	BUf	£5.50
Program Pack I	Gm	Bug Byte	1K	C	BUf	£3.50
Program Pack I	Ut	Anglo American	16K	C	AN	£3.50
Program Pack II	Gm	Bug Byte	16K	C	BUf	£4.50
Program Pack II	Ut	Anglo American	16K	C	AN	£3.50
Program Pack III	Gm	Bug Byte	1K	C	BUf	£3.50
Program Pack IV	Gm	Bug Byte	16K	C	BUf	£4.50
Program Pack V	Gm	Bug Byte	16K	C	BUf	£4.50
Program Pack IV	Gm	Bug Byte	16K	C	BUf	£4.50
Program Store	Bs	ACS	16K	C	BUf	£5.50
Program Store Toolkit	Bs	ACS	16K	C	BUf	£5.50
Programmer's Toolkit	Ut	Hewson	16K	C	BUf	£6.50
Purchase Ledger	Bs	Transform	16K	C	BUf	£8.75
Purchase Ledger	Bs	Transform	32K	C	HEw	£10.75
QS Asteroids	Gm	Quicksilva	4K	C	TRa	£5.50
QS Defenders	Gm	Quicksilva	4K	C	QU	£5.50
QS Invaders	Gm	Quicksilva	8K	C	QU	£5.50
QS Scramble	Gm	Quicksilva	4K	C	QU	£5.50
Revamped Chess	Gm	Micro Gen	16K	C	MK	£6.50
Reversi	Gm	Abersoft	16K	C	ABe	£4.95
Revise Chemistry	Ed	Sci-Soft	16K	C	BUf	£7.50
Revise Maths	Ed	Sci-Soft	16K	C	BUf	£5.50
Revise Physics	Ed	Sci-Soft	16K	C	BUf	£7.50
Sales Ledger	Bs	Transform	16K	C	TRa	£8.75
Sales Ledger	Bs	Transform	32K	C	TRa	£10.75
Scramble	Gm	Quicksilva	4K	C	QU	£5.50
Screenkit I	Bs	Picturesque	16K	C	BUf	£4.95
Secret Valley	Gm	Newsoft	16K	C	BUf	£6.50
Secret of Tenworth Manor	Gm	Hilderbay	16K	C	Hld	£14.95

SOFTWARE LISTING

ZX81

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Shop Window	Bs	Cambell Systems	16K	C	BUf	£7.00
Similes	Ed	AVC Software	16K	C	AVc	£3.00
Snap	Gm	Hard & Soft	3K	C	HAr	£3.95
Sorcerer's Castle	Gm	Micro Gen	16K	C	MK	£3.95
Space Intruders	Gm	Hewson	4K	C	HEw,BUf	£5.95
						£4.95
Space Invaders	Gm	Macronics	16K	C	BUf	£4.95
Space Invaders	Gm	Macronics	1K	C	BUf	£3.95
Space Invaders	Gm	dK'tronics	16K	C	DK	£4.95
Space Invaders/Planetoids	Gm	Software Masters	16K	C	XI	£6.95
Space Trek	Gm	Beam Software	16K	C	THs	£8.00
Spellbound	Ed	Transform	16K	C	TRa	£3.75
Spelling	Ed	Psion	16K	C	PSi	£6.95
Star Fighter	Gm	R & R Software	16K	C	RA	£3.75
Star Quest	Gm	Pizzel	16K	C	BUf	£5.50
Star Quest	Gm	Pixel	16K	C	Plx	£5.50
Star Trek	Gm	Buffer	16K	C	BUf	£4.50
Star Trek	Gm	Bug Byte	16K	C	BUf	£5.00
Star Trek	Gm	Macronics	16K	C	BUf	£3.95
Star Trek	Gm	Silversoft	16K	C	BUf	£4.95
Star Trek	Gm	Abersoft	16K	C	ABe	£4.95
Sargon Chess	Gm	Hilderbay	16K	C	Hld	£22.50
Statistics	Bs	Hewson	1K	C	HEw	£3.75
Stock Book	Bs	A.Parsons	16K	C	AP	£9.95
Stock Control	Bs	Hilderbay	16K	C	MI,Hld	£25.00
Subspace Striker	Gm	Pixel	16K	C	Plx	£5.50
Super Breakout	Gm	Essential S/W	1K	C	BUf	£6.00
Super Invasion	Gm	Beam Software	1K	C	THs	£6.00
Super Invasion	Gm	Essential S/W	1K	C	BUf	£6.00
Super Program I						
Pints/Litres Conversion						
Invasion from Jupiter						
Skittles						
Magic Square						
Doodle						
Kim						
Liquid Capacity	Gm	Psion	16K	C	PSi,SIn	£4.95
Super Wumpus	Gm	Silversoft	16K	C	BUf	£4.95
Tables	Ed	AVC Software	16K	C	AVc	£3.00
Tarot	Ed	V&H Computer	16K	C	VA	£2.50
Tables Test	Ed	Bryants S/W	16K	C	BRy	£1.87
Ten Exciting Games	Gm	Beam Software	1K	C	THs	£6.00
Test Pack	Ed	Mr Purves	16K	C	JP	£7.50
The Bible	Gm	Automata	1K	C	BUf	£5.00
The Collector's Pack	Do	Psion	16K	C	PSi,SIn	£9.95
The Fast One	Bs	Cambell Systems	16K	C	BUf	£15.00
The Plug Record Recorder	Do	Psion	16K	C	PSi,SIn	£9.95
The War Game	Ed	AVC Software	16K	C	AVc	£3.00
Time Bandits	Gm	Newsoft	16K	C	BUf	£4.50
Time Ledger	Bs	Hilderbay	16K	C	Hld	£15.00
Toolkit	Ut	Artic	16K	C	ARt	£5.95
Trader	Gm	Pixel	48K	C	Plx	£9.50
Video Index	Bs	Video Software	16K	C	BUf	£9.95
Video-add	Bs	Video Software	16K	C	BUf	£5.95
Videograph	Ed	Video Software	16K	C	BUf	£5.95
Videomap	Ed	Video Software	16K	C	BUf	£5.95
Videoplan	Bs	Video Software	16K	C	BUf	£5.95
Videoview	Do	Video Software	16K	C	BUf	£5.95
Volcanic Dungeon	Gm	Carnell	16K	C	BUf	£4.50
Vucalc	Bs	Psion	16K	C	PSi,SIn	£7.95
Vufile	Bs	Psion	16K	C	PSi,SIn	£7.95
What can I do with 1K	Do	V&H Computer	1K	C	VA	£4.95
Wordfix	Ut	Nick Godwin	16K	C	NG	£2.50
Wordpack	Ed	Wida Software	16K	C	Wld	£19.00
Wordsearch/Clock Calendar	Do	V&H Computer	16K	C	VA	£3.50
ZX Bomber	Gm	Micro Gen	16K	C	MK	£3.95
ZX Breakout	Gm	Micro Gen	16K	C	MK	£3.95
ZX Bug	Gm	Artic	16K	C	ARt	£6.95
ZX Chess I	Gm	Artic	16K	C	ARt	£6.50
ZX Chess II	Gm	Artic	16K	C	ARt	£13.00
						£9.95
ZX Forth	Ut	Artic	16K	C	ARt	£35.00
ZX Graphical Chess	Gm	Artic	16K	C	ARt	£13.00
ZX Othello	Gm	MOI	16K	C	BUf	£6.95
ZX Scramble	Gm	Micro Gen	16K	C	MK	£3.95
ZX Space Invaders	Gm	Micro Gen	16K	C	MK	£3.95
ZX81 Chess	Gm	Software Masters	16K	C	XI	£6.90
ZXAS	Bs	Bug Byte	16K	C	BUf	£5.00
ZXDB	Bs	Bug Byte	16K	C	BUf	£6.50
ZXMC	Bs	Picturesque	16K	C	BUf	£6.50
Zombie/Sword of Peace	Gm	Artic	16K	C	ARt,THs	£6.50
					MI	£5.50
Zombies	Gm	R & R Software	16K	C	RA,TOw	£3.75
ZOR	Gm	Pixel	16K	C	BUf	£5.50
ZOR	Gm	Pixel	16K	C	Plx	£5.50

ZX SPECTRUM DEALERS

Supplier Code

AA A & F Software
10 Wilpshire Ave
Longsight
Manchester
061 320 5482

ABa Abacus Electronics
186 St Helens Avenue
Swansea
West Glamorgan

ABb Abbex Electronics
20 Ashley Court
Great Northway
London NW4

ABe Abersoft
7 Maes Afallen
Bow Street
Dyfed SY24 5BA

ACs ACS Software
7 Lidgett Crescent
Roundhay
Leeds

AD Addictive Games
PO Box 278
Conniburrow
Milton Keynes
MK14 7NE

AM Amba Software
Freepost
Cambridge CB3 7BR

ARt Artic Computing
396 James Reckitt Avenue
Hull HU8 0JA

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

AU Automata Ltd
65a Osbourne Road
Portsmouth PO5 3LR

AVc AVC Software
PO Box 415
Harborne
Birmingham B17 9TT

BUf Buffer Micro Shop
374A Streatham High Road
London SW16
01 769 2887

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

CAl Calpac Computer Software
108 Hermitage Woods Crescent
St Johns
Woking
Surrey GV21 1VF

CAm Campbell Systems
Rous Road
Buckhurst Hill
Essex IG9 6BL

CAr Carnell Software
4 Staunton Road
Slough
SL2 1NT

CAs Cases Computer Simulations
14 Langton Way
Blackheath
London SE3 7TL

COl Collins Educational
PO Box
Glasgow G4 0NB
041 772 3200

COr Computer Rentals Ltd
140 Whitechapel Road
London E1

CRy Crystal Computing
50 Charles Close
Wroxham
Norwich
NR12 8TV

CT C Tech
184 Market Street
Hyde
Cheshire

DJ DJ Moody
1 Starnhill Cottages
Granby Lane
Bingham
Notts NG13 8DH

DK dk'tronics
23 Sussex Road
Gorleston
Gt Yarmouth
Norfolk
0493 602453

DO Docimodus
161 Walmersley Road
Bury
Lancs BL9 5DE

FO Foilkade Ltd
66 Littledean
Yate
Bristol BS17 4UQ

FUl Fuller Micro Systems
The ZX Centre
Sweeting Street
Liverpool 2

GE Gemini Software
36 Badminton Road
Leicester LE4 7RQ

HA Hartland Software
8 Penzance Place
London W11 4PA

HEw Hewson Consultants
7 Graham Close
Blewbury
Oxon
0235 850075

Hld Hilderbray Ltd
8/10 Parkway
Regents Park
London NW1
01 485 1059

Hll Hilton Computer Services
14 Avalon Road
Orpington
Kent BR6 9AX

Hls Hisoft
60 Hallam Moor
Lidon
Swindon
Wiltshire

IC ICL
Putney Bridge
London

IM Imagine Software
Masons Building
Exchange Street East
Liverpool L2 3PN

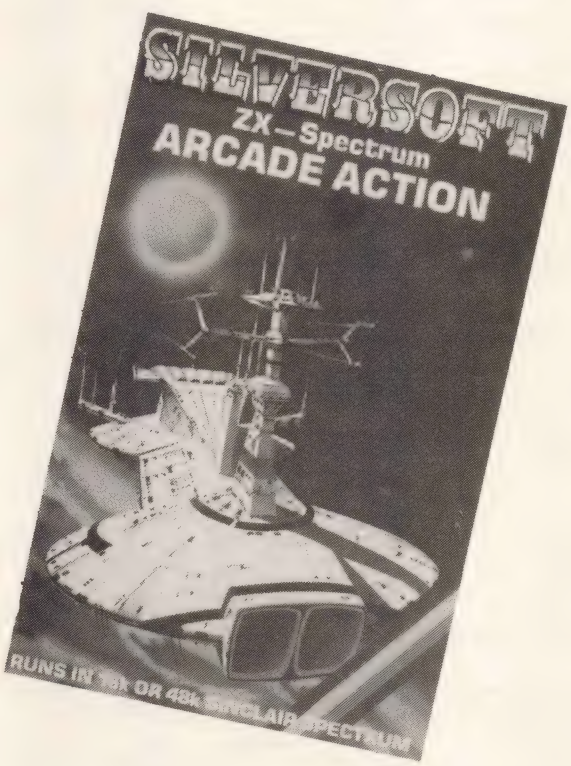
IMp Impact Software
70 Redford Avenue
Edinburgh EH13 0BW

JAy Jaysoft
22 Dane Acres
Bishop's Stortford
Herts

JO John Prince
29 Brook Avenue
Levenshulme
Manchester M19

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3D Mazenture	Gm	Softek	48K	C	SOf	£3.95
3D Tanx	Gm	dK'tronics	16/48K	C	DK	£4.95
3D Tunnel	Gm	New Generation	16/48K	C	NG	£4.95
Adventure	Gm	Foilkade	16/48K	C	FO	£5.95
Adventure	Gm	Abersoft	48K	C	ABe	£9.95
Adventure 1	Gm	D J Moody	16K	C	DJ	£5.00
Adventure 2	Gm	D J Moody	16K	C	DJ	£5.00
Adventure 3	Gm	D J Moody	16K	C	DJ	£5.00
Adventure 4	Gm	D J Moody	16K	C	DJ	£5.00
Adventure Quest	Gm	Level 9	48K	C	LE	£9.90
Airline	Gm	Cases Computer Simulations	16K	C	CAs	£5.00
Alien	Gm	Spectra Soft	16K	C	SPe	£3.95
Alien Command	Gm	Microware	16K	C	MIw	£4.75
Angles	Ed	AVC Software	16K	C	AVc	£3.00
Arcade Pack 1	Gm	Ohmega Electronics	16K	C	OM	£4.82
Arcadia	Gm	Imagine Software	16/48K	C	IM	£5.50
Aspect Assembler	Ur	Bug-Byte	16/48K	C	BU	£9.00
Assembler	Ur	Artic	16K	C	ARt	£9.95
Assembler/Disasembler	Ur	Hewson	16/48K	C	HEw	£8.95
Associateive Database System	Do	Docimodus	16K	C	DO	£15.00
Asteroids	Gm	Abbex Electronics	16K	C	ABb	£5.95
Astro Scramble	Gm	C Tech	16/48K	C	CT	£2.95
Audio Sonics	Ur	Work Force	16/48K	C	WO	£4.99
Autochef	Do	Cases Computer Simulations	16K	C	CAs	£5.00
Avenger	Gm	Abacus Electronics	16K	C	ABa	£4.95
Awari	Gm	Foilkade	16/48K	C	FO	£5.95
Backgammon	Gm	Microware	16K	C	MIw	£5.00
Battle Of Britain	Gm	MS	48K	C	MS	£5.95
Bermuda Triangle	Gm	Kricon Ltd	48K	C	KR	£9.75
Bit, Byte Rotation	Ut	Cornhill	16K	C	JK	£4.50
Biorhythms	Do	ICL	16K	C	IC	£6.95
Black Crystal	Gm	Carnell Software	48K	C	CAr	£7.50
Bridge	Gm	ZX SAS	16/48K	C	ZX	£6.50
Business Bank Account	Bg	Transform	16/48K	C	TRa	£8.75
Business Model Modeller X	Bg	Cases Computer Simulations	16K	C	CAs	£8.00
Business Pack	Bg	Transform	16/48K	C	TRa	£25.00
Breaker	Gm	Wizard	48K	C	WZ	£3.50
Cabman	Gm	Micro Power	16K	C	MIp	£3.95
Centipede	Gm	dK'tronics	16/48K	C	DK	£4.95
Chess	Gm	Artic	48K	C	ARt	£9.45
City	Gm	Docimodus	48K	C	DO	£8.00
Club Record Collector	Do	ICL	48K	C	IC	£9.95
Collector's Pack	Do	ICL	48K	C	IC	£9.95
Colossal Adventure	Gm	Level 9	48K	C	LE	£9.90



ZX SPECTRUM DEALERS

Supplier Code

JR JRS Software
19 Wayside Avenue
Worthing
0903 65691 (eve. & w/e only)

KR Kricon Limited
11 Medway
Hailsham
E Sussex
BN27 3HE
0323 846110

LE Level 9 Computing
229 Hughenden Road
High Wycombe
Bucks

LA Llamasoft Computer S/W
49 Mount Pleasant
Tadley
Hants
07356-4478

MAr Martech Games
9 Dillingborough Road
Eastbourne
E Sussex BN20 8LY

MC MC Lothlorian
4 Granby Road
Cheadle Hulme
Cheshire SK8 6LS

MGa Megadodo S/W
16 While Road
Sutton Coldfield
W. Midlands

MH Melbourne House
Glebe Cottage
Station Road
Cheddington
Leighton Buzzard
Beds
01 405 6347

MHp Melbourne House Publishers
131 Trafalgar Road
Greenwich
London SE10

MIp Micro Power
8/8a Chapel Allerton
Leeds LS7 4PE

MIs Microsphere Computer Services
72 Roseberry Road
London N10

MIw Microware
131 Melton Road
Leicester

MK Mikro Gen
24 Agar Crescent
Bracknell
Berks

MS MS
73 The Broadway
Grantchester
Cambridge CB3 9NQ

ND N Darwood Ltd
Halfacres
Stroud
Petersfield
Hampshire

NG New Generation Software
Freepost
Oldland Common
Bristol BS15 6BR

OM Omega Electronics
37 Chichester Square
Carrickfergus
Co Antrim BT38 8JU

PAl Palantir Programs
Brockham
Hyde Lane
Danbury
Essex

PD PDQ Software
Parsley Rye
Hilders Lane
Edenbridge
Kent TN8 6JV

PI Picturesque
6 Corkscrew Hill
W Wickham
Kent BR4 9BB

PSi Psion Ltd
2 Huntsworth Mews
Gloucester Place
London NW1 6DD

QU Quicksilva
95 Upper Brownhill Road
Maybush
Southampton
Hants
0703 20169

RA R & R Software
34 Bourton Road
Gloucester GL4 0LE
0452 502819

RI Richard Shepherd S/W
Freepost
Maidenhead
Berks SL6 5BY

RO Rose Cassettes
148 Widney Lane
Solihull
W Midlands B91 3LH

SAt Saturn Developments
37 Heol Dulais
Birchgrove
Swansea SA7 9LT

SAx Saxon Computing
3 St Catherine's Drive
Leconfield
Beverly
Humberside

SEv Severn Software
5 School Crescent
Lydney
Glos GL15 5T

SIl Silversoft
40 Empress Avenue
Ilford
Essex

SIm Simon Hessel Softwtare
15 Lytham Court
Cardwell Crescent
Sunninghall
Berks

SIn Sinclair Software
Sinclair Research Ltd
6 Kings Parade
Cambridge CB2 1SN
0276 66104

SOf Softek
329 Croxted Road
London SE24

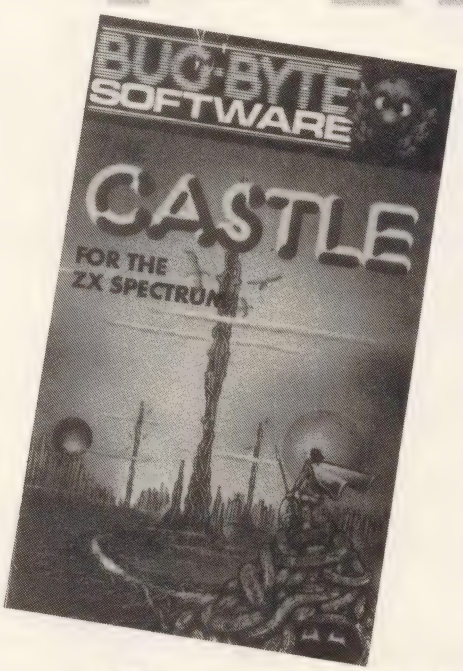
SO Software For All
72 North Street
Romford
0708 60725

SOs Sospan Soft
1 Warborough Close
Old Road
Llanelli
Dyfed

SOFTWARE LISTING

ZX SPECTRUM

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Commercial Accounts	Do	Gemini	16/48K	C	GE	£19.95
Compiler	Ut	Softek	48K	C	SOf	£14.95
Compufile	Do	Jaysoft	16/48K	C	YAy	£4.95
Conflict	Gm	Martech Games	48K	C	MAr	£9.50
Cosmos	Gm	Abbex Electronics	16K	C	ABb	£4.95
Count-down	Ed	AVC Software	16K	C	AVc	£3.00
Crevasse/Hotfoot	Gm	Microsphere	16K	C	MIs	£4.95
Dallas	Gm	Cases Computer Simulations	16K	C	CAs	£5.00
Database	Do	Buffer	16K	C	BUf	£4.50
Data Base	Ut	Gemini	16/48K	C	GE	£19.95
Derby Day	Gm	Computer Rentals	48K	C	COr	£5.95
Digital X-Word Compiler	Gm	N Darwood	16K	C	ND	£6.00
Dragon Adventure	Gm	Level 9	48K	C	LE	£9.90
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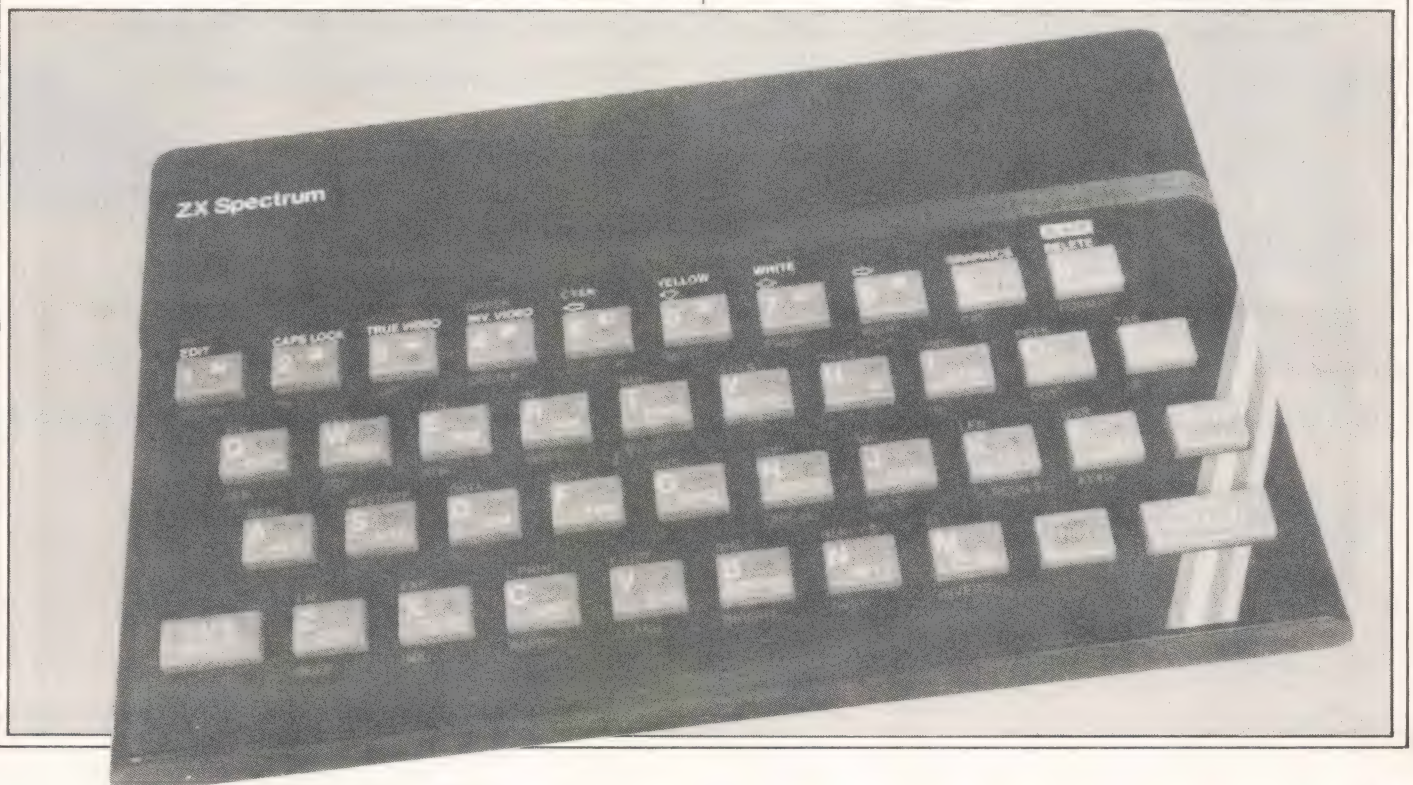
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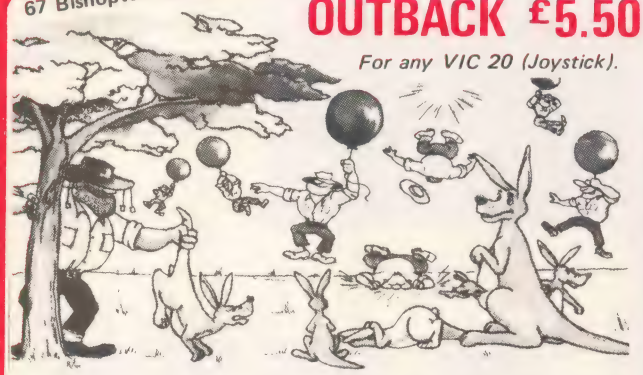
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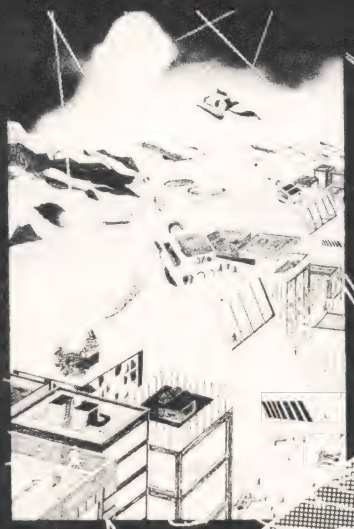
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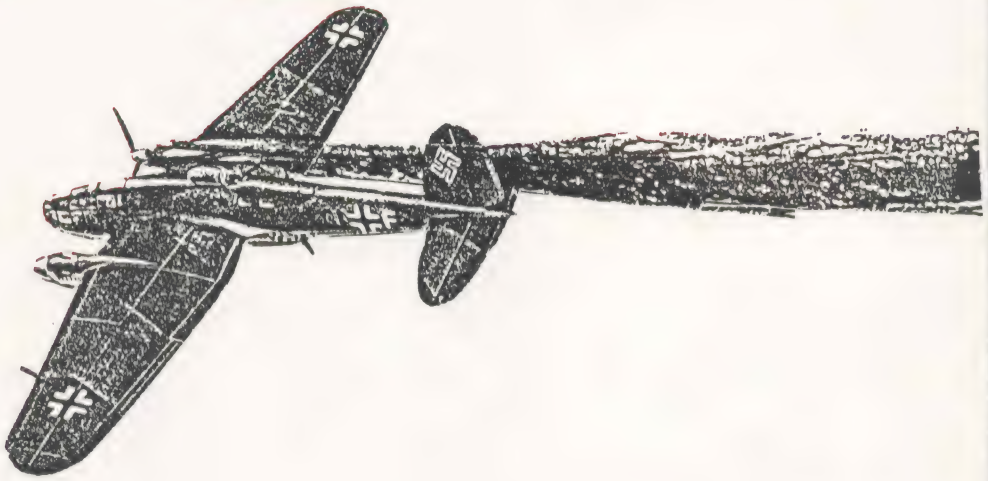
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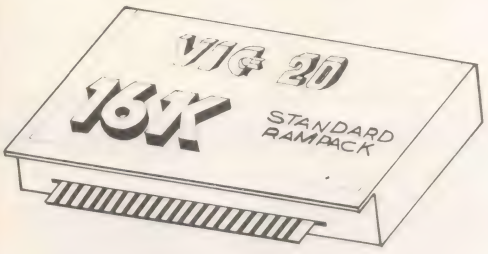
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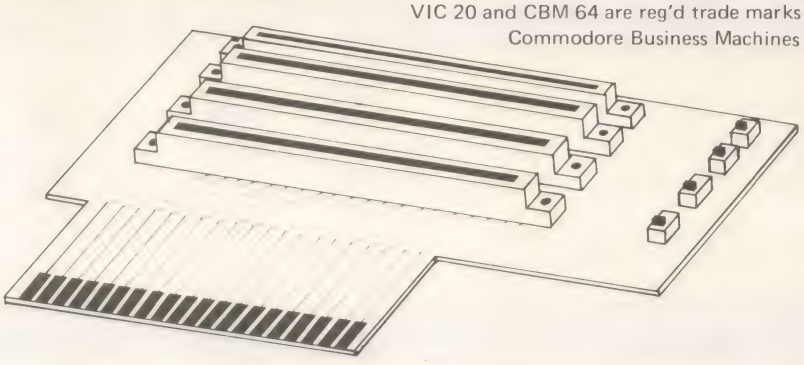
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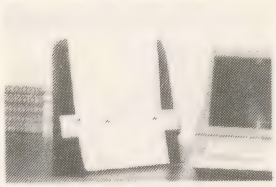
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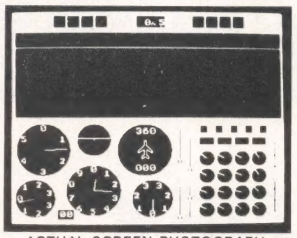
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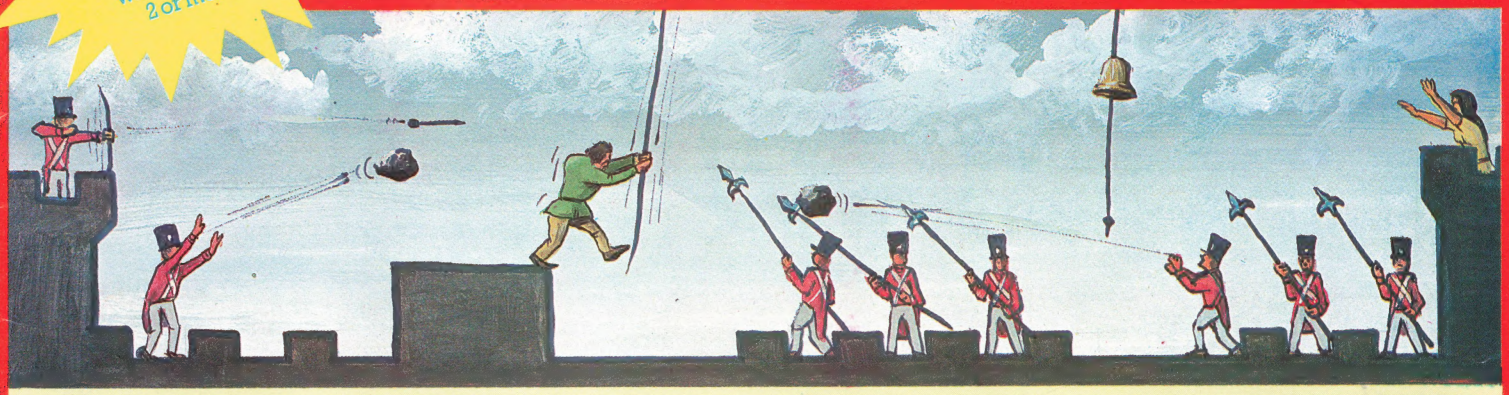
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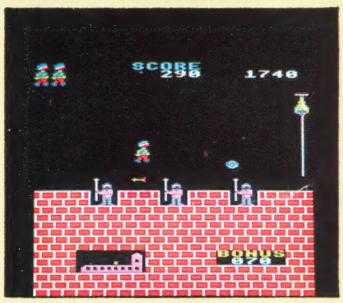
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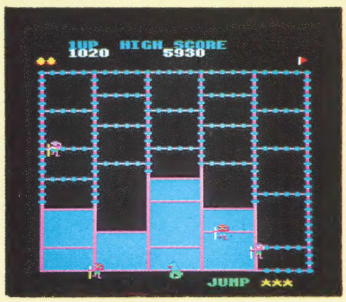


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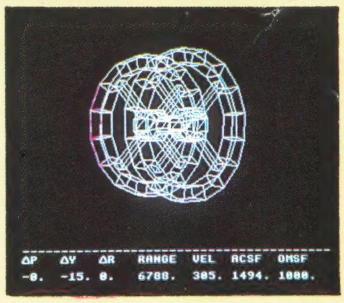


CRAZY PAINTER (32K) £7.95

The only full-feature version available for the BBC micro. On the first screen, you take the part of a monkey being chased by African tribesmen. If you manage to survive by painting-in all the squares, the bonus screen features the monkey trying to reach his bunch of bananas. After that, you take control of a paint-roller and each square painted-in adds to your score. But beware . . . the teddy-bears are now in hot pursuit. Superb animation and sound-effects.

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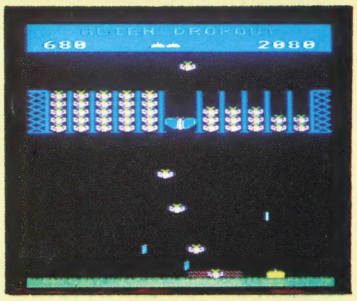
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2002 (32K) £7.95

A space docking simulator using a 3D graphics to model the motions and responses of the ORION 4 spacecraft. Your mission is to pilot the shuttle to a "soft dock" with the space station. PITCH, YAW, ROLL, FORWARD, LATERAL and VERTICAL engines are provided together with orbit manoeuvering booster engines. 6 skill levels provide for the completely inexperienced pilot as well as the fully-fledged commander.

●●● *NEW RELEASE* ●●●



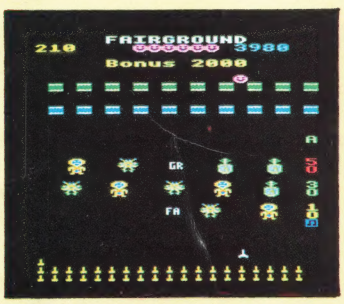
ALIEN DROPOUT (32K) £7.95

A novel and unusual program. Arcade-action with this exciting multi-stage shooting game. You have to shoot the aliens out of their "boxes" before the "boxes" fill up. Once full, the aliens fly down relentlessly, exploding as they hit the ground.

(For use with KEYBOARD or JOYSTICKS).

". . . these moths are out to get more than the clothes in your wardrobe.

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FAIRGROUND (32K) £7.95

An exciting target-shooting game! Bonuses are scored for spelling out the word FAIRGROUND by hitting the appropriate target letters, and for shooting all the targets. Extra bullets are obtained by shooting the numercial targets, but watch out for the "smileys" who are intent on stealing your bullets. Music, sound effects, hi-score, and rankings.

●●● *NEW RELEASE* ●●●



CENTIPEDE (32K) £7.95

Incredible arcade-style game featuring mushrooms, snails, flies, spiders, and the centipedes of course. Excellent graphics and sound. 6 skill levels, hi-score, rankings, bonuses, and increasing difficulty as the spiders become more lively and the number of mushrooms increases.

(For use with KEYBOARD or JOYSTICKS).

"Visually this game compares well with the arcade version, being colourful and clear."

. . . YOUR COMPUTER



ROAD RUNNER (32K) £7.95

The only full feature machine-code version available for the BBC micro. Features include: scrolling screen, radar display, 3 pursuing cars, checkpoint flags, fuel gauge, smoke screens, 6 skill levels, rankings, increasing difficulty, and sound effects.

(For use with KEYBOARD or JOYSTICKS).

"The game becomes very hard and has very smooth graphics. Excellent." . . . BEEBUG MAGAZINE.



FROGGER (32K) £7.95

Not just another version of Frogger . . . this is the arcade-action version that you've been waiting to see. Graphically brilliant with gaping-mouthed crocodiles, diving turtles, flies, and frogs that flex their legs as they jump along. Increasing difficulty, and responsive controls.

(For use with KEYBOARD or JOYSTICKS).

". . . very good indeed . . . fast flicker-free graphics and a frog that really hops!" . . . BEEBUG MAGAZINE

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