Personal Computing Today

MARCH 1983
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Personal Computing Today

VOLUME 1 NUMBER 8 MARCH 1983

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A great deal has been written and said about the future of Prestel, most of it being predictions about its ultimate demise. Despite all these comments, British Telecom look set to give Prestel a boost with a new system.

This new system, called Micronet 800, is aimed at providing microcomputer owners everywhere with a massive database service for their own use. By attracting this fast growing sector of the public British Telecom hope to at last make Prestel a viable proposition

The major problem in implementing this kind of system has been the cost of the modem, which is needed to connect your computer, via a telephone line, into the main computer database. This problem has now been solved by a company called Prism Microproducts Ltd who will be producing the modem, to be sold in the high street for about £50.

So what are the benefits of Micronet to the home computer use? The advantages can be broken down under two main headings, Software and Communications.

When the user taps into Micronet it is hoped that he will have access to a large software database. This means that you will be able to use Micronet as a sort of software library. So when you want a game of Space Invaders you can call up Micronet and tell the system to download the program to you. When it has done this you can then disconnect and play the game. The cost of this, on top of the £1 a week Micronet subscription, will depend on the software and who is supplying it. There is no reason why you shouldn't buy software direct off the Micronet, just download the software, save it onto tape and let the computer debit your account.

The Micronet system will also offer a facility similar to the Prestel Mailbox service. With this you will be able to send a message to Micronet for a friend to pick up when ties into the system. Unfortunately becase of the restrictions of the modem, real-time communications between computer users will not be possible.

Apart from this obvious form of communication the Micronet will carry a large database of information relating to home computer users, so who knows, one day you might even get your copy of *Personal Computing Today* downloaded to you through Micronet.

Unfortunately this system relies on a lot of people using it in order to make it worthwhile, not only for the people who have set it up and invested in it, but also for the users themselves.

So if you are interested in giving your computer the ultimate expansion then stay tuned to *Personal Computing Today*.

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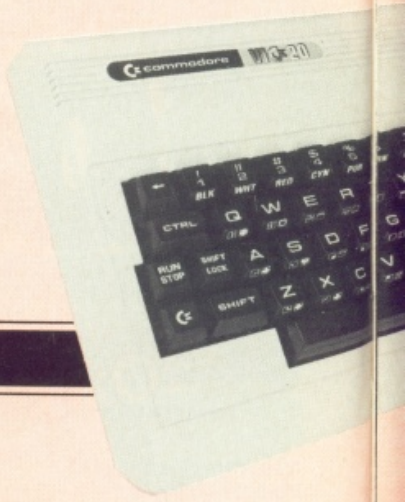

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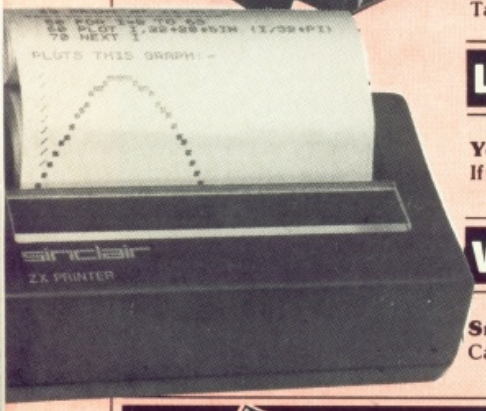

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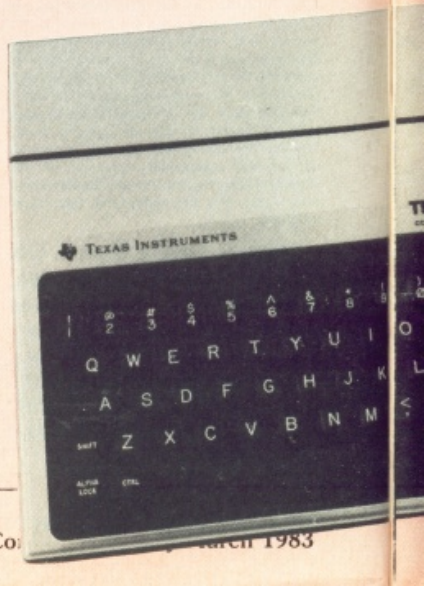

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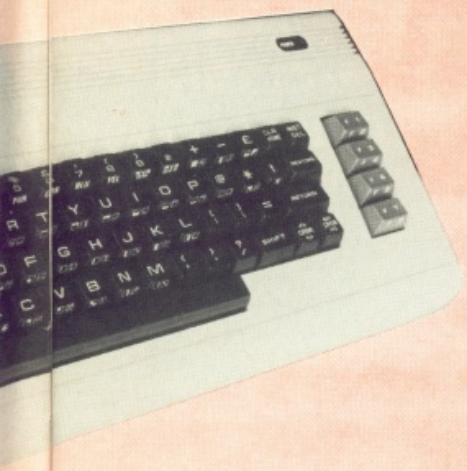

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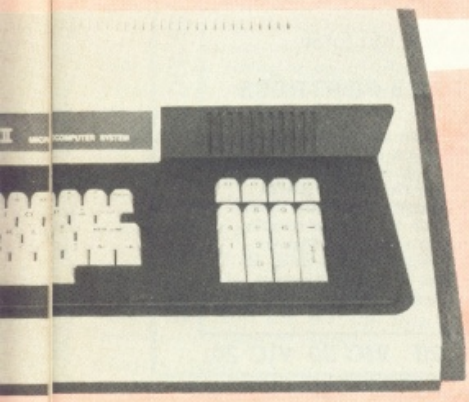

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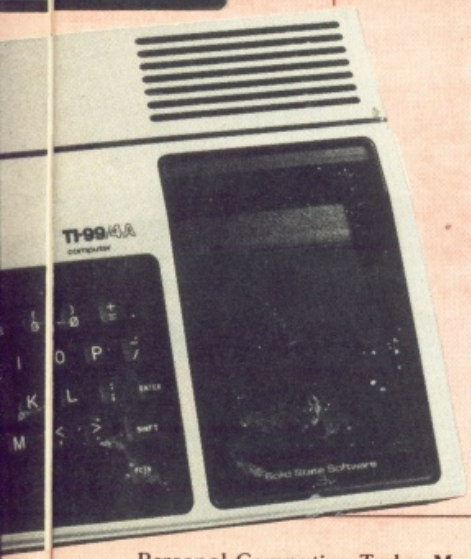

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VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20

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VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20

missile panic

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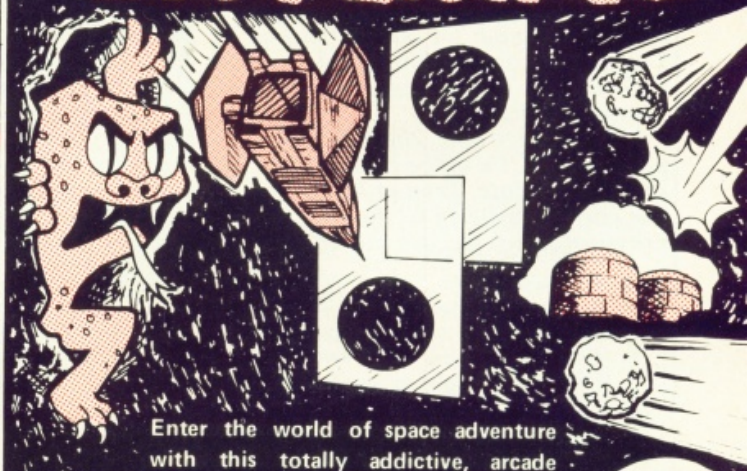

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MISSION 99

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VISA

Commodore 64 Winner

Picking a winner for our Christmas Crossword competition was a difficult task because we could only award one prize.

Altogether over 2000 entries swamped PCT's office right up till the closing date. Printed below are the correct answers to the crossword, just in case any of you were flummoxed by one or two of the clues.

Eventually the lucky winner of the Commodore 64 computer and Simon's BASIC kindly donated by Commodore Business Machines is J.P. Britton of Reading. He was the lucky first correct entry out of the giant bag (a big, black dustbin liner to be precise!). Our hearty congratulations go to Mr Britton and our commiserations to all those who took the time and trouble to complete the crossword and send in their entires. It's nice to know that you are all so keen. The Winner's computer will be presented to him by Commodore in the near future.

Our thanks go to Commodore Business Machines for making a computer available to PCT for this competition and we wish them luck with sales of the machine.

Answers across

1. London Palladium
8. Gate
9. Great
10. Hair
11. Computer Console
12. Ewing
15. Adder
18. Mocks
20. Op Amp
23. Carol
24. Clues
27. Ale
28. Aga
29. Prestel
32. Dmac
35. Corsica
37. Ebbs
39. Supreme
43. Ago
44. Wallow
46. Osprey
48. EFT
49. Crate
51. Salmons
52. Altar
54. Database
58. Eyots
60. Asset
61. Frenetic
64. Den
65. Sale
66. Arch
67. Lea
68. Static and Dynamic
72. Octal
73. Transistor Radios
76. Nod
78. PHI
79. Space Invaders
82. Alien
84. Erase
85. Riles
87. Starter Course
90. Option
91. Yodels
92. Personal Computer
93. Ail
95. Environmentalist
96. Ion
97. Clung
99. Nitre
100. Alibi
101. Mural
102. Sisal
103. Nigel
104. Orate
105. Opera
106. Ensue

Answers down

1. Logic
2. Notum
3. Night
4. A Merry Christmas to all our readers
5. Lotto
6. Idaho
7. Merge
12. Echo
13. Ideal
14. Grip
15. Alec
16. Debug
17. Reds
18. Microwave Oven
19. Silicon Valley
21. Palais
22. Medoc
25. Laser
26. Easter
29. Production Lines
30. Exit
31. Tabbed
32. Doc
33. Away
34. Cato
35. Cos
36. Ass
37. Eels
38. Byte
40. Planes
41. Edit
42. Electricity bill
45. Lets
47. Rash
50. Regina
53. Ataris
55. Add
56. Any
57. Exams
59. Satanic
60. Accords
61. Funds
62. Eli
63. Eat
69. Tepee
70. Novelettes
71. Color
73. These
74. Overeating
75. Oasis
77. Dip
78. PLL
80. Doorbell
81. Rip
83. ET
86. IE
88. Tar
89. Ringmain
93. Ail
94. Inn
97. Commodore
98. Golden Age

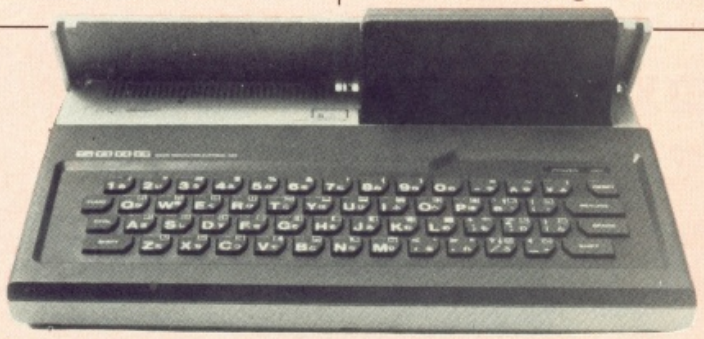
Activision Newsletter

Ray Hodges Associates has cleared up the confusion surrounding Atari VCS and Activision mailing lists (PCT February 1983).

Ray Hodges says she made and kept a verbal agreement with Atari's managing director, Graham Clark, not to use the firm's VCS club newletter mailing list for the PR firm's new client, Computer Games (Activision's UK distributor) when Ray Hodges Associates ceased to act as Atari's PR operation.

Activision's own newsletter, Fun Club News, launched by Computer Games, has built up a substantial mailing list of its own through various sources including taking names from customer records, buying or borrowing lists from retailers and using leads from couponed advertisements.

Ray Hodges also says that Activision cartridge sales were last year 'extremely successful' and did not warrant using 'the fruits of a competitor's labour' to further their own cause.



CGL Sharpen Up With Sord

Britain's largest distributor of micro-processor controlled games is on the brink of moving into the computer field.

Computer Games (CGL) has clinched a deal with the Japanese computer manufacturer Sord to sell the Sord M5 in the UK from the end of March. CGL will market the machine under a name yet to be chosen and it will be on sale for about £170 through multiples and major stores throughout the country.

The Sord M5 will also be sold via the manufacturer's own dealer network in this country for the same price. During 1983 CGL will also bring out any hardware add-ons produced by Sord, including a printer and disc drives. CGL also plans to have a 200 strong software library available by the end of 1983, all of which will be written by the manufacturer. Virtually every sector of the market will be catered for software-wise with programs covering games, business and education.

CGL's managing director David Morein said: 'This is the next logical step to take and one which we were working towards over the last five years.' From originally distributing toys like hand-held space invaders and the infuriatingly frustrating Game & Watch toys CGL last year moved further towards the computer market when it began distributing Activision's video games cartridges compatible with the Atari VCS.

CGL chose the Sord M5 as the computer it wanted to market because its directors believe it to be one of the best micro computers around and it is produced by one of the fastest expanding companies in Japan.

Win A BBC System

Calling all schools in desparate need of a computer.

Now's your chance to win a complete system, the BBC B Microcomputer, its disc drive, teletext adaptor and 15 software programs. Not a bad little package for the price of a trip to the flicks and a bit of imagination.

The Tron Competition is open to both Primary and Secondary Schools in the UK, although each school may enter once only and the entry should comprise a team of six at the most.

The competition is centred around the recently released Walt Disney film, Tron (also the name of the central character). It's packed full of visually stunning computer graphics and special effects to pad out the plot which features Tron as the hero. The concept is quite

complicated, and involves the 'real' world and the 'electronic' world in which the characters assume different identities.

The basic plot is that a video games designer, Flynn, had his games ideas stolen by the boss of his former employer, Encom, a giant international communications corporation. The only way Tron can erase his games from the Master Control Program is to dice with death inside the MCP's memory circuits. Discover whether succeeds or not when you see the film.

Entries from Primary Schools must describe in no more than 100 sentences of 10 words or less the tale of Tron. The winner will be the entry which the judges think is the most exciting description of Tron.

Teams from Secondary Schools have a slightly harder task. They have the option to devise an adventure game on the film of Tron using passages of the film to develop adventures for the Tron cast. The alternative is to devise an arcade game based on the characters and story of the film.

Quicksilva Software Competition In This Issue

A mini competition with a mammoth prize courtesy of Quicksilva is open to all Spectrum owners this month.

The problem to solve is easy, just identify the pictures printed on the competition page (p27). Spectrum software firm Quicksilva has generously donated the prize. The lucky winner will receive all the new releases brought out by Quicksilva during 1983 as well as an invitation to a special conference which will be attended by Quicksilva programmers later this year. There you will have the unique opportunity to rub shoulders with the people who bring you Quicksilva's high-quality, creatively produced software, such as, Meteor Storm, Space Intruders, and Timegate.

Computer Club Round-Up

News from computer clubs is flooding in with the birth of four new ventures. Read on for a round-up.

● *First off is the Jupiter Ace Users Club, (and no prizes for guessing what machine it specialises in). The club is based in Brighton and its purpose is for memebers to exchange information on this new computer. In addition it is bringing out cassette-based software for sale to Ace owners. Two tapes are out so far including a RAM and ROM unraveller and a three-program tape containing a game called Night Rider, a screen layout aid entitled Sketch, and a text editor program called, surprise, suprise, Editor. They are reasonably priced at £3.50 and £4.50.*

Subscription to the club costs £7 a year for which you get three newsletters and the chance to buy cheaper kit machines, and add-ons.

For further information contact John Noyce on Brighton 602354 or write to him at 18 George Street, Brighton BN2 1RH.

● *An all-purpose, any machine computer club for enthusiasts living in Essex has sprung up. The* **Burnham Computer Club** has admirable aims to promote all aspects of computing at every level. Don't worry if you don't yet own a computer or have no computing experience, the Club will welcome you regardless. Presently 20 strong most members have their own computer and the Club eventually hopes to buy a communal computer.

If you are really green in this field and are an absolute beginner you can test the water with a free first meeting. A junior section of the club has already been formed for those still at school.

If you feel this sort of club could be up your street contact the Acting Secretary, Frederick Wheeler on Maldon 783918 or write to him at 93, Maple Way, Burnham-on-Crouch, Essex.

● **Southampton Amateur Computer Club** has a change in secretary. Now the main man is Roger Shears and he can be found at the end of the telephone if you ring Southampton 552927. The Club's address remains the same: 'Gardenways', Chilworth Tower, Chilworth, Southampton, S01 7JH. This club's meetings take place on the second Wednesday of each month and cater for several user groups. Membership is normally £8 a year, but this is cut to £5 for students and old age pensioners, and £1.50 for junior members.

● A plea for more members to swell the ranks of the Eastwood Town Micro Computer Club is out. Having been formed some three or four months ago on a monthly basis the Club is now so popular that it holds two meetings a week. The Club formed a new committee in January to run the club which is held at any of four venues in the Nottingham area. These are Devonshire Junior School (Wednesday at 5.45pm), Eastwood Volunteer Bureau (Friday at 5.30pm or 6.30pm, Upper School Mansfield Road on Wednesday/Friday when not at the previous location, or Sunncroft Scout HQ, Derby Road.

Contacts in these three areas are Ted Ryan (Eastwood area) on Langley Mill 65011, Roger Hellings (Heanor area) on Langley Mill 69281, or Robert Clifford (Underwood and Selston area) on Ripley 812459.

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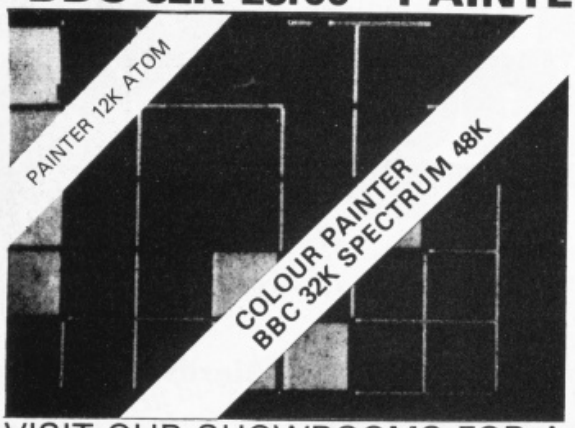

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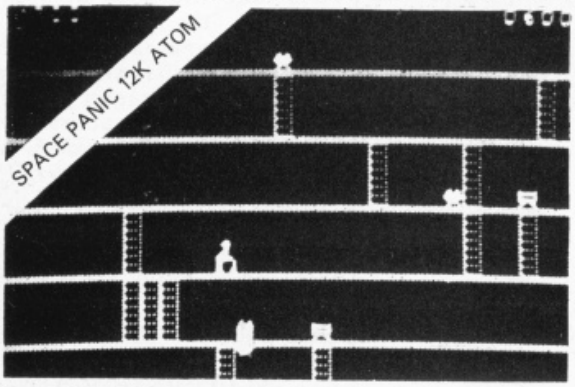

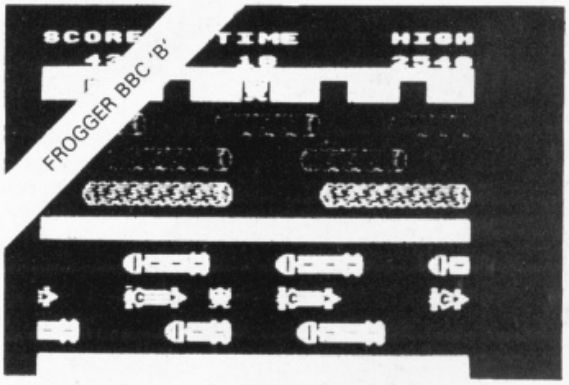

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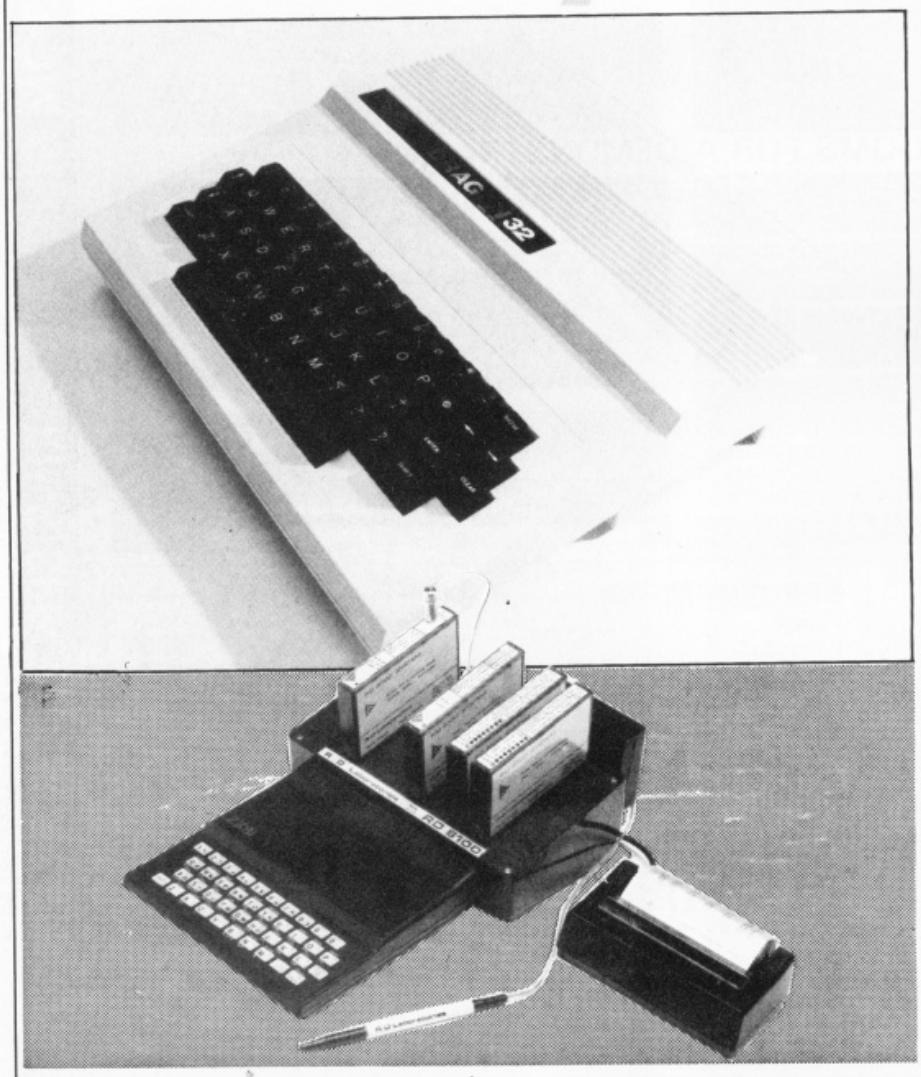

Special Survey: Add-ons

Nestling between the regular features in the April issue of Personal Computing Today will be the first part of our comprehensive look at the peripherals you can buy for your computer. We kick off by looking at the best add ons for the VIC, Spectrum and BBC computer.

Encompassed within our survey will be reports on printers, extra memories, joysticks and virtually anything that you can plug into or bolt onto your computer. So if you are thinking about buying your computer (and yourself) a present then make sure you pick up a copy of our April issue.

Hardware Review

Our hardware review next month will take the form of a comparison between the Dragon 32 and the recently released Colour Genie.

Despite its short time on the market, the Dragon 32 has already become a firm favourite with many home computer owners and many shops found it to be one of the hottest pieces of computer merchandise on sale at Christmas.

The Colour Genie is similar to the Dragon in many ways so we will be putting the two together and examining which comes out tops.

Scintillating Software

On the software front we have a program for the Sharp which will let you recreate the famous battle of El Alamein. So here is your opportunity to fight that decisive battle again from the comfort of your own front room.

For the Atom we have an interesting program that has you trying to trace an escaped gnu by using your dogs to pick up the trail of aniseed which it leaves behind. In case you're wondering how it manages to leave a trail of aniseed you will just have to read the April issue to find out.

All this as well as our regular Software Checklist, Factfile and Software Reviews will be at your newsagent on March 4.

Note: At the time of going to press this information is correct but may be altered for reasons beyond our control.

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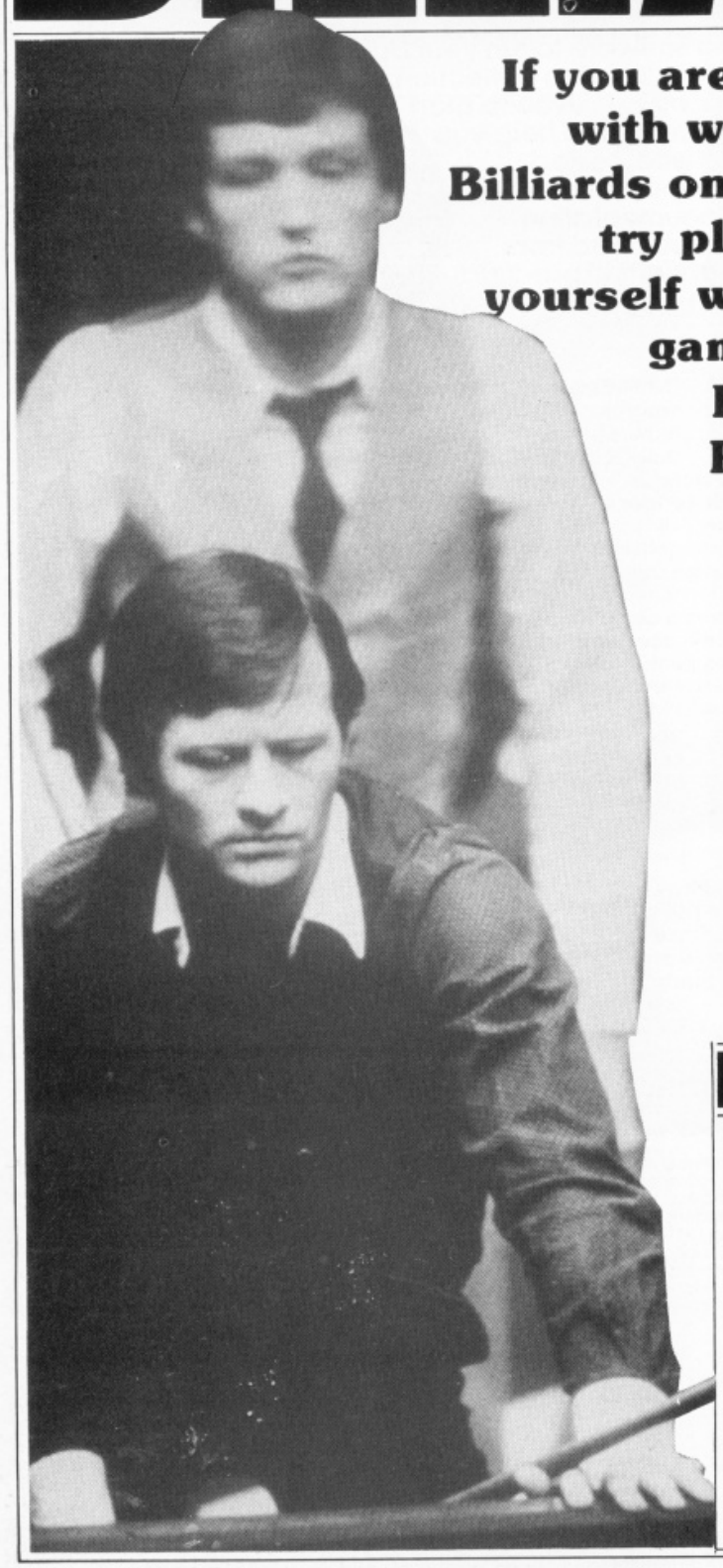

If you are fed up with watching Billiards on the TV try playing it yourself with this game from Eugenio Rapella.

Ever fancied yourself as the computer world's answer to Steve Davis? Now you need step no further than your living room. Snooker it's not, but you can still experience the fun of lining a shot up and calculating the rebound. The game is based loosely on the traditional game of Billiards.

In this version of Billiards the idea is to clear all the balls off the table by knocking them into the pockets using the cue ball. There are no points lost for missing a ball, so you can move the cue ball round the table to line up your shots. You aim the cue ball by pressing on the direction keys. These are: W-North, X-South, D-East, A-West, E-North East, C-South East, Z-South West, Q-North West. If you hold the SHIFT key down when you press the direction key then the shot is a lot stronger and the ball will keep moving round the table for longer.

The score is calculated on the number of balls potted in relation to the number of balls at the start. The total number of shots is taken into account as well. This means that potting ten balls using 20 shots will score higher than potting ten balls using 30 shots. The game is over either when you have potted all the balls on the table or you have accidentally potted the cue ball itself. The game of Billiards runs on an unexpanded VIC-20.

HOW IT RUNS

Line 3	Sets volume.
Lines 5-7	Set initial position of the balls.
Lines 10-14	Move the balls.
Line 20	Sound subroutine.
Lines 110-180	Set colour and draw the table.
Lines 190-210	Put the balls on the table.
Lines 300-390	Detect the key press.
Lines 400-402	Decide whether it's a short or long run.
Lines 410-510	Decide the new position of the ball.
Line 530	Manages movement of ball when in a free area.
Lines 560-570	Ball going into a hole.
Lines 600-830	Ball going against the edge.
Lines 900-920	Ball is striking another ball.
Lines 1000-1090	Print score and ask for another game.
Lines 2000-2120	Print the introductory text and get the required number of balls.

HINTS ON CONVERSION

As with all programs that produce graphic screen displays, any conversion problems centre on the different ways in which machines handle their screen memories.

The VIC-20 has a memory mapped screen, so most of the VIC programs POKE to the screen to display characters, especially when the characters have to move. Billiards employs this technique. If your machine does not support this form of screen handling then these screen POKEs should be replaced with either a PRINT AT or a PLOT command.

The only other POKEs used in this program are those to control the sound and the colour.

The sound POKEs are to location 36878, which controls the volume and location 36876, which is the alto voice. These POKEs should be omitted or replaced with your own machine's sound controls. The colour POKE is to location 36879 and sets the foreground and background colour of the screen. Once again this should either be omitted or changed to your own machines system.

Becuase of the way in which the VIC's memory locations shift when the machine's memory is expanded, it is also necessary to alter the program if you have more than 3K of memory fitted. The following formula will give you the new position of the screen:

S = 4 * (PEEK(36866) AND 128) + 64 * (PEEK(36869) AND 112)

Having now found the new location of the screen you must adjust the screen locations in the program. On the unexpanded VIC or the VIC with 3K expansion the screen starts at location 7680 and runs to location 8191, so in order to run the program you must change any POKE values within these limits to their corresponding positions in the expanded VIC.

PROGRAM LISTING

```
1 REM* BILLIARDS * BY E. RAPELLA **
3 POKE36878,15:S2=SQR(2):N=36876:GOSUB2000:GOTO110
5 RN=INT(505*RND(1))+7680
6 IFPEEK(RN)<>32THEN5
7 RETURN
10 POKEPS,32
12 IFBAL=0THENPOKENP,81
14 IFBAL=1THENPOKENP,87
16 RETURN
20 POKEN,T:FORJ=1TO30:NEXT:POKEN,0:RETURN
110 POKE36879,95:PRINT"■■"
120 FORI=7681TO7700
130 POKEI,160:POKEI+484,160:NEXT
140 FORI=7680TO8164STEP22
150 POKEI,160:POKEI+21,160:NEXT
160 POKE7680,102:POKE7701,102:POKE7690,102:POKE7691,102
170 POKE8164,102:POKE8185,102:POKE8174,102:POKE8175,102
180 GOSUB5
190 POKERN,81:PS=RN
200 FORI=1TONB:GOSUB5
210 POKERN,87:NEXT
300 GETT$:IFT$=""THEN300
310 IFT$="W"ORT$="O"THENAN=1:GOTO400
320 IFT$="E"ORT$="¯"THENAN=2:GOTO400
330 IFT$="D"ORT$="─"THENAN=3:GOTO400
340 IFT$="C"ORT$="─"THENAN=4:GOTO400
350 IFT$="X"ORT$="♣"THENAN=5:GOTO400
360 IFT$="Z"ORT$="♦"THENAN=6:GOTO400
370 IFT$="A"ORT$="♠"THENAN=7:GOTO400
380 IFT$="Q"ORT$="●"THENAN=8:GOTO400
390 T$="":GOTO300
400 IFASC(T$)<100THENNC=13:GOTO403
402 NC=43
403 TR=TR+1
404 IFAN=8ORAN=2ORAN=4ORAN=6THENNC=NC/S2
405 FORK=1TONC
410 ON AN GOTO420,430,440,450,460,470,480,490
420 NP=PS-22:GOTO500
430 NP=PS-21:GOTO500
440 NP=PS+1:GOTO500
450 NP=PS+23:GOTO500
460 NP=PS+22:GOTO500
470 NP=PS+21:GOTO500
480 NP=PS-1:GOTO500
490 NP=PS-23:GOTO500
500 REM
510 TP=PEEK(NP)
520 IFTP<>32THEN550
530 GOSUB10:GOTO950
550 IFTP<>102THEN600
555 T=255:GOSUB20
560 POKEPS,32
565 IFBAL=0THENCX=110:GOTO1000
570 SC=SC+1:IFSC=NBTHENCX=42:GOTO1000
575 GOTO960
600 IFTP<>160THEN893
605 T=230:GOSUB20
610 IFNP>7701THEN700
620 IFAN=1THENAN=5:NP=PS:GOSUB10:GOTO950
630 IFAN=2THENAN=4:NP=PS:GOSUB10:GOTO950
640 IFAN=8THENAN=6:NP=PS:GOSUB10:GOTO950
700 IFNP<8164THEN750
710 IFAN=5THENAN=1:NP=PS:GOSUB10:GOTO950
720 IFAN=4THENAN=2:NP=PS:GOSUB10:GOTO950
730 IFAN=6THENAN=8:NP=PS:GOSUB10:GOTO950
750 PR=NP-7701
760 IFINT(PR/22)*22<>PRTHEN800
770 IFAN=3THENAN=7:NP=PS:GOSUB10:GOTO950
780 IFAN=4THENAN=6:NP=PS:GOSUB10:GOTO950
790 IFAN=2THENAN=8:NP=PS:GOSUB10:GOTO950
800 PR=NP-7680
805 IFINT(PR/22)*22<>PRTHEN950
810 IFAN=7THENAN=3:NP=PS:GOSUB10:GOTO950
820 IFAN=6THENAN=4:NP=PS:GOSUB10:GOTO950
830 IFAN=8THENAN=2:NP=PS:GOSUB10:GOTO950
890 T=250:GOSUB20
900 IFBAL=0THENBAL=1:FL=1:TE=PS:GOSUB12:GOTO950
910 IFBAL=1ANDTP=81THENBAL=0:GOSUB12
920 IFBAL=1ANDTP=87THENBAL=1:GOSUB12
950 PS=NP:NEXT
955 IFBAL=0THEN970
960 IFFL=1THENFL=0:PS=TE:BAL=0
970 GOTO300
1000 FORU=1TO200:NEXT
1010 POKE36879,CX
1015 PRINT"■■■■■";SC;"OUT OF";NB
1020 PRINT"■■■■■■■■■■■■■■ SCORE **"
1030 PRINT"■■■■■■■■■";INT(100*SC+10*SC*NB/TR)
1040 PRINT"■■■■■■■■ANOTHER GAME ?"
1050 PRINT"■■■■■■■■■(Y/N)"
1060 GETR$:IFR$=""THEN1060
1070 IFR$="Y"THENRUN
1080 IFR$="N"THENEND
1090 GOTO1060
2000 POKE36879,59
2010 PRINT"■■■■■■■■ BILLIARDS **"
2020 PRINT"■■■■■■■■■■■USE:■"
2030 PRINT" 'W'=NORTH   'E'=N.E."
2040 PRINT" 'X'=SOUTH   'C'=S.E."
2050 PRINT" 'D'=EAST    'Z'=S.W."
2060 PRINT" 'A'=WEST    'Q'=N.W."
2070 PRINT"■■■■WITH THE ■SHIFT KEY■■"
2080 PRINT"■■■OFF■  FOR A ■SHORT RUN■■"
2085 PRINT"■■■ON ■  FOR A ■LONG  RUN■■■"
2090 PRINT"    HOW MANY BALLS"
2100 INPUT"■■■■■(1 TO 10) ";NB
2110 NB=ABS(INT(NB)):IFNB<10RNB>10THENRUN
2120 RETURN
```

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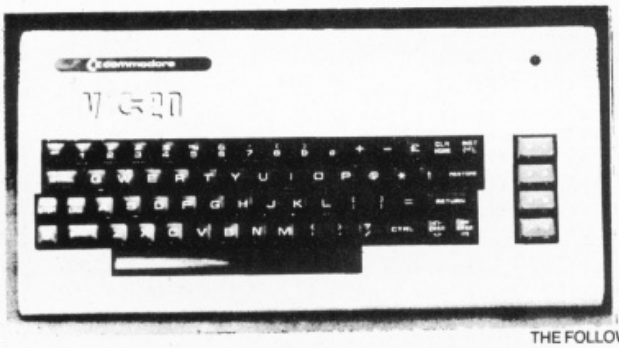

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Dear Sir,

With reference to the article on page 30 in your January publication of Personal Computing Today, 'Beginners Guide to Programming Languages'. Page 31 refers to further reading on:

1. Pascal User Manual and Report by Jensen & Wirth.
2. A Practical Introduction to Pascal by Wilson and Addyman.

I have contacted my local library by phone but they indicate that both books are no longer published. Can you help me by

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Yours faithfully
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Editor's Reply: If you are unable to get either of these books from a library the only alternative is to order them through a bookshop. Specialist bookshops should keep them in stock. If you still draw a blank try and get hold of a copy of Programming in Pascal by Peter Grogono which is published by Addison-Wesley. This is also recommended as a very worthwhile book on Pascal.

I would also like to point out that the section of that article devoted to Pascal was written by C S Ward and not Jeremy Ruston as the credit may have lead you to believe. Apologies and thanks to Mr Ward.

Dear PCT,

My first ever letter to a magazine was stirred to action by sheer frustration.

Firstly, though, a pat on the back to PCT for an excellent balance of contents, even if your program listings are heavily weighted, numerically, in favour of Uncle Clive, and the over-rated BBC machine.

The object of my frustration is the poor, abused TI99/4A. Not only have all reivews of this machine 'and I think I've read *all* of them) been grossly biased towards emphasising the machine's shortcomings, which are I believe fewer than more favoured micros, but also few of the reviews appear to have made any meaningful attempt at researching the machine.

Here your own Factfile is one of the worst offenders, and if it is meant as a serious article, should be kept up to date; for example you list on other languages for the TI when the following are available: TI Logo, UCSD Pascal, TI Pilot (though only from the USA at present), and an Editor Assembler.

You also list no other add-ons when the following are available: Speech Synthesiser (can be bought for £46.60) which has 373 pre-programmed words or phrases but when used in conjunction with the Terminal Emulator II module (£37.80) you have unlimited speech capability within TI Basic programs. An RS232C interface and modems are also available.

Everybody particularly misses the speech capabilities of this machine which are invaluable when used in education programs; TI's own Early Reading makes excellent use of speech and graphics, and can easily be run by very young children with the minimum of instruction. This is in stark contrast to the majority of programs which are puportedly written for children, and yet expect them to be able to read masses of instructions.

I have also yet to see a review of TI Extended Basic, which with speech, sprite graphics, cassette software protection etc enables some really advanced programs to be written.

My only real complaint about this machine is that despite promises from TI they have not made any technical information regarding this machine available. The information promised was a circuit diagram, modulator port pin assignments, ROM port pin assignments. I'm over-flowing with ideas for this machine, which I am unable to put into operation unless this information is available.

Yours
A P Cook
Swindon

Editor's reply: You'll be pleased to see that our Factfile has been updated at your suggestion. Thank you.

Dear PCT,

I think your 'software directory' is a great idea. I saw it first in your October issue and was going to complain about the lack of programs for the Acorn Atom, but I see you have rectified this in the December issue. I assume that this will be an ongoing feature and will build up over the months. For those who have missed some issues, will it be available as a separate item for sale and will the programs listed for just one computer be available separately?

I have just written a picture drawing program for my Acorn Atom which can store and load drawing information at a named file on tape (would you be interested in publishing this?) I have a small problem with this. The cassette handling commands for loading the picture do not seem to synchronise with the start of the data unless a 'tone leader' is being played when 'return' is pressed after the 'play tape' message. If the tape is blank it starts loading right away. Is this normal and if not is there any remedy?

Yours faithfully
John Howson

Editor's reply: First, the software checklist is a regular feature in PCT but because we receive so many entries for each computer we have to alternate some of the computers each month. At present we do not intend to publish each computer's individual software listing.

As far as your drawing program goes, I am afraid to say that when your blank tape starts loading as in the process you have just described it is abnormal. The only thing to do is to thoroughly re-read your Acorn Atom user manual and find out where you are going wrong. Alternatively consult your local user club for their advice. Good luck!

Dear PCT,

At the moment I'm waiting for my 48K Spectrum (which is my third micro) to arrive. As I know of two people that have sent off for a 48K Spectrum but actually received the 16K version, I would like to know if there is a program to test that all the 48K is there.

Yours hopefully
Graham Walden
Wolverhampton

PS Keep up the good work, I think your mag is great.

Editor's reply: The simple answer to this is: when your Spectrum is delivered look at the slot in the back of the machine and see whether or not it contains the extra memory board to make it up to 48K. If it's not there you've only got a 16K machine.

Dear PCT,

Why do you hate the BBC Micro? Each time I buy your magazine for a BBC listing, I find it is rubbish. Pete . . . (As far as I gathered the mistakes are:)
Lines 150-170 Postman 7 — — what are the missing characters?
Postman2
Line 510 is missing
Line 530 — — should it really be IF DIR% *less* than 6 — — or should it be more than?

There are probably other errors that I haven't found. And can't you update your Factfile — printers and disc drives have been around for months, as have other languages (Forth, Lisp, several Logos, BCPL). and CJE Evans doesn't make a carrying case anymore, sadly. And you list the expansion sockets a bit strangely — the A doesn't have A/D converter, B does (and you mention joysticks for other machines, which the B takes through the A/D converter).

I liked your software reviews, and I look forward to the disc reviews — but can't you get your listings right? The last time I complained I was assured that all listings would be dumped from a printer.

Yours sincerely
Douglas Weller

Editor's reply: I am sorry hear that you are so disappointed with PCT. Unfortunately, those dreaded bugs found their way into the system when Pete ran on the BBC — hence the printed result. We can only apologise, and request that if any of you did have trouble with Pete being Plastered just drop us a line (in an envelope marked Pete the Plastered Postman) and we will send you a corrected listing of this program. Also turn to Micro Answers to find the corrections.

I must point out that we do try and print listings direct from tried and tested programs. Sometimes this is impossible, and although run on our own computers (or those belonging to contributors) some listings have to be typeset.

This is partly due to the fact that many people send us programs which are merely hand-written and only invites errors, or the printouts provided are not at all suitable for reproduction.

So now is a good opportunity to ask you all to supply us with tapes of your programs (for easy and quick loading and testing) and a well-presented and easily-definable program listing.

Dear PCT,

I wonder if you would print some more computer programs, especially games, for the ZX Spectrum.

I am a school boy who can't afford to buy many programs that come in books and I am sure many other people and ZX Spectrum owners would appreciate it. I am hopefully getting a Spectrum by the end of January or February as a late Christmas present.

Yours faithfully
Miles Fletcher Brown

Editor's Reply: Each month we try to publish games, utility or educational programs for all the popular micro computers, including the ZX Spectrum. So keep your eyes peeled for Spectrum software.

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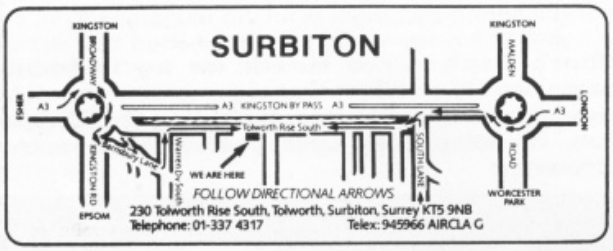

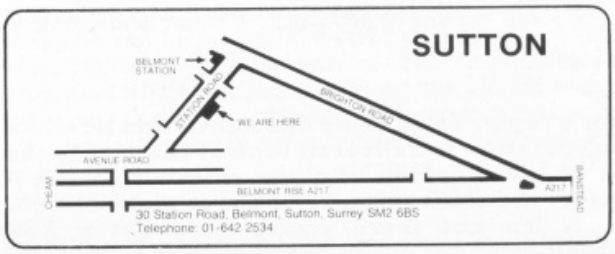

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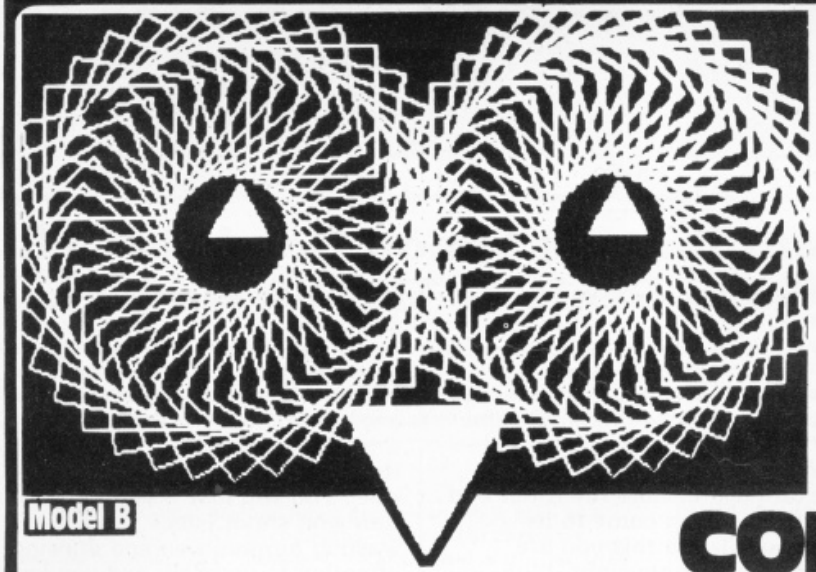

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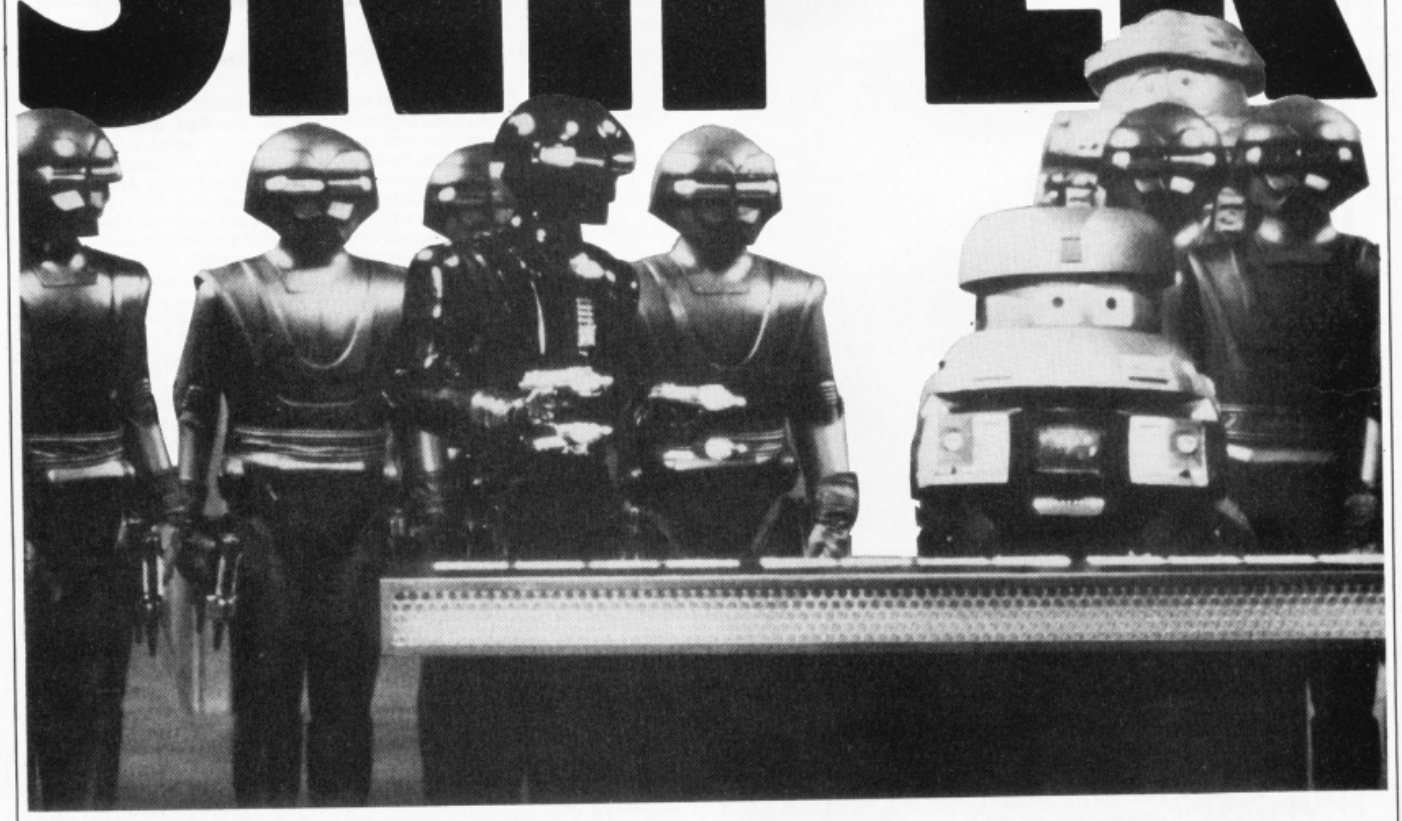
SNIPER



Outwit the malevolent robots in Simon Goodwin's all action game for the Video Genie or TRS-80 Model I.

Here is a game to pit your wits and reflexes against security robots at the top secret research headquarters of IBM (Intergalactic Business Mogul). You are looking through the giant mainframe computer-room, in search of interesting secrets, when you hear a rumbling noise from between the rows of processors and disc units . . .

You dive out of the way just in time as a hi-blast quarkon grenade rolls past you and detonates nearby. In the dimness you can just make out the glowing sensors of a security robot at the other end of the room. The robot's cybo-grip unit reaches behind and it primes another grenade, ready to roll it towards you. The bomb explodes prematurely, showering blue paint over the robot. Unperturbed, the security robot takes aim again.

You must disable the robot and any others which come to its assistance. To do this you are armed with a lightweight, high-resolution, laser rifle, but it is difficult to hit the robot as it dodges back and forth in the darkness at the other end of the computer room. Alternatively you could brave the grenades and attempt to sneak up and eliminate the robot with a sharp blow to its sensitive omniwave radiation sensors. The decision is yours; but hurry, because here comes another grenade . . .

Use the arrow keys or control keys to manoeuvre the sniper around the computer room. Press the space key to fire your laser rifle. You will lose a point every time you shoot (since you are wasting ammunition and drawing attention to yourself) and you lose a 'life' if you collide with a grenade. Points are awarded each time you sucessfully shoot the robot (the shorter the range the greater the score) and if you manage to 'mug' the robot and destroy its sensors. Be warned — you will be unable to shoot down the grenades with your rifle, and the robot will try to evade you if you creep up on it.

HOW IT RUNS

Lines 10-30	Identify the program and send the computer to the set-up routine at line 450.
Line 40	Introduces the routine for rolling bombs across the display. These lines form the main part of the program and consequently they have been placed at its head, where BASIC can find them quickly. The game would be about a third slower if the 'roll bombs' routine was at the end of the program.
Line 50	Selects the next bomb to be moved.
Lines 60-130	Check that the bomb has not yet hit the end wall of the computer room. If it has done so then a new bomb is launched.
Lines 140-160	Advance the bomb across the display.
Line 170	Checks to see whether or not the bomb has spontaneously exploded.
Lines 180-290	Reduce the number of lives if the bomb has hit the player.
Lines 300-430	Handle the hi-blast quarkon grenade explosions.
Lines 440-490	Part of the set-up routine for the game. They clear variable storage and the TRS-80 display. Lines 450 and 460 will not be needed on most computers. Adjust the value of BMAX to change the maximum number of bombs in action at any time. Its value must be a power of two (e.g. 1, 2, 4, 8 or 16).
Lines 500-560	Sets up the graphic characters that will be used in the game. Each item is assumed to be one character high and three characters wide.
Lines 570-680	Draw the walls of the computer room and populate it with chest freezer shaped machines.
Lines 690-730	Prepare the main recording variables of the game. These are P (player's position on screen for PRINTing), E (enemy's position), SC (score), B (bomb position) and LV (number of remaining lives).
Lines 740-760	Set the starting position of all bombs.
Lines 770-790	Label the display.
Lines 800-870	Form the main loop of the game. For simplicity it has been written in four parts. One part rolls the grenades, another allows the player to move, the third handles rifle-fire, and the final part controls the robot's movement.
Lines 880-940	Examine the keyboard (see 'Hints on Coversion') and adjust the player's position accordingly.
Lines 950-970	Punish the sniper if a bomb has been trodden upon.
Lines 980-1000	Blank out the old display of the sniper and set up the new one.
Line 1010	Checks whether or not the sniper has jumped on top of the robot. If so lines 1030-1110 modify the score and display accordingly.
Lines 1120-1190	Decide the robot's move. Line 1160 selects a new direction of movement (up or down) to home in upon the player.
Lines 1200-1210	Adjust the robot's position, preventing moves off the screen!
Lines 1220-1260	Set up the new display of the robot, blanking out the old one as required.
Lines 1270-1290	Handles rifle fire. Line 1280 determines whether or not the space key (fire) has been pressed and line 1290 excludes alternate lines of the display from use (those military-spec. cabinets are 100 per cent laser-proof!).
Lines 1300-1370	Display the laser-beam with an appropriate sound-effect. Line 1300 works out its length and 1370 checks whether or not the robot has been hit.
Line 1380	Allocates points in accordance with the distance between the sniper and the robot.
Lines 1390-1480	Illustrate the robot explosion in sound and vision.

HINTS ON CONVERSION

SNIPER is written in Microsoft 12K Z80 BASIC. As it is a graphic game a number of conversions must be made to enable it to be run on machines not compatible with the TRS-80 Level 2. The game uses the PRINT @ facility to place text and graphics on the screen. The TRS-80 display consists of 1024 characters. The character-code for each element is stored in memory between address 15360 and 16383. Consequently PEEK(15360) will return the ASCII code of the character in the left most position of the top line. PEEK (15487) does the same for the last character of the second line, and so on.

Each character-position has a number which is used as a reference for the PRINT @ command. The top left character position is numbered 0, through to 63 at the end of the line 1023 at the end of the screen. The display consists of 16 lines of 64 characters. For example PRINT @960, "SNIPER"; would cause the word to be displayed at the left-hand side of the last line of the screen.

The STRING$(X,Y) function returns X copies of the character with ASCII code Y. An equivalent function is available in BBC BASIC — on other machines you will have to set up a loop to generate the appropriate string using the CHR$ function.

SNIPER makes considerable use of the logical AND operation. This is available on most micros, but notably not the Apple or current Sinclair machines. A logical AND is used to tell the computer to ignore some of binary digits in a value. The value 30 is written 11110 in binary, and the value 19 is 10011, so that the expression 30 AND 19 has the binary value 100,10 or 18 decimal. (The 1 is copied in the columns where it appears in both numbers). Type PRINT 30 AND 19 on your computer to see if this feature is supported.

The program uses the AND function to generate random numbers. For example RND(3) generates (at random) 1,2 or 3. Long names are used for some string variables (e.g. PLAYER$) but these can be shortened to their first two characters (PL$) without ill-effect.

PEEK(14400) is used to poll the computer's keyboard. The game is controlled by pressing five keys. On a Video Genie you may use ESC and CTRL to move the sniper up and down the screen. If the keys are held down the sniper will move steadily. The CLEAR and TAB keys can be used to move left and right, the SPACE key cause a shot to be fired. If your computer has arrow-keys in place of ESC and CTRL, or CLEAR and TAB are not adjacent on your keyboard, then you can modify the program to recognise control from the arrows simply by changing line 900 so that it starts 'IF (KB AND 32). . .'.

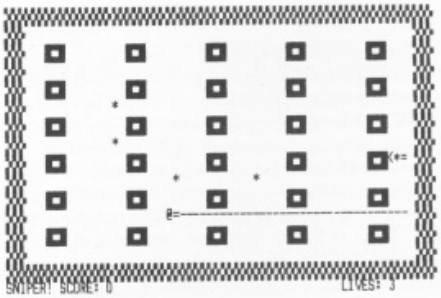
Sound-effects are generated as SNIPER runs. Program lines containing the OUT instruction are used to send noises to the Genie or TRS-80 cassette interface. These lines won't work on other computers but they may be missed out without harming the game.

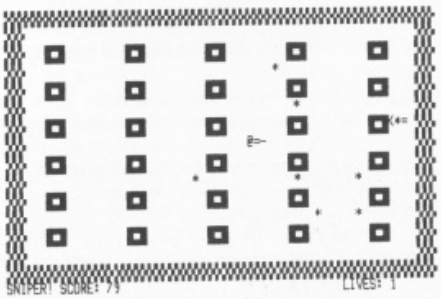
SNIPER

PROGRAM LISTING

```
10 REM ** TRS-80 SNIPER
20 REM ** Simon Goodwin
30 GOTO 450
40 REM ** Roll the bombs!
50 C = C + 1 AND BMAX - 1
60 IF (B(C) AND 63) > 3 THEN 140
70 IF RND(2) < 1 OR (E AND 64) < 64 THEN RETURN
80 B(C) = 54 + (E AND 960)
90 IF Q = B(C) THEN 420
100 Q = B(C)
110 PRINT @B(C),BOMB$;
120 IF Q=P THEN 200
130 RETURN
140 PRINT @B(C),BLANK$;
150 B(C) = B(C) - 3
160 IF (B(C) AND 63) > 3 THEN PRINT @B(C),BOMB$;
170 IF RND(12) > 1 THEN IF B(C) <> P THEN RETURN
180 REM ** See where bomb has gone
190 IF B(C) <> P THEN 310
200 LV = LV - 1
210 PRINT @1016,LV;
220 LP = 515
230 IF LV > 0 THEN 260
240 PRINT @984,"G A M E    O V E R !";
250 GOTO 250
260 IF KB<900 THEN 290
270 KB = KB + B(C)
280 B(C) = LP
290 LP = 515
300 REM ** Bomb explosion
310 FOR Y = 0 TO 1
320 OUT 255,1
330 PRINT @B(C),"+!+";
340 OUT 255,2
350 OUT 255,1
360 PRINT @B(C),"   ";
370 OUT 255,2
380 NEXT Y
390 IF KB < 900 THEN 420
400 B(C) = KB - 1100
410 RETURN
420 B(C) = 515
430 RETURN
440 REM ** SNIPER Program start
450 CLEAR 500
460 DEFINT A-Z
470 BMAX=8
480 DIM B(BMAX-1)
490 CLS
500 REM ** Set up graphics
510 LUMP$ = CHR$(191) + CHR$(179) + CHR$(191)
520 WALL$ = STRING$(3,153)
530 BLANK$ = STRING$(3,32)
540 PLAYER$ = "@=-"
550 ENEMY$ = "(+="
560 BOMB$ = CHR$(32) + CHR$(42) + CHR$(32)
570 REM ** Draw the room
580 PRINT @0,STRING$(64,153);
590 PRINT @896,STRING$(64,153);
600 FOR Y = 64 TO 840 STEP 64
610 PRINT @Y,WALL$;
620 PRINT @Y + 61,WALL$;
630 NEXT Y

640 FOR Y = 134 TO 600 STEP 128
650 FOR X = 0 TO 50 STEP 12
660 PRINT @X + Y,LUMP$;
670 NEXT X
680 NEXT Y
690 REM ** Set up the variables
700 P  = 515
710 E  = 505
720 SC = 0
730 LV = 3
740 FOR Y=0 TO BMAX-1
750 B(Y) = 194
760 NEXT Y
770 PRINT @1010,"Lives:";LV;
780 PRINT @P,PLAYER$;
790 PRINT @960,"SNIPER! Score:";SC;
800 REM ** Main loop of game
810 GOSUB 890 ' Player's move
820 GOSUB 40 ' Roll bomb 1
830 GOSUB 1280 ' Fire rifle
840 GOSUB 40 ' Roll bomb 2
850 GOSUB 1130 ' Target's move
860 GOSUB 40 ' Roll bomb 3
870 GOTO 810
880 REM ** Check keys and move player
890 KB = PEEK(14400)
900 IF (KB AND  2) THEN IF (P AND 63) > 5  THEN LP = P - 3
910 IF (KB AND 64) THEN IF (P AND 63) < 56 THEN LP = P + 3
920 IF (KB AND  8) THEN IF P > 128 THEN LP = P - 64
930 IF (KB AND 16) THEN IF P < 896 THEN LP = P + 64
940 IF P = LP OR PEEK(LP + 15360) > 128 THEN RETURN
950 IF PEEK(LP + 15361) <> 42 THEN 980
960 KB = 1100
970 GOTO 200
980 PRINT @P,BLANK$;
990 PRINT @LP,PLAYER$;
1000 P = LP
1010 IF P <> E THEN RETURN
1020 REM ** You have 'mussed' the enemy
1030 SC = SC + 10
1040 FOR Y = 0 TO 7
1050 OUT 255,1
1060 PRINT @E,")-(";
1070 OUT 255,2
1080 PRINT @E,ENEMY$;
1090 NEXT Y
1100 LP = 515
1110 GOTO 1390
1120 REM ** Move the enemy
1130 L = L - 1
1140 IF L < 6 AND L > 0 THEN RETURN
1150 IF L > 5 THEN 1200
1160 IF E < P THEN D=64 ELSE D=-64
1170 IF E + D < 64 OR E + D > 896 THEN D=-D
1180 IF L < 1 THEN L = RND(4) + 7
1190 RETURN
1200 NE = E + D
1210 IF NE < 128 OR NE > 832 THEN D = -D
1220 PRINT @E,BLANK$;
1230 PRINT @NE,ENEMY$;
1240 E = NE
1250 IF E = P THEN 1030
1260 RETURN
1270 REM ** Check for rifle fire
1280 IF (KB AND 128) = 0 THEN RETURN
1290 IF (P AND 64) < 64 THEN RETURN
1300 L = 57 - (P AND 63)
1310 PRINT @P + 3,STRING$(L,45);
1320 FOR Y = 0 TO 12
1330 OUT 255, Y AND 3
1340 NEXT Y
1350 PRINT @P + 3,STRING$(L,32);
1360 IF SC > 0 THEN SC = SC - 1
1370 IF (P AND 960) <> (E AND 960) THEN 1470
1380 SC = SC + (P AND 63)/3
1390 FOR Y = 0 TO 12
1400 PRINT @E,"=+=";
1410 OUT 255,Y AND 3
1420 PRINT @E,"0+0";
1430 NEXT Y
1440 PRINT @E,BLANK$;
1450 E = 505
1460 PRINT @E,ENEMY$;
1470 PRINT @974,SC;
1480 RETURN
```





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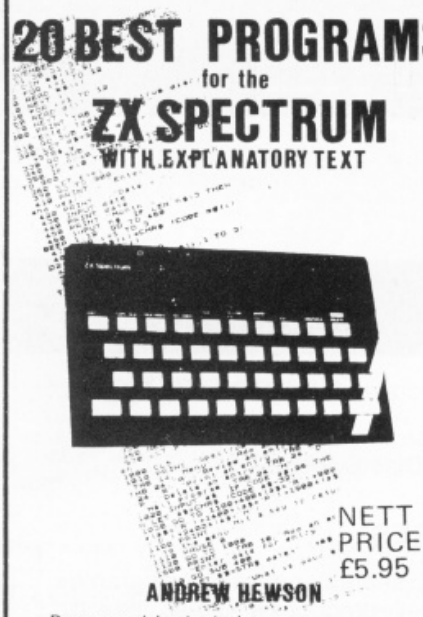

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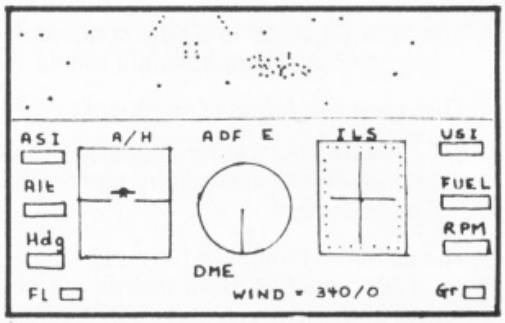

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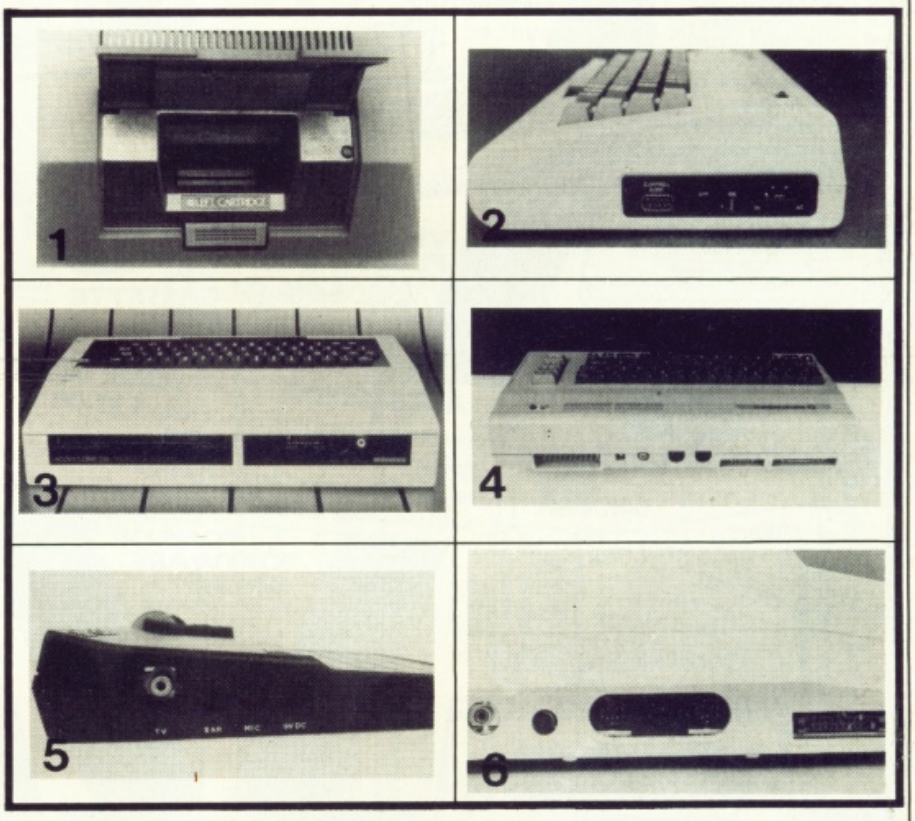

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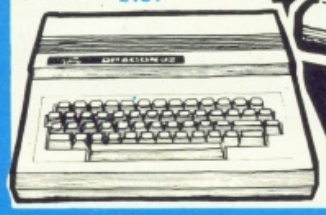

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SOFTWARE

CASH FLOW

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If you want to know which month to the penny, but rather an onthly ly bank ound, over ar. As with ense and ered to allow f situations.

When you have typed in the program, enter RUN 1810 and you will see a prompt for the number of expense categories. This has an upper limit of eleven to keep the display routine simple and should be adequate for general household expenses. When you receive the

UNS

160 — 180	Loop to total each expense catagory for the month.
190	Add each month's salary into years total.
200	Calculate net income for the month.
210	Calculate closing balance for the month.
220	Add net monthly income into years total.
230	Add total monthly expenses into years total.
240	Transfer closing balance each month to opening balance next month except December.
260 — 310	Loop to total each expense category for the year.
270	Reset each expense category year total to zero.
280 — 300	Loop to add each expense category across to find total for year.
320 — 330	Transfer January opening balance and December closing balance to total column.
350 — 370	**RULE A LINE FOR DISPLAY**
400 — 480	**VERIFY DATA ROUTINE**
420	Accepts NEWLINE for zero.
430 — 470	Ensures input is an integer between 0 and 999.
1000 — 1070	**SAVE DATA SECTION**
1080 — 1210	**DISPLAY DATA SECTION**
1100	Print three month's headings.
1110	Call 'Rule a line' routine.
1120 — 1190	Loop to print each category name held in C$ array and all data held in A array.
1140 — 1170	Measures the length of each element of the data array, as if it were a string, and tabulates the printing so that the numbers are justified from the right.
1180	Call 'Rule a line' routine.
1200	Commands available.
1220 — 1260	**SELECT COMMAND CHOSEN**
1270 — 1330	**CHANGE VIEW OF DISPLAY**
1290 — 1300	Verify input as a month number.
1320	Adjust, if required, to avoid display crash. (If M was set to 11 or 12, the program would attempt to print months 13 and 14 at lines 1100, 1150 and 1160).
1330	Pass control to display section.
1340 — 1590	**CHANGE/ENTER DATA**
1350 — 1360	Prompt for a starting month number.
1370 — 1400	Verify input as a month number, or zero.
1380	If input is zero, returns control to display section, after totalling all data.
1410	Prompt for an end month number.
1420 — 1450	Verify input as a month number.
1460 — 1470	Prompt for a category number.
1480 — 1500	Verify input as a category number, or zero.
1485	If input is zero, returns control to start month prompt.
1490	Prevent access to totals and balances except for January opening balance.
1510	Prompt for new amount.
1520	Verify input.
1530 — 1550	Loop to enter new amount into the category specified, for the month(s) specified.
1560	Pass control back to category number prompt.
1570	Call 'Totalling' routine.
1580	Adjust to avoid display crash.
1590	Pass control to display section.
1800 — 2200	**INITIALLISATION**
1810	Prompt for number of categories.
1820 — 1830	Verify input.
1850	Set E as number of expense categories.
1860 — 1900	Set pointers for position in data array of totals and balances.
1910 — 1930	Dimension arrays.
1940 — 1960	Loop to prompt and accept input for category names.
1970 — 1990	Category numbers automatically entered into C$ array.
2010 — 2070	Total and other headings set into C$ array.
2080 — 2140	Set month names into M$ array.
2160 — 2190	Save program list with arrays.
2200	Pass control to display section.

Note: All statements to PRINT AT line 20 to 21, should contain 32 characters, so spaces should be added where necessary to ensure the screen prompts overwrite one another. The exception is statement number 1410 which needs 19 spaces after the "?".

prompts to enter the category names, you will have six spaces each and some suggestions for these are shown with the variables list. When the final name is entered, you will be invited to SAVE the listing and afterwards the option to view the data is given. If you wish, this is a good point to STOP the program and delete the now superfluous lines (1800 to 2200) used for initialisation — this is purely to save those precious seconds when SAVEing and LOADing and they will not affect the running of the program if left in the listing. (Note: if you do delete these lines, restart the program by GOTO 1060 and *not* by RUN.)

Having got back to the option to see the data, press NEWLINE and after a few seconds you should see a display showing your expense and various other headings on the left, then totals for each catagory for January, February and March, followed by a total column on the right which will display the yearly totals. By entering the command 'V' for view and month number you can change the display to see any set of three consecutive months. The end column will always display the yearly totals. At present all the totals will be set to zero and the next step is to enter your expected spending requirements for the calendar year. Enter command 'C' for change and then follow the screen prompts — some useful hints are:

a) Deal first with those catagories which have a fixed monthly figure — eg if you have standing orders of £100 to pay from March to December, then when prompted, enter month number 3 to start and month 12 to end. The category number and amount then completes the entry for the entire ten months.

b) One-off expected bills are best entered a month at a time — eg for February enter month 2 to start and month 2 to end. Then you can enter or amend as many category totals as you wish for that month.

c) The first time you use the command 'C', you will need to enter your opening cash or bank balance for January — this is the only total balance that the program will allow you to directly access, all the others are calculated by the program.

d) The program will accept NEWLINE for zero entries.

The display totals will remain at zero during this operation but once completed, and the display requested, the totalling routine at line 40 is called and the current display is cleared and reinstated, showing all the new totals.

As you progress through the year, each months budgetted figures can be adjusted to reflect your actual spending, and the estimated future balances will be re-calculated accordingly. (The SAVE 'S' command should be used at this point so that you can preserve the data for the following months up-dates).

If your expenses exceed your salary for any given month, your net income will be shown as a minus figure — as will your actual balances if you 'go into the red'. When you approach the end of the calendar year, simply set up another file using the basic program listing first SAVEd, and enter the projected closing balance for the current year as the opening balance for your new year predictions. The program will run on the ZX80 (8K ROM) without conversion, as it is best run in FAST mode to avoid long delays during totalling and printing the full data. However, if you own a ZX81 and prefer a steady screen during input, run the program in SLOW mode with the following changes.

```
1570 FAST
1575 GOSUB 110
1195 SLOW
1935 SLOW
2185 FAST
```

HINTS ON CONVERSION

Sinclair string handling is excellent, but differs from some others in declaration and slicing.
e.g. DIM M$(100) will reserve 1 string, a 100 spaces long.
DIM M$(12,3) will reserve 12 strings each 3 spaces long.
So read lines 1910 to 1930 and adjust your statements accordingly. If your machine has RIGHT$, LEFT$ & MID$ here are some examples of other changes needed:

```
2120        LET M$(K) = MID$(D$,J,3)
2020        LET LEFT$ (C$,S,2) = STR$ S
```

If you have READ/DATA facilities you could change:

```
2090        DATA JAN,FEB,etc
2120        READ M$(K)
```

and lines 2100 & 2130 could then be deleted.

The display is designed to fit 32 columns of 22 lines. Extra months can be displayed, if you have a wider screen, by adding extra TAB statements where appropriate:

```
1100        ......TAB: M$(M + 3) etc
1162        PRINT TAB 31; .....(M + 3) etc
```

Increase TAB figures by 6 each time and don't forget to adjust lines 1320 to 1580.
Less than 22 lines means you will have to make economies on your expense categories and an adjustment to line 1830.
The codes used in line 440 are not standard ASCII. They test that the characters in the string V$ fall between 0 and 9, so replace these with codes appropriate to your machine.

E	= Number of Expense categories.
T	= Array marker for expense Totals.
S	= Array marker for salaries.
N	= Array marker for net income.
B	= Array marker for opening balance.
C	= Array marker for closing balance.
J	= Loop counter to mark data array.
K	= Loop counter to mark data array for calendar months.
M	= Array marker for month to be printed or changed.
ME	= Array marker for end month to be changed.
V$, V	= Temporary store for inputted values whilst verifying.
D$	= Temporary store for month names.
A(13,C)	= Main array to store all data.
C$(C,9)	= String array to hold category names.
M$(12,3)	= String array to hold month names.

CASH FLOW

PROGRAM LISTING

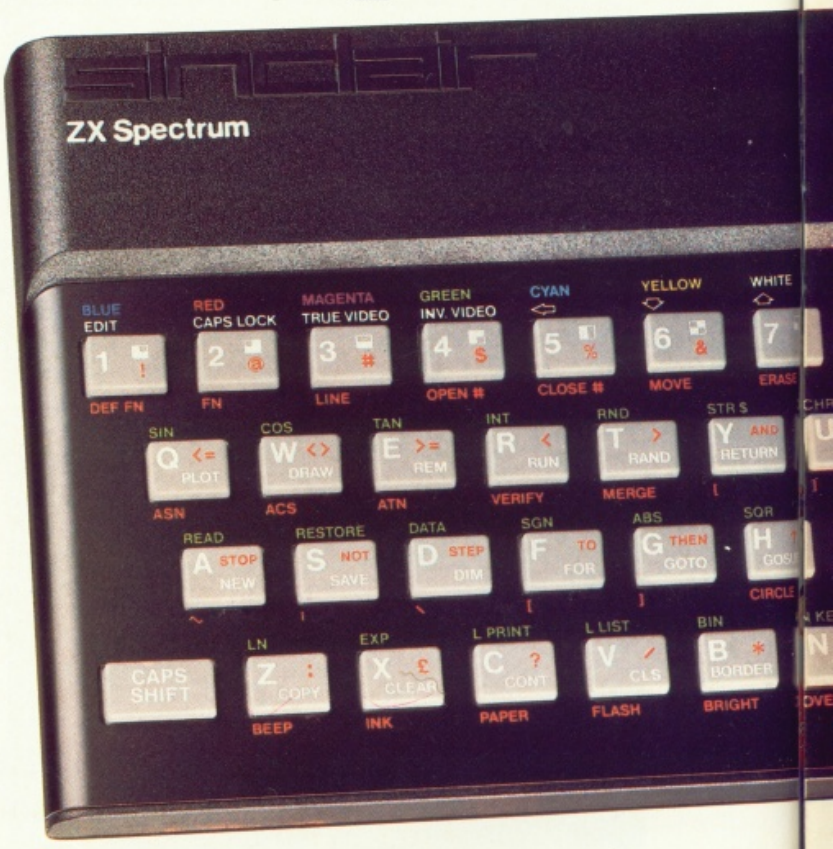
```
    1 REM RON CAVERS  AUGUST 1982
    2 REM ZX81  16K RAM
    3 REM LIST 3.9K BYTES
    4 REM VARS 1.4K BYTES (MAX)
    5 REM ************************
    6 REM
    7 REM START PROG. BY RUN 1810
    8 REM
    9 REM ************************
   98 REM ************************
   99 REM
  100 REM TOTALLING ROUTINE
  101 REM
  102 REM ************************
  110 LET A(13,T)=0
  120 LET A(13,S)=0
  130 LET A(13,N)=0
  140 FOR K=1 TO 12
  150 LET A(K,T)=0
  160 FOR J=1 TO E
  170 LET A(K,T)=A(K,T)+A(K,J)
  180 NEXT J
  190 LET A(13,S)=A(13,S)+A(K,S)
  200 LET A(K,N)=A(K,S)-A(K,T)
  210 LET A(K,C)=A(K,B)+A(K,N)
  220 LET A(13,N)=A(13,N)+A(K,N)
  230 LET A(13,T)=A(13,T)+A(K,T)
  240 IF K<12 THEN LET A(K+1,B)=A
(K,C)
  250 NEXT K
  260 FOR J=1 TO E
  270 LET A(13,J)=0
  280 FOR K=1 TO 12
  290 LET A(13,J)=A(13,J)+A(K,J)
  300 NEXT K
  310 NEXT J
  320 LET A(13,C)=A(12,C)
  330 LET A(13,B)=A(1,B)
  340 RETURN
  348 REM ************************
  349 REM
  350 REM RULE A LINE FOR DISPLAY
  351 REM
  352 REM ************************
  360 PRINT "-------------$------$
------$------"
  370 RETURN
  398 REM ************************
  399 REM
  400 REM VERIFY DATA
  401 REM
  402 REM ************************
  410 INPUT V$
  420 IF V$="" THEN LET V$="0"
  430 FOR V=1 TO LEN V$
  440 IF CODE V$(V)>37 OR CODE V$
(V)<25 THEN GOTO 410
  450 NEXT V
  460 LET V=VAL V$
  470 IF V>999 THEN GOTO 410
  480 RETURN
  998 REM ************************
  999 REM
 1000 REM SAVE DATA
 1001 REM
 1002 REM ************************
 1010 CLS
 1020 PRINT "TO SAVE DATA, START
TAPE AND"
 1030 PRINT "THEN PRESS NEWLINE."
 1040 INPUT D$
 1050 SAVE "CASH FLOW"
 1060 PRINT AT 5,0;"NOW PRESS NEW
LINE TO SEE DATA."
 1070 INPUT D$
 1078 REM ************************
 1079 REM
 1080 REM DISPLAY DATA
 1081 REM
 1082 REM ************************
 1090 CLS
 1100 PRINT TAB 10;M$(M);" ";TAB
16;M$(M+1);" ";TAB 22;M$(M+2);"
 TOTAL"
 1110 GOSUB 360
 1120 FOR J=1 TO C
 1130 PRINT C$(J);
 1140 PRINT TAB 13-LEN STR$ A(M,J
);A(M,J);" ";
 1150 PRINT TAB 19-LEN STR$ A(M+1
,J);A(M+1,J);" ";
 1160 PRINT TAB 25-LEN STR$ A(M+2
,J);A(M+2,J);" "
 1170 PRINT TAB 32-LEN STR$ A(13,
J);A(13,J)
 1180 IF J=E OR J=S OR J=N THEN G
OSUB 360
 1190 NEXT J
 1200 PRINT AT 21,0;"ENTER (S)AVE
 (V)IEW OR (C)HANGE"
 1210 INPUT D$
 1218 REM ************************
 1219 REM
 1220 REM SELECT COMMAND OPTION
 1221 REM
 1222 REM ************************
 1230 IF D$="S" THEN GOTO 1010
 1240 IF D$="V" THEN GOTO 1280
 1250 IF D$="C" THEN GOTO 1350
 1260 GOTO 1210
 1268 REM ************************
 1269 REM
 1270 REM CHANGE VIEW OF DISPLAY
 1271 REM
 1272 REM ************************
 1280 PRINT AT 21,0;"WHICH MONTH
FOR VIEWING? (1-12)  "
 1290 GOSUB 410
 1300 IF V<1 OR V>12 THEN GOTO 12
90
 1310 LET M=V
 1320 IF M>10 THEN LET M=10
 1330 GOTO 1090
 1338 REM ************************
 1339 REM
 1340 REM CHANGE/ENTER DATA
 1341 REM
 1342 REM ************************
 1350 PRINT AT 20,0;"AT WHICH MON
TH NO.(1-12), IS THE"
 1360 PRINT AT 21,0;"CHANGE TO ST
ART? (0 FOR DISPLAY)"
 1370 GOSUB 410
 1380 IF V=0 THEN GOTO 1570
 1390 IF V>12 THEN GOTO 1370
 1400 LET M=V
 1410 PRINT AT 21,10;"END?

 1420 GOSUB 410
 1430 IF V<1 OR V>12 THEN GOTO 14
20
 1440 IF V<M THEN GOTO 1420
 1450 LET ME=V
 1460 PRINT AT 20,0; WHICH CATEGO
RY NO. IS AFFECTED? "
 1470 PRINT AT 21,0;"(0 TO CHANGE
 MONTH)  "
 1480 GOSUB 410
 1485 IF V=0 THEN GOTO 1350
 1490 IF V>8 OR V=7 OR V=N OR V=8
 AND M<>1 OR V=8 AND ME<>1 THEN
GOTO 1460
 1500 LET J=V
 1505 PRINT AT 20,0;"
                    "
 1510 PRINT AT 21,0;"WHAT IS NEW
AMOUNT OF ";C$(J,4 TO );"?   "
 1520 GOSUB 410
 1530 FOR K=M TO ME
 1540 LET A(K,J)=V
 1550 NEXT K
 1560 GOTO 1460
 1570 GOSUB 110
 1580 IF M>10 THEN LET M=10
 1590 GOTO 1090
 1798 REM ************************
 1799 REM
 1800 REM INITIALISATION
 1801 REM
 1802 REM ************************
 1810 PRINT "HOW MANY EXPENSE CAT
EGORIES?","(MAX 11, MIN 8.)"
 1820 GOSUB 410
 1830 IF V<8 OR V>11 THEN GOTO 18
20
 1840 CLS
 1850 LET E=V
 1860 LET T=E+1
 1870 LET S=E+2
 1880 LET N=E+3
 1890 LET B=E+4
 1900 LET C=E+5
 1905 LET M=1
 1910 DIM A(13,C)
 1920 DIM C$(C,9)
 1930 DIM M$(12,3)
 1940 FOR J=1 TO E
 1950 PRINT AT 0,0;"ENTER EXPENSE
 CATEGORY NAME","NUMBER ";J
 1960 INPUT C$(J,4 TO )
 1970 LET C$(J,3)="."
 1980 IF J<10 THEN LET C$(J,2)=ST
R$ J
 1990 IF J>=10 THEN LET C$(J, TO
2)=STR$ J
 2000 NEXT J
 2010 LET C$(T)="   TOTALS"
 2020 LET C$(S, TO 2)=STR$ S
 2030 LET C$(S,3 TO )=".SALARY"
 2040 LET C$(N)="NET INCOM"
 2050 LET C$(B, TO 2)=STR$ B
 2060 LET C$(B,3 TO )=".OP/BAL"
 2070 LET C$(C)="   CL/BAL"
 2080 REM SET UP CALENDAR ARRAY
 2090 LET D$="JANFEBMARAPRMAYJUNJ
ULAUGSEPOCTNOVDEC"
 2100 LET J=1
 2110 FOR K=1 TO 12
 2120 LET M$(K)=D$(J TO J+2)
 2130 LET J=J+3
 2140 NEXT K
 2150 CLS
 2160 PRINT "TO SAVE LISTING, STA
RT TAPE AND","THEN PRESS NEWLINE

 2170 INPUT D$
 2180 CLS
 2190 SAVE "CASH FLOW LIS"
 2200 GOTO 1060
```

sinclair
ZX Spectrum
BLUE EDIT
RED CAPS LOCK
MAGENTA TRUE VIDEO
GREEN INV. VIDEO
CYAN
YELLOW
WHITE
GRAPHICS
BLACK DELETE
1 ! DEF FN
2 @ FN
3 # LINE
4 $ OPEN #
5 % CLOSE #
6 & MOVE
7 ' ERASE
8 (POINT
9) CAT
0 _ FORMAT
SIN Q ⇐ PLOT ASN
COS W <> DRAW ACS
TAN E >= REM ATN
INT R < RUN VERIFY
RND T > RAND MERGE
STR$ Y AND RETURN
CHR$ U OR IF]
CODE I AT INPUT IN
PEEK O ; POKE OUT
TAB P " PRINT ©
READ A STOP NEW ~
RESTORE S NOT SAVE |
DATA D STEP DIM \
SGN F TO FOR {
ABS G THEN GOTO }
SQR H ↑ GOSUB CIRCLE
VAL J − LOAD VAL $
LEN K + LIST SCREEN $
USR L = LET ATTR
ENTER
CAPS SHIFT
LN Z : COPY BEEP
EXP X £ CLEAR INK
LPRINT C ? CONT PAPER
LLIST V / CLS FLASH
BIN B * BORDER BRIGHT
IN KEY$ N , NEXT OVER
PI M . PAUSE INVERSE
SYMBOL SHIFT
BREAK SPACE

Sinclair ZX Spectru

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

From only £125!



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

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

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

Professional power– personal computer price!

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

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

You have the facility to support separate data files.

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

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

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

Ready to use today, easy to expand tomorrow

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

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

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

Key features of the Sinclair ZX Spectrum

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

rum

The ZX Printer – available now

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

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

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

The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

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

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.

How to order your ZX Spectrum

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

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

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

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
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*Please delete/complete as applicable

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ZX Spectrum software on cassettes – available now

The Spectrum software library is growing every day. Subjects include games, education, and business/household management. Flight Simulation...Chess...Planetoids...History...Inventions...VU-CALC...VU-3D...Club Record Controller...there is something for everyone. And they all make full use of the Spectrum's colour, sound, and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, and the module will be available in the early part of 1983 for around £30.

sinclair

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

Sinclair ZX Spectrum–technical data.

Dimensions

Width	233 mm
Depth	144 mm
Height	30 mm

CPU/ memory

Z80A microprocessor running at 3.5 MHz. 16K-byte ROM containing BASIC interpreter and operating system.

16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Keyboard

40-moving-key keyboard with full upper and lower case with capitals lock feature. All BASIC words obtained by single keys, plus 16 graphics characters, 22 colour control codes, and 21 user-definable graphics characters. All keys have auto repeat.

Display

Memory-mapped display of 256 pixels x 192 pixels; plus one attributes byte per character square, defining one of eight foreground colours, one of eight background colours, normal or extra brightness and flashing or steady. Screen border colour also settable to one of eight colours. Will drive a PAL UHF colour TV set, or black and white set (which will give a scale of grey), on channel 36.

Sound

Internal loudspeaker can be operated over more than 10 octaves (actually 130 semitones) via basic BEEP command. Jack sockets at the rear of computer allow connections to external amplifier/ speaker.

Graphics

Point, line, circle and arc drawing commands in high-resolution graphics.

16 pre-defined graphics characters plus 21 user-definable graphics characters. Also functions to yield character at a given position, attribute at a given position (colours, brightness and flash) and whether a given pixel is set. Text may be written on the screen on 24 lines of 32 characters. Text and graphics may be freely mixed.

Colours

Foreground and background colours, brightness and flashing are set by BASIC INK, PAPER, BRIGHT and FLASH commands. OVER may also be set, which performs an exclusive–or operation to overwrite any printing or plotting that is already on the screen. INVERSE will give inverse video printing. These six commands may be set globally to cover all further PRINT, PLOT, DRAW or CIRCLE commands, or locally within these commands to cover only the results of that command. They may also be set locally to cover text printed by an INPUT statement. Colour-control codes, which may be accessed from the keyboard, may be inserted into text or program listing, and when displayed will override the globally set colours until another control code is encountered. Brightness and flashing codes may be inserted into program or text, similarly. Colour-control codes in a program listing have no effect on its execution. Border colour is set by a BORDER command. The eight colours available are black, blue, red, magenta, green, cyan, yellow and white. All eight colours may be present on the screen at once, with some areas flashing and others steady, and any area may be highlighted extra bright.

Screen

The screen is divided into two sections. The top section – normally the first 22 lines – displays the program listing or the results of program or command execution. The bottom section – normally the last 2 lines – shows the command or program line currently being entered, or the program line currently being edited. It also shows the report messages. Full editing facilities of cursor left, cursor right, insert and delete (with auto-repeat facility) are available over this line. The bottom section will expand to accept a current line of up to 22 lines.

Mathematical operations and functions

Arithmetic operations of +, –, ×, ÷, and raise to a power. Mathematical functions of sine, cosine, tangent and their inverses; natural logs and exponentials; sign function, absolute value function, and integer function; square root function, random number generator, and pi.

Numbers are stored as five bytes of floating point binary – giving a range of $+3\times10^{-39}$ to $+7\times10^{38}$ accurate to $9\frac{1}{2}$ decimal digits.

Binary numbers may be entered directly with the BIN function. =, >, <, >=, <= and <> may be used to compare string or arithmetic values or variables to yield 0 (false) or 1 (true). Logical operators AND, OR and NOT yield boolean results but will accept 0 (false) and any number (true).

User-definable functions are defined using DEF FN, and called using FN. They may take up to 26 numeric and 26 string arguments, and may yield string or numeric results.

There is a full DATA mechanism, using the commands READ, DATA and RESTORE.

A real-time clock is obtainable.

String operations and functions

Strings can be concatenated with +. String variables or values may be compared with =, >, <, >=, <=, <> to give boolean results. String functions are VAL, VAL$, STR$ and LEN. CHR$ and CODE convert numbers to characters and vice versa, using the ASCII code.

A very powerful string slicing mechanism exists, using the form a$ (x TO y).

Variable names

Numeric – any string starting with a letter (upper and lower case are not distinguished between, and spaces are ignored).
String – A$ to Z$.
FOR-NEXT loops – A-Z.
Numeric arrays – A-Z.
String arrays – A$ to Z$.

Simple variables and arrays with the same name are allowed and distinguished between.

Arrays

Arrays may be multi-dimensional, with subscripts starting at 1. String arrays, technically character arrays, may have their last subscript omitted, yielding a string.

Expression evaluator

A full expression evaluator is called during program execution whenever an expression, constant or variable is encountered. This allows the use of expressions as arguments to GOTO, GOSUB, etc.

It also operates on commands allowing the ZX Spectrum to operate as a calculator.

Cassette interface

The ZX Spectrum incorporates an advanced cassette interface. A tone leader is recorded before the information to overcome the automatic recording level fluctuations of some tape recorders, and a Schmitt trigger is used to remove noise on playback.

All saved information is started with a header containing information as to its type, title, length and address information. Program, screens, blocks of memory, string and character arrays may all be saved separately.

Programs, blocks of memory and arrays may be verified after saving to confirm successful saving.

Programs and arrays may be merged from tape to combine them with the existing contents of memory. Where two line numbers or variables names coincide, the old one is overwritten.

Programs may be saved with a line number, where execution will start immediately on loading.

The cassette interface runs at 1500 baud, through two 3.5 mm jack plugs.

Expansion port

This has the full data, address and control busses from the Z80A, and is used to interface to the ZX Printer, the RS232 and NET interfaces and the ZX Microdrives.

IN and OUT commands give the I/O port equivalents of PEEK and POKE.

ZX81 compatibility

ZX81 BASIC is essentially a subset of ZX Spectrum BASIC. The differences are as follows.

FAST and SLOW: the ZX Spectrum operates at the speed of the ZX81 in FAST mode with the steady display of SLOW mode, and does not include these commands.

SCROLL: the ZX Spectrum scrolls automatically, asking the operator "scroll?" every time a screen is filled.

UNPLOT: the ZX Spectrum can unplot a pixel using PLOT OVER, and thus achieves unplot.

Character set: the ZX Spectrum uses the ASCII character set, as opposed to the ZX81 non-standard set.

ZX81 programs may be typed into the ZX Spectrum with very little change, but may of course now be considerably improved. The ZX Spectrum is fully compatible with the ZX Printer, which can now print out a full upper and lower case character set, and the high resolution graphics; using LLIST, LPRINT and COPY. ZX81 software cassettes and the ZX 16K RAM pack will not operate with the ZX Spectrum.

sinclair

ZX Spectrum

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

Software from PCT

ADVENTURE GAMES

THE WHITE BARROWS Program approximately 8K
Somewhre amid this maze of burial chambers lurks an Evil Sorcerer whom you need to trap. Trouble is he's protected by Trolls, Dwarves, Serpents and the occasional Dragon or two! Your magic staff will block the tunnel to prevent him escaping . . . unless, that is, he outwits you.
A real brain-twister, White Barrows requires both brains and brawn from its players. It's no good just hacking your way through the Barrows and hoping to fall over the Sorcerer. Eventually you'll meet a Dragon and they don't hack easily!

CONQUERING EVEREST Program approximately 11K
So you think climbing mountains is all about scrambling over rocks? This superb piece of programming will soon change all that.
You are in charge of an expedition comprising 18 climbers, 34 Sherpas, and 40 Porters. There is food, tents and equipment for all, including the oxygen you'll need as you near the summit. Trouble is, it all starts at the BOTTOM of the mountain and you'll have to get it all to the TOP! Each upward route must be forced and any camp you make must be properly supplied, otherwise the expedition members will retreat down the mountain.
The monsters in this game are avalanches, starvation, storms and, worst of all, bad planning! A real thinking man's adventure, Everest will test your skill and forward planning to the limit.
PRICE: £11.45 all inclusive.

KILLING MONSTERS AND MAKING MONEY ISN'T EASY!

CELLS AND SERPENTS Approximately 11K
More monsters than you ever thought could fit behind your keyboard. Wander the halls in search of gold and glory but be very, very careful where you tread! There are things here which make your wildest nightmares look like Julie Andrews! Fancy meeting a Mind Plyer for example? Or shaking hands with Asmodeus maybe? Treasure is here to be found . . . the HARD way.

STOCKMARKET Approximately 11K
There are other ways of making money than bashing Trolls on the head. Try this one for a change. Contend with a fluctuating economy, tax investigations, bullish opponnents, impatient bank managers and consortium takeovers as you try to make your first million.
It is decidedly difficult and definitely compulsive. A must for all those aspiring financial wizards, both young and old. Easy to play but harder to beat than a Dragon. Up to six players can join in too.
PRICE: £11.45 all inclusive.

MOVING THE HARD WAY

LADDERS AND WALKWAYS VIC-20 6.5K
Beat the monsters on your journey up through several walled levels in a frantic but fun game based on the original arcade game. Move your man quickly or the monsters will trap and kill him.
MELODY MAKER VIC-20
Turn your VIC into a musical synthesiser with our easy to use program. With it you can build up your own tunes to suit your personal taste in music.

PRICE: £8.50

PETE THE PLASTERED POSTMAN BBC Model A & B
Guide your drunken postman as he totters on his way delivering parcels and avoid the vicious dog which is out attack him at ankle level.
ASTEROID LANDER BBC Model A & B
Your task in this space game is to fly your ship through an asteroid storm and land the craft safely on an outer galaxy planet's surface. Tackle the space lanes with the help of your BBC A or B computer.
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Pete/Asteroid**	£8.50 ☐	Sharp MZ80A	☐
		TRS-80	☐
		Spectrum	☐
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* VIC20 only
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TECHNICAL ENQUIRIES

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

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

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

Dear PCT
I own a TRS-80 Model 1, Level II and I am an absolute beginner with computers. I have tried to program it to pick words beginning with a chosen letter out of a list of 20 words. I tried the following program:

```
5    CLS
10   DIM A$(20)
20   INPUT B$
30   FOR X = 1 TO 20
40   READ A(X)
50   IF LEFT$(A$(X),1) = B$ PRINT A$(X)
60   NEXT X
70   GOTO 20
500  DATA (A LIST OF 20 WORDS)
```

On initial input it works perfectly, but on next INPUT I get an OUT OF DATA ERROR. I have tried increasing the DATA list and moving the INPUT command but nothing works. Could you help me with the following:

a) Why am I getting the error?
b) How can I make it work?

M. Thomas
Gwynedd

There are two solutions to your problem and you are half-way between the two with the program you have written. To start with, the reason you are getting the OUT OF DATA ERROR is that after one run through the program you are not resetting the data pointer. This is a pointer created by the computer to tell it where the next piece of DATA is to be read from. When you cycle through your program for the second time, the computer, having already READ the 20 words cannot find anymore DATA to READ. This can be remedied by adding the following line:

```
65 RESTORE
```

This command will set the DATA pointer back to the first item of DATA, enabling you to READ the 20 words again.

A slightly more elegant way of solving the problem would be to READ the words into an array as you have done and then look through the array each time as opposed to reading the DATA again. The following program illustrates this:

```
5   CLS
10  DIMA$(20)
20  FOR X=1 TO 20
30  READ A$(X)
40  NEXT X
50  INPUT B$
60  FOR X=1 TO 20
70  IF LEFT$(A$(X),1)=B$ THEN PRINT A$(X)
80  NEXT X
90  GOTO 50
100 DATA (A LIST OF 20 WORDS)
```

PRIORITY REPLY

March 1983 Issue

Personal Computing Today Reader Enquiry Service

Name .....

Address .....

.....

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.....

Dear PCT
As a newcomer to the mysteries of computer programming I would be most grateful if you could suggest what alteration I should make to the enclosed program in order to run it on the unexpanded VIC 20.

This is a very short program called Character Presentation. In it, each of the component letters of the words contained in A$ should be printed out in their correct order from left to right, at the speed preset in line 40. The additional lines 55,70,80,90 do the same for words instead of sentences.

Looking at the program, with my scant knowledge of BASIC, it would appear to be straightforward and logical as written, but when I attempt to RUN it I keep getting the infuriating 'Bad Subscript error in 30' message on the screen.

Referring to this error message in my machine manual I am informed that the program was trying to reference an element of an array that was outside the limit specified in the DIM statement.

As there is no DIM statement in the program, and even if I add, say DIM A$(30) for instance, it does not appear to make any difference.

The significance of 'IF A$(A) = CHR$(0)' in line 55 also escapes me, as there appears to be no value given for CHR$(0) in the CHR$ code listing in the manual.

I know the solution will be a simple one when you explain it, but the annoying thing about it is that with my limited knowledge of BASIC, I don't seem able to work it out for myself.

```
10   INPUT A$
20   FOR A = 1 TO LEN(A$)
30   PRINT A$(A);
40   FOR B = 1 TO 20
50   NEXT B
60   NEXT A

55   IF A$(A) = CHR$(0) THEN GOTO 80
70   STOP
80   IF INKEY$ = "C" THEN GOTO 60
90   GOTO 80
```

G. Beattie
Maidenhead

The problem that you have here is one commonly encountered by people converting between dialects of BASIC. Although line 30 is perfectly feasible in many BASICs it does in fact mean something totally different to what you had assumed. In this context, line 30 is performing the same function as the MID$ command does in other BASICs.

This line takes one letter from the string A$, at position 'A' and will PRINT it on the screen. So, to make the program work on your VIC 20, you must change line 30 to read:

```
30   PRINT MID$(A$,A,1);
```

This will move along the string A$ one character at a time and PRINT out the appropriate character. Line 80 should be changed to:

```
80   GET A$: IF A$ = "C" THEN 60
```

And line 55 should be changed to:

```
55   IF MID$(A$,A,1) = " " THEN GOTO 80
```

This will now look for a space in your input string and if it finds one it will give you the option of pressing 'C' to continue.

Dear PCT
I have recently taken delivery of my 16K Spectrum and having now recovered from the shock I have set about exploring its graphics capabilities. My problem lies in the area READ and DATA. I understand the use of USR + BIN numbers to produce certain graphics and that incorporating BIN numbers into a DATA list would make them rather long, although this can be done as shown in the Sinclair manual.

In some programs I have seen DATA lists consisting of a series of numbers from one to three digits long are used to produce graphics. One example from Richard Altwasser's 'Cambridge Collection' book showed the following line:

```
3000 DATA 0,0,0,0,0,224,224,224: FOR Q = USR"A"
TO USR"A" + 7: READ A: POKEQ,A: NEXT Q:
RETURN
```

This line produced a square at the centre of a maze. There are numerous other examples in Altwasser's book and some in the Sinclair manual (for which no explanation is offered !!!). The fact that they are in groups of eight leads me to assume that they relate to BIN numbers in some way. But how I don't know?
D. Slinn
Bristol

All these numbers are the decimal equivalent of the binary numbers that you see in the Bin statement. For a more in-depth analysis of how the user-defined characters work on the Spectrum you should read the article on them in the October 1982 issue of *Personal Computing Today*.

Meanwhile here is a brief explanation of those numbers. All the characters on the Spectrum are made up of eight rows of eight dots. Each of these rows can be represented by the pattern of one's and zero's in the Bin statement. If you think of the one as representing a dot in the character and the zero as representing a space you should be able to see the correlation between the BIN statement and the character.

To convert the BIN statement into a single decimal number is easy. Starting from the left of the BIN statement label each position from 0 to 7. If there is one in the BIN number then write its value down as two raised to the power of its position number. If you then add these numbers together you will have the decimal equivalent of the binary number.

WHOOPS!!

It seems that the office gremlins had a field day in our January issue. Working under cover of night they attacked our Pete the Plastered Postman listing and made off with a number of lines and symbols from the page. However we launched a counter-attack and recovered the missing lines which are as follows:

```
150  K = 30 *2↑I
160  F = 3 *4↑I *4↑J
170  IF J = 2 THEN F = 15 *4↑I
240  VDU 23,236,136,112,80,0,0;0;

510  IN% = ASC(INKEY$(0))
530  IF DIR% > 6THEN DIR% = DIR% – 7 ELSE IF
     DIR% < 0 THEN DIR% = DIR% + 7
```

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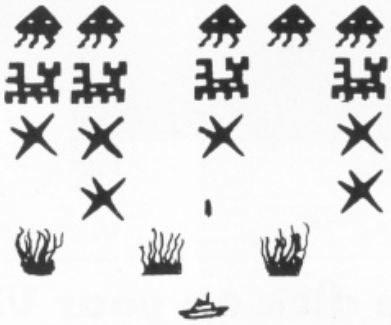

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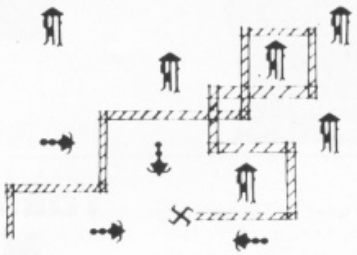

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YHATZI

Toss the dice on your VIC using Mychajlo Dubil's program.

Based on a popular dice game Yhatzi is very easy to learn. The basics of the game lie in achieving certain combinations with 5 dice.

These combinations are:-

A- 2 Pairs: Two Pairs and an odd die in any order eg. 4 5 6 6 4.

B- 1 Prile: 3 dice with the same number and two odd dice in any order g. 34336.

C- 1 4-fold: 4 dice with the same number and one odd die in any order eg 66646.

D- 1 Poker: A Prile and a Pair in any order eg. 33434.

E- 1 5-fold: All dice with the same number eg. 66666.

F- 1 yhatzi: A run in numbers from 1to5 or 2to6 in any order eg. 35642.

This program was written for the VIC-20 with a minimum of 6K of memory. Between 2 and 8 players may play and the game is fun for young and old alike.

Each player has a maximum number of 3 throws. At the end of each throw the player may hold any number dice to achieve a combination, but once held that die will be held for the duration of that turn. When a player has achieved a combination which he wants he types S to score that combination. The computer will then ask which combination the player wishes to score, to which the player replies by typing a letter A-F corresponding to the combination. The computer will then check the die and score accordingly. It is now the turn of the next player. The game ends when a player has scored all the combinations.

HOW IT RUNS

Lines 1-7	Set up graphics for dice (a number enclosed in a box).
Lines 8-17	Ask how many Players and their names and set variables and flags to 0.
Lines 18-24	Main display with title and dice.
Lines 27-34	Sub-routine to display Player G's scoreboard.
Lines 35-40	Hit <T> key routine to throw dice.
Lines 57-67	Choose random numbers between 1 and 6 for dice.
Lines 42-43	Display dice.
Lines 43-56	Input hold numbers and set hold flags.
Lines 68-72	'How would you like to score' routine.
Lines 73-83	Check for 2 Pairs.
Lines 84-94	Check for Prile.
Lines 95-105	Check for 4-fold.
Lines 106-120	Check for a Poker.
Lines 121-125	Check for 5-fold.
Lines 126-142	Check for a yhatzi.
Lines 143-149	Update scoreboard and display new scores.
Lines 150-154	Display winner.

■ = CLEAR SCREEN
■ = CURSOR HOME
■ = CURSOR UP
■ = CURSOR DOWN
■ = CURSOR RIGHT
■ = CURSOR LEFT
■ = PRINT IN BLACK
■ = PRINT IN RED
■ = PRINT IN PURPLE
■ = PRINT IN GREEN
■ = PRINT IN BLUE
■ = PRINT IN YELLOW
■ = REVERSE ON
■ = REVERSE OFF

POKE 36879,25 CHANGES SCREEN TO ALL WHITE

ready.

D$/1),,D$(6) – The dice
P = Number of Players G = Number of Player whose turn it is.
TS(G) = Total score of Player G.
S1(G),,S6(G) = Combination score for player G.

Q$ = Input from keyboard. T = Number of throws.
R1,,R5 = Flags for dice being held. H$ = Hold numbers.
D(1),,D(5) = Random number for dice.
AA(G),,FF(G) = Flags for combinations.
I,U,K,L,M,N = Used in loops and to read data.

HINTS ON CONVERSION

Conversion should not be difficult. The only poke in the listing is to change the colour of the VIC screen and can be ommitted.

The cursor control and colour symbols used between quotes can be changed to suit your computer using the table below.

PROGRAM LISTING

```
READY.

 1 DIMD$(6)
 2 D$(1)="
 3 D$(2)="
 4 D$(3)="
 5 D$(4)="
 6 D$(5)="
 7 D$(6)="
 8 INPUT"
 9 IFP>0ORP<2THEN8
10 IFINT(P)<>PTHEN8
11 FORG=1TOP
12 PRINT"PLAYER"G" NAME":INPUTN$(G)
13 TS(G)=0:S1(G)=0:S2(G)=0:S3(G)=0:S4(G)=0:S5(G)=0:S6(G)=0
14 AA(G)=0:BB(G)=0:CC(G)=0:DD(G)=0:EE(G)=0:FF(G)=0
15 NEXTG
16 G=0
17 G=G+1:IFG>PTHEN16
18 PRINT"
19 POKE36879,25
20 PRINT"
21 PRINT"
22 PRINT"
23 PRINT"
24 R1=0:R2=0:R3=0:R4=0:R5=0:R6=0:T=0
25 GOSUB27
26 GOTO35
27 PRINT"
28 PRINT"
29 PRINT"
30 PRINT"
31 PRINT"
32 PRINT"
33 PRINT"
34 RETURN
35 IFT>3THEN17
36 PRINT"
37 GETQ$:IFQ$=""THEN37
38 IFQ$<>"T"THEN37
39 PRINT"
40 T=T+1
41 GOSUB57
42 A=D(1):B=D(2):C=D(3):D=D(4):E=D(5)
43 PRINT"
44 PRINT"
45 INPUTH$:PRINT"
46 IFLEFT$(H$,1)="S"THEN68
47 FORI=1TO4
48 Z$=MID$(H$,I,1)
49 Z=VAL(Z$)
50 IFZ=1THENR1=1
51 IFZ=2THENR2=1
52 IFZ=3THENR3=1
53 IFZ=4THENR4=1
54 IFZ=5THENR5=1
55 NEXTI
56 GOTO35
57 IFR1=1THEN59
58 D(1)=INT(RND(1)*6)+1
59 IFR2=1THEN61
60 D(2)=INT(RND(1)*6)+1
61 IFR3=1THEN63
62 D(3)=INT(RND(1)*6)+1
63 IFR4=1THEN65
64 D(4)=INT(RND(1)*6)+1
65 IFR5=1THEN67
66 D(5)=INT(RND(1)*6)+1
67 RETURN
68 PRINT"
69 GETSC$:IFSC$=""THEN69
70 QQ=ASC(SC$)-64
71 IFQQ>6ORQQ<1THEN68
72 ONQQGOTO73,84,95,106,121,126
73 CK=0:IFFAA(G)=1THEN81
74 FORU=1TO10
75 READK:READL
76 IFD(K)=D(L)THENCK=CK+1
77 NEXTU
78 RESTORE
79 DATA1,2,1,3,1,4,1,5,2,3,2,4,2,5,3,4,3,5,4,5
80 IFCK=2THEN82
81 GOTO144
82 S1(G)=(A+B+C+D+E)*10
83 AA(G)=1:GOTO143
84 CK=0:IFBB(G)=1THEN92
85 FORU=1TO10
86 READK:READL:READM
87 IFD(K)=D(M)ANDD(K)=D(L)ANDD(L)=D(M)THENCK=1
88 NEXTU
89 RESTORE
90 DATA1,2,3,1,2,4,1,2,5,1,3,4,1,3,5,1,4,5,2,3,4,2,3,5,2,4,5,3,4,5
91 IFCK=1THEN93
92 GOTO144
93 S2(G)=(A+B+C+D+E)*15
94 BB(G)=1:GOTO143
95 CK=0:IFCC(G)=1THEN103
96 FORU=1TO5
97 READK,L,M,N
98 IFD(K)=D(L)ANDD(K)=D(M)ANDD(K)=D(N)ANDD(L)=I(M)ANDD(L)=D(N)ANDD(M)=D(N)THENCK
=1
99 NEXTU
100 RESTORE
101 DATA1,2,3,1,2,4,1,2,5,1,3,4,1,3,5,1,4,5,2,3,4,2,3,5,2,4,5,3,4,5
102 IFCK=1THEN104
103 GOTO144
104 S3(G)=(A+B+C+D+E)*20
105 CC(G)=1:GOTO143
106 CK=0:IFDD(G)=1THEN118
107 FORU=1TO10
108 READK,L
109 IFD(K)=D(L)THENCK=CK+1
110 NEXTU
111 FORU=1TO 0
112 FEADK,L,M
113 IFD(K)=D(L)ANDD(K)=D(M)ANDD(L)=D(M)THENCK=CK+1
114 RESTORE
115 DATA1,2,1,3,1,4,1,5,2,3,2,4,2,5,3,4,3,5,4,5,1,2,3,1,2,4,1,2,5
116 DATA1,3,4,1,3,5,1,4,4,2,3,4,2,3,5,2,4,5,3,4,5
117 IFCK>3THEN119
118 GOTO144
119 S4(G)=(A+B+C+D+E)*25
120 DD(G)=1:GOTO143
121 CK=0:IFEE(G)=1THEN123
122 IFA=BANDA=CANDA=DANDA=EANDB=CANDB=DANDB=EANDC=DANDC=EANDD=ETHEN124
123 GOTO144
124 S5(G)=(A+B+C+D+E)*30
125 EE(G)=1:GOTO143
126 CK=0:IFFF(G)=1THEN140
127 J(1)=A:J(2)=B:J(3)=C:J(4)=D:J(5)=E
128 FORI=1TO4
129 X=0
130 FORV=1TO4
131 IFJ(V)<=J(V+1)THEN136
132 W=J(V)
133 J(V)=J(V+1)
134 J(V+1)=W
135 X=1
136 NEXTV
137 IFX=0THEN139
138 NEXTI
139 IFJ(5)=J(4)+1ANDJ(4)=J(3)+1ANDJ(3)=J(2)+1ANDJ(2)=J(1)+1THEN141
140 GOTO144
141 S6(G)=(A+B+C+D+E)*50
142 FF(G)=1
143 TS(G)=S1(G)+S2(G)+S3(G)+S4(G)+S5(G)+S6(G)
144 GOSUB27
145 IFAA(G)=1ANDBB(G)=1ANDCC(G)=1ANDDD(G)=1ANDEE(G)=1ANDFF(G)=1THEN150
146 PRINT"
147 GETQQ$:IFQQ$=""THEN147
148 IFQQ$=CHR$(13)THEN17
149 GOTO147
150 PRINT"
151 FORG=1TOP
152 PRINTN$(G)TAB(14)TS(G)
153 NEXTG
154 END

READY.
```

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SOFTWARE REVIEWS

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

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

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

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.

Title: **Timegate**
Type: **Tape**
Supplier: **Quicksilva**
Machine: **Spectrum 48K**
Price: **£6.95**

If there ever was a game to demonstrate the Spectrum's capabilities to the fullest then this is it. From the first laser blast to the last warp through time and space this program reeks quality.

Written in machine code, this program uses every trick in the book to give you a fast moving, graphically stimulating space adventure in 4D!

The game concept places you in control of the last space fighter of the free empire. It is your unenviable task to fight your way back in time to the home planet of the alien oppressors and destroy it, thus freeing the galaxy from their reign of terror. Your journey is not easy, because at every turn you are confronted with hoards of aliens intent on preserving themselves and their ancestors.

Your television screen becomes the screen of your fighter. It not only displays the enemy as they swoop down to annihilate you, but also displays your ship's status along with long range scan and tracking radar. Using these controls you can steer your ship into battle with the enemy even though they are not in visual range.

The status indicators give you information as to the state of repair of your craft. When they start moving into the red it is time to land on a planet to repair and refuel your craft. These landing sequences are very impressive because the Spectrum stores a number of planets in its memory and these are displayed in full high resolution as you come into land. Unfortunately your craft draws on the molten core of the planet to refuel itself, causing the planet to be destroyed on your departure.

Scattered randomly about each time zone are the timegates. On finding one of these you are warped backwards in time, nearer to your destiny with the aliens home planet.

All the action is complemented with continous sound effects, ranging from the reassuring throb of your engines, to the shuddering blasts as an alien's bolt strikes home. To really get the best from these effects you should connect the Spectrum up to the biggest amplifier you can lay your hands on.

You can control your flight through time and space by either a joystick or the keyboard. If you can afford it, I would recommend getting a joystick, as you will find that it is easier to relate the movements on the screen to the movement of the joystick. I found the keyboard controls a little difficult to get on with at first, although Quicksilva do supply a clearly marked keyboard overlay that makes finding the correct key in an emergency a lot simpler.

To complement the program you get some well written sleeve notes and a separate program to train you in the use of the keyboard controls. This program also deals with description and meanings of all the system controls displayed on the screen.

Ratings Table

Program Quality	* * * * *
Value for Money	* * * *
Presentation On-screen	* * * * *
Ease of use	* * * *
Crashproofing	* * * *
Supplied Instructions	* * * *
Overall	86%

C.P.

Title: **Rabbit Writer**
Type: **Tape (also available on disc)**
Supplier: **Rabbit Software**
Machine: **Vic 20 plus 16K**
Price: **£19.99**

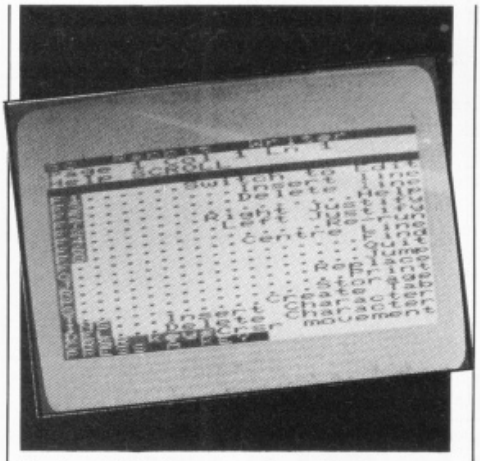
Rabbit Writer is a word processing that will enable you to emulate many of the features available on more expensive programs for your VIC.

Unlike many programs here the cursor stays in one place, while the words you are typing move to the left. This looks odd at first but works well in practice. Although you can only show 22 columns on the screen at any one time, your copy can be up to 80 columns wide. To show the rest of the text, you scroll the copy across the screen. This is a feature used on many more expensive word processing packages.

On setting up Rabbit Writer, you decide on the width of your copy and the page length. At the top of the page is a status line where you are always told the page number, line number and column number.

Rabbit Writer has two basic modes. Edit, where you are changing the copy in some way and Scrolling, which is used to move around the screen to see the rest of the text. All of the function keys on the right hand side of the Vic are used, the top key is used to change modes and the bottom one for the Help facility. This useful feature is available in both the Edit and Scroll modes.

After pressing this bottom key you can soon solve any problem starting with 'What do I do next?'



In fact this feature also eliminates the need for any written instructions, though three pages of written details are supplied.

Although the cursor starts off in the centre of the screen, you can easily move it around by pressing the cursor keys. But when you do, it appears to have the opposite effect. Pressing cursor left makes all the text move to the right, but in fact its the cursor that moves left and the page that moves right.

In the scroll mode you have all the functions needed to manipulate your copy, and to see them you either read the instructions or press the Help key. I just used the Help key as it was easier.

The F1 key changes the mode between Edit and Scroll. F3 gives you the facility to insert a line of copy. While F5 lets you delete it. F7 is the Help key. For justifying F2 gives you right justified and F4 left justified. And for the centre line type F8. If you want to re-run the program F6 gives this facility. For the first occurrence of a set of characters just press F for Find, but don't try to find commas as this doesn't work.

To leave or quit the program just press Q and if you want to replace a set of characters then R gives this option. But the new set must be the same length. So John can be replaced with Mark, but not with Richard. If you want to print out your text and most people do, just press P for print.

When you press this key you will be asked whether you want to merge a letter with a database file created by Rabbit Base. This Mail Merge facility is something that is sometimes extra even with much more expensive programs.

But Rabbit Writer does not have the block move feature of more expensive word processors, neither do you have the facility of word wrap around at the end of each line of copy. These are refinements which you can manage without, considering this package costs under £20 on tape.

Rabbit Writer is a very useful addition to the range of Vic software, especially if you have already bought a copy of Rabbit Base.

Ratings Table

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

N.A.

Title: **Computer Scrabble**
Type: **Disc**
Supplier: **Little Genius**
Machine: **Apple II**
Price: **£24.95**

Scrabble by computer is comparable to chess by computer — it's useful for solitary players — but how good is it? Can the computer's in-built (and limited) dictionary cope with the challenge of a mind comparable to the Concise Oxford?

It not only coped, but more than admirably, giving this Scrabble fanatic several tough games.

The instructions were easy to follow — seasoned Scrabble players will already know the rules of the game — and the graphics were good with a clear screen layout, although after an hour of play my eyes were beginning to tire from gazing at luminescent characters.

A beginner to the game might find it inconvenient and distracting to have to call up information such as values and distribution of characters (couldn't this have been printed along with the instructions?) but the program did allow you to do almost anything you would normally do in a Scrabble game, including shuffling and changing letters. My biggest complaint was that it allowed you to cheat — it was too easy to overcome the computer's challenge — and I found it a little odd when the computer challenged words such as sorrel — gastronomes need not play! 4 levels of speed and play added to the enjoyment and all in all I found it a compulsive program.

Ratings Table

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

J.C.

GAMES

Title: Robot Nim
Type: Tape
Supplier: A & F Software
Machine: Acorn Atom
Price: £3.95

Nim is believed to have originated in ancient China. In its classic form, you have 4 heaps of counters with 7,5,3 and 1 counters in each heap respectively.

Two players take it in turns and may remove as many counters as they wish, but only from one heap each turn. The one who takes the last counter is the winner. The strategy can be defined mathematically and, once you know it, it's easy to win against an inexperienced player.

In this version, you play the computer and the objects being removed are cute little baby robots! On running the program, you are given the option of defining the number of lines (heaps) and the number of robots per line. Then you are asked whether you wish to go first, and the robots are displayed. The robots seem to be aware of their fate, because periodically they open their mouths and bleat!

After specifying the line number and number of robots to be removed, the robot executioner appears and marches up the screen, pausing to look at your response, before setting off to find his victims — if he has to go back to find them, he grumpily stumps his way down the screen! After finding the right line, he turns and gives a sinister laugh, before blasting the robots off the screen.

The program runs in 5K and uses the Atom's basic graphics. The author is to be congratulated on his imaginative use of graphics and this program is an object lesson in what can be achieved. It is well crashproofed and the instruction sheet is hardly needed, as the program provides all the necessary prompts. The tape also includes an Index routine so that you can set up your tape recorder.

This program presents a simple game in a most imaginative and entertaining way.

Ratings Table

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

B.P.

Title: Chess
Type: Tape
Supplier: Program Power
Machine: BBC Computer A or B
Price: £7.95

In this game of chess for the BBC micro you will find all the standard computer chess features that you would expect to find on any normal game. Some of the more notable inclusions are the ability to castle and to capture pieces by en passant.

All the moves are entered in algebraic notation, although this is not as easy as it could be because the board is not labelled on-screen but instead a labelled board is included in the instructions.

You have six levels of play to choose from. On level one the computer generally takes about five seconds to reply to your move. The computer is also very quick to chastise you for an illegal move. Included in the game is the option to save the game to tape.

Apart from playing a normal game the computer will allow you to set up positions on the board and then play them through to their conclusion. Also included is the option of playing a 'blitz' game against the computer. When you select this option you play the computer with a ten second time limit on each move.

For reasons of speed the game is written entirely in machine code. The display is produced using mode seven graphics and while it isn't stunning, it is perfectly adequate for the game. My one criticism of the game is that it is sometimes difficult to distinguish between the pieces, for instance between the Queen and the Bishop.

The game should provide a good few hours of amusement for both novice and intermediate chess players alike.

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * *
Ease of use	* * *
Crashproofing	* * * *
Supplied Instructions	* * * *
Overall	73%

A.S.

Title: Buck Dodgers in the 25th Century
Type: Tape
Supplier: The Software House
Machine: Vic 20
Price: £5.95

Buck Dodgers, or his closely named associate, have been assigned to clear the way for the first intergalactic highway, route 42.

His cosmic Dozer has anti-matter shovels which are used to clear the space debris left by previous hitchikers. Buck gets 10 zats for each load of debris he zaps, then he must get more energy from the green zargovian antimatter when he looks low on fuel.

But you can also find space junk in your way. You must avoid this junk, which is clearly marked, otherwise you get a large fine. And when you have done enough work to go through the red star gates, you are paid 100 zats. Be careful, if you attack the space gates by mistake you are fined again.

If you suddenly vanish for no apparent reason, it's probably because you have made contact with some forbidden object. So watch what you are touching, it could be fatal.

As the green zargovians appear at random and your fuel soon runs low, you have a distinct possiblity of completely vanishing up your own warp. For a program that runs on the Basic VIC, Buck Dodgers is an amusing game that represents good value for money.

Ratings Table

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

N.A.

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Alien 3.95

Set on board the spaceship Nostrodamus, can you choose the right weapon to repel the alien before he kills your crew?

DCoder 5.95

Essentially a disassembler for your machine code but with one important difference – it will relocate the code in whole or part to any other part of memory.

Zonix 12.95

Sound effects for your ZX81 are now available at a price you can afford! Zonix is a hardware/software combination that allows you to write programs with real impact. The software includes two programs:

a) A program set to produce bombs, missiles, fire engines, tunes, telephones and sirens. Also includes the facility to make your own.

b) A program that turns your ZX81 into an electronic organ.

The hardware is an amplifier with volume control and loudspeaker which simply plugs into the mic socket of your ZX81. The sounds can be actuated from within your programs with a simple command. They can also be of various lengths so the limit is only your own imagination.

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This truly amazing program is the most flexible compiler available for the ZX81 AND NOW THE SPECTRUM TOO!.

MCoder will instantly translate your slow basic programs into super fast machine code at the touch of a key. It is also extremely easy to use: just load MCoder (the ZX81 version is just 2K long, the spectrum versions 3K) and then write your basic program as normal or you can load a basic program from tape to save you retyping the whole thing. MCoder then allows you to run and debug the basic until it is fault free. Now you can bring MCoder into operation using a print USR command – the basic will then be compiled into machine code as you watch!.

On average MCoder will increase the speed of basic programs 75 times. Both the ZX81 and the spectrum version will handle 95% of all basic commands and is quite simply the best compiler on the market. state 16K or 48K when ordering spectrum MCoder.

DRAGON 32K

Dragbug 9.95

Dragbug is a powerful machine code monitor plus a full disassembler for your Dragon 32. An essential software tool for writing, debugging and running your machine code programs or machine code subroutines to be called from basic.

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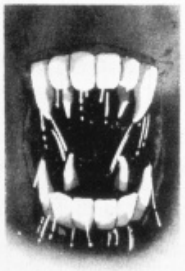

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2. Highly sophisticated software which will load and Save programs at 16 times their normal speed (i.e. 8K in 10 secs; 48K in 110 secs). Programs can be named to allow a superfast file search through a tape. It works equally well with autorun programs, Basic or machine code.

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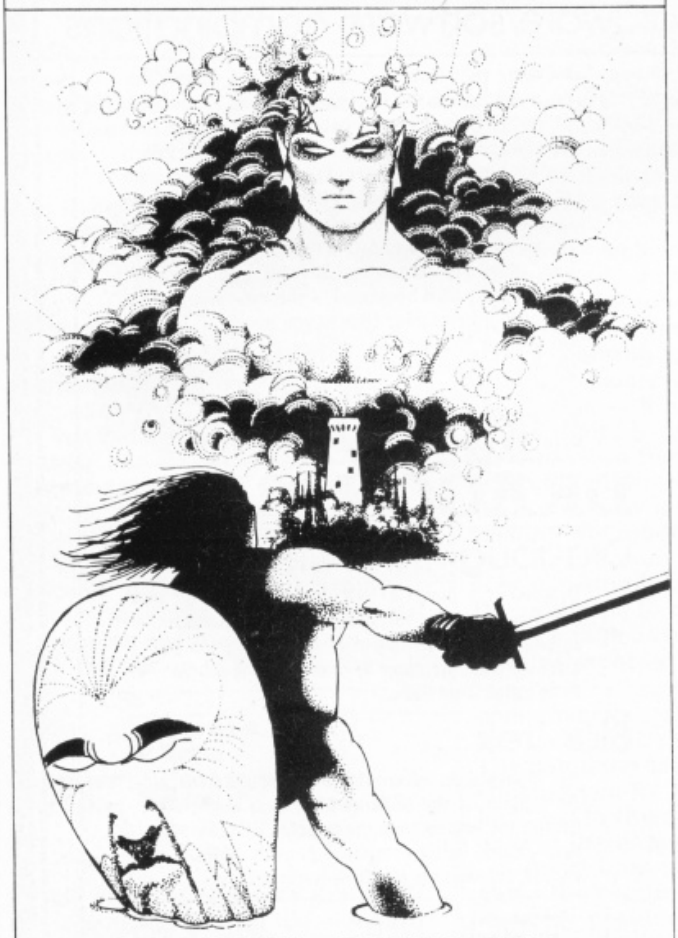

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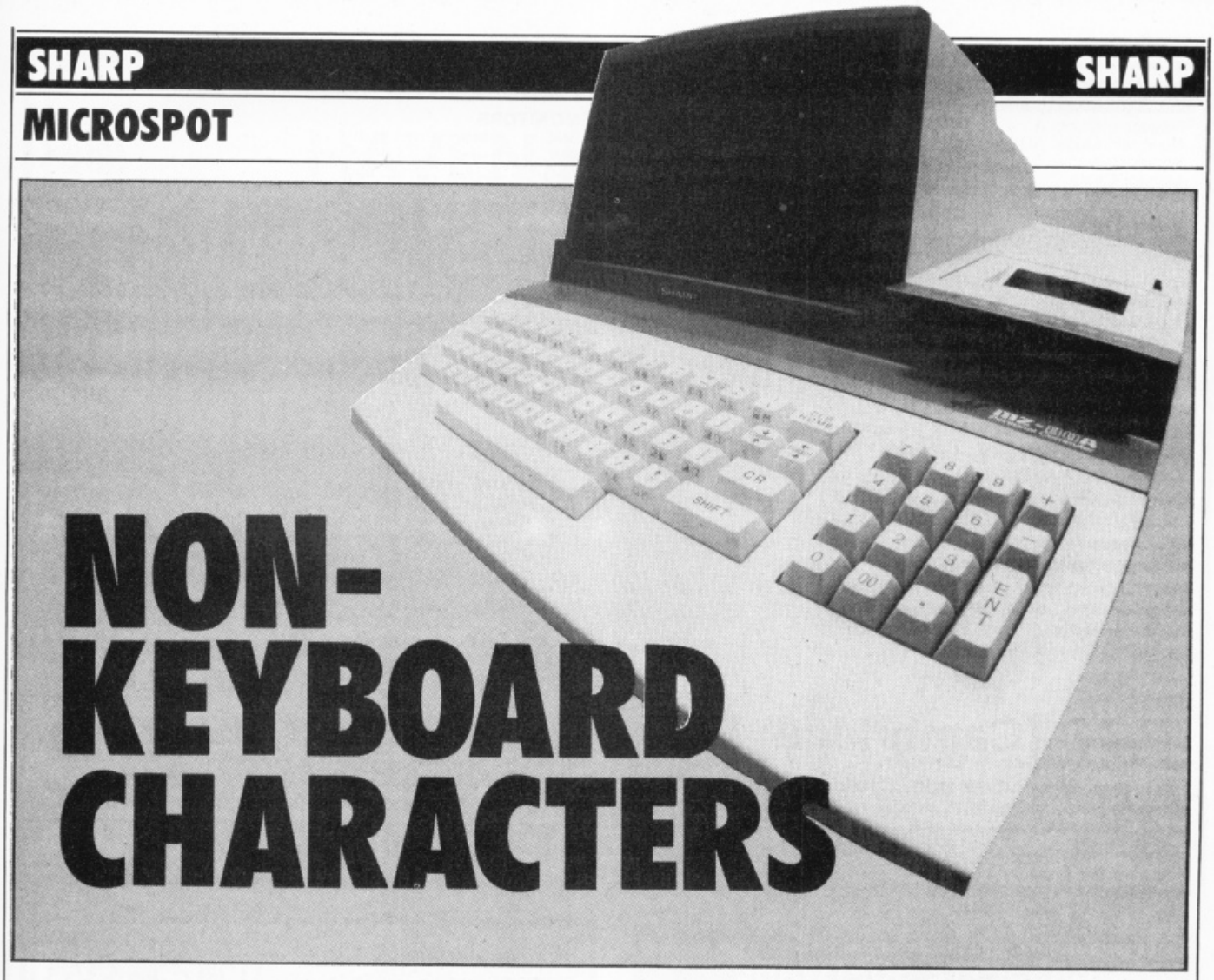

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Many micros contain lots of exciting characters for you to use in your programs. The only problem is that many will not let you put them into PRINT statements like normal characters. This routine shows a quick and clever way of doing just that on your Sharp MZ-80K.

All you have to do is to place a temporary character in the PRINT statement where you want your little man, face or whatever to be, then run the routine and watch as the computer replaces the dummy symbols with the ones of your choice.

Program Listing

```
 9999    STOP
10000    FOR I = 53248 TO 54247
10010    IF PEEK(I) = 65 THEN POKE I,202
10020    NEXT
```

Using the Program

1 Enter the lines 9999-10020.

2 Enter your main program in the usual way but enter a temporary character (in this example I have used a 'spade' whose character code is 65) in place of the desired character, (in this example, 'little man', code 202).

3 After a line containing the temporary character is entered, enter RUN 10000 and the character will be changed wherever it appears on the screen.

4 At this stage, only the display has been changed. To change the line in memory, move the cursor back to the modified line and press RETURN.

5 When they are no longer needed, lines 9999 to 10020 are deleted.

Program Notes

Line 9999 prevents the program from being executed when not required, eg after a trial run of part of your program.

Lines 1000-10020 look at each screen location in turn and substitute your desired character for the temporary one. You will obviously choose characters and codes to suit your particular requirement.

The line numbers used should obviously be well away from those used in your main program.

Conversion to another system should involve little more than using the appropriate screen locations in line 10000, i.e. top left and bottom right corners of your screen.

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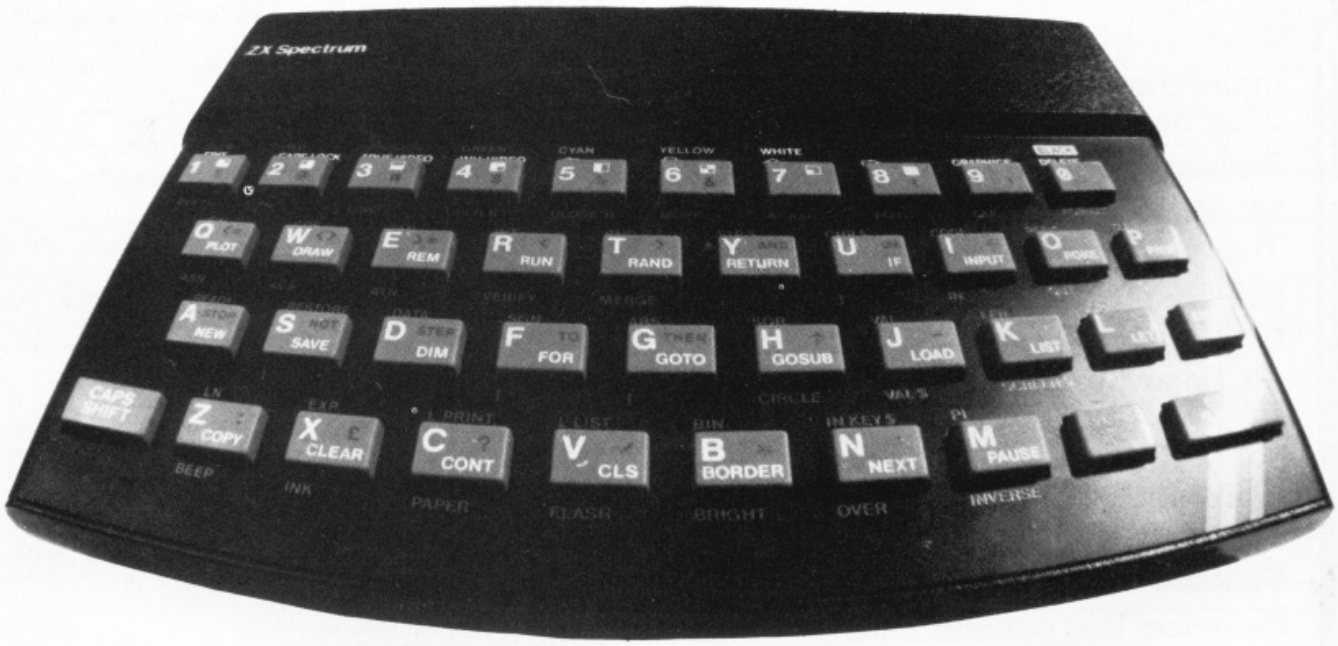


The recent flood of books relating to the ZX Spectrum computer have turned out to be better quality overall than their ZX81 counterparts. None of the books reviewed were bad, but some were slightly expensive for what they were.

Cover designs are a vast improvement over ZX81 books — most Spectrums books have colour covers with a high sheen finish. Trouble is, almost every book has a photo of a Spectrum and a band of colour similar to the go-faster coloured stripes on the keyboard of the Spectrum. A little bit of variety would not go amiss here — publishers please take note.

THE SPECTRUM BOOK OF GAMES:
by Mike James, S.M. Gee, Kay Ewbank.
Granada
£5.95, (146 pages).

This is a collection of 21 games, mainly graphics games, which, although nothing to shout about, are generally fairly good as books of games programs go. Under 'Perfect Programming' the authors claim "that there is no such thing as the last bug in a program".

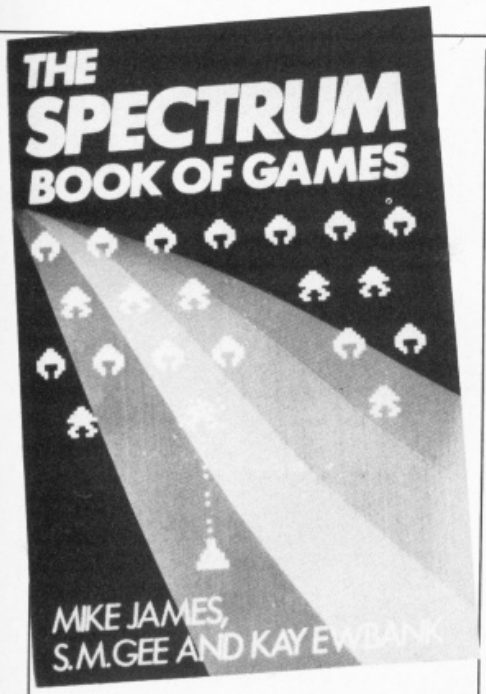
Maybe so, but silly little bugs lie in some of the programs which detract from them even though they do not affect the running of the program. This is the sort of thing I'm talking about, a sentence from one of the programs: "You took one jumps to . . ." That is, not paying attention to singulars and plurals.

The error could have been avoided through something as simple as the inclusion of a short AND clause along the lines of this, within the PRINT statement:

```
PRINT "You took";jump;"s" AND
jump>;"to . . ."
```

The same sort of attention to detail applied throughout the book could have made a world of difference to the finished product.

The programs themselves are a



mixture of old and new ideas, some rather ordinary and others infuriatingly good and addictive. I spent a lot of time trying to get my dog on the screen to herd some cute fluffy white sheep into a pen only to end up being told I was no good as a shepherd and should hand in my shepherd's crook!

There are fairly good explanations and descriptions of the programs and their structure and also included with each program is a Typing Tips section to help make sure you don't confuse the letter 0 with the digit zero in the dot-matrix printed listings (not ZX printer listings) for example.

These listings are reproduced from a good quality printer and are large, bold, easy to read and tidier than ZX printer listings although this means there is no 'spot the error at a glance' as a result.

GAMES TO PLAY ON YOUR ZX SPECTRUM

Martin Wren-Hilton
Shiva Publishing
£1.95, (43 pages).

A slim book mainly comprising of games to play on your Sinclair Spectrum computer. Despite the title, there are some non-games programs included.

The book claims to be one of Shiva's Micro Puzzle books although there are no puzzles as such, despite some challenging games. The programs are reasonable and a few interesting techniques can be learnt from studying the listings. Some rather poorly reproduced screen photographs accompany the listings and there is only a brief documentation with each program which is at best described as adequate.

A series of 'bugs' type of cartoons are interspersed with the programs and the humour can either add to or detract from the programs depending on taste (would you describe 'Breakout' as a game to drive you up the wall?). The program listings are typeset but I found no major errors in the programs I tried. Good use is made of sound and graphics and the book is, despite its small size, worth the £1.95 cover price. Beginners may find the book of more interest than the more experienced user.

TWENTY BEST PROGRAMS

by Andrew Hewson
Hewson Consultants
£5.95, (118 pages).

This book contains a collection of twenty programs which for the most-part are non-games orientated. They are well documented and the instructions and explanations are generally as clear as the complexity of the methods used allow.

Some of the ZX printer listings are rather faintly reproduced, although this may cause problems with variable names. For instance, it won't prevent you using any of the programs and only applies to a minority of the listings.

The programs are on the whole good, ranging from a 'Learning Hangman' game which has either you or the computer attempting to guess the word (the Spectrum's vocabulary can be increased with experience and even saved on tape!), through a program to give you a screen and paper printout of a calendar for a month or year you specify, to a full disassembler program which fills the 16K Spectrum to the byte. The programs are mainly in BASIC although some use is made of machine code in the book.

The book doesn't have many faults, but it didn't click with me entirely. Nevertheless there is something for everybody here especially as the programs illustrate a number of advanced techniques and routines both generally applicable to other computers and specifically to the Spectrum. From studying the programs you can learn a lot even if the programs do not appeal to you as such.

This book is very clear, instructive and helpful. It is more free of technical jargon than the customary manuals on machine code for a particular microprocessor. For those with a Spectrum and a yearning to learn to program in machine code, this book should most certainly be considered.

A few major programs are given such as the Freeway Frog and the EZ machine code monitor which has a lot of useful facilities for the machine code programmer even though it is not an assembler. The book is well laid out as a whole and could even serve as a reference guide for the more experienced programmer who needs some occasional help with a particular subject.

THE ZX-SPECTRUM AND HOW TO GET THE MOST FROM IT

by Ian Sinclair
Granada
£5.95, (130 pages)

With a title like that one may be forgiven for thinking that this was a book of fairly advanced material about the Spectrum. But no so.

In fact it is mainly a beginner's book in the old 'teach yourself Spectrum programming' mould, with a few useful routines, advice and hints thrown in. There are so many books of this kind around that it takes a very good book to stand out from the crowd. Also, this book covers much similar ground to another book from Granada, The Spectrum Programmer by S.M. Gee.

As such, this book is nothing special, although it is comparable with most other books of its kind. I sometimes think it would be a very good idea to compile the best from these books, selected by beginners, into one book that is good throughout.

The book starts very well with a very comprehensive guide to setting up the television and the computer in those first few tentative moments afte the Spectrum is taken out of its packaging. Such subjects as tuning in the TV set, choosing the optimum brightness, colour and contrast settings — all obvious to experienced users but a great help to the newcomer and perhaps indicative of Mr. (no relation) Sinclair's background in electronics.

This is followed with a useful section on cassette recordings and the probelms that can be encountered, but why, oh why, was the possibility of broken cassette leads (as happened to me) not clearly mentioned in the checklist of errors?

From here on the book is rather disappointing and there are a few silly mistakes.

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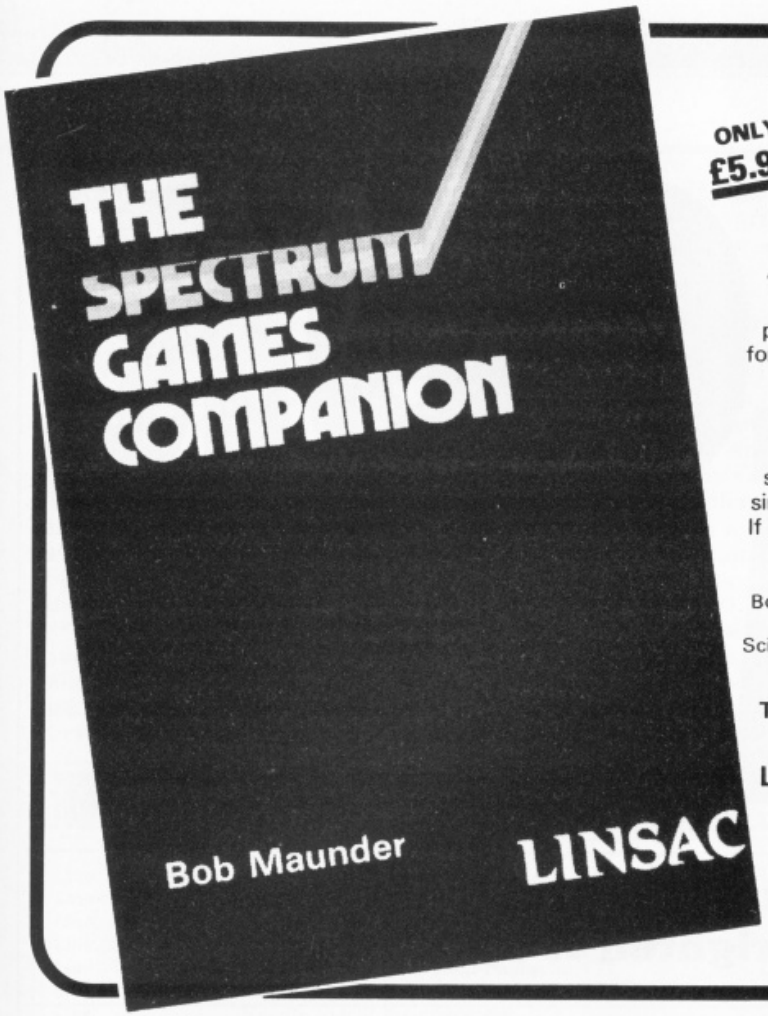

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Bob Maunder is co-author of 'The ZX80 Companion' and author of 'The ZX81 Companion'. He is a Senior Lecturer in Computer Science at Teesside Polytechnic, holds an MSc degree in Computer Science, and is a Member of the British Computer Society.

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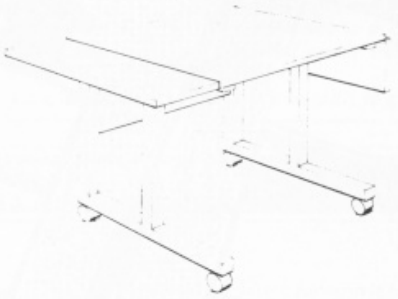

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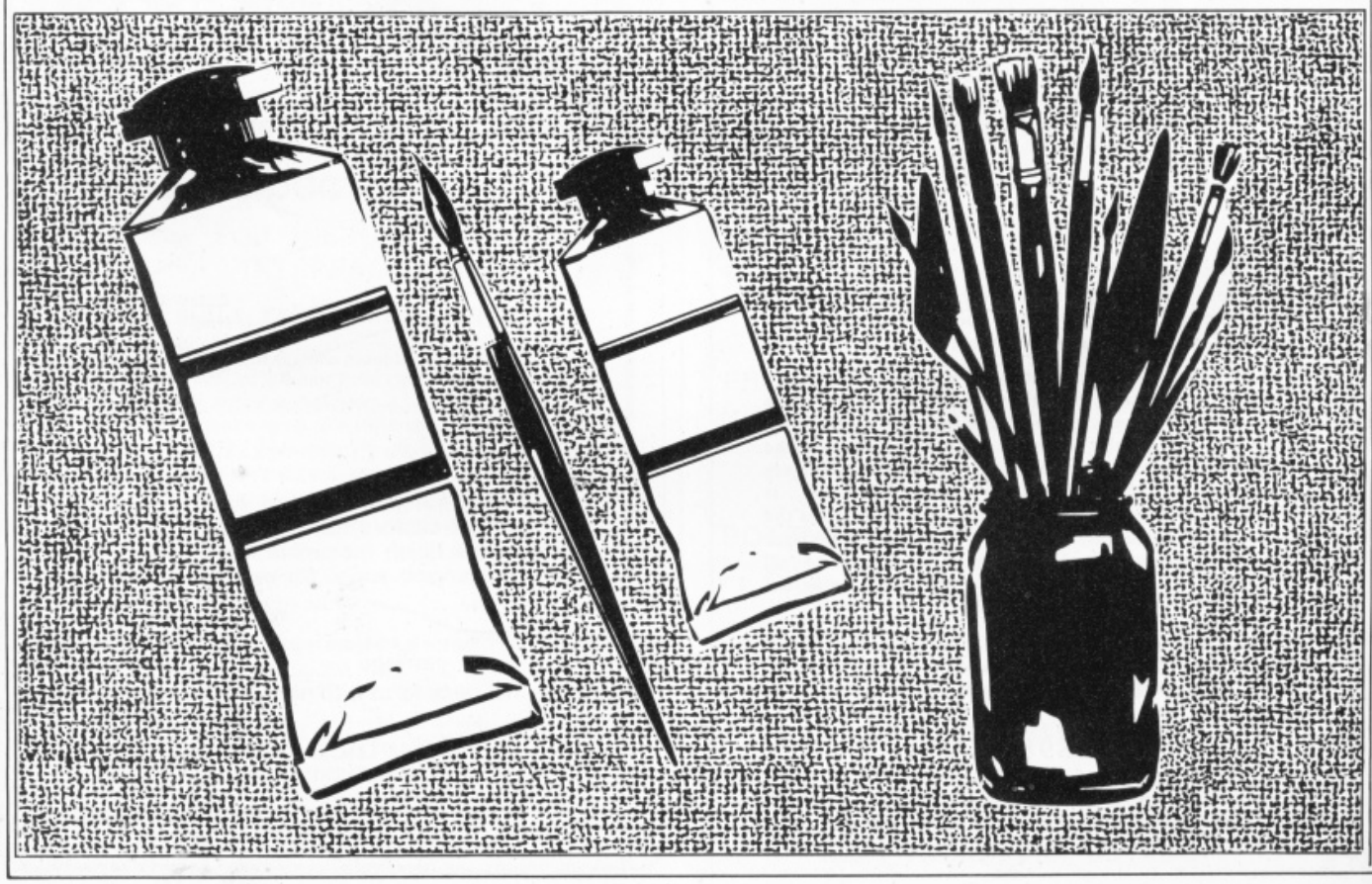
COLOUR MIX

If your Spectrum is dull and boring then Carolyn Arthur can help you brighten it up.

If you find yourself restricted by the colours your Spectrum can offer you then Colour-Mix will open up a whole new realm of colourful characters for you to decorate your screen with. So now is the time to



unleash those Pink Space Invaders and those Orange Pac-Men.

Colour-Mix uses the Spectrum's user-definable graphics facility to mix up two colours thoroughly enough for them to look like a new colour. In this way oranges, browns and the purples can be formed, which are not normally possible. The only limitation is that you cannot print characters on these colours unless you re-define them on your background as user-graphics. The information for the graphics is held in the data statements at the start. They are in decimal, not binary, form as it is shorter to type in.

When typing in the program I suggest that you type up to line 70 and "RUN" that part first, to get the user graphics. This makes it easier to type line 160 for which the PRINT statements are:-
6 spaces, 5 graphic mode A's, 5 graphic B's, 5 graphic C's, 5 graphic 8's and the second PRINT statement:
6 graphic 8's

Running The Program

When run, the program tells you to press a key and then proceeds by displaying 6 strips of colour filling the screen. They range from a pure colour in the left, to another in its "BRIGHT" form on the right, through three different mixtures of the two. Pressing a key will change the right hand colour. This goes on through all the possible combinations (there are 28). If you press "c" at any time except when being asked "Scroll?" a chart showing some of the new colours will be displayed. There are 6 rectangles horizontally going through the shades of a colour and 5 rows of different colours to illustrate some of the possibilities for subtle shading in pictures.

Finally, if you press "N" after displaying the chart, the numbers in the data statements from which the colours are formed will be printed on the screen in the corresponding chart positions. This is so that you can easily reproduce the colours that you want. The numbers can be interpreted as follows:—

"1" above the numbers for a colour represents the BRIGHT form.
143 is the code (on page 186 of the Manual) for a square of ink colour.
144,145, 146 are the codes for the user-graphics on the A,B and C keys respectively.

The next two numbers are the paper and ink colours.

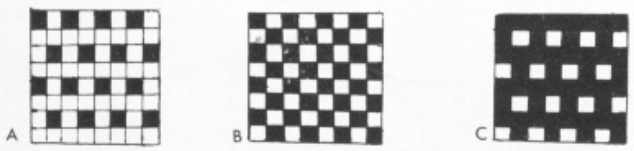
HOW IT RUNS

Line 5	Data for user-graphics on A key.
Line 10	Data for user-graphics on B key.
Line 15	Data for user-graphics on C key.
Line 20	Count for defining 3 characters.
Line 30	Count for 8 rows in each character.
Line 40	Choose the user character to be used.
Line 50	Read a row of the character.
Line 60	Poke it to the memory location.
Line 65	End of n loop.
Line 70	End of x loop.
Line 80	Print a title.
Line 90	Wait for a key to be pressed.
Line 95	Option for seeing chart.
Lines 110-190	Print 22 rows of the characters in line 160 for each possible colour mixture. Line 130 prevents combinations from being repeated.
Line 200	Not strictly necessary.
Line 205	Not strictly necessary.
Line 220	Title for chart.
Lines 230-238	Data for colours in chart.
Line 250	Start of loop for vertical position.
Line 260	Start of loop for horizontal position.
Lines 270-287	Read a. If a = 1 then print "1" in red if using number chart, or set BRIGHT state if using colour chart. In either case go back and read another value of a.
Line 290	Read data for paper and ink colour.
Line 300	Start of loop for height of individual block of colour.
Line 310	Start loop for width of individual block of colour.
Line 315	Check if number chart is wanted.
Line 320	Print appropriate character in chosen colours.
Line 325	Print numbers in number chart.
Line 340	End of width loop.
Line 350	End of height loop.
Line 360	Go on to next colour.
Line 365	Go onto next row.
Line 370	Stop if number chart has been printed.
Line 375	Finish off colour chart.
Line 380	Wait for a key to pressed.
Line 385	Option for number chart. Restore data for chart.
Line 395	Go back to start of chart drawing routine.

HINTS ON CONVERSION

It is arguable whether this program would be suitable for conversion for other Computers since most which allow user-graphics have a greater range of colours than the Spectrum. It could possibly be used where the number of on-screen colours in BASIC is limited.

The user graphics are designed on an 8 x 8 grid and have the following shapes:-



The command "BRIGHT 1" makes whatever is printed appear slightly brighter. An apostrophe between two items which are to be printed, as in line 80, merely causes the second item to begin a new line.

Most of the other Spectrum commands are either typical BASIC or are self-explanatory (such as PAPER, INK and BORDER).

Variables

x	Count for selecting letter for user-graphic. Also acts as a check for whether to draw the number chart (is x = 1) or the colour chart (if X < > 1).
n	Count for reading 8 rows of user-graphic.
p$	Stores letter of user-graphic.
a	Data for a row of the user character.
b	Count for left hand colour of stripes.
c	Count for right hand colour of stripes.
i	Count for number of lines.
l	Count for vertical height of first row in block of colour.
t	Count for horizontal position of start of block.
a	Data for whether or not Bright 1 state required, and also the code of the character to be used.
p	Data for paper colour.
i	Data for ink colour.
c	Count for number of rows in block of colour.
w	Count for width of block.

COLOUR MIX

PROGRAM LISTING

```
    5 DATA 170,0,85,0,170,0,85,0
   10 DATA 170,85,170,85,170,85,1
70,85
   15 DATA 255,170,255,85,255,170
,255,85
   20 FOR x=0 TO 2
   30 FOR n=0 TO 7
   40 LET p$=CHR$ (x+144)
   50 READ a
   60 POKE USR p$+n,a
   65 NEXT n
   70 NEXT x
   80 PRINT "       Colour-mix"'"P
ress any key to start"'"Press""c
"" for the chart at any "'"point
."
   90 IF INKEY$="" THEN GO TO 90
   95 IF INKEY$="c" THEN GO TO 21
0
  100 CLS
  110 FOR b=0 TO 7
  120 FOR c=0 TO 7
  130 IF c<=b THEN GO TO 160
  140 FOR i=1 TO 22
  150 IF INKEY$="c" THEN GO TO 21
0
  160 PAPER b: INK c: BRIGHT 0: P
RINT "
";: BRIGHT 1: PRINT "
";
  170 NEXT i
  180 NEXT c
  190 NEXT b
  200 PAPER 7: INK 0
  205 LET x=0
  220 PAPER 0: INK 7: BORDER 0: C
LS : PRINT TAB 10;"Chart"
  230 DATA 143,7,0,144,0,7,145,0,
7,146,0,7,143,0,7,1,143,0,7
  232 DATA 145,0,6,145,2,6,146,2,
6,146,0,6,143,0,6,1,143,0,6
  234 DATA 144,0,3,145,0,3,145,2,
3,146,2,3,143,0,3,146,3,7
  236 DATA 144,1,0,145,0,1,144,1,
7,146,1,5,143,7,5,145,5,7
  238 DATA 144,0,4,145,0,4,146,0,
4,146,4,6,146,4,7,146,4,5
  250 FOR l=0 TO 17 STEP 4
  260 FOR t=0 TO 26 STEP 5
  270 READ a
  280 IF a=1 THEN BRIGHT 1
  285 IF x=1 AND a=1 THEN INK 2:
PRINT AT l,t;a;",";
  286 INK 0
  287 IF a=1 THEN GO TO 270
  290 READ p,i
  300 FOR c=1 TO 4
  310 FOR w=1 TO 5
  315 IF x=1 THEN GO TO 325
  320 PAPER p: INK i: PRINT AT l+
c,(t+w);CHR$ a;
  325 IF x=1 THEN PAPER 7: PRINT
AT l+1,t;a;",": PRINT AT l+2,t;p
;",";i;","
  340 NEXT w
  350 NEXT c
  360 BRIGHT 0: NEXT t
  365 NEXT l
  370 IF x=1 THEN STOP
  375 PAPER 7: INK 0: BORDER 7
  380 IF INKEY$="" THEN GO TO 380
  385 IF INKEY$="n" THEN LET x=1:
RESTORE 230: PAPER 7
  395 GO TO 210
  400 SAVE "chart"
```

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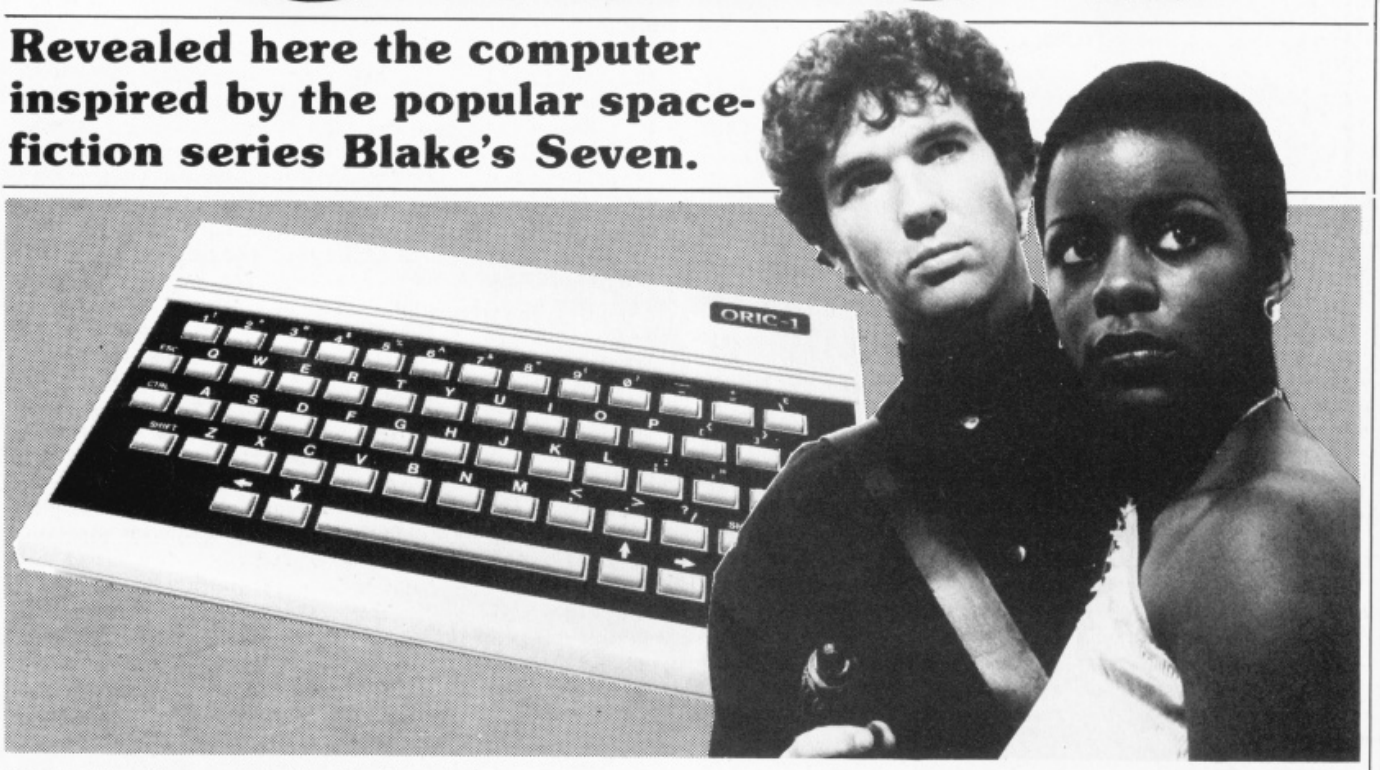
ORIC 1

ORIC 1

Revealed here the computer inspired by the popular space-fiction series Blake's Seven.



On reading the specification for the Oric I computer and looking at the way it has been styled it is fair to say that it has been designed to be a direct competitor to the ZX Spectrum. Certainly, comparing the machines specification for specification it seems that the Spectrum wouldn't stand a chance. When the Oric is plugged in it's a different matter.

Unfortunately, for this review we had to use a pre-production Oric for the basis of this review so some aspect of the machine's operation may seem a little less well covered than others, but hopefully you will be able to get a good idea of how the machine works despite this.

The Oric measures 28cm x 18cm x 4.5cm and the case is made of a heavy duty plastic. One nice feature which the designers have built into the Oric case is a small tilted plinth, so that when you place the Oric on a hard surface, the keyboard is tilted towards you.

Quality Keyboard

The keyboard is better than the Spectrum's rubber monstrosity but is still a fair way off a proper typewriter keyboard. Each key is made out of a small plastic moulding which is mounted on some form of click switch. This arrangement gives the keyboard a very positive feel which is reinforced by an audible bleep when a key is depressed. These bleeps vary in accordance to which group of keys is being used. The letter keys give one tone and keys such as the ESC and RETURN give another. All this makes the Oric's keyboard very positive, but quite slow.

The Oric has been provided with a good selection of sockets for connecting it to the outside world. From left to right they are: RF output for the television, RGB output for a colour monitor, 7 pin DIN plug for cassette operations and sound output to an external amplifier, Centronics printer interface, expansion socket for extra memory, joysticks, cartridges, modem, and finally, the power input.

Mounted inside the case are a reset button, a fine tune for the modulator and the loudspeaker. The Oric would be an ideal machine for anybody who wants to generate heavy-metal computer music, for instead of incorporating an electronic party squeaker like the Spectrum, the Oric has a full blown loudspeaker and take it from me, it can certainly blast out the watts.

The reset button, when pushed with a pencil or other suitable object, forces the Oric to do a warm restart, without losing any program that is in memory. This is particularly useful because I found that my Oric had several nasty bugs that had me reaching for the reset button with alarming regularity. More of this later though.

The BASIC contained in the Oric is fairly standard Microsoft. All

its commands are listed in Figure 1. Unfortunately the editing software had not been included in my machine, but from what I gather the machine has a standard screen editor. You call the line you want to edit by using the command EDIT and then use the cursor, escape and delete keys to change the line. The closest BASIC to the Oric's BASIC seems to be the Spectrum BASIC, especially when you start to look at the way the graphics work.

Crazy Characters

The error messages produced by the Oric are all in plain English, which makes a nice change from having to check up in the manual what error 23 stands for. By using the CTRL key you have access to some of the Oric's control characters. These are the 'caps' lock, 'delete line' and a switch to turn the keyboard click on or off.

I found some other slightly more alarming control characters by using the CTRL and ESC keys. For instance, if you hold the ESC key down and press the Y key then release the ESC key, the whole screen goes into an uncontrollable flurry of flashing and scrolling.

It was only through further investigating the actions of some of the Oric's characters that I found that this alarming display could be turned off by printing CHR$(154). The Oric lets you turn off both the keyboard and the display which often happened by accident while I was programming. Whether this was just a feature of the early model I have I do not know because the people at Oric products were unavailable for comment at the time of writing this review.

Perhaps one of the Oric's most impressive features is its sound capacity. As well as providing commands to make your own sounds, it also has four pre-programmed sounds that you call by name from within your program. These are ZAP, PING, SHOOT and EXPLODE. The actual sounds they make are quite accurate to their names. This takes a little bit of the frustration out of getting good sounds to accompany your games.

Sounding Out

If you are not satisfied with these sound effects the Oric gives you three commands with which to make your own noises and music. These are SOUND, MUSIC and PLAY. The SOUND command allows you to select the channel, period and the volume for either a tone or a noise.

MUSIC allows you to select the channel, octave, note and the volume for any musical tone. PLAY is perhaps the most useful of the sound generation commands, as it lets you select one of seven preset envelopes to modify your sound.

By using these commands and adjusting the speed at which the envelope acts it is possible to create some very impressive and professional sounding zaps and explosions of your own.

The Oric has stepped outside convention in the choice of recording speed for its cassette interface. Whereas most machines operate at between 300 and 700 baud for their cassette transfers, with a few going up as high as 1200 baud, the Oric has a data transfer rate of 2400 baud. This is great for loading long programs quickly but in the tests I carried out using the cassette I found that not only was volume critical but also the programs had a tendency to corrupt when they loaded into the computer. All is not lost though because the Oric also offers an option of loading and saving programs at 300 baud.

Hi-Res Haywire

When I came to examine the high resolution capabilities of the machine I must admit that I was both perplexed and disappointed. Firstly the Oric has only eight colours for use on its screen, and not sixteen as some early advertising stated. These colours are black, red, green, yellow, blue, magenta, cyan and white. They are accessed using the commands INK and PAPER, as on the Spectrum.

The problem with this is that as soon as you change the INK colour then everything on the screen changes to assume the new INK colour. This is a serious failing on behalf of the Oric's designers. This happens in both the text and the high resolution modes. In the text mode you can get round it by using a Prestel style display because the Oric contains the control codes to manipulate colours as well as double height and flashing characters.

The text screen has a resolution of 28 rows by 40 characters and the high resolution screen has a resolution of 240 pixels by 200, with a three line deep window at the bottom which is reserved for text. My other critiscm of the high resolution on the Oric is the fact that it uses relative positions in its DRAW command. This is great for moving a shape into different positions on the screen but makes virtually all other high resolution work on the screen unnecessarily difficult.

The command set for high resolution graphics is fairly comprehensive. It includes CIRCLE and FILL commands, as well as a PATTERN command for drawing dotted lines in any style you want. I also find that on my model if you pressed certain keys on the keyboard while it was drawing, the screen literally went haywire.

This could make games playing with the high resolution screen a very hazardous business, especially as the only way to recover from some of these graphic excursions was to use the warm reset button on the bottom of the case.

Bear in mind that the Oric computer I tested was a pre-production model and some of the faults encountered could be due to this.

One of the other interesting quirks of the machine I found was that it seemed to use the screen memory to store some of its variables. Because as I ran programs that involved storing a large number of items in a string array, the screen started to fill up from the bottom with the information that I was storing in the array. This meant that clearing the screen also wiped the contents of my array. Very worrying.

Overall, my impression of the Oric was that it has nothing special to offer although it functions reasonably well as a computer of this kind should. For the money it is quite adequate.

Figure 1

ABS	ASC	ATN	LOG	CLOAD	MID$
CHAR	CHR$	CIRCLE	MUSIC	NEW	ON...GOSUB
CLEAR	CLS	CONT	ON...GOTO	PAPER	PATTERN
COS	CURMOV	CURSET	PEEK	PING	PLAY
DATA	DEF FN	DIM	POINT	POKE	PRINT
DRAW	EDIT	END	READ	RELEASE	REM
EXP	EXPLODE	FILL	RESTORE	RETURN	RIGHT$
FOR...TO	STEP	NEXT	RND	RUN	SGN
FRE	GET	GOSUB	SHOOT	SIN	SOUND
GOTO	GRAB	HIRES	SPC	SQR	STOP
IF/THEN	INK	INPUT	STR$	TAB	TAN
INT	LEFT$	LEN	TEXT	USR(N)	VAL
LET	LIST	LLIST	WAIT	ZAP	

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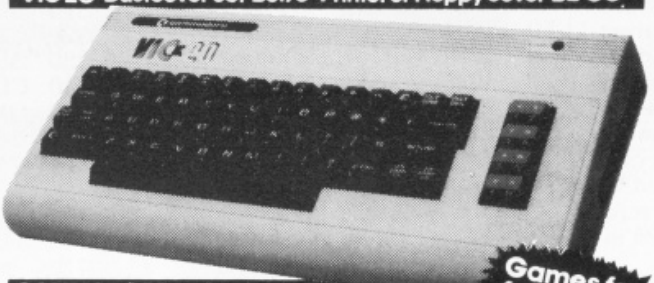

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MICROSPOT

INVERSE VIDEO

When it comes to using inverse video the Atom can be miserly. But fear not because N. Tonks has come up with a solution.

If you have an Atom, you will have no doubt realised by now that you are restricted in the use of inverse video in your programs.

The Atom will only let you print the characters A to Z, along with a few others such as square brackets, in this reverse state. This short routine will allow you to considerably expand this capability and will let you print things such as numbers, punctuation marks and the contents of variables, in reverse field.

This piece of code replaces the Atom's own write character routine with one which, every time it is called, checks the state of a flag held in position 90 hex in memory to determine in which state the character is to be printed. If this flag is set to one then the character will be printed in its normal form, if it is set to zero then the character will be printed in inverse video.

To set this flag and thus determine the state of your printing, two normally unused character codes are used. These codes are 16 and 18. The command PRINT $16 causes the flag to be set and acts as an 'inverse video off' instruction.

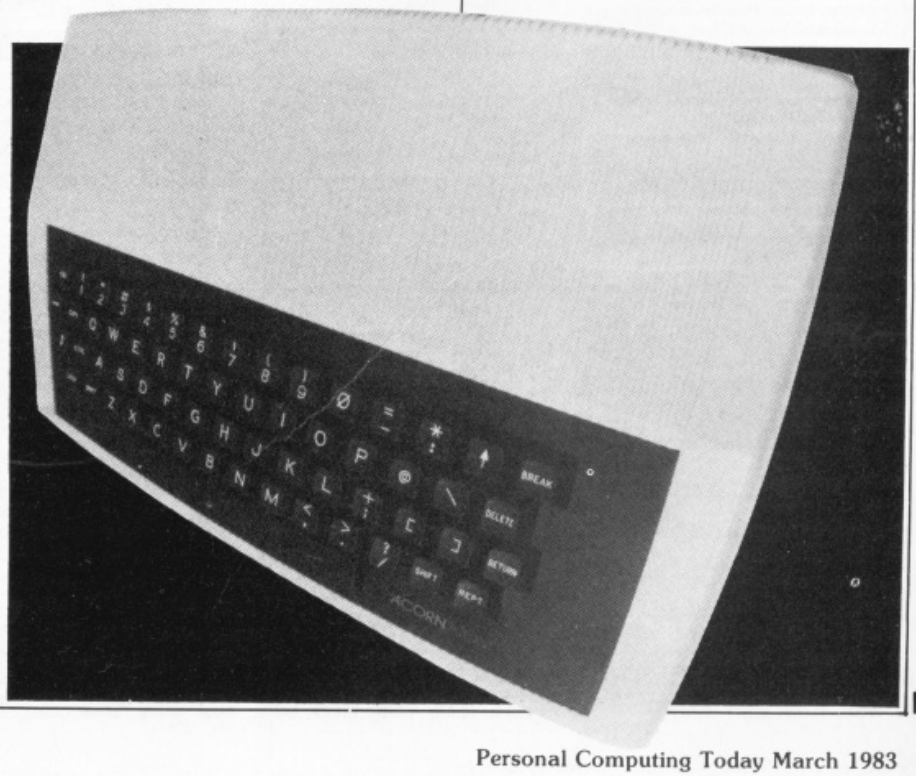
PRINT $18 sets the flag to zero and thus acts as an 'inverse video in' instruction. In the following line of code these two characters change the state of the printing to produce "THIS IS INVERTED" in inverse video, followed by "AND THIS IS NOT" displayed normally.

```
PRINT$18,"THIS IS
INVERTED",$16"AND THIS IS
NOT" '
```

As soon as this flag is set to zero all the subsequent screen printing is displayed in inverse video form, including the contents of variables. This will continue until the flag is reset to one.

Once the program has been entered and run then it can be deleted, as the machine code it produces is free standing. If at any time you press the BREAK key then the code can be activated by typing LINK 10430. The routine occupies an area in RAM between 28BE hex and 28FF hex. This area is protected from corruption provided that the floating point arrays %YY and %ZZ are not used.

```
10   DIM LL6
20   A = #28BE
30   P.$21
40   GOSUB 80 ;GOSUB 80
50   P.$6
60   LINK A
70   END
80   P = A;[
90   LDA@ #28
100  STA #209
110  LDA@ #C9
120  STA #208
130  RTS
140  CMP @16
150  BEQ LL1
160  CMP @18
170  BNE LL2
180  LDA @0
190  STA #90
200  RTS
210  :LL1   LDA @1
220  STA #90
230  RTS
240  :LL2   PHA
250  LDA #90
260  BEQ LL3
270  PLA
280  JMP #FE52
290  LL3   PLA
300  CMP @32
310  BMI LL5
320  CMP @127
330  BEQ LL5
340  CLC
350  CMP @64
360  BMI LL6
370  CMP @95
380  BPL LL6
390  ADC @32
400  JMP #FE52
410  :LL6 ADC @96
420  :LL5 JMP #FE52
430  ]; RETURN
```



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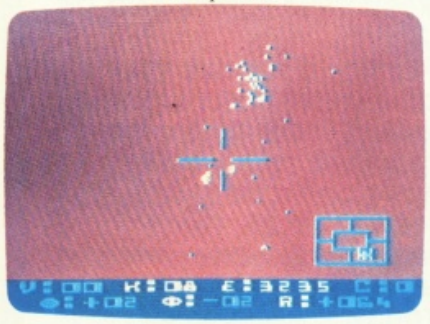

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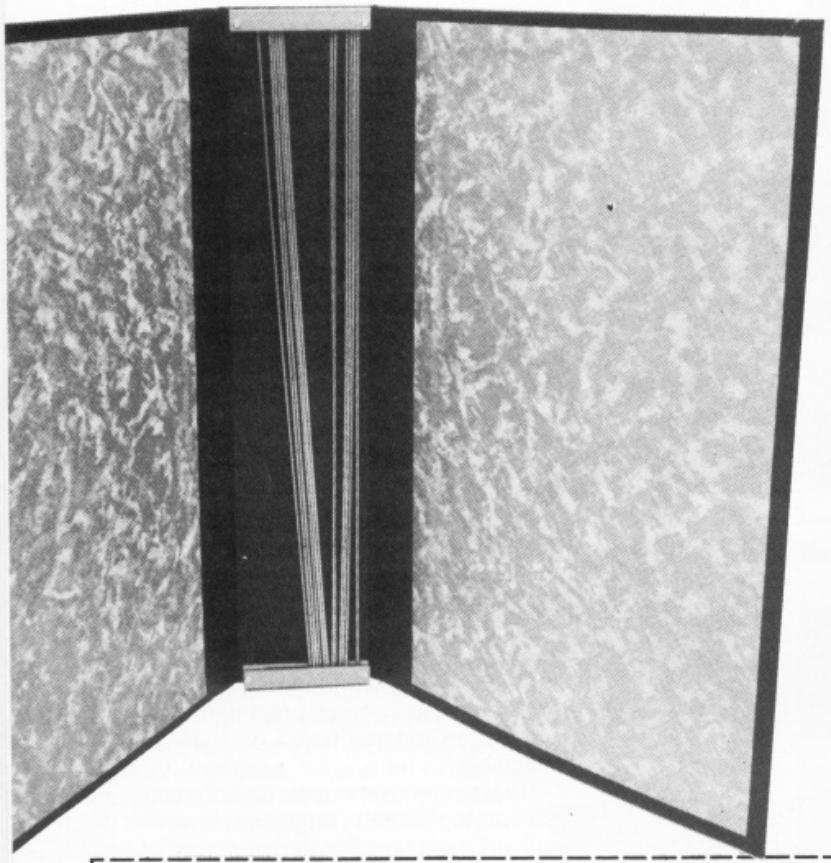

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Software News

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TRIAL PACKAGE

The Snapp utilities Extended Basic, Built In Functions, Mapping Support, Autofile and the Garbage Collector are all described in our catalogue. Literature is also available from us on request. These programs are available for the machines listed below.

All of this software is installed into the Disk Basic interpreter of the host machine and thereafter is fully integrated into TRSDOS Basic. Once installed it is entirely transparent to the user.

Extended Basic has six separate utilities within it, including cross reference; variable dump (including values), compression, string and keyword find.

Built In Functions contains a large number of new commands and utilities to aid the programmer, the exact number depending on the machine. For instance, one can POKE up to 255 bytes at one time, sort a number of arrays, erase any or all arrays from the Array Table, PEEK multiple bytes at one time, calculate passwords, exchange the contents of variables and so on.

The Garbage Collector gets over that big failing of Microsoft Basic whereby the machine appears to hang from time to time whilst it sorts out its string area.

Automap is a product designed to automate for the Basic programmer the tasks of presenting information on the VDU and accepting information from the keyboard operator.

Autofile carries out very similar tasks to Automap, but instead of interfacing between the keyboard and the VDU, it interfaces between the keyboard and a file.

These utilities are hard to describe but once you use them, then like us, you will never let them go. They are almost miraculous in their use and are the greatest programming time savers that we have ever seen. They are, however, expensive. This Trial Package has, therefore, been produced to provide a "sample" of these utilities for a very low price. The catch is that this sample can only be installed on one of your disks contalning Disk Basic and can only be accessed on that disk 99 times. This is more than sufficient to give the user an idea of the very real and very important advantages of using these utilities.

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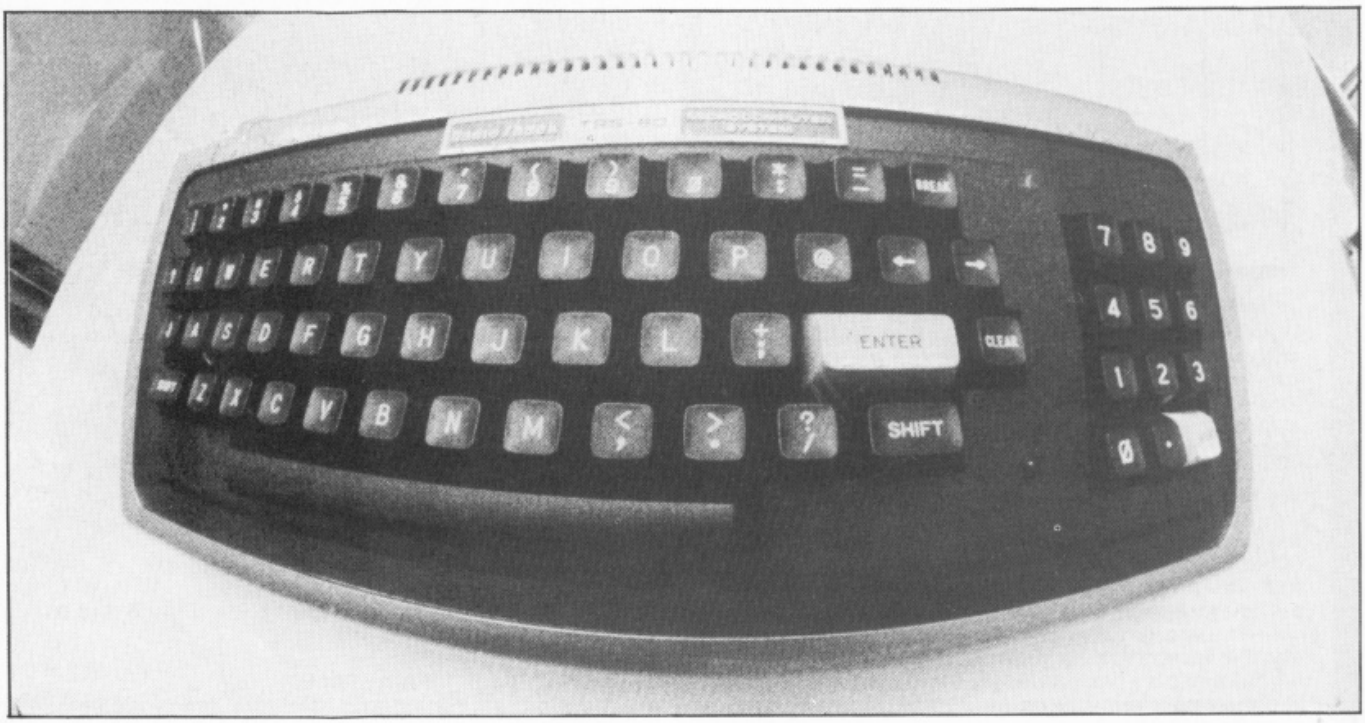
TECHNIQUE

TRS 80 TIPSTER

In the second of our occasional series of TRS-80 hints and tips Keith Campbell takes you through the steps of transferring cassette stored programs to disc storage.



Buying disc drives for your TRS-80 is a natural progression that keen owners will make, but the trouble is what can you do with your existing cassette stored software without it going to waste?

The answer is simple. Just transfer it on to your discs, thereby you will save time and sometimes the frustration of CLOADing. First of all though, be sure and make your backup copy of TRSDOS.

A BASIC program will present no difficulty in copying to disc, but will not be compatible with disc BASIC if it calls a machine-code subroutine. Before saving a BASIC program to disc, find out if there is a USR call to a machine-code subroutine by loading the program and typing CM"X",USR. The computer will reply with either a blank line, indicating that USR has not been found, or will list the line number(s) in which USR occurs.

In the first case there is no problem, simply SAVE the program to disc. If USR is found, note the line numbers where it occurs, then type CMD"X",POKE. Again, note the line numbers. List each of these lines on the screen, and look for POKE 16526 and POKE 16527.

These tell BASIC in 2-byte form, from which address to start executing the USR call. In disc BASIC, this address must be specified as a single decimal number (or Hex number using the prefix &H) equated to DEFUSR. The following example demonstrates the conversion required:

1000 POKE 16526,48 : POKE 16527,117

This specifies an address of 48 + (117 x 256), ie 30000.
The conversion to Disc BASIC is:

DEFUSR0 = 30000

For addresses above 32767 use a value of (address — 65536).

Now look for the associated USR call following the POKE statements.

1010 X = USR(0) : REM JUMP TO M/C SUBROUTINE

The conversion for this is:

1010 X = USR0(0)

Note that the 0 directly following USR relates to the 0 following DEFUSR. Up to 10 calls (0 through 9) may be defined in this way.

Having made changes for all the USR calls and associated POKEs,

the program should run from Disc BASIC so SAVE it to disc.

The above assumes that there will be room for the BASIC program to Load and Run in the existing 'memory size' needed to break the machine code.

This means that a program originally written for a 16K machine should not exceed about 11K bytes. If it does, then you will have to consider relocating the machine code at a higher address, and modifying the DEFUSR address and 'memory size' to correspond.

Running a cassette-based machine-code program from Disc presents an altogether different problem, since machine-code will load in memory exactly where it is told. This may, and probably does, start at an address like 4300H (17152 decimal). The trouble is that the Disc Operating System DOS resides in this area, up to 5200H, and therefore, in loading your program, you will overwrite the operating system. TRSDOS won't like this, and will reboot, causing the machine code to abort.

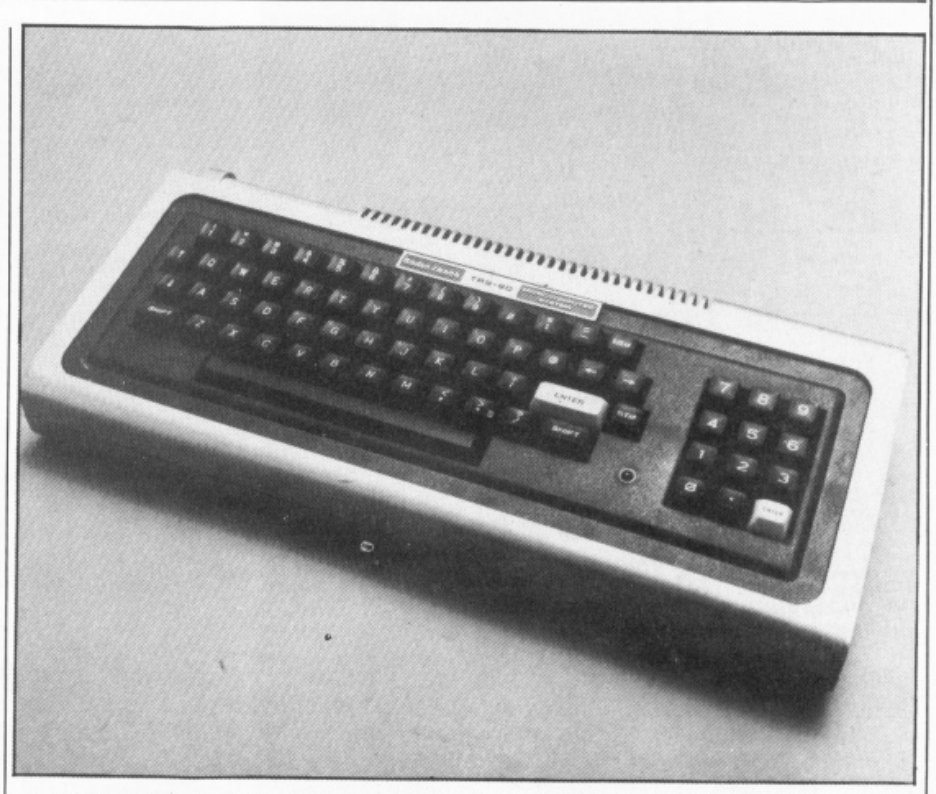
Problem Solving

The way to overcome this is to load the machine-code higher up in memory than it should go. Unfortunately it is extremely unlikely that it will successfully execute from this new location. However, it WILL load. The secret in executing it is to add a small machine-code routine to shift it back down to the original location and execute the new routine rather than the original program.

Before you can do all this, you will need to know the start, end and transfer addresses of the program. This may be achieved by using a disassembler such as that published by Misosys, which has a very useful 'T' command that will examine a tape and output just this very information.

Having discovered the required addresses, use the TAPE command of TRSDOS to dump the program to disc. Now use RELO to change the loading address. Suppose the program starts at 4300H, has a transfer address of 4350H and ends at 7FFFH. To help keep track of numbers, specify a new start at 8300H, ie RELO FILENAME (ADD = 8300).

When this operation has been completed, LOAD the program, then enter the DEBUG utility and display the end of the program at the top of the screen. (This will now be at BFFFH.) Add the required



machine-code routine by modifying memory successively from C000H on as follows: C000-21 C001-00 C002-43 C003-11 C004-00 C005-83 C006-01 C007-FF C008-3C C009-ED C00A-B0 C00B-C3 C00C-50 C00D-43.

Locations C001,C002 hold the required start address, C004,C005 hold the relocated start address, C007,C008 hold the length of the program to be transferred (3CFFH), and C00C,C00D contain the transfer address (4350H).

An Assembly language listing of the source code to produce this machine code subroutine is shown in Figure 1.

Having thus modified memory, exit DEBUG by the 'Q' command, and DUMP the whole thing to disc:

DUMP FILENAME
(START = 8300,END = 0C00D,
TRA = 0C000)

Now just type the filename, the program should load and start executing.

The only snag is that leaving the program will cause TRSDOS to reboot, since the added machine code will have forced the program to overwrite the DOS. A small price to pay for the advantage of not having to load from tape any more!

The Misosys Disassembler referred to is available from Molimerx Ltd., of Bexhill.

Figure 1

Assembly language listing of machine-code routine to move program from 8300H to 4300H and execute at 4350H

```
C000            00100   ORG   0C000H      ;START IT HERE
C000  210043    00110   LD    HL,4300H    ;WHERE YOU WANT
                                          IT
C003  110083    00120   LD    DE,8300H    ;WHERE YOU'VE GOT
                                          IT
C006  01FF3C    00130   LD    BC,3CFFH    ;HOW BIG IT IS
C009  EDB0      00140   LDIR              ;SHIFT IT
C00B  C35043    00150   JP    4350H       ;JUMP TO START IT
0000            00160   END
00000 Total Errors
```

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Local dealers have recently sprouted countrywide and this month we look at an up-and-coming Kingston store.

Until recently if you wanted to look at a large range of computers and software you have had to travel into the centre of London or any other major city. But that is now changing.

Nestling in the prestigious Eden Walk Precinct in Kingston Vision Store offers a selection of machines and software that you would not expect to find outside central London.

Vision Store was set up at the beginning of October by Jan Murray. He had just completed several years with REW Audio Visual, running their shops which sold Hi-Fi, video and recording equipment. During his time with REW some of the shops dabbled in computers and this prompted Jan to buy an Atari 800 computer for his own use at home. He soon came to realise the potential for the home computer market, so on his departure from REW he immediately set up his own shop to sell computers, along with Hi-Fi and video equipment.

Since its instigation the people at Vision Store soon found that the demand for the computers far outstripped their initial expectations. They carry an impressive range of computers, starting at the bottom end with the ZX81 and the VIC-20, moving up through the mid-price computers including the Dragon 32, Atari 400 and the Commodore 64 and at the top end stocking the Atari 800 and the PET range to cover the business end of the market. By the time you read this they should also be carrying the Oric-1 and the Sinclair Spectrum.

Their premises are large and modern, with the computers sharing display space with a large number of videos, televisions and tape recorders, although this will soon change to give more space to the demonstration and display of computers. The staff are on the whole friendly and enthusiastic and are always willing to take time to discuss customers requirements, or to demonstrate some new piece of software.

Vision Store's prices are about par for the course but they do offer special packs to suit most needs and these often work out cheaper then assembling the parts separately. They will also consider part exchange or purchasing second hand equipment.

To complement the shop's range of computers they also attempt to carry as comprehensive a range of software and peripherals as possible. They carry all the software from the machines' manufacturers as well as most of the independent software available. Particularly impressive was the range of American software which they had obtained for the Atari 400/800 computers. The staff do not object to demonstrating the software, so at least the customer can see what he is buying, before having to part with his hard earned cash.

A Plethora of Peripherals

One of the peripherals in stock which particularly drew my attention was the B Key 400. This device could be a godsend for all frustrated Atari 400 owners. The B Key 400 is a proper typewriter style keyboard to replace the touch sensitive keyboard on the 400. It costs £79.95, along with a charge of about £9.00 if you want the people at Vision Store to fit it. They will also undertake an internal upgrade for the 400 to put it up to either 32K or 48K. If you were intending to buy an Atari 400, but were put off by either the lack of memory or the thought of having to type on a touch sensitive keyboard then it could be worth your while checking out some of Vision Store's Atari deals.

In the future Jan is intending to set up more Vision Stores around the South-East of England, but if you can't wait until one arrives on your doorstep then they also run a blossoming mail-order business.

If you're thinking about buying a computer, some software or some peripherals and don't fancy a trip to see the big city lights, I would recommend a trip to Kingston to see Jan Murray and his crew. The address of Vision Store is: 3 Eden Walk Precinct, Kingston-on-Thames, Surrey. Tel: 01-546-8974. ■

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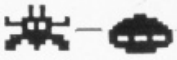

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Coach House, Kelsterton Road, Flint, Clwyd.
Tel: DEESIDE 810518

FACTFILE

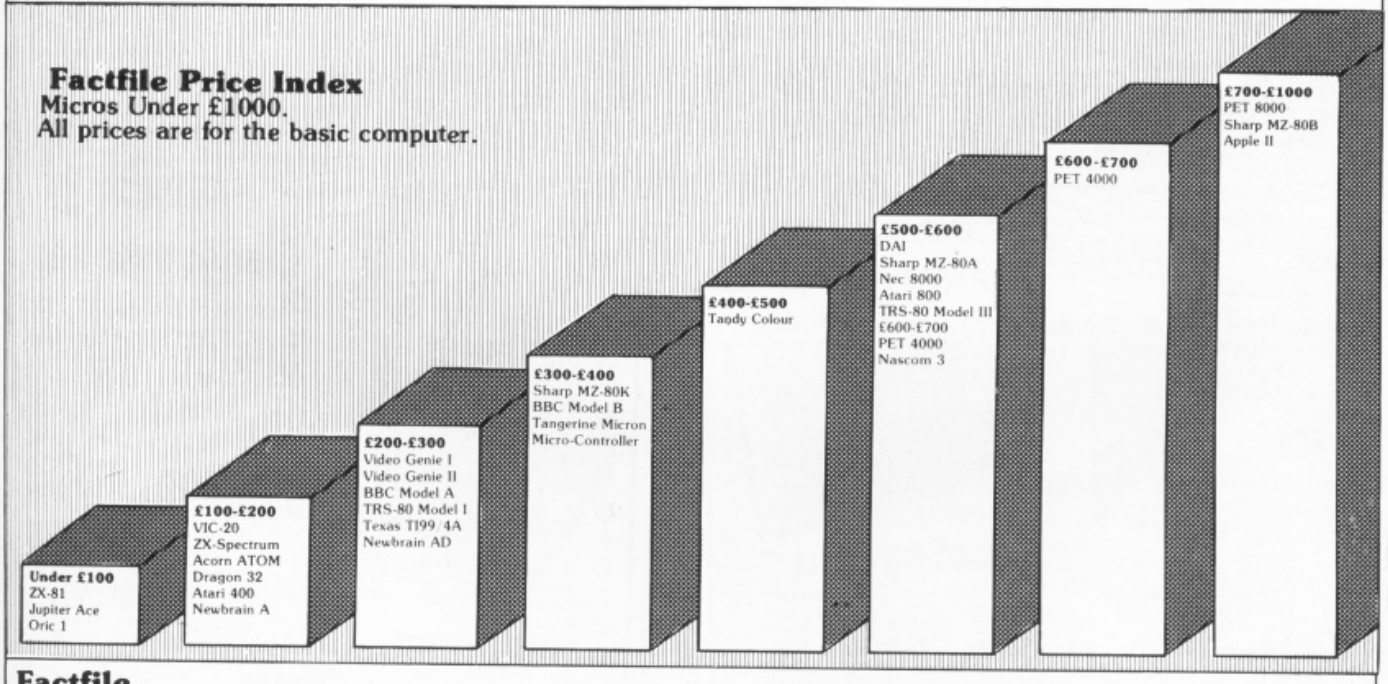
MICRO FACTFILE

Factfile is our regular buyer's guide to microcomputers. Herein you will find all the important facts and figures on 28 of the most important micros on the market under £1000. The idea is that you are able to directly compare what different manufacturers are offering you and how much they are charging you for it. Many brochures and adverts bury the reader in a mass of irrelevant facts and figures, which make it difficult to judge one against the other.

Factfile sorts it all out for you!

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

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



Factfile

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

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

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

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

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

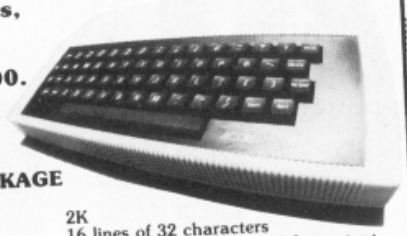
SERIAL/PARALLEL OUTPUT: This refers to the manner in which the micro transmits data to other units. If it puts out information in a long string, one bit after another, down a single wire or connector, it is a serial output. Parallel output is where pins or wires carry information simultaneously and are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

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

FACTFILE

ACORN ATOM

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



STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

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

APPLE II

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

STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

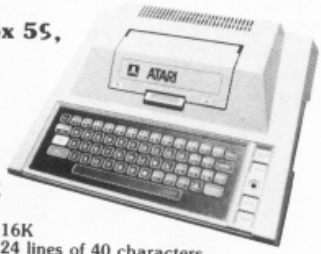
	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£200-1700
Monitor	Yes	£134
Disc Drives	Yes	£379
Other Languages	Yes	£84-500
Multi-user Capabilities		
BASIC extensions (Toolkits)	No Yes	— £26

OTHER ADD-ONS:

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

ATARI 400

Atari UK Ltd, PO Box 55,
Alperton Lane,
Wembley, Middx.



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£199.95**

MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

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

ATARI 800

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

STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

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

BBC MICROCOMPUTER

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

STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

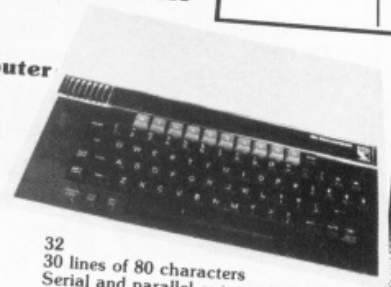
	DETAILS	PRICE
RAM	up to 32K	£100
Printer	TBA	—
Monitor	Yes	£200
Disc Drives	TBA	—
Other Languages	TBA	—
Multi-user Capabilities	Yes	—
BASIC extensions (Toolkits)	TBA	

OTHER ADD-ONS:

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



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

COMMODORE PET 4000

Commodore,
675 Ajax Avenue,
Slough, Berks

STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

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

COMMODORE PET 8000

Commodore,
675 Ajax Avenue,
Slough, Berks

STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

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

FACTFILE

COMMODORE VIC20

Commodore,
675 Ajax Avenue,
Slough, Berks

STANDARD PACKAGE

Memory Size (RAM)	5K
Screen Size	23 lines of 22 characters
Expansion Sockets	BUS connection, Disc, Printer, Serial output, joystick
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£169.99**

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.

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	**£350**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	–
Printer	Yes	£230-276
Monitor	No	–
Disc Drives	Yes	£299
Other Languages	Yes	–
Multi-user Capabilities	Yes	–
BASIC Extensions	Yes	–
OTHER ADD-ONS:		

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

DAI

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

STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

None Reported

DRAGON 32

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

STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	–	–
Printer	No	–
Monitor	No	–
Disc Drives	No	–
Other Languages	Yes	–
Multi-user	No	–
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.

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, £169**

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 ZX81

Sinclair Research,
6 Kings Parade,
Cambridge CB2 1SN

STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

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

OTHER ADD-ONS:

Memory expansion unit 16K or 64K, Memotech Ltd, 3 Collins St, Oxford OX4 1XL, £39.95-79; 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	
Monitor	Yes	£239-1200
Disc Drives	Yes	£100
Other Languages	Yes	£369
Multi-user Capabilities		£100
BASIC extensions (Toolkits)	No 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	—

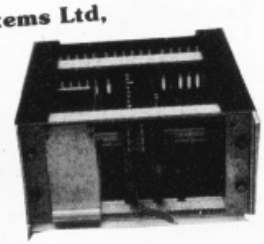
OTHER ADD-ONS:

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

FACTFILE

TANGERINE MICRON

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



STANDARD PACKAGE

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

MANUFACTURER'S EXPANSIONS

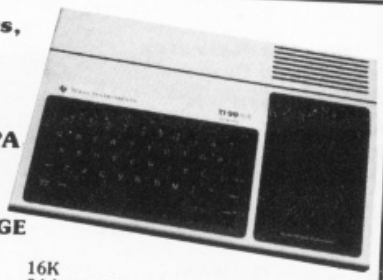
	DETAILS	PRICE
RAM	48K in system rack	£144
Printer	No	—
Monitor	No	—
Disc Drives	Yes	TBA
Other Languages	Yes	£40
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

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

TEXAS TI 99/4A

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



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 32 characters
Expansion Sockets	ROM pack, Bus connector, joystick, socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	14K
Average Price	**£199**

MANUFACTURER'S EXPANSIONS

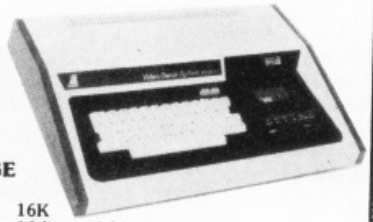
	DETAILS	PRICE
RAM	up to 48K (max)	£300
Printer	Yes	£275
Monitor	No	—
Disc Drives	Yes	£300
Other Languages	Yes	£50-£100
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

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

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

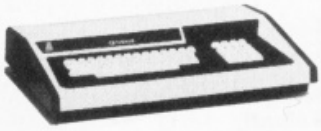
	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

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

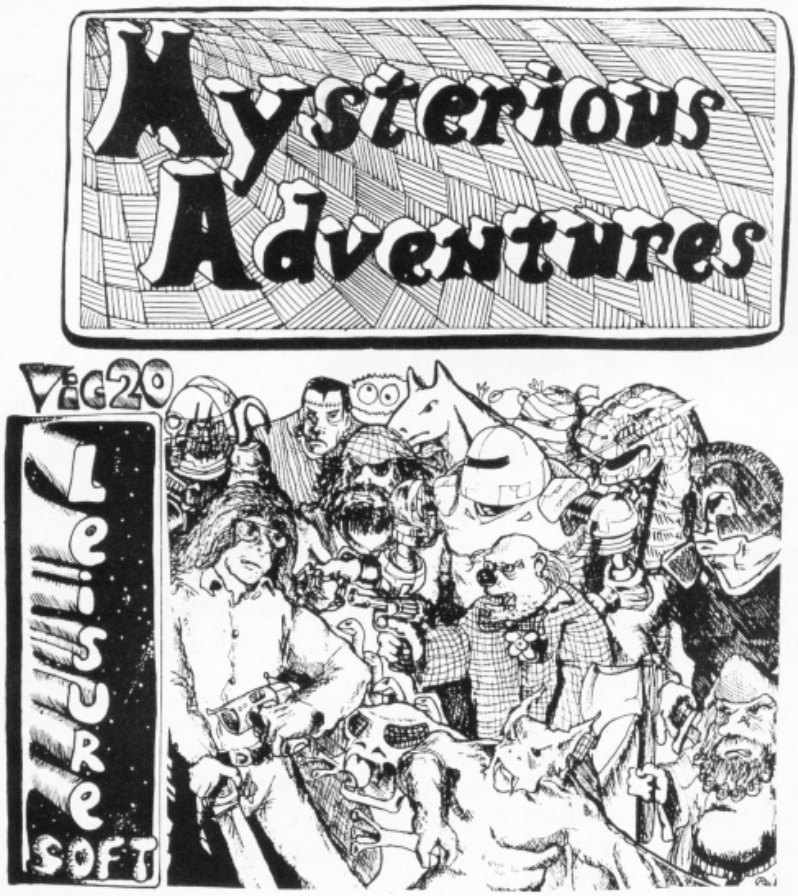
Memory Size (RAM)	16K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	13K
Average Price	**£299**

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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SOFTWARE FROM PCT

THE VALLEY

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

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

You've read the program (Computing Today — April '82) . . . Now buy the tape. Tape versions (£11.45 each inc P&P and VAT) available for: ZX Spectrum (48K), Atari 400 and 800 (32K), Tandy TRS-80 Model 1 Level 2, BBC Model B, Sharp MZ-80A, Sharp MZ-80K (18K), VIC-20 (with 16K RAM pack) and PET (New ROM, 16K RAM minimum).

Disc versions (£13.95 each inc P&P and VAT) available for: Apple II (DOS 3.3), Sharp MZ-80A, Sharp MZ-80K and PET 8032 (8050 drives).

Fill in the coupon and return it to CT Software, ASP Ltd., 145 Charing Cross Road, London WC2H 0EE and become one of the many to play . . . The Valley . . .

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I enclose cheque/PO for £ . . . . . (payable to ASP Ltd). OR Debit my Access/Barclaycard (delete as necessary)

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Address . . . . . .

. . . . . Postcode . . . . . .

Signature . . . . . Date . . . . . .

Please allow 21 days for delivery

ASP SOFTWARE

SOFTWARE LISTING

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

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

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

Table Codes

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

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

The codes we have used are:

Program Type

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

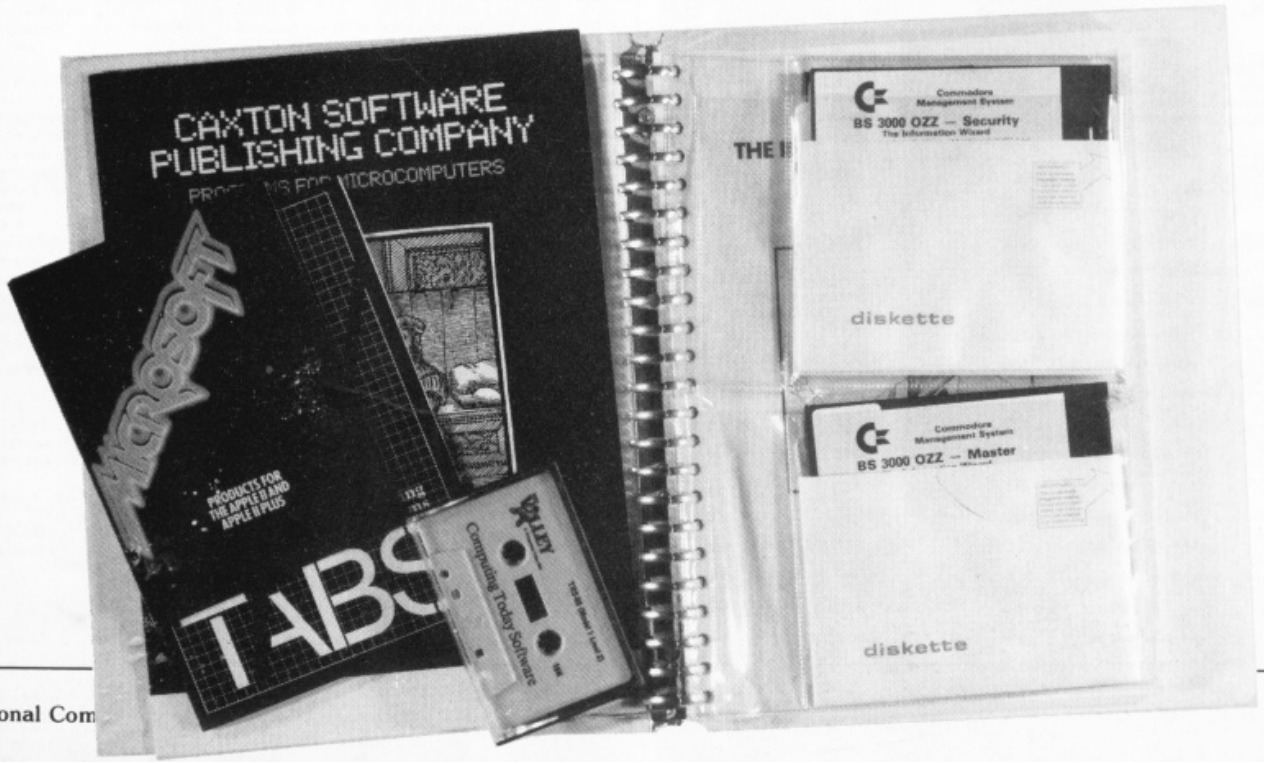
How Sold

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

Due to overwhelming response we have been forced to alternate machines included in our checklist each month. Out this month are the TRS-80 and Sharp.

Not Here?

To companies whose products are not listed herein we can only say TELL US ABOUT IT! This applies particularly to the smaller retailer who may sell only half a dozen or so programs for one machine. If you produce software for *any* of the machines on the market today, then we would love to include your wares in our checklists. Send it in to us, marked for the attention of the Editor (in our format *Please*!) or ring Chris Palmer on 01-437 1002 as soon as possible.



SOFTWARE LISTING

ATOM

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
3-D Asteroids	Gm	Program Power	5K	C	GK	£6.85
747 Flight simulator	Gm	Bug Byte	12K	C	CH,GA,GB	£8.00
Adventure	Gm	Program Power	12K	C	CH,GK	£9.15
Adventures	Gm	Acornsoft	12K	C	EJ	£30.00
Air Attack	Gm	Program Power	12K	C	CH,GK	£9.15
Air Attack	Gm	Program Power	12K	C	GK	£7.95
Alien Maze	Gm	Program Power	8K	C	GK	£5.69
Astrafire	Gm	Program Power	5K	C	GK	£4.54
Astro Birds	Gm	Program Power	12K	C	CH,GK	£9.15
Atom Adventure	Gm	Acornsoft	12K	C	GA,AL	£11.50
Atom Adventure	Gm	Hopesoft	12K	C	JV	£6.75
Atom Breakout	Gm	Bug Byte	4K	C	HO	£4.00
Atom Business Games	B/G	Program Power	12K	C	GK	£7.99
Atom Business Cassette	Bs	Acornsoft		C	AL	£7.50
Atom Business Pack	Bs	Acornsoft		C	AY,FA	£11.50
Atom Chess	Gm	Acornsoft	12K	C	GA,EA,AL	£11.50
Atom Chess	Gm	Acornsoft	12K	C	GK	£11.44
Atom Forth	Ut	Acornsoft		C	GA,EJ,AL	£11.50
Atom Invaders	Gm	Bug Byte	12K	C	HO	£8.00
Atom Life Category	Bs	Acornsoft		C	AL,GA	£11.50
Atom List	Ut	Acornsoft		C	AL	£17.25
Atom Man	Gm	Hopesoft	12K	C	JV	£6.75
Atom Store	Bs	Program Power	12K	C	GK	£9.15
Atom Synthesiser	Gm	Acornsoft	12K	C	AL,GA	£11.50
Atomic Cube	Gm	A&F S/W	12K	C	GE	£4.95
Backgammon	Gm	Bug Byte	7K	C	GA	£7.00
Blitz	Gm	Rucksoft	4K	C	KO	£2.65
Chaser	Gm	Hopesoft	4K	C	JV	£3.75
Chess	Gm	Bug Byte	12K	C	CH,GA,GB	£9.00
Chess	Gm	Program Power	12K	X	GK	£9.15
Constellation	Gm	Program Power	12K	C	GK	£7.99
Constellation	Gm	Program Power	12K	C	GK	£7.99
Colour Invaders	Gm	Hopesoft	12K	C	JV	£3.75
Cowboy Shootout	Gm	Program Power	12K	C	CH,GK	£7.99
Cylon Attack	Gm	A&F S/W	12K	C	GE	£4.95
Dambusters	Gm	Program Power	10K	C	GK	£5.69
Data Base	Ut	Acornsoft	6K	C	EJ,FZ,FA,GA	£11.50
Death Satelite	Gm	A&F S/W	12K	C	GE	£6.00
Demon Dungeon	Gm	Program Power	5K	C	GK	£6.85
Derby, Blitz and Rat Race	Gm	Program Power	12K	C	GK	£6.84
Desk Diary	Bs	Acornsoft	12K	C	FA,EJ,AL,GA	£11.50
Disassembler	Ut	Hopesoft	3K	C	JV	£1.75
Disassemble Program	Ut	Program Power	4K	C	GK	£6.85
Dragon's Lair	Gm	Program Power	12K	C	GK	£6.85
Early Warning	Gm	A&F S/W	12K	C	GE	£4.95
Earth Rescue	Gm	Rucksoft	6K	C	HO	£2.80
Easy Talker	Ed	Acornsoft	16K	C	AW	£5.00
Escape	Gm	A&F S/W	8K	C	GE	£4.95
Fall of Rome	Gm	Program Power	12K	C	GK	£7.99
Forth Tape	Ut	Acornsoft		C	FA	POA
Forth, Theory & Practice	Bs	Acornsoft		C	AL	£6.00
Fruit Machine	Gm	Bug Byte	8K	C	HO	£4.00
Galactica	Gm	Program Power	12K	C	GK	£5.69
Galaxian	Gm	Bug Byte	12K	C	CH,GA,GB	£8.00
Galaxian War and Invasion	Gm	Program Power	2K	C	GK	£6.84
Golf	Gm	Bug Byte	6K	C	HO	£5.00
Games Pack 1:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Asteroids			10K		EJ,AL,CH	
Sub Hunt			6K		FZ	
Break Out			4 K			
Games Pack 2:	Gm	Acornsoft		C	AY,FA,GA	
Dog Fight			10K		EJ,AL,CH	
Mastermind			4K		FZ	
Zombie			4 K			
Games Pack 3:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Rat Trap			10K		EJ,AL,CH	
Lunar Lander			6K		FZ	
Black Box			10K			
Games Pack: 4	Gm	Acornsoft		C	AY,FA,GA	£11.50
Star Trek			8K		EJ,AL,CH	
Four Row			12K		FZ	
Games Pack 5:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Invaders			10K		EJ,AL,CH	
Wumpus			3K		GZ	
Reversi			5K			

SOFTWARE DEALERS

Supplier Code			
AA	Micro Centre Ltd	CD	Omega Plus
AB	Micro and Video Palace	CE	Southern Software
AC	Laskys	CF	Sigma Systems
AD	Datarite Terminals Ltd	CG	Planet Software
AE	Vincelord Ltd	CH	Brighton Gamer
AF	MicroComputerLand	CI	Picturesque
AG	Comart Ltd	CJ	ACS Software
AH	Cream Computer Shop	CK	Chrisalid
AI	Microvalue	CL	MED
AJ	Molimerx Ltd	CM	Simple Software
AK	GW Computers Ltd	CN	Buffer Micro Shop
AL	Acornsoft Ltd	CO	Pixel Productions
AM	Acorn Computers	CP	Computics Microsoft
AN	Microcomputers Products Int.	CQ	KW Software
AO	Xitan Systems	CR	Sideline Freepost
AP	KGB Micros Ltd	CS	IQ Services
AQ	Broadside	CT	Willow Software
AR	Software Ltd	CU	Level 9 Computing
AS	Lucas Logic Ltd	CV	J Purves
AT	Atlantic Micro System	CW	Cambell Systems
AU	TCL Software	CX	Microdeal
AV	I A S	CY	Prof. F H George
AW	Intelligent Artefacts Ltd	CZ	J Wolstencroft
AX	Kuma Computers	CA	Terodec Ltd
AY	Microstore	CB	Poolsoft
AZ	London Retail	CC	Highlight Software
BA	Micro-Spares	CD	Omega Plus
BB	CAPS Ltd	CE	Southern Software
BC	Maplin	CF	Sigma Systems
BD	Caxton Software	CG	Planet Software
BE	Cornshall Ltd	CH	Brighton Gamer
BF	Micro Technology	CI	Picturesque
BG	Elcon Research Ltd	CJ	ACS Software
BH	Avalon Hill Games	CK	Chrisalid
BI	Call Apple (UK)	CL	MED
BJ	Lifeboat Associates	CM	Simple Software
BK	L & J Computers	CN	Buffer Micro Shop
BL	Peach Tree Software	CO	Pixel Productions
BM	ACT (Microsoft) Ltd	CP	Computics Microsoft
BN	Personal Computer Palace	CQ	KW Software
BO	Sinclair Software	CR	Sideline Freepost
BP	Leicester Computer Centre Ltd	CS	IQ Services
BQ	TABS Ltd	CT	Willow Software
BR	IBR Microcomputers	CU	Level 9 Computing
BS	Computer Plus	CV	J Purves
BT	The Essential Software Co.	CW	Cambell Systems
BU	Guestel	CX	Microdeal
BV	Lowe Electronics	CY	Prof. F H George
BW	Gate Micro System Ltd	CZ	J Wolstencroft
BY	Almarc Data Systems Ltd	DA	Ground Control
BZ	Interam Computer Systems Ltd	DB	Mick Bignell
CA	Terodec Ltd	DC	Giltrole Ltd
CB	Poolsoft	DD	Deep Thought Software
CC	Highlight Software	DE	Silversoft

Games Pack 6:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Dodgems			10K		EJ,AL,CH	
Simon			8K		FZ	
Amoeba			6K			
Games Pack 7:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Life Forms			8K		EJ,AL,CH	
Ballistics			10K		FZ	
Snake			10K			
Games Pack 8:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Star Date			8K		EJ,AL,CH	
Gomoku			8K		FZ	
Robots			10K			
Games Pack 9:	Gm	Acornsoft		C	AY,FA,FA	£11.50
Snapper			8K		FJ,AL,CH	
Minotaur			12K		FZ	
Babies			8K			
Games Pack 10:	Gm	Acornsoft	2K	C	AY,FA,GA	£11.50
10 Games for minimum					EJ,AL,CH	
Atom					FZ	
Games Pack 11:	Gm	Acornsoft	12K	C	AY,FA,GA	£11.50
Missile Base					EJ,AL,CH	
Snooker					FZ	
Dominoes						
High Stats	Bs	Program Power	12K	C	GK	£7.99
Hyper Fire	Gm	Program Power	12K	C	GK	£9.15
Introductory Pack	Ed	Acornsoft	3K	C	GA,FA,AL	£23.00
Invader Force	Gm	Program Power	12K	C	GK	£9.15
Invaders	Gm	Bug Byte	12K	C	CH,GA,GB	£8.00
Labyrinth	Gm	Bug Byte	12K	C	Ho	£6.95
Last Run	Gm	Bug Byte	7K	C	HO	£3.00
Lunar Lander	Gm	Program Power	12K	C	GK	£7.99
Martians	Gm	Program Power	12K	C	GK	£7.99
Maths Pack 1:	Ed	Acornsoft	4K	C	EJ,FA,FZ,AL, GA	£11.50
Maths Pack II:	Ed	Acornsoft	6K	C	EJ,FA,FZ AL,GA	£11.50
Maze Ball	Gm	Program Power	12K	C	GK	£5.69
Microbudget	Bs	Program Power	12K	C	GK	£9.15
Mine Field	Gm	A&F S/W	6K	C	GE	£4.95
Missile Command	Gm	A&F S/W	12K	C	GE	£4.95
Mode 4 VDU	Ut	Program Power	12K	C	GK	£7.99
Moon Lander	Gm	Rucksoft	6K	C	HO	£2.25
Munchy Man	Gm	Program Power	12K	C	GK	£5.69
Music Box	Gm	Program Power	12K	C	GK	£7.99
Parachute	Gm	Rucksoft	5K	C	HO	£2.25
Peeko Computer	Ed	Acornsoft	6K	C	GA,FA,AL	£11.50
Pinball	Gm	Bug Byte	6K	C	HO	£4.50
Pirate Island	Gm	Hopesoft	12K	C	JV	£6.75
Polaris	Gm	A&F S/W	12K	C	GE	£3.95
Polecat	Gm	A&F S/W	12K	C	GE	£4.95
Pontoon	Gm	A&F S/W	12K	C	GE	£3.95
Programmer's Toolkit	Gm	Program Power		C	GK	£28.15
Reversi	Gm	Program Power	8K	C	GK	£5.69
Rhino and Wiggle	Gm	Bug Byte	10K	C	Ho	£5.00
Robot Control	Ed	Acornsoft	16K	C	AW	£35.00
Robot Nim	Gm	A&F S/W	6K	C	GE	£3.95
Sketch Pad Program	Gm	Program Power	5K	C	GK	£5.69
Softscreen	Ut	Computer Concepts	12K	C	GJ	£11.50
Space Fighter	Gm	Program Power	12K	C	GK	£9.15
Space Invaders	Gm	Computer Concepts	12K	C	GJ	£7.80
Space Storm	Gm	Program Power	4K	C	GK	£5.69
Spirographics	Gm	Rucksoft	8K	C	HO	£2.45
Star Raid	Gm	Rucksoft	11K	C	HO	£3.30
Star Trek	Gm	Program Power	5K	C	GK	£6.85
Star Trek	Gm	Bug Byte	12K	C	HO	£5.00
Statistics Pack	Ut	Bug Byte	12K	C	Ho	£20.00
Stockbroker	Gm	Program Power	5K	C	GK	£4.54
Super Race Track	Gm	Program Power	12K	C	GK	£5.69
Squares, Simon and Parachute	Gm	Bug Byte	7K	C	HO	£5.00
Tangle	Gm	A&F S/W	6K	C	GE	£3.95
The Soft VDU	Gm	Acornsoft	8K	C	AY,FA,GA EJ,AL,CH,FZ	£11.50
The Park	Gm	Program Power	12K	C	GK	£5.69
Time Tutor	Ed	A&F S/W	6K	C	GK	£3.95
2K Programs (1)	Gm	Bug Byte	2K	C	HO	£4.50
2K Programs (3)	Gm	Bug Byte	2K	C	HO	£4.50
Typist	Ut	Bug Byte	6K	C	HO	£4.00
Tunnel	Gm	Rucksoft	6K	C	HO	£2.65
UFO Bomber	Gm	Bug Byte	7K	C	HO	£4.00
Utility Pack 1	Ut	Acornsoft	2K	C	FA,GA,AL,GA	£11.50
Warlords	Gm	Program Power	12K	C	GK	£7.99
Word Pack ROM	Ut	Acornsoft	8K	C	AJ,EJ,GA	POA
Word Processings Pack	Bs	Acornsoft	8K	C	FA	POA
Word Tutor	Bs	Acornsoft	12K	C	GA,EJ,FA,AL	£11.50

SOFTWARE DEALERS

DF	Michael Orwin
DG	Hisoft
DH	The Soft Option
DJ	Microcomputer Spacedrome
DK	Spider Software
DL	Xavier Business Systems
DM	Camden Electronics
DN	Sumlock Electronic Services
DO	Microstyle
DP	Small Systems Engineering
DQ	Woodland Software
DR	Telesystems Ltd
DS	Macronics
DT	Hewson Consultants
DU	Silicon Office Services
DV	Sirton Computer Systems
DW	Psion Ltd
DX	JRS Software
DY	Calisto Computers Ltd
DZ	Micro Gen
EA	Anglia Computer Centre
EB	SBD Software
EC	Abacus Software
ED	Qdos Business Software
EE	dK'tronics
EF	Computech Systems
EG	Electronics Experts
EH	Artic Computing
EI	Knights TV & Computers
EJ	Microage Electronics
EK	Holly Products
EL	I O Systems
EM	Merton Electronics
EN	Davinci Computer Shop
EO	Calco Software
EP	Richard Francis
EQ	Microtek Ltd
ER	Diskwise Ltd
ES	Control Technology
ET	Comp Shop
EU	Micro Computer Prods
EV	GW Computers
EW	C/WP Computers
EX	Metrotech Mail Order
EY	Microsystems Ltd
EZ	Superior Systems Ltd
FA	Control Universal Ltd
FB	Pete & Pam Computers
FC	Zenith Data Systems
FD	Commodore Information
FE	Logic Computers
FF	Overseas Computer
FG	Blyth Computers
FH	Taurus Computer Design
FI	HITEC (Austria)
FJ	Graffcom Systems
FK	Electronic Aids (Tewkesbury)
FL	BUG-BYTE
FM	Learning Computer Systems
FN	Jentech Services Ltd
FO	Work Force
FP	Twickenham Computer Centre
FQ	Sbd Software
FR	Beebug
FS	RAM Computer Services Ltd
FT	Ozwise Computers
FU	Compusense
FV	The Avery Computer Company
FW	Hilderbey Ltd
FX	Micromedia
FY	Wida Software
FZ	Superior Systems Ltd
GA	Eletec Serives Limited
GB	Anglo American Software
GC	Castle Electronics
GD	Quicksilva
GE	A&F Software
GF	SRS Microsystems
GG	Stirling Microsystems
GH	Microtanic Software
GI	Lander Microsystems
GJ	Computer Concepts
GK	Program Power
GL	Syrtis Software
GM	Lutterworth Software
GN	Collins Computing
GO	Datafax
GP	CCSoft
GQ	Microx
GR	Pro Software
GS	Sussex Software
GT	Rose Cassettes
GU	Axis
GV	PR Software
GW	Bridge Software
GX	Video Software Limited
GY	J M Steadman
GZ	Transform Ltd
HA	Baust Computing Consultants
HB	University Computers
HC	Educare
HD	Simon Software
HE	Docimodus
HF	M C Associates
HG	Addictive Games
HH	J K Greye Software
HI	John Prince
HJ	Titan Programs

REFERENCE

SOFTWARE LISTING

ATOM

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Write Your Own Adventure	Ut	Hopesoft	12K	C	JV	£5.75
Yan	Gm	Program Power	3K	C	GK	£5.69
Yellow Pearl	Gm	Rucksoft	7K	C	HO	£3.30

ATARI

Air Strike	Gm	English S/W	16K	C	CH,HM	£15.95
Ali Baba	Gm	Quality S/W	32K	D	HM	£22.95
Alien Hell	Gm	Syncro	24K	D	JR	£16.95
Alien Hell	Gm	Syncro	16K	C	JR	£13.95
Alpha Fighter	Gm	Dinacomp	24K	C	AB,IK	£11.99
Analog Adventure	Gm		32K	D	BC	£34.95
Angle Worms	Gm	Adventure Int.	8K	C	AB,IK	£12.50
Ants Hill	Gm	Atari	8K	C	GC	POA
					AB	£11.25
Armoured Patrol	Gm	Adventure Int.	16K	C	AB	£16.50
Arcade Baseball	Gm	Arcade Plus	16K	C	JR	£18.95
Arcade Baseball	Gm	Arcade Plus	16K	D	JR	£20.95
Assembler Editor	Ut	Atari		R	AB,HM	£39.95
Assembler	Ut	Quality S/W	16K	C	BC	£14.95
Assembler Editor	Ut	United S/W of America	16K	R	BC	£34.50
Asteroids	Gm	Atari	16K	R	AC, BC,CH, HM,IK	£29.95
					BC	£18.95
Atari Word Processor	Bs	Atari	32K	C	AB	£95.95
Atari Word Processor	Bs	Atari	32K	C	BC	£85.00
Atari Word Processor	Bs	Atari	32K	D	HM	£99.95
Atari World Graphics	Ut	United S/W of America	48K	D	BC	£43.95
Avalanche	Gm	Atari	16K	C	GC	POA
					CH	£13.95
					AB	£16.75
Babel	Gm	Atari	16K	C	GC	POA
					AB,IK	£16.75
Balrog Sampler	Gm	Adventure Int.	32K	C	AB	£24.95
Basic A Plus	Ut	OSS S/W	48K	D	BC	£52.50
Basic A Plus and Operating System A	Ut	OSS S/W	48K	D	BC	£99.50
Basic Program Compress.	Ut	Atari	32K	D	AB	£16.75
Basic Utility/Renumber	Ut	Atari	16K	C	AB	£16.75
Basics of Animation	Ed	Santa Cruz	24K	D	BC	£10.95
Basics of Animation	Ed	Atari	16K	C	BC	£9.95
Basics of Animation	Ed	Santa Cruz	16K	C	AB	£13.95
Basketball	Gm	Atari	16K	C	AC,HM,IK	£24.50
Basketball	Gm	Atari	16K	R	AB,BC,IK	£29.95
Beta Fighter	Gm	Allrian	16K	C	JS	£15.50
Beneath the Pyramids	Gm	Chrystal	48K	C	CH,AB,IK	£19.99
Beta Fighter	Gm	Artworx	16K	C	JR	£13.95
Beta Fighter	Gm	Artworx	16K	D	JR	£16.50
Black Jack	Gm	Atari	16K	C	GC	POA
					AC,BC	£8.95
					AB,HM,IK	£9.95
Black Jack Shooter	Ed	Atari	16K	C	AB	£16.75
Bob's Business	Bs	Santa Cruz	16K	C	AB	£9.95
Bridge 2.0	Gm	Allrian	24K	C	JS	£16.00
British Heritage Jigsaw Puzzle	Gm	Thorn EMI	16K	C	BC,HM,IK	£19.95
Bug Attack	Gm	Cavalier Computers	16K	C	JR	£19.25
Bug Attack	Gm	Cavalier Computers	16K	D	JR	£19.25
Bumper Pool	Gm	Atari	16K	C	GC,IK	POA
					AB	£11.25
Calculator	Bs	Atari	24K	D	BC,IK	£16.95
Canyon Climber	Gm	Datasoft	16K	D	HM	£20.00
				C	JR	£18.95
				D	JR	£19.25
Caverns of Mars	Gm	Atari	16K	C	BC,HM,IK	£24.50
Caverns of Mars	Gm	Atari	16K	C	BC,HM,IK	£24.50
Centipede	Gm	Atari	16K	R	GC	POA
					BC,HM,IK	£29.95
Champelo	Gm	Dinacomp	16K	C	AB,IK	£10.99
Character Generator	Ut	Data Soft	16K	C	BC	£9.97
Character Generator	Ut	Data Soft	16K	D	BC	£12.50
Checker Kim	Gm	Personal S/W	16K	C	BC	£15.95
Chicken	Gm	Synapse	16K	C	HM	£19.95
Chicken	Gm	Synapse	16K	D	£19.95	
Chrystals	Gm	Dinacomp	24K	C	AB,IK	£9.99
Close Encounter	Gm	Concom	16K	C	JR	£13.95
Code Cracker	Gm	Atari	8K	C	GC	POA
					AB	£11.25
Commbat	Gm	Adventure Int	24K	C	JR	£12.95
Commbat	Gm	Adventure Int	24K	D	JR	£16.95
Computer Acquire	Gm	Avalon Hill	16K	C	GB	£17.25

SOFTWARE DEALERS

Supplier Code		Supplier Code	
HK	Micro Computer Software	JI	Precision Software Engineering
HL	Phipps Associates	JJ	Spectre Soft
HM	Gemini Electronics	JK	Cornhill Services
HN	The Vic Centre	JM	Morris Associates (Computing)
HP	R & R Software	JN	Terminal Software
HQ	Town Book & Toys	JO	Mossoft Microcomputer Software
HR	Screen Scene	JP	Romik
HS	Software Masters	JQ	David Computer Software
HT	John Prince Software	JR	Creative Software
HU	Nick Godwin	JS	Allrian Data Services
HV	A.Parsons	JT	Apex Trading Ltd
HW	Bryants (Educational) Software	JU	TX Software
HX	Abersoft	JV	Hopesoft
IC	Ogre Games & Software	JW	GT Software
ID	Tridata Micro's Ltd	JX	Garland Computing
IE	Plympton Computer Services	JY	Corona Software
IF	Electronics Applied	JZ	MP Software & Services
IG	Emjay	KA	Ludinski Computer-Assisted Learning
IL	V&H Computer Services	KB	B.B.C. Publications
IM	AVC Software	KC	Miking S/W
IN	Computator	KD	Inverse
IO	Ohmega Electronics	KE	Alan Turnbull
IP	A.V.O. Software Distribution	KF	Chromasoft
IQ	Big Softie	KG	Llamasoft
IR	Adamsoft	KH	Superior Software
IS	Microcomputer Applications	KI	Earthshock Software
IT	I.J.K. Software	KJ	Bridge Software
IU	Aardvark Software	KK	ME&P Micro Products
IV	James Hager	KL	Calpac Computer Software
IW	Simon Hessel Software	KM	KCET Software
IX	Mayday Software	KN	Software for All
IY	Persoft	KO	Rucksoft
IZ	Micro-Aid	KP	Liverpool Computer Centre
JA	Hexagon Software	KQ	W.E. Hunt
JB	N. Darwood Ltd	KR	ABC Software
JC	Futura Software	KS	Rainbow Software
JE	Ultra-Tech Services	KT	Chalksoft
JF	Mr. Laird	KU	Wizard Software
JG	Gary Smith	KV	Data-Brain Software
JH	Aquarius Software		

Computer Chess	Gm	Atari	16K	R	GC	POA
					CH,AC,HM	
					AB,BC	£24.95
Conflict 2500	Gm	Avalon Hill		C	GB,AB	£12.50
Controller	Gm	Avalon Hill	32K	D	BH	£17.95
Conversational French	Ed	Atari	16K	C	AC,BC,IK	£32.50
Conversational French	Ed	Atari	16K	R	AB,HM,IK	£39.95
Conversational German	Ed	Atari	16K	C	AC,BC,IK	£32.50
Conversational German	Ed	Atari	16K	R	AB,HM,IK	£39.95
Conversational Italian	Ed	Atari	16K	R	AB,HM,IK	£39.95
Conversational Italian	Ed	Atari	16K	C	AC,BC,IK	£32.50
Conversational Spanish	Ed	Atari	16K	R	AB,HM,IK	£39.95
Conversational Spanish	Ed	Atari	16K	C	AC,BC,IK	£32.50
Convoy Raider	Gm	Avalon Hill	16K	C	BH	£10.95
					GB,AB	£12.50
Crazitack	Gm	Allrian	16K	C	JS	£16.00
Cribbage and Dominoes	Gm	Thorn EMI	16K	C	CH,BC,HM	£14.95
					,IK	
Cross Fire	Gm	On Line	16K	C	HM	£19.95
Cross Fire	Gm	On Line	32K	D	HM	£19.95
Crush, Crumble, Chomp	Gm	Avalon Hill	16K	C	GB,IK	£15.50
Crush, Crumble, Chomp	Gm	Avalon Hill	16K	D	GB,IK	£17.95
Crypts of Terror	Gm	In Home S/W	16K	C	CH,HM	£19.95
Curse of Rah	Gm	Auto Simulations	32K	C	JR	£13.80
Curse of Rah	Gm	Auto Simulations	32K	D	JR	£13.80
Curse of Crawley Manor	Gm	Adventure Int.	16K	C	AB	£16.50
Cyclod	Gm	Sirius Software	32K	D	JR	£19.25
Cypher Bowl	Gm	Artsci Inc.	32K	D	BC	£22.45
DI Nuclear Bomber	Gm	Avalon Hill	16K	C	BH	£10.95
Darts	Gm	Thorn EMI	16K	C	CH,BC,HM	£19.95
					IK	
Data Management S/W	Bs	C E S/W	48K	D	AB	£101.00
Data Management System	Do	Atari	32K	D	AB	£20.50
Datestone of Ryn	Gm	Avalon Hill		D	GB,IK	£15.50
Datestone of Ryn	Gm	Avalon Hill		C	BC	£14.95
					GB,IK	£13.50
Deadline	Gm	Infocom	32K	C	JR	£34.50
Deflections	Gm	Adventure Int.	8K	C	AB,IK	£12.50
DeLuxe Invaders	Gm	Rocklan	32K	D	JR	£22.99
Disc Fixer	Ut	Atari	16K	D	AB	£22.50
Diskassembler	Ut	Allrian	32K	D	JS	£27.95
Display List	Ed	Santa Cruz	16K	C	BC	£9.95
Display List	Ed	Santa Cruz	16K	D	BC	£10.95
Dnieper River	Gm	Avalon Hill	48K	C	BH	£15.95
					CH	£14.50
Doctor Goodcodes Cavern	Gm	Gebelli Software	32K	D	JR	£18.95
Domination	Gm	Atari	24K	C	GC	POA
					AB	£16.75
		Allrian	24K	C	JS	£16.00
Dos 2	Ut	Atari	32K	D	AB	£21.95
Dragon of Hong Kong	Gm	Adventure Int.	32K	C	AB	£16.50
Drawpic	Ut	Artworx	16K	C	JR	£22.75
Drawpic	Ut	Allrian	16K	C	JS	£24.50
Drawpic	Ut	Artworx	16K	D	JR	£25.00
Eastern Front	Gm	Atari	16K	C	CH	£24.95
Eastern Front	Gm	Atari	16K	D	AB	£30.25
Empire of the Overmind	Gm	Avalon Hill		C	BH	£17.95
					CH	£18.95
Empire of the Overmind	Gm	Avalon Hill		D	GB,AB	£24.95
Encounter at Questar IV	Gm	Allrian	24K	C	JS	£19.50
Escape from Tramm	Gm	Adventure Int.	16K	C	AB	£16.50
European Capitals	Ed	Atari	16K	C	AC,BC	£8.95
					AB,HM,IK	£9.95
European Scene Jigsaw Puzzle	Gm	Thorn EMI	16K	C	BC,HM,IK	£19.95
Extended WSNA	Ut	Atari	16K	C	AB	£19.00
Fantasy land 2041	Gm	Chrystal	48K	C	CH,AB,IK	£34.99
Fastgammon	Gm	Quality S/W	16K	C	BC	£9.95
Forest Fire	Gm	Dinacomp	24K	C	AB,IK	£15.99
Frog	Gm	C E S/W	16K	C	AB	£9.95
Frogger	Gm	On Line	16K	C	HN	£22.95
Frogger	Gm	On Line	32K	D	HN	£22.95
Galactic Chase	Gm	Spectrum	16K	C	AB,BC,HM	£15.99
Galactic Chase	Gm	Spectrum	16K	D	AB	£20.25
Galactic Chase	Gm	Spectrum	16K	D	BC,HM	£17.95
Galactic Empire	Gm	Adventure Int.	32K	C	BC	£14.95
					AB,IK	£16.50
Galactic Guest	Gm	Chrystal	48K	C	CH,AB,IK	£19.99
Galactic Trader	Gm	Adventure Int.	32K	C	AB,CH,IK	£16.50
Galaxy	Gm	Avalon Hill	16K	C	BH	£12.95
Galaxy	Gm	Avalon Hill	16K	D	BH	£14.95
Ghost Hunter	Gm	Arcade Plus	16K	C	HM	£19.95
Ghost Hunter	Gm	Arcade Plus	16K	D	HM	£22.95
Ghost Town	Gm	Adventure Int.	24K	C	BC	£14.95
					AB,IK	£16.50
Giant Slalem	Gm	Dinacomp	16K	C	AB	£11.99
Golden Voyage	Gm	Adventure Int.	24K	C	BC	£14.95
					AB	£16.50
Gomoku	Gm	Artsci Inc	16K	C	BC	£14.95
Graph it	Ut	Atari	16K	C	AC,BC,IK	£11.95
					AB,HM	£13.95
Graphic Sound Demo	Gm	Atari	16K	D	GC	POA
					AB	£16.75
Graphics Machine	Ut	Santa Cruz	16K	C	AB	£13.50
Guns of Fort Defiance	Gm	Avalon Hill	32K	C	BH	£12.95
HMS Impetuous	Gm	Adventure Int.	32K	C	AB	£16.50
Hangman	Gm	Atari	16K	C	AC,BC	£8.95
					AB,HM,IK	£9.95
Hickory Dickory Dock	Gm	Thorn EMI	16K	C	BC,HM,IK	£19.95
Home Financial Mg'ment	Dm	Thorn EMI	16K	D	HM	£29.95
Horizontal/Vertical Scrolling	Ed	Santa Cruz	16K	C	AB	£13.95
House of Usher	Gm	Chrystal	48K	C	AB,CH,IK	£19.99
Humpty Dumpty/Jack & Jill	Gm	Thorn EMI	16K	C	BC,HM,IK	£19.95
Intruder Alert	Gm	Dinacomp	16K	C	AB,IK	£15.99
Invasion Orion	Gm	Avalon Hill		C	GB,IK	£13.25
Invasion Orion	Gm	Avalon Hill		D	GB,IK	£15.75
Invitation to Prog I	Ed	Atari	16K	C	AB,HM,IK	£15.95
Invitation to Prog. II	Ed	Atari	16K	C	GC,IK	POA
					AB,BC,HM	£22.95
Invitation to Prol. III	Ed	Atari	16K	C	AB,BC,HM	£22.95
					IK	
Nautilus	Gm	Synapse	32K	C	HM	£20.00
Nomino's Jigsaw	Gm	Dinacomp	24K	C	AB,IK	£15.99
Norton Forth	Gm	Adventure Int.	32K	C	AB	£24.95
Nuke War	Gm	Avalon Hill	16K	C	BH	£10.95
Old McDonald's Farm	Gm	Adventure Int.	16K	C	AB	£12.50
Operating System A Plus	Ut	OSS S/W	48K	D	BC	£52.50
Outlaw Howitzer	Gm	Atari	24K	C	GC	POA
					AB	£16.75
Pacific Coast Highway	Gm	Datasoft	16K	C	HN	£20.00
Pacific Coast Highway	Gm	Datasoft	16K	D	HN	£20.00
Pac-Man	Gm	Atari	16K	R	GC,IK	POA
					BC,HM	£29.95
Page Flipping	Ed	Santa Cruz	16K	C	BC	£9.95
Page Flipping	Ed	Santa Cruz	16K	D	BC	£10.95
Personal Finance	Gm	Atari		R	BC,HM,IK	£49.00
Pilot (Educator)	Ut	Atari	16K			
				C/R	AB,BC,HM	£79.95
Pirate Adventure	Gm	Adventure Int.	24K	C	BC	£14.95
					AB,IK	£16.50
Planet Miners	Gm	Avalon Hill	24K	C	BH	£10.95
Player Missile Graphics	Ed	Santa Cruz	24K	D	BC	£19.95
Player Missile Graphics	Ed	Santa Cruz	24K	C	BC	£18.95
					AB	£19.95
Poker & Solitaire	Gm	Artsci Inc.	16K	C	BC	£10.95
Program Pack I	Ut	Avalon Hill	16K	C	GB	£3.50
Protector	Gm	Synapse	32K	C	HN	£19.95
Purchase Ledger	Bs	Atari	48K	C	AB,IK	£149.95
Pyramid of Doom	Gm	Adventure Int.	24K	C	BC	£14.95
					AB,IK	£16.50
QS Forth	Ut	Quality S/W	24K	D	BC	£44.90
Quest for Power	Gm	Chrystal	48K	C	CH,AB	£26.99
Race in Space	Gm	Analog S/W	16K	C	BC	£14.95
Race in Space	Gm	Analog S/W	16K	C	HN	£15.95
Race in Space	Gm	Analog S/W	16K	D	HN	£15.95
Raster Blaster	Gm	Budgeco	32K	C	HN	£22.95
Rescue at Rigel	Gm		32K	C	BC,IK	£22.45
Reversi	Gm	Artsci Inc	16K	C	BC	£14.95
Rings of the Empire	Gm	Dinacomp	16K	C	AB,IK	£15.99
Rotate and Tilt	Gm	Thorn EMI	16K	C	BC,HM	£14.95
T:A Text Display Device	Do	Allrian	16K	C	JS	£16.00
Tack Trek	Gm	Atari	24K	C	GC	POA
					AB	£13.50
Tank Trap	Gm	Quality S/W	16K	C	BC	£8.95
Tank Trap	Gm	Quality S/W	16K	D	BC	£11.95
Tanktics	Gm	Avalon Hill	32K	C	CH	£16.95
Tari Trek	Gm	Quality S/W	16K	C	BC	£8.95
Teachers Pet	Ed	Allrian	16K	C	JS	£14.00
Tari Trek	Gm	Quality S/W	16K	D	BC	£11.95
Tele Link	Gm	Atari	16K	R	HM,IK	£21.50
Tele Link	Ut	Atari	16K	R	AB,IK	£19.95
Telelink	Ut	Data Soft	16K	R	BC,IK	£14.95
Terrie	Gm	Atari	32K	C	GC	POA
					AB	£16.75
Text Editor	Bs	Allrian	32K	D	JS	£30.00
Text Wizard	Ut	Data Soft	16K	D	AB	£99.95
The Count	Gm	Adventure Int.	24K	C	BC,IK	£14.95
					AB	£16.50

REFERENCE

SOFTWARE LISTING

ATARI

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices*
The Cranston Manor Adventure	Gm	Allrian	32K	D	JS	£30.00
The Vaults of Zurich	Gm	Allrian	24K	C	JS	£19.50
The Predictor	Bs	Allrian	32K	D	JS	£27.95
The Rings of the Empire	Gm	Allrian	16K	C	JS	£15.50
Threshold	Gm	On-Line	32K	C	HM,IK	£24.95
Thunder Island	Gm	Analog S/W	16K	C	BC	£10.95
Touch Typing	Ed	Atari	16K	C	AC,BC,IK AB,HM	£14.95 £15.95
Tournament Pool and 8 Ball Pool	Gm	Thorn EMI	16K	C	CH,BC,HM IK	£19.95
Track Attack	Gm	Broada Bond	32K	D	HM	£32.95
Triple Blockade	Gm	Dinacomp	16K	C	AB,IK	£12.99
Tumble Bugs	Gm	Datasoft	24K	D	HM	£19.95
Two Heads of the Coin	Gm	Adventure Int.	32K	C	AB	£16.50
Ulysses	Gm	On-Line	40K	D	HM	£24.95
Video Easel	Gm	Atari	16K	R	GC,IK AB,BC,HM	POA £24.50
Visicalc	Bs	Personal S/W	32K	D	BC,IK	£119.95
Voodoo Castle	Gm	Adventure Int.	24K	C	BC,IK AB	£14.95 £16.50
Voyager	Gm	Avalon Hill	32K	C	CH,BH	£12.95
Waterloo	Gm	Chrystal	48K	C	CH,IK	£32.99
Wizard and the Princess	Gm	On Line	48K	D	CH,IK	£22.95
World War III	Gm	Chrystal	48K	C	CH,AB,IK	£19.99

BBC

Action of the Heart	Ed	Garland Comp.	32K	C	JX	£11.76
Algebraic Manipulation	Ut	Acornsoft	16K	C	AL,GA	£9.95
Algebraic Manipulation	Ut	Acornsoft	32K	C	AL,GA	£9.95
Airlift	Gm	Bug Byte	32K	C	KP	£5.50
Angle	Ed	Chalksoft	32K	C	KT	£6.95
Append It	Ut	Aztec S/W	16K	C	IB	£3.00
Asteroids/Frong	Gm	Aardvark Software	16K	C	IU	£4.00
Asteroid Belt	Gm	Electronics Appplied	32K	C	IF	£11.50
Backgammon	Ut	Bug Byte	32K	C	EA,KP	£8.00
Basic Maths	Ed	Aztec S/W	16K	C	IB	£3.00
Battlefield	Gm	Micro-Aid	32K	C	IZ	£2.50
Banner	Do	Micro-Aid	16K	C	IZ	£2.95
Beebmunch	Gm	I.J.K. S/W	32K	C	IT	£5.95
Beebtrek	Gm	Software for All	16K	C	KN	£7.95
Bounty Pirates	Gm	Aztec S/W	16K	C	IB	£5.50
Break-Up	Gm	Miking S/W	32K	C	KC	£3.95
Breakout	Gm	I.J.K. S/W	16K	C	IT	£3.95
Breakout	Gm	Bryants S/W	32K	C	HW	£3.75
Bridgeman	Gm	Bridge S/W	32K	C	KJ	£7.90
Carbohydrate Metabolism	Ed	Garland Comp.	32K	C	JX	£18.24
Cashbook A	Do	Micro-Aid	16K	C	IZ	£3.95
Cashbook B	Do	Micro-aid	16K	C	IZ	£3.95
Cells & Serpent	Gm	Hexagon S/W	16K	C	JA	£5.00
Centipede	Gm	Superior S/W	32K	C	KH	£7.00
Characters	Ut	Computer Concepts	32K	C	GJ	£6.67
Character Generator	Ut	MP S/W	32K	C	JZ	£3.00
Character Generator	Ut	Software for All	32K	C	KN	£4.95
Characters	Ut	Computer Concepts	16K	C	GJ	£6.67
Characters & Envelope Definer	Ut	Electronics Applied	32K	C	IF	£5.50
Chess	Gm	Bug Byte	32K	C	EA	£11.50
Claws	Ed	Bryants S/W	16K	C	HW	£3.75
Cards	Gm	Micro-Aid	16K	C	IZ	£2.95
Cobra/Robo-Swamp	Gm	Software for All	16K	C	KN	£6.95
Cobra/Robo-Swamp	Gm	Software for All	32K	C	KN	£6.95
Code Race	Gm	Computer Concepts	16K	C	GJ	£6.67
Code Race	Ut	Computer Concepts	32K	C	GJ	£6.67
Creative Graphic Pack	Ut	Acornsoft	16K	C	AL,GA	£9.95
Creative Graphics	Ut	Acornsoft	32K	C	AL,GA	£9.95
Crossed Words	Ed	Aztec S/W	16K	C	IB	£6.50
Data-Quiz	Ut	Bryants S/W	32K	C	HW	£4.88
Database	Bs	Computercat	16K	C	IJ	£11.95
Database	Bs	Software for All	16K	C	KN	£9.95
Defchr	Ut	Micro-Aid	16K	C	IZ	£2.95
Defender	Gm	Acornsoft	32K	C	AL,GA	£9.95
Desk Diary	Bs	Acornsoft	32K	C	AL,GA	£9.95
Desk Diary	Bs	Acornsoft	16K	C	AL	£9.95
Distances	Ed	Micro-Aid	32K	C	IZ	£2.95
Dissembler	Ut	Rainbow S/W	16K	C	KS	£2.50
Digital X-Word Compiler	Gm	N. Darwood	16K	C	JB	£6.00
DNA Replication	Ed	Garland Comp.	32K	C	JX	£17.65
Dragon Quest II	Gm	Bug Byte	32K	C	KP	£11.50
Dragon Quest	Gm	Bug Byte	32K	C	KP	£11.50
Drawing	Ut	B.B.C.	16K	C	KB	£10.00
Early Learning	Ed	B.B.C.	16K	C	KB	£10.00
Early Numbers	Ed	Bryants S/W	32K	C	HW	£4.80
Early Warning	Gm	A&F Software	16K	C	GE	£6.00
Eldorado Gold	Gm	Program Power	32K	C	GK	£7.99
European Studies	Ed	Aztec S/W	32K	C	IB	£6.50
Firien Wood	Gm	MP S/W	32K	C	JZ	£6.50
Flags	Ed	Micro-Aid	16K	C	IZ	£2.95
Flush	Ut	Micro-Aid	16K	C	IZ	£1.00
Frenzy	Gm	Persoft	16K	C	IY	£5.75
Fruit Machine	Gm	Bug Byte	32K	C	KP	£5.50
FORTH	Ut	Acornsoft	32K	C	AL	£16.85
Fun Games	Gm	B.B.C.	16K	C	KB	£10.00
Galaxians	Gm	Superior S/W	32K	C	KH	£7.00
Game of Logic	Ed	N. Darwood	16K	C	JB	£8.00
Games of Strategy	Gm	B.B.C.	16K	C	KB	£10.00
Genetic Code	Ed	Garland Comp.	32K	C	JX	£17.65
Geography Italy	Ed	Corona S/W	32K	C	JY	£5.00
Ghost Maze	GM	Software for All	32K	C	HN	£6.95
Grand Prix	Gm	Software for All	32K	C	HN	£5.95
Golf	Gm	Bryants S/W	32K	C	HW	£4.88
Golf	Gm	Bug Byte	32K	C	GA,EA	£7.00
Graph and Charts Pack	Bs	Acornsoft	32K	C	AL,GA	£9.95
Graph and Charts Pack	Bs	Acornsoft	16K	C	AL,GA	£9.95
Great Britain Ltd	Gm	S.W. Hessel S/W	32K	C	IW	£5.95
Hangman	Gm	Aztec S/W	16K	C	IB	£5.50
Hangman	Gm	MP S/W	32K	C	JZ	£4.00
Home Accounts	Do	Persoft	32K	C	IY	£12.50
Home Finance	Do	B.B.C.	16K	C	KB	£10.00
Inkosi	Gm	Chalksoft	32K	C	KT	£5.95
Invaders	Gm	Superior S/W	32K	C	KH	£7.00
Invaders	Gm	Software for All	16K	C	KN	£6.95
Invaders	Gm	Hexagon S/W	16K	C	JA	£6.00
Invaders	Gm	MP S/W	32K	C	JZ	£6.50
Invisible Man	Ed	Chalksoft	32K	C	KT	£5.95
Inheritance	Gm	S.W. Hessel S/W	32K	C	IW	£5.95
Inheritance	Ed	Garland Comp.	32K	C	JX	£34.70
J.R.	Gm	Software for All	32K	C	KN	£6.95
Jumbles	Ed	Bryants S/W	32K	C	HW	£4.88
La Princesse (French)	Ed	Aztec S/W	32K	C	IB	£6.50
Landfall & Serpent	Gm	GT Software	32K	C	JW	£6.50
Letters	Ed	Chalksoft	32K	C	KT	£6.95
Library Dewey Classification	Ed	Aztec S/W	32K	C	IB	£6.50
Link-4-Plus	Gm	ABC Software	16K	C	KR	£6.95
Lisp	Ut	Acornsoft	32K	C	AL,GA	£16.85
Lisp	Ut	Acornsoft	16K	C	AL,GA	£16.85
Mailing A	Bs	Micro-aid	16K	C	IZ	£3.95
Mailing B	Bs	Micro-Aid	16K	C	IZ	£3.95
Metrics (5)	Ed	Chalksoft	32K	C	KT	£9.95
Micro Maths	Ed	LCL	16K	C	KA	£24.50
Master Copier	Ut	Aztec S/W	16K	C	IB	£6.50
Maths Translation	Ed	Corona S/W	32K	C	JY	£5.00
Micro-Derby	Gm	Bug Byte	32K	C	KP	£5.50
Minefield	Gm	A&F Software	16K	C	GE	£6.00
Mission Impossible	Gm	Aztec S/W	16K	C	IB	£6.50
Mixed Games	Gm	I.J.K. S/W	16K	C	IT	£3.95
Model A Invaders	Gm	I.J.K. S/W	16K	C	IT	£4.95
Model B Invaders	Gm	I.J.K. S/W	32K	C	IT	£6.95
Money Box	Ed	Bryants S/W	32K	C	HW	£4.88
Monsters	Gm	Acornsoft	32K	C	AL,GA	£9.95
Monster Battles	Gm	Bryants S/W	32K	C	HW	£4.80
Multifile	Bs	Bug Byte	16K	C	EA	£25.00
Music	Do	B.B.C.	16K	C	KB	£10.00
Music Maker	Gm	Rainbow S/W	16K	C	KS	£3.50
Musical Numbers	Ed	Bryants S/W	32K	C	HW	£4.88
Musical Number Box	Gm	Bryants S/W	16K	C	HW	£3.75
Mutant Invaders	Gm	I.J.K. S/W	16K	C	IT	£5.95
MX 80 Type 3 Screen Dump	Ut	Software for All	16K	C	KN	£6.95
Othello	Gm	Computer Concepts	16K	C	GJ	£8.95
Othello	Gm	Computer Concepts	32K	C	GJ	£8.95
Othello	Gm	Computercat	16K	C	IJ	£8.95
Parity	Ed	N. Darwood	16K	C	JB	£6.00
Payroll	Bs	Micro-Aid	32K	C	IZ	£5.95
Payroll 2	Bs	Micro-Aid	32K	C	IZ	£5.95
Peeko Computer	Bs	Acornsoft	16K	C	AL,GA	£9.95
Picsave	Ut	Hexagon S/W	16K	C	JA	£6.00
Painting	Ut	B.B.C.	16K	C	KB	£10.00
Peeko Computer	Ut	Acornsoft	32K	C	AL,GA	£9.95
Powerboat Race	Gm	Futura S/W	32K	C	JC	£7.95
Polaris	Gm	Bug Byte	32K	C	KP	£5.50
Procvar	Ut	Micro-Aid	16K	C	IZ	£1.95
Princess	Gm	Aztec S/W	16K	C	IB	£6.50
Punctuation	Ed	Bryants S/W	32K	C	HW	£4.88
Robot	Gm	Miking S/W	32K	C	KC	£4.95
Searchbas	Ut	Micro-Aid	16K	C	IZ	£1.95
Skwosh	Gm	Miking S/W	32K	C	KC	£3.95
Seed Germination	Ed	Garland Comp.	32K	C	JX	£18.82
Sequences	Ed	Chalksoft	32K	C	KT	£5.95
Sheepdog Trials	Ed	Bryants S/W	32K	C	HW	£4.80
Shootout	Gm	MP S/W	32K	C	JZ	£5.00
Snake	Gm	Computer Concepts	32K	C	GJ	£6.67
Snapper	Gm	Acornsoft	32K	C	AL,GA	£9.95
Sort M/C	Ut	Micro-Aid	16K	C	IZ	£1.00

Sortbas	Ut	Micro-Aid	16K	C	IZ	£1.00
Soundplan	Ut	ME & P Products	16K	C	KK	£10.00
Spacefight	Gm	Miking S/W	32K	C	KC	£7.95
Space Warp	Gm	Bug Byte	32K	C	GA,EA	£11.50
Space Fighter	Gm	MP S/W	32K	C	JZ	£8.50
Space Fighter	Gm	Superior S/W	32K	C	KH	£7.00
Space Games Pack 1	Gm	Futura S/W	16K	C	JC	£3.99
Space Games Pack 2	Gm	Futura S/W	16K	C	JC	£3.99
Space Games Pack 3	Gm	Futura S/W	16K	C	JC	£4.99
Space Games Pack 4	Gm	Futura S/W	16K	C	JC	£4.99
Space Pirates	Gm	Bug Byte	16K	C	KP	£8.00
Speechparts	Ed	Bryants S/W	32K	C	HW	£4.88
Squash	Gm	Aztec S/W	16K	C	IB	£5.50
Startrek/Candy Floss	Gm	I.J.K. S/W	16K	C	IT	£5.95
Star Treck	Gm	Hexagon S/W	16K	C	JA	£5.50
Statpack	Ed	Micro-Aid	32K	C	IZ	£7.95
Storybuilder	Ed	Bryants S/W	32K	C	HW	£4.88
Stats 1	Bs	ME & P Products	16K	C	KK	£15.00
Super Hangman	Gm	I.J.K. S/W	32K	C	IT	£3.95
Tables Test	Ed	Bryants S/W	32K	C	HW	£4.88
Teacher's Toolkit	Ed	Wida Software	32K	C	FY	£30.00
The Frog	Gm	James Hager	32K	C	IV	£6.50
3D Maze	Gm	I.J.K. S/W	32K	C	IT	£3.95
Touch Typist	Ed	Computercat	16K	C	IJ	£9.95
Towns of Britain	Ed	Aztec S/W	16K	C	IB	£6.50
The Computer Programme Programs Vol 2	Do	B.B.C	32K	C	KB	£10.00
The Computer Programme Programs Vol 1	Do	B.B.C.	16K	C	KB	£10.00
Threed OXO	Gm	Micro-Aid	16K	C	IZ	£2.50
3-D Mouse Maze	Gm	Rainbow S/W	32K	C	KS	£3.50
3-D Maze	Gm	Hexagon S/W	16K	C	JA	£6.00
3D Maze	Gm	Earthshock S/W	16K	L	KI	£3.00
Utility A	Ut	Micro-Aid	16K	C	IZ	£4.95
Valley, The	Gm	CT Software	32K	C	PF	£9.95
Varkman/Meanies	Gm	Aardvark Software	16K	C	IU	£4.00
Water Relations of Plant Cells	Ed	Garland Comp.	32K	C	JX	£18.82
Whole Number Arithmatic	Ed	W.E. Hunt	32K	C	KQ	£7.95
Wordwise	Gm	Computer Concepts	32K	C	GJ	£74.75
Word Processor	Bs	Rainbow S/W	32K	C	KS	£8.00

DRAGON

Arcade Action	Gm	Apex S/W	32K	C	JT	£3.95
Berserk	Gm	Dragon Data	32K	R	DN	£19.95
Breaker	Gm	Wizard S/W	32K	C	KU	£3.50
Cosmic Invaders	Gm	Dragon Data	32K	R	DN	£19.95
Devil's Island	Gm	Apex S/W	32K	C	JT	£4.95
Dragon Selection 1	Gm	Dragon Data	32K	C	DN	£7.95
Dragon Selection 2	Ut	Dragon Data	32K	C	DN	£7.95
Examples from the Manual	Ut	Dragon Data	32K	C	DN	£7.95
Forbidden City	Gm	Apex S/W	32K	C	JT	£4.95
Fruita	Gm	Wizard S/W	32K	C	KU	£6.50

Galleons	Gm	Wizard S/W	32K	C	KU	£5.00
Gamestape 1	Gm	Apex S/W	32K	C	JT	£1.95
Gamestape 2	Gm	Apex S/W	32K	C	JT	£2.95
Gamestape 3	Gm	Apex S/W	32K	C	JT	£2.95
Ghost Attack	Gm	Dragon Data	32K	R	DN	£24.95
Graphic Animator	Ut	Dragon Data	32K	C	DN	£7.95
Haunted House	Gm	Apex S/W	32K	C	JT	£3.95
Island Adventure	Gm	Apex S/W	32K	C	JT	£3.95
Madness and the Minotaur	Gm	Dragon Data	32K	C	DN	£7.95
Meteoroids	Gm	Dragon Data	32K	R	DN	£19.95
Personal Finance	Do	Dragon Data	32K	C	DN	£7.95
Pharaoh's Curse	Gm	Apex S/W	32K	C	JT	£4.95
Quest	Gm	Dragon Data	32K	C	DN	£7.95
Sirius IV	Gm	Wizard S/W	32K	C	KU	£6.50
Triplet	Gm	Wizard S/W	32K	C	KU	£5.50
3-D Maze	Gm	Apex S/W	32K	C	JT	£3.95
Wizard	Gm	Wizard S/W	32K	C	KU	£6.50

TEXAS

3D O's and X's/Mastermind	Gm	Apex S/W	16K	C	JT	£4.95
A-Maz-Ing	Gm	Texas	8K	R	AB,CH	£24.00
Addition, Subtraction I	Ed	Texas	8K	R	AB	£35.00
Addition, Subtraction II	Ed	Texas	8K	R	AB	£35.00
Attack	Gm	Texas	8K	R	AB	£30.00
Adventure Land	Gm	Texas	8K	C	AB	£24.95
Battlefront	Gm	TX Software	16K	C	JU	£6.00
Beginning Grammar	Ed	Texas	8K	R	AB	£20.00
Blackjack Poker	Gm	Texas	8K	R	AB	£24.00
Blasto	Gm	Texas	8K	R	AB	£25.00
Car Wars	Gm	Texas	8K	R	AB,CH	£25.00
Chequebook Manager	Bs	Texas Max	16K	D	AB	£19.00
Chess File	Gm	TX Software	16K	C	JU	£6.00
Connect 4	Gm	Texas	8K	R	AB	£24.00
Early Reading	Ed	Texas	8K	R	AB	£35.00
Editor Assembler	Ut	Texas	8K	R	AB	£115.00
Electrical Eng'g Library	Bs	Texas Max	16K	C	AB	£24.00
Electrical Eng'g Library	Bs	Texas Max	16K	D	AB	£35.00
Extended Basic	Bs	Texas	8K	R	AB	£100.00
Four in a Row	Gm	TX Software	16K	C	JU	£6.00
Gamestape 1	Gm	Apex S/W	16K	C	JT	£1.95
Gamestape 2	Gm	Apex S/W	16K	C	JT	£3.95
Gamestape 3	Gm	Apex S/W	16K	C	JT	£4.95
Ghost Town	Gm	Texas	8K	C	AB	£24.95
Golden Voyage	Gm	Texas	8K	C	AB	£24.95
Golf	Gm	TX Software	16K	C	JU	£6.00
Graphing Package	Do	Texas Max	16K	C	AB	£14.00
Graphing Package	Do	Texas Max	16K	D	AB	£19.00
Hangman	Gm	Texas	8K	R	AB	£24.00
Haunted House	Gm	Apex S/W	16K	C	JT	£5.95
Household Money Management	Do	Texas	8K	R	AB	£25.00
Hunt The Wumpus	Gm	Texas	8K	R	AB,CH	£25.00
Hustle	Gm	Texas	8K	R	AB	£30.00
Lunar Lander	Gm	Apex S/W	16K	C	JT	£4.95
Mailing List	Bs	Texas Max	16K	D	AB	£60.00
Market Simulation	Bs	Texas	32K	C	AB	£9.00
Market Simulation	Bs	Texas	32K	D	AB	£19.00
Maths Routine Library	Ed	Texas Max	16K	C	AB	£24.00
Maths Routine Library	Ed	Texas Max	16K	D	AB	£35.00
Maze/Towers of Hanoi	Gm	Apex S/W	16K	C	JT	£5.95
Mind Challenges	Gm	Texas	16K	R	CH	£24.95
Minimemory	Ut	Texas	8K	R	AB	£89.95
Minimemory	Ut	Texas	8K	C	C	£89.95
Mission Impossible	Gm	Texas	8K	C	AB	£24.95
Multiplication	Ed	Texas	8K	R	AB	£35.00
Munchman	Gm	Texas	8K	R	AB	£29.95
Music Makers	Do	Texas	8K	R	AB	£35.00
Music Maker	Ed	Texas	16K	D	AB	£14.00
Music Skills Trainer	Ed	Texas Max	16K	C	AB	£19.00
Music Skills Trainer	Ed	Texas Max	16K	D	AB	£24.00
Mystery Funhouse	Gm	Texas	8K	C	AB	£24.95
Nim/O's and X's	Gm	Apex S/W	16K	C	JT	£4.95
Number Magic	Ed	Texas	8K	R	AB	£18.00
Oldies but Goodies	Gm	Texas Max	16K	C	AB	£9.00
Oldies but Goodies	Gm	Texas Max	16K	D	AB	£14.00
Othello	Gm	Texas	8K	R	AB	£40.00
Personal Financial Aid	Do	Texas	8K	C	AB	£9.95
Personal Record Keeping	Do	Texas	8K	R	AB	£50.00

REFERENCE

SOFTWARE LISTING

TEXAS

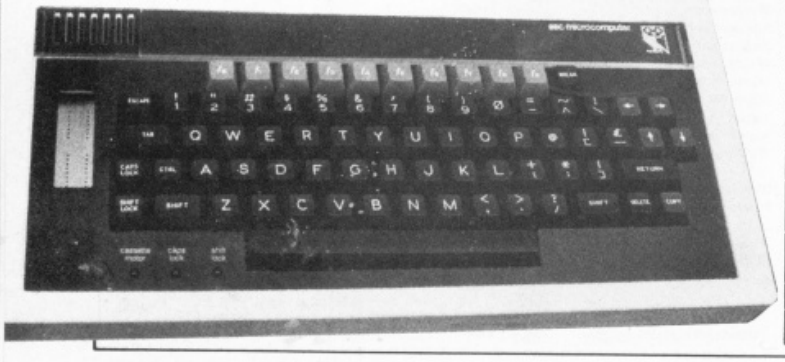
Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Personal Report Generator	Do	Texas	8K	R	AB	£70.00
Physical Fitness	Do	Texas	8K	R	AB	£20.00
Pirate Adventure	Gm	Texas	8K	R	AB	£39.95
Pre-School Learning Fun	Ed	Texas	8K	R	AB	£17.00
Programming Aids I	Ut	Texas	16K	C	AB	£9.00
Programming Aids I	Ut	Texas	16K	D	AB	£14.00
Programming Aids II	Ut	Texas	16K	D	AB	£24.00
Programming Aids III	Ut	Texas	16K	D	AB	£19.00
Pyramid of Doom	Gm	Texas	8K	C	AB	£24.95
Roulette/Craps	Gm	Apex S/W	16K	C	JT	£4.95
Savage Island I	Gm	Texas	8K	C	AB	£29.95
Savage Island II	Gm	Texas	8K	C	AB	£29.95
Saturday Night Bingo	Gm	Texas Max	16k	C	AB	£14.00
Soccer	Gm	Texas	8K	R	AB,CH	£30.00
Sorcerers Castle	Gm	Apex S/W	16K	C	JT	£5.95
Speech Editor	Ut	Texas	8K	R	AB	£35.00
Statistics	Do	Texas	8K	R	AB	£45.00
Strange Odyssey	Gm	Texas	8K	C	AB	£24.95
Structural Eng'g Library	Bs	Texas	16	C	AB	£24.00
Structural Eng'g Library	Bs	Texas Max	16K	D	AB	£35.00
TI Logo	Ut	Texas	48K	R	AB	£160.00
TI Invaders	Gm	Texas	8K	R	AB,CH	£40.00
TI Trek	Gm	Texas Max	16K	D	AB	£14.00
Teach Yourself Extended Basic	Ed	Texas	32K	C	AB	£20.00
Teach Yourself Extended Basic	Ed	Texas	32K	D	AB	£29.00
Teach Yourself Basic	Ed	Texas	32K	C	AB	£30.00
Teach Yourself Basic	Ed	Texas	32K	D	AB	£40.00
Terminal Emulator	Ut	Texas	8K	R	AB	£57.00
The Count	Gm	Texas	8K	C	AB	£24.95
Tombstone City	Gm	Texas	8K	R	AB,CH	£40.00
Tunnels of Doom	Gm	Texas	8K	R	AB,CH	£40.00
UCSD PASCAL 4	Ut	Texas	48K	D	AB	£380.00
US Football	Gm	Texas	8K	R	AB	£24.00
Video Chess	Gm	Texas	8K	R	AB,CH	£50.00
Video Games I	Gm	Texas	8K	R	AB,CH	£25.00
Video Games II	Gm	Texas	8K	R	AB	£25.00
Voodoo Castle	Gm	Texas	8K	C	AB	£24.95
Yahtzee	Gm	Texas	8K	R	AB	£30.00
Zero Zap	Gm	Texas	8K	R	AB	£24.00

TANDY COLOUR

Alcatraz II	Gm	Spectral Assoc	16K	C	IA	£8.95
Artillery	Gm	Spectral Assoc	16K	C	IA	£7.95
Battlefleet	Gm	Spectral Assoc	16K	C	IA	£13.95
Black Sanctum	Gm	Mark Data Prods.	16K	C	IA	£17.50
Bugoutc Monitor	Ut	Spectral Assoc	4K	C	IA	£19.95
Calixto Island	Gm	Mark Data Prods.	16K	C	IA	£17.50
Cave Hunter	Gm	Mark Data Prods.	16K	C	IA	£19.95
Chromasette	Gm	Cload Inc	16K	C	IA	£5.95
Color Beserk	Gm	Mark Data Prods.	16K	C	IA	£19.95
Colour Invaders	Gm	Spectral Assoc	16K	C	IA	£19.95
Compuvoice	Ut	Spectral Assoc	16K	C	IA	£44.95
Croid	Gm	Spectral Assoc	16K	C	IA	£11.95
Editor Assembler	Ut	Spectral Assoc	16K	C	IA	£34.95
Game Of Life	Gm	Spectral Assoc	16K	C	IA	£13.95
Graphic Animator	Gm	Spectral Assoc	4K	C	IA	£9.95
Laser Command	Gm	Spectral Assoc	16K	C	IA	£9.95
Lothars Labyrinth	Gm	Spectral Assoc	16K	C	IA	£13.95
Madness & Minotaur	Gm	Spectral Assoc	16K	C	IA	£17.95
Magic Box	Ut	Spectral Assoc	16K	C	IA	£24.95
Magikube	Gm	Computer Ware	16K	C	IA	£17.50
Mazerace	Gm	Computer Ware	16K	C	IA	£14.95
Meteoroids	Gm	Spectral Assoc	16K	C	IA	£19.95
Scarfman	Gm	Cornsoft	4K	C	IA	£11.95
Secs	Ut	Datasoft	16K	C	IA	£19.95
Sigmon	Ut	Datasoft	16K	C	IA	£19.95
Sound Source	Ut	Spectral Assoc	16K	C	IA	£24.95
Space Traders	Gm	Spectral Assoc	16K	C	IA	£13.95
Space War	Gm	Spectral Assoc	16K	C	IA	£19.95
Storm	Gm	Computer Ware	16K	C	IA	£19.95
Sub Hunt	Gm	Spectral Assoc	16K	C	IA	£13.95
3D Drawing Board	Gm	Computer Ware	16K	C	IA	£19.95
Typing Teacher	Gm	Spectral Assoc	16K	C	IA	£19.95
Voyager	Gm	Avalon Hill	16K	C	IA	£14.95

VIC20

3-D Maze	Gm	Adcom	8K	C	AB	£7.50
3-D Maze	Gm	Hi-Tech	3K	C	FZ	£8.30
					CF,AO	£8.62
A-Maz-Ing	Gm	Audiogenic	8K	C	AA,CH,HM	£6.99
Alien	Gm	Commodore	3K	R	FZ,AB,GF	
					CF,DM,CH	
					FD,FP,AA	£19.95
Alien Attack	Gm	Adcom	5K	C	AB	£7.00
Alien Attack	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Alien Blaster	Gm	Paysoft	5K	C	FP	£5.25
Alien Blaster	Gm	MAC	3K	C	JM	£5.50
Alien Blitz	Gm	Audiogenic	3K	C	AA,HM	£7.99
Alien Blitz	Gm	Audiogenic	5K	C	CH	£7.99
Alien Maze	Gm	Adcom	8K	C	AB	£7.50
Alien Maze	Gm	Hi-Tech	3K	C	FZ	£8.30
					CF,AO	£8.62
Alien Invasion	Gm	Computermat	3K	C	IP	£8.95
Alien Wars	Gm	Hi-Tech	3K	C	FZ	£8.30
					AY	£7.80
					CF,AO	£8.62
Amok	Gm	Audiogenic	5K	C	AA,HM	£6.99
Ant Raiders	Gm	PR Software	3K	C	HN	£7.95
					GV	£7.50
Asteroid Belt	Gm	Adcom	8K	C	AB	£7.50
Asteroid Belt	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Asteroid Blitz	Gm	Mossoft	3K	C	JO	£6.00
Asteroids	Gm	Bug Byte	5K	C	HN	£8.99
Asteroids	Gm	Arcadia	3K	C	KQ	£1.99
Astro Sled	Gm	Arcadia	3K	C	KQ	£1.99
Avenger	Gm	Commodore	3K	R	FZ,AB,GF	
					CF,DM,CH	
					FD,FP,AA	£19.95
A.V.I.T.W.	Gm	Bug Byte	5K	C	HN	£8.99
Balloon	Gm	MAC	3K	C	JM	£5.50
Balloon Bomber	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Bill Sowerbutts Gardening Hints	Do	Micro Computer S/W	16K	C	HK	£4.99
Bill Sowerbutts Gardening Hints	Do	Micro Computer S/W	16K	C	HK	£4.99
Blitz	Gm	Commodore	3K	C	FD	£4.99
Blitzkrieg	Gm	Llamasoft	3K	C	KG	£4.95
Boxing	Gm	MAC	5K	C	JM	£4.95
Booby Trap	Gm	MAC	3K	C	JM	£5.50
Bomber	Gm	Mossoft	3K	C	JO	£4.00
BOSS	Gm	Audiogenic	8K	C	HN	£14.99
Car Drive	Gm	Adcom	5K	C	AB	£7.00
Car Drive	Gm	Hi-Tech	3K	C	FZ	£8.30
					AY	£7.80
					CF	£8.62
Car Race	Gm	Adcom	5K	C	AB	£7.00
Car Race	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Cattle Roundup	Gm	Computermat	3K	C	IP	£8.95
Charset 20	Gm	Adcom	8K	C	AB	£8.00
Charset 20	Gm	Rabbit S/W	3K	C	AH	£4.99
Chase	Gm	Computermat	3K	C	IP	£8.95
Chess	Gm	Commodore	3K	R	HN	£24.95
City Bomber	Gm	Data-Brain	3K	C	KV	£3.00
Cloudburst	Gm	Audiogenic	3K	R	HN	£19.99
Code Breaker	Gm	Adcom	5K	C	AB	£5.00
Code Breaker	Gm	Rabbit S/W	3K	C	AH	£2.99
Cosmic Battle	Gm	Adcom	5K	C	AB	£8.00
Cosmic Battle	Gm	Rabbit S/W	3K	C	AH	£4.99
Cosmic Blaster	Gm	MAC	3K	C	JM	£5.50
Crazy Balloon	Gm	Hi-Tech	3K	C	CF,AO	£8.62



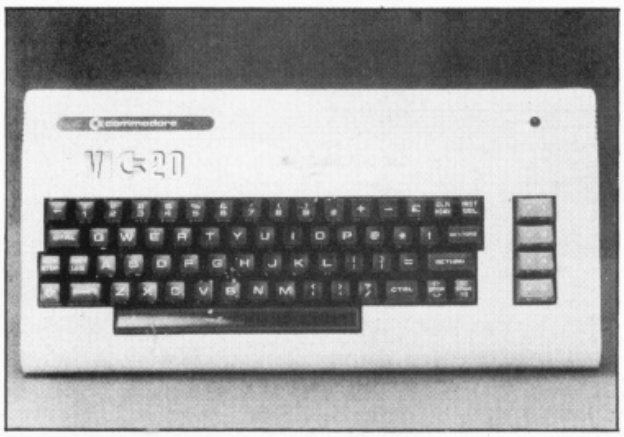
Death Maze	Gm	Mossoft	3K	C	JO	£5.00
Defenda	Gm	Llamasoft	5K	C	HN	£9.95
Deflection	Gm	Adcom	5K	C	AB	£7.00
Deflection	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Dice	Gm	MAC	3K	C	JM	£5.50
Diggles Kitchen Vol 1	Do	Micro Computer S/W	16K	C	HK	£4.99
Diggles Kitchen Vol 2	Do	Micro Computer S/W	16K	C	HK	£4.99
Diggles Kitchen Vol 3	Do	Micro Computer S/W	16K	C	HK	£4.99
Dissassembler/Data Writer/Joystick Read	Ut	Aardvark S/W	8K	C	IU	£5.00
Dive Bomber	Gm	MAC	3K	C	JM	£5.50
Dragon Maze	Gm	Adcom	8K	C	AB	£7.50
Dragon Maze	Gm	Hi-Tech	3K	C	FZ	£8.30
					CF,AO	£8.62
Dune Buggy	Gm	Rabbit S/W	3K	C	AH	£4.99
Duplicate	Gm	Paysoft	5K	C	FP	£5.25
Explosion	Gm	Big Softie	3K	C	IQ	£4.50
Fire Trek	Gm	Hi-Tech	3K	C	AY	£7.80
					FZ	£8.30
					CF,AO	£8.62
Fly Snatcher	Gm	PR Software	3K	C	HN	£7.95
					GV	£7.50
Frog/Varkman	Gm	Aardvark S/W	12K	C	IU	£5.00
Frogger	Gm	Rabbit S/W	8K	C	AH	£7.99
Editor/Softkey 24 Game Graphics & Graphics Editor	Ut	Llamasoft	3K	C	KG	£6.00
Games Tape I	Ut	Soft Toys	3K	C	IG	£8.00
Grand Prix	Gm	Hi-Tech	3K	C	HJ	£5.00
					FZ, 8.30 AY	£7.80
Graphvics	Ut	Adamsoft	3K	C	IR	£19.00
Graphvics	Ut	Adamsoft	8K	C	IR	£19.00
Gun Men	Gm	Hi-Tech	3K	C	AY	£7.80
					FZ	£8.30
					CF,AO	£8.62
Guzzle-Man	Gm	Data-Brain	3K	C	KV	£3.00
Hangman	Gm	Paysoft	5K	C	FP	£5.25
Hangman Maths	Gm	Audiogenic		C	AA,HM	£7.99
Head On	Gm	Computermat	3K	C	IP	£8.95
Hesdon	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Highways Plot	Gm	Adcom	8K	C	AB	£5.00
Hires/Multicolor Utilities	Ut	Adamsoft	3K	C	IR	£13.00
ICBM	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Invader Fall	Gm	Hi-Tech	3K	C	FZ	£8.30
					CF,AO	£8.62
Indi 500	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Inkosi	Gm	Chalksoft	8K	C	KT	£5.95
Intro. to Basic 1	Ed	Commodore	3K	C	AA,AB	£14.95
Invader Fall	Gm	Adcom	8K	C	AB	£7.50
Invader Fall	Gm	Audiogenic	3K	C	AA	£6.99
Invaders	Gm	Arcadia	3K	C	KQ	£1.99
Invisible Man	Ed	Chalksoft	8K	C	KT	£5.95
Jelly Monsters	Gm	Commodore	3K	R	AB,CF,DM GC,GF,AA CH	£19.95
Jungle	Gm	Adcom	5K	C	AB	£6.00
Jungle	Gm	Rabbit S/W	3K	C	AH	£4.99
Kiddy Checkers	Gm	Audiogenic	3K	C	AA,HM	£6.99
King	Gm	Big Softie	3K	C	IR	£13.00
Life	Gm	Big Softie	3K	C	IQ	£4.50
Line Up 4/Panic Driver	Gm	Terminal S/W	3K	C	JN	£7.95
Lunar Lander	Gm	Adcom	5K	C	AB	£7.00
Lunar Lander	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Lunar Maths	Ed	Titan	3K	C	HJ	£6.00
M/C Monitor + Graphics Aid	Ut	Arcadia	3K	C	KQ	£2.99
Machine Code Monitor	Ut	Commodore	3K	R	AA,AB	£34.95
Machine Code Monitor	Ut	Commodore	3K	R	GF	POA
Martian Raider	Gm	Romik	3K	C	JP	£9.99
Mastermind	Gm	Big Softie	3K	C	IQ	£4.50
Master Wits	Gm	Audiogenic	3K	C	AA,HM	£6.99
Maths Hurdler/Monster Merge	Gm	Audiogenic		C	AA,HM	£7.99
Maze Men	Gm	Titan	3K	C	HJ	£6.00
Maze Muncher/Reversi	Gm	Terminal S/W	3K	C	JN	£7.95
Memory Pack	Ut	Commodore	16K	R	FZ	£74.95
Memory Pack	Ut	Commodore	3K	R	FZ	£24.95
Memory Pack	Ut	Commodore	8K	R	FZ	£44.95
Meteor Run	Gm	Anglo American	3K	R	HN	£24.99
Meteroid	Gm	Adcom	5K	C	AB	£10.00
Metrics (5)	Ed	Chalksoft	8K	C	KT	£9.95
Mind Twisters	Gm	Romik	3K	C	JP	£9.99
Missile Command	Gm	Adcom	3K	C	HN	£7.95
Missile Commander	Gm	Hi-Tech	3K	C	CF	£8.62
Moak	Gm	Audiogenic	5K	C	CH	£6.99
Mole Attack	Gm	Hi-Tech	5K	C	CF,AOAB	£8.62
Moonlander	Gm	MAC	3K	C	JM	£5.50
Multi Sound Synthesiser	Do	Romik	3K	C	JP	£9.99
Music Maker	Gm	Adcom	5K	C	AB	£10.00
Music Tutor	Ed	Micro Computers S/W	3K	C	HK	£7.95
Music Tutor de Luxe	Ed	Micro Computer S/W	8K	C	HK	£8.95

Naval Attack	Gm	Titan	3K	C	HJ	£7.00
Naval Battle	Gm	Hi-Tech	3K	C	CF,AO,FZ	£8.62
New York	Gm	Paysoft	5K	C	FP	£5.25
Night Flight	Gm	Rabbit S/W	3K	C	AH	£4.99
Noughts and Crosses	Gm	Mossoft	3K	C	JO	£4.00
Othello	Gm	Hi-Tech	3K	C	FZ	£8.30
					CF	£8.62
					AO,AY	£7.80
Pack Man	Gm	Hi-Tech	3K	C	GZ	£8.30
					AO	£8.62
					AY	£7.80
Pick Up	Gm	Mossoft	3K	C	JO	£4.00
Piper	Gm	Adamsoft	3K	C	IR	£19.00
Pontoon	Gm	Mossoft	3K	C	JO	£6.00
Pontoon	Gm	Big Softie	3K	C	IR	£4.50
Programmer's Aid	Ut	Commodore	3K	R	AA,AB	£34.95
Puckman	Gm	MAC	3K	C	JM	£6.50
Rabbit Functions	Ut	Rabbit S/W	3K	C	AH	£4.99
Rabbit Writer	Ut	Rabbit S/W	16K	C	AH	£9.99
Ratman	Gm	Llamasoft	8K	C	KG	£5.00
Rat Race	Gm	Commodore	3K	R	HN	£19.95
Renaissance	Gm	Audiogenic	3K	R	HN	£19.99
Reversi	Gm	Big Softie	3K	C	IQ	£4.50
Road Race	Gm	Commodore	3K	R	FZ,AB,GF CF,DM,CH, GC,FD,FP AA	£19.95
Robot Zap	Gm	Paysoft	5K	C	FP	£5.25
Rogue Elephant	Gm	Micro Computer S/W	3K	C	HK	£4.95
Rugby Game	Gm	Adcom	5K	C	AB	£7.00
Rugby Game	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Seawolf/Bounceout	Gm	Audiogenic		C	AA,HM	£8.99
Sea Invasion	Gm	Romik	3K	C	JP	£9.99
Sequences	Ed	Chalksoft	8K	C	KT	£5.95
Shark Attack	Gm	Romik	3K	C	JP	£9.99
Simple Simon	Gm	Audiogenic	5K	C	AA,HM	£6.99
Sir Lancelot/Trekker Polaris	Gm	Aardvark S/W	12K	C	IU	£5.00
Six Program Pack: War Game, Smash Out, Black Jack, Logic, Pick Up Game, Alarm Clock	Gm	PR Software	3K	C	GV	£7.50
Ski Run	Gm	Rabbit S/W	3K	C	AH	£4.99
Skier	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Skimetts	Gm	Audiogenic	3K	C	AA	£6.99
Skramble!	Gm	Terminal S/W	3K	C	JN	£9.95
Slot Machine	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Snakeout	Gm	Computermat	3K	C	IP	£8.95
Soft Toys 1	Gm	Soft Toys	3K	C	IG	£6.50
Soft Toys 2	Gm	Soft Toys	3K	C	IG	£6.50
Soft Toys 2	Gm	Soft Toys	5K	C	IG	£8.00

SOFTWARE LISTING

VIC20

Title	Program Type	Program Produced By	Memory Reqd	How Sold	Supplier Codes	Prices
Space Defence	Gm	Adcom	5K	C	AB	£10.00
Space Defender	Gm	Hi-Tech	3K	C	CF,AO,FZ	£8.62
Space Division	Gm	Audiogenic	3K	C	AA	£6.99
Space Fighter	Gm	Arcadia	3K	C	KQ	£1.99
Space Invaders	Gm	Hi-Tech	3K	C	CF,AO,FZ	£8.62
Space Storm	Gm	Rabbit S/W	3K	C	HA	£6.99
Space Travel	Gm	MAC	3K	C	JM	£5.99
Space Wars/Battle Zone	Gm	Titan	3K	C	HJ	£6.00
Spiders from Mars	Gm	Audiogenic	5K	R	CH,AA	£24.99
Spiders of Mars	Gm	Anglo American	3K	R	AA,CH,AB CF,DM,GC	£19.95
Star Trek	Gm	Big Softie	8K	C	IQ	£4.50
Star Wars	Gm	Audiogenic	3K	C	AA	£6.99
Star Wars II	Gm	Titan	3K	C	HJ	£7.00
Stella Shootout	Gm	Adcom	5K	C	AB	£15.00
Stunt Cycle	Gm	Coloursoft	5K	C	FP	£7.75
Sub Attack/Missile Command	Gm	PR Software	3K	C	HN	£7.95
Submarine	Gm	Hi-Tech	3K	C	CF,AO,FZ	£8.62
Super Breakout	Gm	Adcom	5K	C	AB	£7.00
Super Breakout	Gm	Coloursoft	5K	C	FP	£7.75
Super Breakout	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Super Expander High Resolution Pack	Ut	Commodore	3K	R	AA,AB,FZ	£34.95
Super Lander	Gm	Commodore	3K	R	AA,AB,FZ CF,CH,DM FD,FP,GF	£19.95
Super Moonlander	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Super Slot	Gm	Commodore	3K	R	CH,GC,AA, DM,AB,FZ FD,CF	£19.95
Super Snake	Gm	Adcom	5K	C	AB	£7.00
Super Snake	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Super Worm	Gm	Rabbit S/W	3K	C	AH	£4.99
Surround	Gm	MAC	3K	C	JM	£5.50
Tailer	Gm	Mossoft	3K	C	JO	£5.00
Target Command	Gm	Computermat	3K	C	IP	£8.95
Terminal Invaders	Gm	Terminal	3K	C	JN	£7.95
The Alien	Gm	Audiogenic	88K	C	AB	£5.00
They're Off	Gm	MAC	3K	C	JM	£5.50
Traxx	Gm	Llamasoft	8K	C	KG	£10.00
Treasure Carrying	Gm	Hi-Tech	3K	C	CF,AO	£8.62
UFO Shooting	Gm	Adcom	5K	C	AB	£7.00
UFO Shooting	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Varkman/Invaders/Joystick						
Read	Gm	Aardvark S/W		C	IU	£5.00
VIC Code Monitor	Ut	Commodore	3K	R	FZ	£34.95
VIC Forth	Ut	Datatronic	3K	R	HN	£38.95
VIC Graf	Ut	Datatronic	3K	R	HN	£28.95
VIC Men	Gm	Coloursoft	5K	C	FP	£7.00
VIC Invaders	Gm	Bridge S/W	3K	C	KJ	£6.90
VIC Stat	Ut	Datatronic	3K	R	Hn	£29.95
VICalc	Ut	Audiogenic	3L	C	AA,HM	£6.99
Vicgammon	Gm	Bug Byte	8K	C	CH	£7.00
Vicmen	Gm	Anglo American	3K	C	GB	£7.00
Vic Cube	Gm	Hi-Tech	3K	C	CF,AO	£8.62
Vigil	Ut	Adamsoft	8K	C	IR	£25.00
Wall Street	Gm	Audiogenic	3K	C	AA,HM	£6.99
Wheel of Fortune	Gm	MAC	3K	C	JM	£4.95
3D Xeosy	Gm	Big Softie	3K	C	IQ	£4.50



ZX81

1K Chess	Gm	Artic	1K	C	EH	£2.95
1K Fun Learning	Ed	A.Parsons	1K	C	HV	£3.95
1K Games Pack	Gm	Artic	1K	C	BT,EH	£6.00
1K Maths	Ed	Mr Purves	1K	C	CV	£3.50
1K Super Trio	Gm	Software Masters	1K	C	AO	£7.95
16K Fun Learning	Ed	A.Parsons	16K	C	HV	£4.95
16K Games	Gm	Serious S/W	16K	C	HV	£5.95
16K Maths	Ed	Mr Purves	16K	C	CV	£3.50
3-D Labyrinth	Gm	dK'tronics	16K	C	EE	£3.95
3-D Monster Maze	Gm	J K Greye	16K	C	CN	£4.95
Adventure	Gm	Anglo American	16K	C	GB	£6.00
Adventure A	Gm	Artic	16K	C	EH,BT,CN AB	£6.00 £8.00
Adventure B	Gm	Artic	16K	C	EH,BT,CN AB	£7.00 £8.00
Adventure C	Gm	Artic	16K	C	AB,CH,BT,EH	£8.00
Adventure I	Gm	Abbersoft	16K	C	CN	£9.95
Angle	Ed	AVC Software	16K	C	IM	£3.00
Adventure	Gm	Abersoft	16K	C	CN,HX	£8.95
Action Games	Gm	A.Parsons	16K	C	HV	£4.95
Aladdin	Ed	Bryants S/W	16K	C	HW	£1.87
Arithmetic Teasers	Ed	Hard & Soft	3K	C	HZ	£3.95
Around Europe in 80hrs	Gm	S W Hessel	16K	C	CN	£4.25
Assembler	Ut	Artic	16K	C	EH	£6.95
Art & Fun	Gm	A.Parsons	16K	C	HV	£4.95
Asset Stripper	Gm	Micro Games	16K	C	CN	£4.50
Asteroids	Gm	Quicksilva	16K	C	CN	£5.50
Atoms	Ed	AVC Software	16K	C	IM	£3.00
Astro Invaders	Gm	John Prince S/W	16K	C	HT	£3.65
Bagatelle	Gm	Cambell Systems	1K	C	CN	£4.00
Bank Account	Bs	Transform	16K	C	GZ	£8.75
Bank Account	Bs	Transform	32K	C	GZ	£10.75
Battleships/Kami-Kazi Drive	Gm	V&H Computer	16K	C	IL	£3.50
Battle of Britain	Gm	Micro Games	16K	C	CN	£4.50
Beam Analysis	Bs	Hilderbay	16K	C	FW	£25.00
Biology 1	Ed	AVC Software	16K	C	IM	£3.00
Biology 2	Ed	AVC Software	16K	C	IM	£3.00
Bearings	Ed	Bryant S/W	16K	C	HW	£1.87
Breakout	Gm	Anglo American	16K	C	GB	£4.50
Breakout	Gm	Bug Byte	1K	C	CN	£3.50
Brick-Stop	Gm	R & R Software	16K	C	HP,HQ	£3.75
Budget & Address Book	Do	Mr Purves	16K	C	CV	£4.00
Budget Programs (2)	Bs	Hilderbay	16K	C	FW	£17.00
Bumper 7	Gm	Software Masters	1K	C	AO	£4.95
Cassette 1	Gm	Michael Orwin	1K	C	DF	£3.80
Cassette 2	Gm	Michael Orwin	1K	C	DF	£5.00
Cassette 3	Gm	Michael Orwin	16K	C	DF	£5.00
Cassette 4	Gm	Michael Orwin	16K	C	DF	£5.00
ZX-Scaramble						
Gunfight						
Invaders						
Galaxy Invaders						
Snakebite						
Fungaloids						
Life						
3D Tic Tac Toe						
Cassette G10	Gm	Psion	16K	C	BO,DW	£5.95
Backgammon						
Cassette G11	Gm	Psion	16K	C	BO,DW	£6.95
Chess						
Cassette G12	Gm	Psion	8K	C	BO,DW	£4.75
Perilous Swamp						
Sorceror's Island						
Cassette G13	Gm	Psion	16K	C	BO,DW	£3.95
Space Raiders						
Bomber						
Cassette G14	Gm	Psion	16K	C	BO,DW	£5.95
Flight Simulation						
Cassette G2	Gm	Psion	16K	C	BO,DW	£4.95
Feet/Metres Conversion						
Rings Round Saturn						
Secret Code						
Mind Boggling						
Silvelte						
Memory (Educ)						
Cassette G3	Gm	Psion	16K	C	BO,DW	£4.95
Train Race						
Challenge						
Secret Message						
Mind That Meteor						
Character Doodle						
Currency Conversion						
Cassette G4	Gm	Psion	16K	C	BO,DW	£4.95
Down Under						
Submarines						
Doodling With Graphics						
Invisible Invader						
Reaction						
Petrol Conversion						
Cassette G5	Gm	Psion	16K	C	BO,DW	£4.95
Martian Knockout						
Graffiti						
Find the Mate						
Labyrinth						
Drop a Brick						

Continental (Educ)						
Cassette G6	Gm	Psion	16K	C	BO,DW	£4.95
Galactic Invasion						
Journey into Danger						
Create						
Nine Hole Golf						
Solitaire						
Daylight Robbery						
Cassette G7	Gm	Psion	16K	C	BO,DW	£4.95
Race Track						
Chase						
Nim						
Tower of Hanoi						
Docking the Spaceship						
Golf						
Fascinating Tower of Hanoi (problem)						
Cassette G8	Gm	Psion	16K	C	BO,DW	£4.95
Tower Trail						
Blank						
Cassette G9	Gm	Psion	16K	C	BO,DW	£6.95
Bio-Rhythms						
Your Bio-Rhythms						
Catacombs	Gm	J K Greye	16K	C	CN	£4.95
Catalogue	Ed	Bryants S/W	16K	C	HW	£1.87
Centipede	Gm	dK'tronics	16K	C	EE,CN	£4.95
Centipede (Graphics)	Gm	dK'tronics	16K	C	EE	£4.95
Champions Quiz	Ed	Rose Cassettes	16K	C	CN	£4.50
Character Predictor	Do	Hard & Soft	1K	C	HZ	£3.95
			3 K			
Chess	Gm	Micro Gen	16K	C	DZ	£6.50
Chess Board	Gm	Hard & Soft	1K	C	HZ	£3.95
Chess 1.4	Gm	Abersoft	16K	C	HX	£8.95
Chess II Special	Gm	Artic	16K	C	EH	£45.00
Claws	Ed	Bryants S/W	16K	C	HW	£1.87
Compound	Ed	AVC Software	16K	C	IM	£3.00
Computer Count ZX	Bs	Silicon Tricks	16K	C	CN	£7.95
Constellation	Gm	Anglo American	16K	C	GB	£8.00
Counter	Gm	Pizzel	16K	C	CN	£5.50
Critical Path Analysis	Bs	Hilderbay	16K	C	FW	£15.00
Crystal Ball	Do	Hard & Soft	1K	C	HZ	£3.95
			3 K			
Cursor Input	Ut	Serious S/W	1K	C	II	£2.95
			1 6 K			
Damsel & the Beast	Gm	Anglo American	16K	C	GB	£6.50
Damsel & the Beast	Gm	Bug Byte	16K	C	CN	£6.50
Data Base	Bs	Mr Purves	16K	C	CV	£10.00
Data Base	Ut	Cambell Systems	16K	C	CN	£10.00
Data File/Graphics	Ut	V&H Computer	16K	C	IL	£2.50
Death Isle	Gm	Buffer	16K	C	CN	£4.50
Defender	Gm	Quicksilva	16K	C	CN	£5.50
Deflex	Gm	dK'tronics	16K	C	EE	£3.95
Dictator	Gm	Anglo American	16K	C	GB	£9.00
Dictator	Gm	Bug Byte	16K	C	CN	£9.00
Diggles Kitchen S/W	Do	Micro Computer	16K	C	HK	£4.99
Diggles Kitchen Vol 1 S/W	Do	Micro Computer	16K	C	HK	£4.99
Diggles Kitchen Vol 2 S/W	Do	Micro Computer	16K	C	HK	£4.99
Diggles Kitchen Vol S/W	Do	Micro Computer	16K	C	HK	£4.99
Double Breakout	Gm	Beam Software	1K	C	BT	£6.00
Dragon Maze/Life	Gm	Software Masters	16K	C	AO	£6.95
Electricity	Ed	AVC Software	16K	C	IM	£3.00
Encounter	Gm	Pixel	16K	C	CO	£5.50
Fast Life	Gm	dK'tronics	16K	C	EE	£3.95
Financial Package	Bs	Hilderbay	16K	C	FW	£8.00
Football Manager	Bs	Addictive Games	16K	C	HG	£7.95
					CN	£9.95
Forces	Ed	AVC Software	16K	C	IM	£3.00
Forensic	Ed	AVC Software	16K	C	IM	£3.00
Forth Compiler	Ut	Artic	16K	C	EH	£35.00
Fortress/Pontoon	Gm	V&H Computer	16K	C	IL	£3.50
French	Ed	AVC Software	16K	C	IM	£3.00
GB Ltd	Gm	S W Hessel	16K	C	CN	£5.25
GCE Maths	Ed	Rose Cassettes	16K	C	CN	£4.50
Galaxian	Gm	Artic	16K	C	EH,BT	£3.95
					AB	£5.50
Galaxy Warrior/Star Trek	Gm	Artic	16K	C	EH,BT	£6.50
					AB	£5.50
Games Pack I	Gm	Silversoft	16K	C	CN	£4.95
General Knowledge	Ed	A.Parsons	16K	C	HV	£4.95
Geography	Ed	Psion	16K	C	BO,DW	£6.95
Geography	Ed	AVC Software	16K	C	IM	£3.00
Gold	Gm	Hilderbay	16K	C	CN,FW	£8.00
Gobbleman	Gm	Artic	16K	C	EH	£3.95
Graph	Ed	AVC Software	16K	C	IM	£3.00
Golf	Gm	R & R Software	16K	C	HP,HQ,HR	£3.75
Gospel Stories	Ed	Bryants S/W	16K	C	HW	£1.87
Grapix 2	Ut	Nick Godwin	16K	C	HU	£6.99
Greedy Gulch	Gm	Phipps Associates	16K	C	HL	£5.00
Gulp	Gm	Cambell Systems	16K	C	CN	£4.00
Hangman	Gm	Nick Godwin	16K	C	HU	£2.99
Hedgehog & Co	Gm	Buffer	1K	C	CN	£3.00
High Res. Graphics	Gm	Macronics	16K	C	CN	£4.00
History	Ed	Psion	16K	C	BO,DW	£6.95
House of Gnomes	Gm	Anglo American	16K	C	GB	£7.00
Human Biology 1	Ed	AVC Software	16K	C	IM	£3.00
Human biology 2	Ed	AVC Software	16K	C	IM	£3.00

Inheritance	Gm	S W Hessel	16K	C	CN	£4.25
Invaders	Gm	Anglo American	16K	C	GB	£4.00
Invaders	Gm	Bug Byte	16K	C	CN	£4.00
Invaders	Gm	Quicksilva	16K	C	CN	£5.50
Invaders	Gm	Abersoft	16K	C	HX	£4.45
Inventions before 1850	Ed	Psion	16K	C	BO,DW	£6.95
Junior English I	Ed	Rose Cassettes	16K	C	CN	£4.50
Junior English II	Ed	Rose Cassettes	16K	C	CN	£4.50
Junior Maths I	Ed	Rose Cassettes	16K	C	CN	£4.50
Junior Maths II	Ed	Rose Cassettes	16K	C	CN	£4.50
Kingdom of Nam	Gm	Micro Games	16K	C	CN	£4.50
Knockout Whist	Gm	Anglo American	16K	C	GB	£4.00
Labyrinth	Gm	Axis	16K	C	CN	£5.95
Labyrinth	Gm	Software Masters	16K	C	AO	£5.95
Language Dictionary	Ut	Hewson	16K	C	DT	£3.75
Life	Gm	Artic	2K	C	BT	£3.00
Line Renumber	Ut	Hewson	16K	C	DT	£4.95
Love and Death	Gm	Automata	1K	C	CN	£5.00
Machine Code Monitor Disassembler	Ut	Micro Gen	16K	C	DZ	£3.95
Madame ZX81	Do	AVC Software	16K	C	IM	£3.00
Magic Cube	Gm	Cambell Systems	16K	C	CN	£4.00
Magic Mountain	Gm	Phipps Associates	16K	C	HL	£5.00
Man Page	Gm	Newsoft	16K	C	CN	£4.00
Master Maths IV	Ed	LCL	16K	C	CN	£5.00
Master Maths V	Ed	LCL	16K	C	CN	£5.00
Master Mind	Gm	Hard & Soft	3K	C	HZ	£3.95
Mathematics	Ed	Psion	16K	C	BO,DW	£6.95
Maths	Ed	A.Parsons	16K	C	HV	£4.95
Maths Pack	Ed	Artic	4K	C	BT	£11.00
Matrix Planner	Bs	G Asher	16K	C	CN	£6.00
Mazeman	Gm	Abersoft	16K	C	CN,HX	£4.45
Mazogs	Gm	Bug Byte	16K	C	CN	£9.00
Minefield	Gm	R & R Software	16K	C	HP,HQ	£3.75
Mini Space Invaders	Gm	Hewson	1K	C	DT	£3.95
Mission Impossible	Gm	Buffer	16K	C	CN	£4.50
Multifile	Ut	Anglo American	16K	C	GB	£17.50
Music & Composers	Ed	Psion	16K	C	BO,DW	£6.95
Music/Breakout/Invaders	Gm	Macronics	1K	C	CN	£7.95
Namitar Raiders	Gm	Artic	16K	C	EH	£3.95
Nasty Invaders	Gm	Giltrole	16K	C	DC	£4.95
Nasty Mountain	Gm	Giltrole	16K	C	DC	£4.95
Nightmare Park	Gm	Software Masters	16K	C	AO	£6.95
Novelists & Authors	Ed	Psion	16K	C	BO,DW	£6.95
Nowotnik, Demolition & Tenpin	Gm	Phipps Assoc	16K	C	HL	£5.00
Numerology	Gm	Carnell	16K	C	CN	£4.50
Odd One Out	Gm	Nick Godwin	16K	C	HU	£1.50
Office	Bs	Nick Godwin	16K	C	HU	£4.99
O Level Chemistry	Ed	Calpac	16K	C	CN	£4.95
O Level French	Ed	Rose Cassettes	16K	C	CN	£4.50
On Your Marks	Ed	Computatutor	16K	C	EH	£3.95
Optimisation Package	Bs	Hilderbay	16K	C	FW	£20.00
Oracle's Cove	Gm	Doric	16K	C	CN	£6.95
Passwords	Gm	Giltrole	16K	C	DC	£3.95
Payroll	Bs	Hilderbay	16K	C	AB,FW	£25.00
Payroll	Bs	V&H Computer	16K	C	IL	£11.50
Payroll/Coin Analysis	Bs	V&H Computer	16K	C	IL	£12.65
Personnel Record System	Bs	Computator	16K	C	IN	£9.95
P-E-P	Ut	R & R Software	4K	C	HP,HQ,HR,HS	£5.95
Pharaoh's Tomb	Gm	Phipps Associates	16K	C	HL	£5.00
Phipps Adventures I	Gm	Phipps Associates	16K	C	CN	£5.00
Phys Prob	Ed	AVC Software	16K	C	IM	£3.00
Pilot	Gm	Hewson	16K	C	DT	£5.95
Planet Defender	Gm	John Prince S/W	16K	C	HT	£3.65
Planet Lander	Gm	Hewson	1K	C	DT	£3.75
Plotter	Ut	Nick Godwin	16K	C	HU	£4.99
Poets & Playwrites	Ed	Psion	16K	C	BO,DW	£6.95
Program Merge	Bs	ACS	16K	C	CN	£5.50
Program Pack I	Gm	Bug Byte	1K	C	CN	£3.50
Program Pack I	Ut	Anglo American	16K	C	GB	£3.50
Program Pack II	Gm	Bug Byte	16K	C	CN	£4.50
Program Pack II	Ut	Anglo American	16K	C	GB	£3.50
Program Pack III	Gm	Bug Byte	1K	C	CN	£3.50
Program Pack IV	Gm	Bug Byte	16K	C	CN	£4.50
Program Pack V	Gm	Bug Byte	16K	C	CN	£4.50
Program Pack IV	Gm	Bug Byte	16K	C	CN	£4.50
Program Store	Bs	ACS	16K	C	CN	£5.50
Program Store Toolkit	Bs	ACS	16K	C	CN	£5.50
Programmer's Toolkit	Ut	Hewson	16K	C	DT	£6.50
Purchase Ledger	Bs	Transform	16K	C	GZ	£8.75
Purchase Ledger	Bs	Transform	32K	C	GZ	£10.75
QS Asteroids	Gm	Quicksilva	4K	C	GD	£5.50
QS Defenders	Gm	Quicksilva	4K	C	GD	£5.50
QS Invaders	Gm	Quicksilva	8K	C	GD	£5.50
QS Scramble	Gm	Quicksilva	4K	C	GD	£5.50
Revamped Chess	Gm	Micro Gen	16K	C	DZ	£6.50
Reversi	Gm	Abersoft	16K	C	HX	£4.95
Revise Chemistry	Ed	Sci-Soft	16K	C	CN	£7.50
Revise Maths	Ed	Sci-Soft	16K	C	CN	£5.50
Revise Physics	Ed	Sci-Soft	16K	C	CN	£7.50
Sales Ledger	Bs	Transform	16K	C	GZ	£8.75
Sales Ledger	Bs	Transform	32K	C	GZ	£10.75
Scramble	Gm	Quicksilva	4K	C	GD	£5.50
Screenkit I	Bs	Picturesque	16K	C	CN	£4.95
Secret Valley	Gm	Newsoft	16K	C	CN	£6.50
Secret of Tenworth Manor	Gm	Hilderbay	16K	C	AB	£14.95
Shop Window	Bs	Cambell Systems	16K	C	CN	£7.00
Similes	Ed	AVC Software	16K	C	IM	£3.00

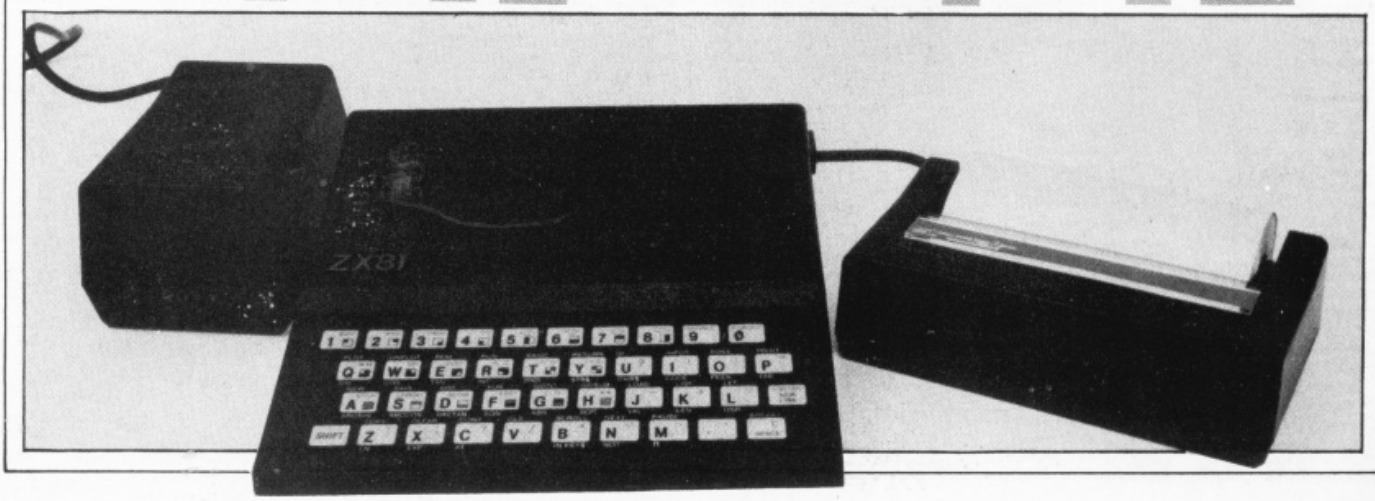
SOFTWARE LISTING

ZX81

Title	Program Type	Program Produced By	Memory Reqd	How Sold	Supplier Codes	Prices
Snap	Gm	Hard & Soft	3K	C	HZ	£3.95
Sorcerer's Castle	Gm	Micro Gen	16K	C	DZ	£3.95
Space Intruders	Gm	Hewson	4K	C	DT	£5.95
					CN	£4.95
Space Invaders	Gm	Macronics	16K	C	CN	£4.95
Space Invaders	Gm	Macronics	1K	C	CN	£3.95
Space Invaders	Gm	dK'tronics	16K	C	EE	£4.95
Space Invaders/Planetoids	Gm	Software Masters	16K	C	AO	£6.95
Space Trek	Gm	Beam Software	16K	C	BT	£8.00
Spellbound	Ed	Transform	16K	C	GZ	£3.75
Spelling	Ed	Psion	16K	C	BO,DW	£6.95
Star Fighter	Gm	R & R Software	16K	C	HP,HQ	£3.75
Star Quest	Gm	Pizzel	16K	C	CN	£5.50
Star Quest	Gm	Pixel	16K	C	CO	£5.50
Star Trek	Gm	Buffer	16K	C	CN	£4.50
Star Trek	Gm	Bug Byte	16K	C	CN	£5.00
Star Trek	Gm	Macronics	16K	C	CN	£3.95
Star Trek	Gm	Silversoft	16K	C	CN	£4.95
Star Trek	Gm	Abersoft	16K	C	HX	£4.95
Sargon Chess	Gm	Hilderbay	16K	C	AB	£22.50
Statistics	Bs	Hewson	1K	C	DT	£3.75
Stock Book	Bs	A.Parsons	16K	C	HV	£9.95
Stock Control	Bs	Hilderbay	16K	C	AB,FW	£25.00
Stocktaker	Bs	D.C. Roberts	16K	C	HY	£6.50
Subspace Striker	Gm	Pixel	16K	C	CO	£5.50
Super Breakout	Gm	Essential S/W	1K	C	CN	£6.00
Super Invasion	Gm	Beam Software	1K	C	BT	£6.00
Super Invasion	Gm	Essential S/W	1K	C	CN	£6.00
Super Program I						
Pints/Litres Conversion						
Invasion from Jupiter						
Skittles						
Magic Square						
Doodle						
Kim						
Liquid Capacity	Gm	Psion	16K	C	BO,DW	£4.95
Super Wumpus	Gm	Silversoft	16K	C	CN	£4.95
Tables	Ed	AVC Software	16K	C	IM	£3.00
Tarot	Ed	V&H Computer	16K	C	IL	£2.50
Tables Test	Ed	Bryants S/W	16K	C	HW	£1.87
Ten Exciting Games	Gm	Beam Software	1K	C	BT	£6.00
Test Pack	Ed	Mr Purves	16K	C	CV	£7.50
The Bible	Gm	Automata	1K	C	CN	£5.00
The Collector's Pack	Do	Psion	16K	C	BO,DW	£9.95
The Fast One	Bs	Cambell Systems	16K	C	CN	£15.00
The Plug Record Recorder	Do	Psion	16K	C	BO,DW	£9.95
The War Game	Ed	AVC Software	16K	C	IM	£3.00
Time Bandits	Gm	Newsoft	16K	C	CN	£4.50
Time Ledger	Bs	Hilderbay	16K	C	FW	£15.00
Toolkit	Ut	Artic	16K	C	EH	£5.95
Trader	Gm	Pixel	48K	C	CO	£9.50
Very Nasty Mountain	Gm	Giltrole	16K	C	DC	£6.95
Video Index	Bs	Video Software	16K	C	CN	£9.95
Video-add	Bs	Video Software	16K	C	CN	£5.95
Videograph	Ed	Video Software	16K	C	CN	£5.95
Videomap	Ed	Video Software	16K	C	CN	£5.95
Videoplan	Bs	Video Software	16K	C	CN	£5.95
Videoview	Do	Video Software	16K	C	CN	£5.95
Volcanic Dungeon	Gm	Carnell	16K	C	CN	£4.50
Vucalc	Bs	Psion	16K	C	BO,DW	£7.95
Vufile	Bs	Psion	16K	C	BO,DW	£7.95
What can I do with 1K	Do	V&H Computer	1K	C	IL	£4.95
Wordfix	Ut	Nick Godwin	16K	C	HU	£2.50
Wordpack	Ed	Wida Software	16K	C	FY	£19.00
Wordsearch/Clock Calendar	Do	V&H Computer	16K	C	IL	£3.50
ZX Bomber	Gm	Micro Gen	16K	C	DZ	£3.95
ZX Breakout	Gm	Micro Gen	16K	C	DZ	£3.95
ZX Bug	Gm	Artic	16K	C	EH	£6.95
ZX Chess I	Gm	Artic	16K	C	CN,EH,BT	£6.50
ZX Chess II	Gm	Artic	16K	C	CN,BT	£13.00
					EH	£9.95
ZX Forth	Ut	Artic	16K	C	AB	£35.00
ZX Graphical Chess	Gm	Artic	16K	C	CN	£13.00
ZX Othello	Gm	MOI	16K	C	CN	£6.95
ZX Scramble	Gm	Micro Gen	16K	C	DZ	£3.95
ZX Space Invaders	Gm	Micro Gen	16K	C	DZ	£3.95
ZX81 Chess	Gm	Software Masters	16K	C	AO	£6.90
ZXAS	Bs	Bug Byte	16K	C	CN	£5.00
ZXDB	Bs	Bug Byte	16K	C	CN	£6.50
ZXMC	Bs	Picturesque	16K	C	CN	£6.50
Zombie/Sword of Peace	Gm	Artic	16K	C	BT,EH	£6.50
					AB	£5.50
Zombies	Gm	R & R Software	16K	C	HP,HQ	£3.75
ZOR	Gm	Pizzel	16K	C	CN	£5.50
ZOR	Gm	Pixel	16K	C	CO	£5.50

ZX SPECTRUM

Adventure	Gm	Abersoft	48K	C	HX	£9.95
Alien	Gm	Spectre Soft	16K	C	JJ	£3.95
Angles	Ed	AVC Software	16K	C	IM	£3.00
Arcade Pack 1	Gm	Ohmega Electronics	16K	C	IO	£4.82
Assembler	Ut	Artic	16K	C	EH	£9.95
Associative Database System	Do	Docimodus	16K	C	JD	£15.00
Atoms	Gm	B.G. Cornhill	16K	C	JK	£5.50
Bit, Byte Rotation	Ut	B.G. Cornhill	16K	C	JK	£4.50
Bomber	Gm	Llamasoft	16K	C	KG	£2.95
City	Gm	Docimodus	48K	C	JD	£8.00
Count-down	Ed	AVC Software	16K	C	IM	£3.00
Database	Do	Chromasoft	16K	C	KF,CN	£4.50
Digital X-Word Compiler	Gm	N. Darwood	8K	C	JB	£6.00
Escape	Gm	New Generation S/W	16K	C	CH,CN	£4.95
Fortune	Do	AVC Software	16K	C	IM	£3.00
French	Ed	AVC Software	16K	C	IM	£3.00
Game of Logic	Ed	N. Darwood	16K	C	JB	£8.00
Galaxian	Gm	Artic	16K	C	EH	£3.95
Gobbleman	Gm	Artic	16K	C	EH	£3.95
Graph	Ed	AVC Software	16K	C	IM	£3.00
Graph	Ut	Spectre Soft	16K	C	JJ	£4.95
Graphics Creator	Ut	Llamasoft	16K	C	KG	£2.95
Great Britain Ltd	Gm	S.W. He				£14.39
Hangperson	Ed	AVC Software	16K	C	IM	£3.00
Hangman	Gm	Spectre Soft	16K	C	J	£4.95
Inheritance	Gm	S.W. Hessel S/W	48K	C	IW	£5.95
Learning	Ed	AVC Software	16K	C	IM	£3.00
Magic Cards	Gm	B.G. Cornhill	16K	C	JK	£3.50
Mazing	Gm	Spectre Soft	16K	C	JJ	£4.95
Mazeman	Gm	Abersoft	16K	C	HX	£4.95
Namitar Raiders	GM	Artic	16K	C	EH	£3.95
Parity	Ed	N.Darwood	16K	C	JB	£6.00
Payroll	Bs	V&H Computer	48K	C	IL	£14.65
Physprob	Ed	AVC Software	16K	C	IM	£3.00
Reversi	Gm	Spectre Soft	16K	C	JJ	£4.95
Space Inturders	Gm	Quicksilva	16K	C	GD	£5.85
Spectral Invaders	Gm	Bug Byte	16K	C	CH	£5.00
Tables	Ed	AVC Software	16K	C	IM	£3.00
Turtle	Ed	AVC Software	16K	C	IM	£3.00
User-Defined Graphics	Ut	B.G. Cornhill	16K	C	JK	£1.50
Wordprocess	Bs	Spectre Soft	16K	C	JJ	£4.95



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MIDLAND HOTEL
April 22/23/24

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MICROTERMS

Get to grips with terminology in this month's issue dictionary. A quick reference guide to common computer jargon.

Address
A label or name (usually a *binary* or *hexadecimal* number) specifying a particular *memory* location.

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

Assembly Language
Means of representing *program* statements in mnemonics and conveniently handling *memory* addressing by use of symbolic terms.

BASIC
Beginner's All Purpose Symbolic Instruction Code. An easy to learn, widely used computer language.

Bit
A single *binary* digit, representing either a 'one' or a 'zero'.

Bug
An error in *software*.

Byte
A *binary* number, usually of eight *bits*. It can represent a number from 0 to 255 (8-bit byte) as there are 256 possible combinations of "ones" and 'zeros" eight bits long.

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

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

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

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

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

Debug
To correct the errors in a *program*.

Disc
Magnetic storage device allowing fast random access to a large volume of *data*. A full-size hard disc will hold, say, 5 *megabytes* or more; a smaller *floppy disc* typically holds from 80 to 250 *kilo* bytes but in either case the capacity is being increased all the time.

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

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

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

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

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

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

Gcol
A colour command used in BBC Basic.

Hard Copy
A computer printout or listing on paper.

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

Hex
Shortened version of hexadecimal, meaning '6 plus 10', which is a funny way of saying 16. It refers to the number system with a base of 16. This uses 0 to 9 and then A to F of the alphabet to represent its 16 digits. Two hex digits can be conveniently used to represent a byte (eight bits).

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

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

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

I/O
Input/Output. A computer generally has one or more *ports* through which it communicates with 'the outside world' — *peripheral* devices such as a *keyboard*, video display *(VDU)*, *printer* etc. An I/O port may be just an input or just an output or it can be bidirectional.

Kilo (K)
Normally means 1000, but stands for1024 (2^{10}) when referring to memory.

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

Location
Physical position; *memory* location is the same as *address*.

Loop
Program technique where one section of program (the loop) is performed many times over.

Machine Language (or Code)
The lowest (and most tediously detailed)

level of *program instructions*. All higher level coding must be converted to *machine language* (by *compiler* or *interpreter)* before a *processor* can obey it.

Memory Map
Chart showing how *memory* is used by a computer. The arrangement of *data* and *program* within the memory.

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

Modulator
A device, included in every good hobby computer, which takes the computer's output and converts it to an RF signal on a suitable TV channel, giving you a cheap, convenient visual display.

Monitor
(1) The first level of computer *operating systems:* the *program* which turns *machine code* commands into action, managing input, output etc.
(2) A TV-type device which is specially constructed to handle video signals from a computer that does not have a *modulator*.

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

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

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

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

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

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

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

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

Print Out
Same as *hardcopy*.

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

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

Qwerty
The traditional typewriter keyboard layout adopted by computer designers.

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

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

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

ROM
Read Only Memory. *Memory* device which has its *data* content established as part of manufacture and cannot be changed.

Routine
A whole *program* or part of a program designed to perform a single function or action.

RS232
A communications *interface* used for *modems* and for serial *printers*.

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

Software
The different kinds of *program* required to work a computer.

Source Code
Program written in one of the *high-level languages* and requiring *compilation* into *machine language* before use.

String
A sequence of characters used in a program.

Subroutine
A part of a *program* which performs a specific task and which is available for use elsewhere in a program, as often as you like.

Syntax
The grammar of a programming *language*.

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

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

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

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

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

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

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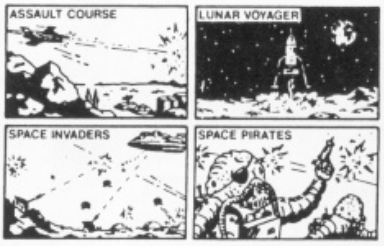

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